Is Textese a Threat to Traditional Literacy?
Dutch Youths' Language Use in Written
Computer-Mediated Communication and
Relations with their School Writing

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Chapter 1. Introduction

Textese

The language use in Dutch youths' written computer-mediated communication (CMC) via new media has for many years aroused worries that it might affect literacy skills and especially formal written language (Crystal, 2006, 2008; Spooren, 2009). Examples (1)–(6) below illustrate this informal register. These digital messages are composed in what is called 'textese',[1] 'digitalese', 'CMC language', or in Dutch '*digitaal*' ('digi-talk'). They are filled with non-standard language: all the words in bold deviate from Standard Dutch. These messages exemplify that youths' 'textiquette' or 'CMC netiquette' does not require them to follow standard language conventions:[2] orthographic and grammatical norms are generally loosened in CMC. Many people see this non-adherence to traditional norms of correctness in spelling, grammar, and punctuation as language transgressions, even as the breakdown or "bastardization" of language (O'Connor, 2005). Such 'transgressions' abound in (1)–(6).

(1) **Haaj**,
     In de **bijlaguh** vinden jullie de chronologie van **Geschichte**. Alvast veel **suc6** met leren **ofzow**! En een prettig weekend gewenst. **=P**
     xxxusjes lieke.
     ('Haay,
     In the attachmunt you can find the chronology of Geschichte. Gud luck with studying or somethin! And have a nice weekend. =P
     xxxisses lieke.')

(2) **halloooootjesss**!
     hierissiedan! En zo snel mogelijk **terugmeeelen he :P**. In de bijlage staan ook **GS** samenvatting §4 en van het hele hoofdstuk (van internet **ofzo?:S**).
     Greetz von L.I.E.K.E.
     ps.: veel leer/oefenplezier **;)**.
     ('hellowdy!
     hereitis! And maaail back asap right :P. In the attachment are also HI summary §4 and of the entire chapter (from the web maybs?:S).
     Greetz von L.I.E.K.E.
     ps.: have lots of fun studying/practising ;).')

(3) **Jahaa**, ze zijn ingevoerd. Mijn deel **iig**. 500-539. Ik neem aan dat je die van jou zo spoedig mogelijk stuurt **:P**. **Groetjus li&k&.**

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[1] Although it obviously originated in 'text messaging,' the term 'textese' now refers to CMC language in general, not just in text messages.

[2] As defined by the Urban Dictionary, which is an "absolutely unacademic" but "useful" Internet-based dictionary of English slang (De Decker & Vandekerckhove, 2012:332), textiquette is a "code that governs the expectations of social mobil[e] texting behavior."

('Yeeesh, they've been entered. My part neways. 500-539. I assume that you will send yours as soon as possible :P. Greets li&k&.')

(4) **haaloo**.
Hier is het huiswerk weer. Misschien heeft iemand nog zin om de teksten die erbij horen door te lezen? **iknie :P**. **Maja** tot **mogu**.
mzlxlieke
('heeloo.
Here is the homework again. Maybe someone still feels like reading the corresponding texts? idont :P. Butyeah see you tomrow.
baixlieke')

(5) **Jow**. Stop. Veel plezier nog met **PO**. Stop. Tot **mogu** 7.30 uur. Stop. Neem je paraplu mee. Stop. Groeten. Stop. Lieke. Stop.
[leuk **he zown** mailtje in morse **;P**]
('Yo. Stop. Have fun with PA. Stop. See you 2morrow 7.30 am. Stop. Bring your umbrella. Stop. Regards. Stop. Lieke. Stop.
[nice rite such n email in morse code ;P]')

(6) **Haaj**, Hier zijn de samenvattingen van tekst 2-9, behalve 8. veel **suc6** met leren! de **groenten**, **kuzz liekje**.
('Haay, Here are the summaries of texts 2-9, except 8. gud luck with studying! rgds, kizz liekje.')

These messages are typical of textese. Characteristic of such CMC language is a frequent disregard for standard grammar and spelling conventions, which is reflected in the prevalence of 'textisms', i.e. orthographically unconventional words. The examples in (1)–(6) show many deviations in terms of spelling, which include abbreviations (*GS*, *ofzo*, *iig*, *PO*), reduplicated letters (*halloootjesss*, *terugmeeelen*, *haaloo*, *kuzz*), phonetic respellings (*Haaj*, *bijlaguh*, *ofzow*, *terugmeeelen*, *Jahaa*, *Groetjus*, *mogu*, *Jow*, *zown*), alphanumeric homophones (*suc6*), an accent stylization (*issie*), a clipping (*nie*), a contraction (*mzl*), a visual respelling (*li&k&*), and miscellaneous unconventional spellings (*xxxusjes*, *Greetz*, *groenten*, *kuzz*). Deviations can also be found in orthographic details such as capitalization (missing or extra: *lieke*, *halloootjesss*, *hierissiedan*, *L.I.E.K.E.*, *ps*, *Hier*, *veel*, *de*, *liekje*), spacing (missing: *hierissiedan*, *iknie*, *mzlxlieke*), punctuation (extra or missing: *L.I.E.K.E.*, *iig*, *Groetjus li&k&.*), and diacritics (missing: *he*). Distinctive typographic CMC-language features are emoticons (=P, :P, :S, ;), ;P) and symbols (*xxx*, *x*) – and nowadays also emoji (absent in examples (1)–(6)). Syntactic deviations from Standard Dutch writing occur in the form of omissions (ellipsis of preposition: *samenvatting [van] §4*; ellipsis of article: *met [de] PO*) and sentence fragments (*En zo snel mogelijk terugmeeelen he*; *van internet ofzo?*). Finally, we also see lexical elements that are characteristic of CMC among youths, namely borrowings from English (*Greetz*) and in these messages also from German (*Geschichte*, *von*), as well as informal interjections (*Haaj*, *halloootjesss*, *he*, *haaloo*, *Maja*, *Jow*). Textese has been found to have many similar characteristics in other languages

(Rúa, 2005; Bieswanger, 2006; Plester et al., 2011), but the present thesis focuses on Dutch youths' written CMC and its supposedly corruptive impact on their writings in an educational context.

Language Corruption?

The CMC messages presented in (1)–(6) above were written over a decade ago by the author of this thesis. They are authentic personal emails to classmates from 2006, when the author was 16-17 years old, so of adolescent age. The author was in grammar school with classics, i.e. in higher secondary education; nevertheless, she still greatly deviated from Standard Dutch in her online messages to peers. Such deviations are at the heart of adults' fears of language deterioration due to written CMC and new media. These fears are still very much present in the Netherlands, as shown by a recent survey among about 2,300 Dutch people over the age of 50 (MAX Magazine, 2018a, 2018b). Although some respondents (16%) saw textese as an enrichment of the Dutch language, many more (63%) were annoyed by this 'chat language'. A great majority (84%) of the respondents believed that the Dutch language was deteriorating and 80% felt that the Dutch government should take actions against this deterioration. What is more, as the main culprit of language corruption, 73% of the participants identified the rise of social media, the Internet, smartphones, and other forms of digitalisation – where, according to one of the respondents, everything is typed concisely, carelessly, and hurriedly (MAX Magazine, 2018a, 2018b). Clearly, many respondents had a prescriptivist view on language, favouring Standard written Dutch over the informal register often used by youths in written CMC, because they feel that the former is inherently 'better' and 'correct', whereas the latter is 'incorrect'. They believe that young people just want to get their digital messages across as rapidly and succinctly as possible, irrespective of standard language rules that are violated along the way, and fear that this may somehow corrupt the Dutch language. Such fears are responded to by the recent television language quiz 'De S.P.E.L.-show' (2018), whose hostess links deteriorating language skills to digitalisation, specifically the widespread use of spell checkers (Tienhooven, 2018).

Fears of language corruption are fuelled by anecdotal evidence of textisms intruding into school writings (Henry, 2008; Stoffelen, 2016), but may stem from a lack of understanding (the point) of textese. Many adults remain puzzled by the unconventional orthography and shorthand that have become an essential part of online youth culture (EditieNL, 2016; Jolly, 2017). This fear of the unknown is what may lead to severe criticism of textese. Any lexicographic attempts of creating handbooks or 'grammars' of Dutch CMC language (e.g. Daniëls' (2009) SMS/chat dictionary) are not very helpful either, since linguistic realisations depend upon the user, the medium, and the situation in which the communication takes place, and single words can be spelled in various ways (Waldron, Kemp, & Wood, 2015), witness *thanks*, *thnks*, *thanx*, *thnx*, and *tnx*. Moreover, the fast-moving nature of CMC language, similar to that of other youth languages (Van Wijk & Den Ouden, 2006), prevents it from being properly codified: as Bennis (2015) suggests, 'WhatsApp language' may already be replaced by a different variety of CMC language in a few

years from now (213), similar to how 'SMS language' and 'MSN language' were once all the rage (Roos, 2007), but have now become outdated.

Not only textese, but also the CMC landscape is diverse and in constant change. For example, a wildly popular chat program in the Netherlands in the first decade of the twenty-first century was MSN Messenger. In 2004, over 4 million people used MSN – 85% of the Dutch Internet population who chatted online, with more than 22 million chat conversations held per day via MSN (NU.nl, 2004); still, it was cancelled in 2013. Another example is the Dutch social networking site Hyves, which used to be massively popular in the Netherlands. Despite having over 6 million users and even being the most used search word via Google.nl in 2008 (Trouw, 2008; NU.nl, 2008), it was also cancelled in 2013, due to the growing popularity of Facebook (NU.nl, 2013). These are both clear testimonies to the changeability of the CMC landscape. The rapid changes in both CMC language and the new media via which youths communicate cannot but intensify existing fears among elderly people about possible language degradation. The present study aims to determine whether such fears are irrational or, conversely, well-founded. Before investigating any possible impact of CMC on literacy, we first need to clearly define the central concepts of CMC and new/social media, and ascertain their use in the Netherlands.

Computer-Mediated Communication

Over two decades ago, CMC was defined as "communication that takes place between human beings via the instrumentality of computers" (Herring, 1996:1), but CMC is now no longer restricted to computers, as it can also take place via digital tools such as mobile phones, smartphones, tablets, and even smartwatches. Accordingly, it has also been called 'internet-mediated communication' (IMC), 'digitally mediated communication' (DMC) and 'electronically mediated communication' (EMC), and – more briefly – 'digital communication' and 'electronic communication' (Lotherington, 2004; Crystal, 2006; Yus, 2011; Herring, 2012; Tagg, 2015). Related terms are 'computer-mediated discourse' (CMD), 'electronic discourse' (Herring, 2001; Watt, 2010), and in reference to synchronous CMC, 'interactive written discourse' (Ferrara, Brunner, & Whittemore, 1991; Werry, 1996; Hård af Segerstad, 2002; Dresner & Barak, 2006). The study of CMD, defined as "the communication produced when human beings interact with one another by transmitting messages via networked computers" (Herring, 2001:1), can be regarded as a specialization within the broader study of CMC, emphasizing dialogue and using a discourse analysis approach. Throughout this thesis, 'computer-mediated communication' and its corresponding abbreviation CMC are used when referring to the transfer of digital messages, because these are more well-known terms.

CMC has become widely used by youths as well as adults all over the world. Van Dijck (2013) attributes this popularity to the "culture of connectivity": the omnipresence of new media causes us "to move many of [our] social, cultural, and professional activities to these online environments" and to stay constantly connected online through computers and mobile phones (4). The use of CMC has been growing globally for years, due to massive increases in the ownership of smartphones (phones with additional functionalities including Internet access),

laptops, and tablets (Consultancy.nl, 2018). In the Netherlands, especially the ownership of smartphones has grown rapidly in the last years. While in 2013 fewer than 75% of Dutch people owned a smartphone, in 2017 over 93% reported owning a smartphone, making the Netherlands the country with the highest smartphone penetration of all countries researched (Consultancy.nl, 2018): the #1 smartphone country worldwide.

Digital communication tools are used at increasingly younger ages; even children are receiving mobile phones and are embracing social media nowadays (Van Gaalen, 2017; Van der Veer et al., 2018). It may hardly come as a surprise that in our top-ranked smartphone country, nearly all Dutch adolescents and young adults own a smartphone or at least a mobile phone: according to the Dutch Central Bureau for Statistics, 98% of Dutch youths between the ages of 12 and 25 own a mobile phone or smartphone, whereas 94% and 76% respectively own a laptop/netbook or tablet (CBS StatLine, 2018). Almost all youths use the Internet for communication and social media, with 97.5% using it for social networking and 96% for exchanging text messages (CBS StatLine, 2018). One apparent difference in new media use between adolescents (12-17) and young adults (18-25) is whether they only use it for social networking or also for professional networking; the latter function is barely used by adolescents, but becomes more important as youths become older (CBS StatLine, 2018). In the Netherlands, the most used social medium is currently WhatsApp with 11.5 million users in 2018, followed by Facebook with 10.8 million users (Van der Veer, Boekee, Hoekstra, & Peters, 2018). The mobile chat application WhatsApp is widely used by younger generations: a staggering 97% of all youths between 15 and 19 use WhatsApp (Van der Veer et al., 2018). Its immense popularity is not dwindling either: in fact, the number of WhatsApp users in the Netherlands has slowly but steadily increased in the last years, while the number of Facebook users has stagnated here and has even decreased somewhat among youths up to 20 years old (Van der Veer et al., 2018). All this tells us that although the popularity of specific social media is subject to change, the overall use of CMC, particularly via smartphones, remains at an all-time high. This is connected with the rise of new media – from *MSN Messenger* and *Hyves*, to *WhatsApp* and *Facebook*, to *Snapchat* and *Instagram*: a new medium for social networking catches on every few years, which makes it unlikely that CMC will ever bore the younger generations.

New Media, Social Media

As noted above, CMC can take place via various digital tools, but can also involve various media. New media have been defined as "information and communications media using digital technologies, including technologies for the creation and storage of text, still and moving images and sound, and the distribution of this content through local computing systems and the Internet" (Cope & Kalantzis, 2010:87). Nowadays, most technologies described as new media are digital: new media include the Internet, in its various forms, and video games. They can be distinguished from 'old media', i.e. the traditional, mainstream mass media, which consist of print media, such as books, newspapers, and magazines; and broadcast media, such as films,

television, radio, and audio recordings.[3] The distinction between old and new media has been described by Kress (2003) as the "older media of book and page" versus the "new media of information and communication" (48–9), but this implies that broadcast media are also new media, a view which is now outdated. Several characteristics set new media apart from old media: multimodality (combinations of the written modality with other modes, e.g. visual or aural), interactivity (two-way communication; bi- instead of unidirectionality), 'despatialized simultaneity' (real-time communication without being in the same place), integration of different functions (interpersonal and mass media communications), and an impact on social relations (such as opportunities for group participation and stretched boundaries between familiarity and formality) (Kress, 2003:5–6; Van Kruistum, 2013:16–7). New media that are participatory, interactive, interpersonal, and involve social relations can be called social media.

This thesis focuses on three new media, which could all be called 'social': on classic text messaging (SMS), on the microblogging platform *Twitter*,[4] and on instant messaging (IM) via two media – the formerly popular desktop application *MSN Messenger* and the now popular mobile application *WhatsApp*.[5] Text messaging, instant messaging, and microblogging all usually involve brief, informal digital messages. Other social media include social networking sites (SNS, platforms to make one's social network visible via a (semi-)public profile, e.g. *Facebook*), visual media sharing platforms (VMSP, for exchanging user-generated content, i.e. photos or videos, e.g. *Instagram*, *YouTube*), online forums (message/discussion boards, e.g. *FOK!forum*), chat rooms (public Internet spaces for chatting, often with strangers about shared interests, e.g. *ChatPlaza*), and virtual social worlds (web-based simulated environments, e.g. *Second Life*) (Hoffmann & Bublitz, 2017). Even social news sites (websites that feature user-posted stories, e.g. *Reddit*), wikis (collaboratively written webpages on knowledge-sharing sites, e.g. *Wikipedia*), marketing sites (web shops, e.g. *Amazon*), and gaming sites (e.g. *FarmVille*) are called social media (Van Dijck, 2013), but communication is not the main purpose of these media.

In contrast with texting, IMing, and tweeting, CMC in some other new media – that likewise have communication as their primary purpose – can involve longer and more formal messages, for example emailing and blogging. Formal CMC deviates much less from standard language norms and its impact on school writing will hence be much more limited in comparison to informal CMC. Emails and blog posts, which can range from informal to formal depending on the communicative goal (personal vs. professional communication) and intended audience

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[3] Van Kruistum (2013) rightly points out, though, that 'old' and 'new' are relative terms: "what is considered new changes over time in the eyes of those who use media and researchers who study their uses" (15). This means that media now still seen as 'new' will at some point no longer be classified as new media.

[4] Microblogs have been described as "a blend of blogging, text messaging and social networking" (Tomita, 2009:186). They consist of short sentences, hyperlinks, or individual images.

[5] Mobile instant messaging, of which WhatsApp is a prime example, has been referred to with the acronym MIM (Church & De Oliveira, 2013).

(friends/family vs. colleagues or general audience), as well as the business- and employment-oriented networking site *LinkedIn*, are therefore not the focus of the present thesis. What this thesis focuses on instead is further explained in the next section.

Research Questions and Structure of Thesis

The main question the present thesis attempts to answer is as follows: what is the impact of written computer-mediated communication on Dutch youths' literacy? A subquestion that will be addressed is whether (and if so, how) youths' age and educational level affect any relationship between CMC use and writing skills. The research questions will be explored in three steps, corresponding to the three parts of this thesis. These three parts, together with this introduction and the discussion, make up eleven chapters.

The first part of this thesis presents the theoretical background on CMC and literacy. Chapter 2 reports on a theoretical study to explore previous literature into conceptualisations of literacy in the present digital age, in which CMC is omnipresent. It discusses sundry valuable suggestions that have been put forward in previous studies about reconceptualising literacy into new literacies, since the traditional notion of literacy, viz. reading and writing print-based texts, according to many people no longer suffices nowadays. Still, as chapter 3 shows, such new literacies are not the focus of prior research into the effects of online writing on literacy. Chapter 3 presents an extensive overview of how previous researchers have studied the possible impact of written CMC on literacy and what they found. Studies to date have all focused on CMC affecting traditional literacy: my empirical research acknowledges and follows this conservative approach, thus focusing on young people's traditional writing skills in an educational context. This choice is also motivated by the limited practical applicability of new literacies (no standardised tests, how to measure them?) and, above all, by the widespread worries about the impact of written CMC, which are all about formal writing and spelling – aspects of traditional literacy. The latter chapter is based on a published paper in a peer-reviewed journal (Verheijen, 2013), which has been greatly expanded and updated.

In order to find out if, and if so, how, written CMC use affects school writings, we first need to establish how the language used by Dutch youths in informal CMC exactly deviates from Standard Dutch. The second part of this thesis presents several quantitative corpus studies into Dutch youths' language use in their written CMC, based on manual analyses of nearly 400,000 words of social media messages, to investigate this question. This part is divided into two subparts. Part 2.1 is about the data collection, i.e. compiling a corpus of Dutch youths' written CMC. Chapter 4 presents a short paper on how in addition to the CMC data that were already present in an existing corpus, namely data from MSN, SMS, and Twitter, additional data representing private social media messages were collected for the corpus studies – in

particular, WhatsApp chats and Facebook posts (Verheijen & Stoop, 2016).[6] Part 2.2 concerns the data analysis. This is split up into three studies, focusing on different aspects of CMC language. Chapter 5 presents a preliminary corpus study into Dutch adolescents' and young adults' use of textisms in their written CMC in different media, which was published in a conference proceedings (Verheijen, 2015). Chapter 6 reports on a more in-depth paper on the use of these unconventional orthographic features in CMC, focusing on the functions of textisms and how their use interacts with the author's age and the medium in which the digital messages were composed; this has been published in a peer-reviewed journal (Verheijen, 2018). Chapter 7 is a book chapter on youth language use in Dutch written CMC, further exploring the differences between CMC language and Standard Dutch and their interaction with medium and age, not just in terms of orthographic features, but also including typographic, syntactic, and lexical features (Verheijen, 2017). These three chapters together provide a close to complete picture of the linguistic characteristics of Dutch youths' CMC language.

The third and final part of this thesis focuses on relations between Dutch written CMC and traditional literacy, specifically school writing. This has been explored in three studies. Chapter 8, a brief conference paper, compares linguistic characteristics of Dutch youths' written CMC to school writings, focusing on several lexical and syntactic measures, to determine whether youths indeed employ different registers in the writing contexts of CMC and school (Verheijen, 2016). The final two chapters start from the premise that youths' frequent switching between the two registers in which they are proficient, i.e. the textese used in informal CMC and the Standard Dutch they are supposed to use in more formal contexts such as at school, is similar to bilinguals' switching between their first and second language, and that consequently, youths might experience interference of the other register in the process of switching, similar to how bilinguals may experience interference of their first of second language. It is also considered whether this interference might be greater for youths who use CMC frequently or intensively and whether it depends on youths' age group or educational level, i.e. whether more interference occurs with adolescents than young adults, and more with lower- than higher-educated youths. Chapter 9 presents the results of a survey study, in which 400 Dutch youths participated, which aimed to find correlational evidence for relationships between youths' written CMC use and the text quality of their school writings (Verheijen, Spooren, & Van Kemenade, submitted). Chapter 10 reports on an experimental study, with 500 youths as participants, into the direct impact of WhatsApp on Dutch youths' performance in productive as well as receptive school writing tasks, i.e. on the quality of their school writings and their results on grammaticality judgement tasks. The goal of this last study was to empirically determine the causality of possible connections between CMC use and school writing skills: does CMC indeed interfere with literacy? (Verheijen & Spooren, submitted).

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[6] The Facebook data remain to be analysed in future studies. They were not analysed for the present thesis, since most submissions were from (young) adults, so Facebook posts from adolescents were lacking.

Chapter 11, finally, presents the general discussion, including an overview of the main findings, implications of the results, limitations of the studies presented in this thesis, suggestions for further research, and my current conclusion on the effects of informal written CMC on Dutch youths' school writings.

Societal and Scientific Relevance

Since CMC has become part and parcel of youths' communicative practices, the so-called "Gr8 Db8" has arisen: people have conflicting opinions on the possible effects of CMC on traditional literacy (Crystal, 2008). As mentioned above, many adults fear that CMC is detrimental to youths' writing skills, or even to (the Dutch) language in general. For example, they believe that too much exposure to non-standard forms in CMC may come to replace the standard representation of words in youths' mental lexicons – or, simply put, may cause them to forget the standard spelling or grammar. Such concerns have been openly expressed in the media (Thurlow, 2006; Postma, 2011), as exemplified in newspaper headlines such as "Techspeak Ruining Kids' Grammar" (Mlot, 2013) and "Help, My Child Writes in Textese" ("*Help, mijn kind schrijft in digi-taal*," Van Baars, 2014). On the other hand, there are also some linguists who point out the possible language benefits of CMC, such as creativity and playfulness with written language, more motivation to read and write, increased exposure to written texts, and even a greater awareness of letter-sound correspondences in language – the latter due to abbreviations based on sounds, e.g. *strax* < *straks* ('later'), *suc6* < *success* ('success') (Van Oostendorp, 2003; Baron, 2005; Crystal, 2008; Wood, Kemp, & Plester, 2013; Blom, 2014; Tagg, 2015; Waldron, Kemp, & Wood, 2015). This debate has continued up to the now popular social medium WhatsApp (e.g. Sánchez-Moya & Cruz-Moya, 2015b). The ongoing debate gives great societal relevance to any study into the impact of written CMC on literacy. As one of the first studies into this issue in the Dutch context (after Spooren, 2009; Radstake, 2010; Van Dijk et al., 2016), the present thesis aims to make a valuable contribution to the Gr8 Db8.

Furthermore, this thesis provides considerable insight into what literacy entails in this age of CMC, a comprehensive overview of how it has been reconceptualised since the 1970s, and a detailed discussion of how these new literacies compare to traditional literacy. More importantly, this thesis is also scientifically relevant in that it is one of the first ever major studies in the Netherlands (besides Bennis, 2015) to empirically investigate how Dutch youths' informal written CMC, in the form of MSN chats, SMS text messages, tweets, and WhatsApp chats, is linguistically realised and how that differs from Standard Dutch.[7] Furthermore, social media corpora including WhatsApp chats are rare (see Dorantes et al. (2018) for an overview), and linguistic studies into WhatsApp even rarer (see e.g. Pérez-Sabater (2015) for an analysis of Catalan, English, and Spanish WhatsApp chats), so the present corpus and corresponding studies are a notable addition to existing research about online communication. As Barton and Lee (2013) convincingly explain (giving ten reasons), studying the online world is crucial for understanding

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[7] This has already been investigated in Flanders by De Decker (2015).

language; accordingly, the present thesis helps to understand current digital language practices. Waldron, Kemp, and Wood (2015) note that most prior research has focused on relations between CMC use and specific literacy or language skills and that it is "important to look further at relationships with higher-level writing skills" (191): that is exactly what the present doctoral research does. In addition, this thesis provides new ways to scientifically determine the writing quality of Dutch texts, specifically when written in an educational context, via a diverse set of linguistic features and by effectively using analysis software called T-Scan (Pander Maat et al., 2014). Moreover, the studies reported here on the impact of the register of informal CMC on the register of Standard Dutch, as displayed in school writing, can yield new insights into reverse transfer (Gass & Selinker, 2008): whether a frequently used second register interferes with the previously acquired register – or, conversely, whether youths display an ability to keep these registers separate.

Co-Authors' Contributions

The present thesis is thus based on eight papers (corresponding to chapters 3 to 10), three of which were co-authored. This section summarizes each author's contribution to these three papers.

The second author of the paper presented in chapter 4 is Wessel Stoop (Verheijen & Stoop, 2016). He created the website to collect WhatsApp chats, as well as the application to scrape Facebook posts from users' timelines, and carried out the maintenance of both websites. I created the website to collect Facebook posts, promoted both websites in local and national media, designed the informed consent forms, obtained ethical approval for the data collection project from Radboud University's Ethics Assessment Committee, conducted the preliminary data analysis, and was the primary author of the paper.

Wilbert Spooren and Ans van Kemenade are listed as co-authors of chapter 9 (Verheijen, Spooren, & Van Kemenade, submitted). Spooren helped in conceptualising the study and in conducting the complex statistical analyses. Both Spooren and Van Kemenade helped outline the theoretical background, gave feedback on the manuscript, and made editorial suggestions; Van Kemenade especially provided advice on the structure and wording. I gathered the participants, collected and interpreted the data, conducted the analyses, and wrote the paper.

The paper presented in chapter 10 was written together with Wilbert Spooren (Verheijen & Spooren, submitted). He helped in designing the experiment and in outlining the theoretical background, and contributed to the refinement of the paper. Again, I was responsible for gathering the participants, collecting the data, conducting and interpreting the analyses, and writing the paper.

Part 1.

Theoretical Background on CMC and Literacy

Chapter 2. Literacy in the Age of Computer-Mediated Communication

Abstract

The impact of CMC on youths' literacy goes beyond their traditional literacy skills: the entire concept of literacy has evolved because of new media. This chapter problematizes the seemingly straightforward notion of literacy, by focusing on how it has been reconceptualised in previous research, in light of the digital age which has emerged in recent decades. It discusses how the old literacies of reading and writing print-based texts have traditionally been defined and why many scholars felt that there was a need for a broader conceptualisation of literacy. The numerous 'new literacies' that have been coined as a response are examined, as well as definitions for these that have been proposed in the literature. Finally, we consider whether old and new, digital literacies can co-exist.

1. Introduction

The traditional notion of literacy – reading and writing print-based texts – may no longer suffice in this 'computer age' (Tuman, 1992), 'Internet age' (Gilster, 1997), 'electronic age' (Tyner, 1998), 'digital age' (Soetaert & Bonamie, 1999), 'new media age' (Kress, 2003), or 'age of information and communication technologies (ICTs)' (Unsworth, 2008) we live in nowadays. The digital communication tools and information technologies of the last decades, in tandem with the increasingly dominant role of computer-mediated communication in our everyday lives, have changed the way we communicate. Moreover, they have prompted numerous reconceptualizations of what literacy entails. Tuman (1992) argues, when contemplating the impact of computers on literacy:

> Will they make us more or less literate? But [...] our sense of what it means to be literate is likely to shift in the very process of analysis, with the result of our arguing at cross purposes. The only solution here is to problematize literacy. (15)

This line of reasoning can also be applied to the impact of CMC on literacy. CMC, as Merchant (2007) notes, "confound[s] recent attempts to simplify or reduce literacy to a set of basic skills" (127). Several new kinds of literacy have accordingly been devised in previous research. Such 'new literacies',[8] 'emergent literacies', or

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[8] I use the word *new* in 'new literacies' in what Lankshear and Knobel (2011) call its "ontological sense" (28). This should be distinguished from 'New Literacy Studies', where *new* is used in a "paradigmatic sense" (ibid.). New Literacy Studies is a particular theoretical and research paradigm for studying literacy, a socio-cultural approach to literacy that considers literacy as practices situated in social and cultural contexts (rather than as a set of skills independent of context) and was presented as new and different from the existing

'twenty-first century literacies' are constantly evolving. They are "the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world" (Leu, Kinzer, Coiro, & Cammack, 2004:1572); in other words, "the skills needed to produce and navigate the text, graphic representations, and other media that fill the digital spaces on the Internet and various technological devices" (Sweeny, 2010:121–2). New literacies contrast with 'old literacies', which are print-, paper-, and text-based (Baynham & Prinsloo, 2009). In this age of new media, new literacies are indispensible in our personal and professional lives, to fully participate in the world "civic[ally], economic[ally], and personal[ly]" (Coiro, Knobel, Lankshear, & Leu, 2008:14). Although this thesis focuses on the impact of CMC on traditional literacy, CMC has been key in evoking these new literacies. This makes it important to not restrict ourselves to considering 'old literacies'. After determining what has traditionally been regarded as literacy, the focus of this chapter is thus on new literacies.

2. The Old Literacies of Reading and Writing

In its most basic form, literacy is often equated with the ability to read and write, which are, according to Mayer (2000), "the fundamental skills needed to be able to learn" (363–4). Various terms refer to these 'old literacies'. Since the advent of new literacies, reading and writing have usually been called traditional literacy – alternatively, conventional literacy (Lee, 2011a), classic literacy (Mayer, 2000), classical literacy (Craig, 2003; Martin, 2008), and heritage literacy (Kalantzis & Cope, 2008). Because conventional literacy practices have always been a fundamental part of school curricula, they have also been dubbed school literacy (Spatafora, 2008; Plester & Wood, 2009) or schooled literacy (Jacobs, 2008b). Other terms for reading and writing focus on the linguistic aspect, i.e. language literacy (Radi, 2002; Westby, 2010), alphabetic literacy (Tyner, 1998; Bowen & Whithaus, 2013), textual literacy (Tyner, 1998; Soetaert & Bonamie, 1999; Felten, 2008), and verbal literacy (Mayer, 2000). Classic definitions of literacy, moreover, often restrict it to reading and writing *print* texts, called print or print-based literacy (Tuman, 1992; Carrington, 2005; Livingstone, 2008), typographic literacy (Reinking, McKenna, Labbo, & Kieffer, 1998), book literacy (Calfee, 1985), even pen-and-pencil literacy (Kalmar, 1988; Winkelmann, 1995). The skills of reading and writing have thus together been referred to with a great many terms.

All these terms embrace receptive and productive skills. Reading is a receptive skill, as it concerns the comprehension of language, whereas writing is a productive skill, involving the ability to actively produce language. Literacy is often regarded as "the technical competence that enables people to read and write" (Nixon, 2003:407); this involves decoding texts for reading and encoding texts for writing. Yet even from a traditional perspective, there is no full agreement about what literacy entails:

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psycholinguistic approach (e.g. Street, 1993; Gee, 2000). New Literacy Studies focuses on the social dimension of literacy.

while many see it as just reading and writing printed language (Kress, 2003), others see literacy as a somewhat wider spectrum of communicative practices (Cope & Kalantzis, 2000). Mayer (2008), for example, states that the traditional view on literacy is that "it consists mainly of skill in reading and writing in words (as well as listening and speaking)" (359), so he mentions four skills – two productive and two receptive. Other traditional conceptualisations of literacy are even broader, such as the "ability to perform the basic functions of communication – to read, write, and speak as well as to compute and solve problems at levels of proficiency necessary to function in society" (Brown-Owens, Eason, & Lader, 2003): this definition includes speaking, but not listening, and it even includes problem solving. Despite these differences, all definitions of traditional literacy have one thing in common: they do not include any skills connected to digital tools or new media. Yet many scholars feel that the use of such media also requires some form of literacy. Therefore, they have argued for a radical change in the conceptualisation of literacy.

3. The Need for a Broader Conceptualisation of Literacy

Prior empirical studies into the impact of CMC on literacy focus on the relation between CMC and traditional literacy, as will be discussed in this thesis in chapter 3. Yet there seems to be a consensus that the rise of CMC and new media in the last decades have had a more profound impact on which literacy skills are essential now to function in the world. Over two decades ago, in 1992, Tuman (1992) already pointed out that "technology generally affects [...] our most basic understanding of what it means to be literate" (x) and that "the very term *literacy* is changing as a result of the rapid spread of computer technology" (blurb). Likewise, Reinking (1994) wrote, "as electronic technology becomes more advanced and more available, expanding our ideas about what it means to be literate seems almost inevitable" (¶1). Leu (1996) agreed, stating that "the nature of literacy [...] is being redefined by the digital technologies that are quickly becoming a part of the information age in which we live": he saw "a historic change in the nature of literacy" taking place (¶5). Along the same lines, Rizvi and Lingard (1997) felt that in this "computer-mediated communications world," there is a need to "devise new ways of thinking about literacy in which both the page and the screen are brought together" (xii). Reinking (1998) formulated this as follows:

> Digital forms of expression are increasingly replacing printed forms and there is a widespread consensus [...] that this shift has consequences for the way we communicate and disseminate information, how we approach the task of reading and writing, and how we think about helping people to become literate. (xv)

The next decade saw a similar call for a broader conceptualisation of literacy. As Gurak (2001) concluded, "in the digital age, the concept of literacy must be reconfigured if it is to be useful for helping us understand communication" (12). Similarly, Brown-Owens, Eason, and Lader (2003) asserted that classic definitions of

literacy had become insufficient: "as technology has evolved and has increasingly shaped our society, the skills we need to function successfully have gone beyond these basic elements. [...] CMC provides the basis for a new and separate literacy" (Electronic Literacies section, ¶1). Hull (2003) even stressed that there was "a most urgent need to expand our conceptions of what it means to be fully literate in new times" (230). A new literacies perspective was presented by Leu et al. (2004), because new digital technologies call for expanded definitions of literacy: "definitions of literacy must change to include electronic environments," "must consider the rapid changes we are experiencing today as new ICTs regularly emerge," "must move beyond being located in only paper-printed media," and "must acknowledge the expanded presence of multimedia" (1585–6). Jones and Flannigan (2005) also said that with "the rapidity with which technology has changed society, the concept of literacy has assumed new meanings" (3). Adopting the same standpoint, Buckingham (2006) argued that "we need a much broader reconceptualisation of what we mean by literacy in a world that is increasingly dominated by electronic media" (276). A similar point was made by Vosloo (2009): "When considering the increasingly digital lives of young people [...] taking a broader view of literacy is crucial" (3). As such, Stornaiuolo, Hull, and Nelson (2009) felt that it was "hugely important […] to widen our definitions of literacy" in this new media age (384).

Such statements continue to be made in the current decade. Indeed, Cole and Pullen (2010) wrote, "Computers and the Internet are transforming [...] the very notion of literacy itself" and added that in the digital age, "the term 'literate' is so much more than the ability to read and write" (blurb, 120). According to Mills (2010),

> Technologies for communication in the world outside of schools have ended an era dominated by the pen and paper. This is an age of multimedia authoring where competency with written words is still vital, but is no longer all that is needed to participate meaningfully in the many spheres of life. (36)

In the same way, Watt (2010) stated that "computer use has redefined and expanded what we understand as literacy skills," that "the traditional concept of literacy may no longer be appropriate in this new age" (146–7). Next, Ho, Anderson and Leong (2011) noted, "Being literate now means more than just being able to read and write the printed word," because digital media transform literacies through "dynamic processes" (2–3). Merchant (2013) added, "To 'read' new media and to function effectively in a constellation of literacy practices requires a diverse set of resources that exceed those provided through basic instruction in print literacy" (158). Bowen and Whithaus (2013) claimed that "what it means to be literate in the world today is changing" (5): alphabetic literacy, focusing on words, is no longer sufficient. Finally, Howes (in Mills, 2015) agreed that "the digital revolution has put an end to literacy as we knew it" and bluntly claimed that "the old definition of literacy as essentially alphabetical is exploded" – indeed, exploded into a myriad of literacies.

These quotes richly illustrate that for decades now, scholars have argued that although traditional conceptions of literacy may still be relevant, they are also limited

and should hence be expanded. Literacy is not a static concept: it is affected by changes in technology (Soetaert & Bonamie, 1999). In fact, "the nature of literacy has always been tightly entwined with the nature of the communication technology used in any historical period" (Karchmer, 2001:442). In short, literacy and technology are inextricably linked. The great technological changes at the end of the twentieth and in the beginning of the twenty-first century have created a need for a broader view on literacy, which includes newly emerged practices.

4. Expanding the Conceptualisation of Literacy

The technological advancements of the past decades aroused a general feeling that traditional literacy was no longer sufficient. As called for by many, literacy research eventually broadened in perspective, breaching the frontiers of the old literacies. How literacy is defined is significant, because people's "definitions shape their beliefs, agendas, and actions" (Pailliotet, 2000:xxii); put differently, "words can be the catalyst for action" (Tyner, 1998:61). Definitions can thus determine what we *think* and *do* – and in the context of literacy, they can determine what is *taught*: they can have an impact on educational views of literacy instruction and thereby influence school curricula and policies.

A multitude of new literacies have emerged since the 1970s. The proliferation of new literacies in our 'post-typographic' world in which printed texts no longer dominate (Reinking, 1998) has led literacy to encompass "a nebulous conceptual landscape" (Lotherington, 2004:67). As early as 1994, it was observed that there was a "confusing array of terms and definitions" related to literacy (McClure, 1994:116). Tyner (1998) was also early in noticing that "a constellation of multiple kinds of literacy [had] emerged to represent addenda to literacy, or aspects of literacy that are felt to be missing in its common usage" (63). The profusion of new literacies that arose stretched literacy far beyond the traditional concept, and made it a productive term – a pluralistic rather than monolithic concept. The overwhelming proliferation of all these new literacies, i.e. the "literacy boom" (Tuominen, Savolainen, & Talja, 2005:329), has greatly changed the literacy landscape. The following new literacies are most relevant in the context of CMC. Views on which skills new literacies encompass abound (Hobbs, 2006): what these new literacies exactly entail, how they are related, and how they have been defined throughout the years by the authors in the enumeration below are extensively discussed in Appendix A, which is presented at the end of this thesis.

- **computer literacy** (Watt, 1980; Hanley, Terpstra, Gillaspy, & McCoy, 1983; Hunter, 1984; Calfee, 1985; Simonson, Maurer, Montag-Torardi, & Whitaker, 1987; Besser, 1993; McMillan, 1996; Bawden, 2001; Warschauer, 2002; Childers, 2003; Kershner 1998, 2003; Pincas, 2004; Selber, 2004; Gupta, 2006; Martin, 2008; Westby, 2010) or **computing literacy** (Nevison, 1976)
- **web literacy** (Sorapure, Inglesby, & Yachtisin, 1998; Darrow, 1999; Sutherland-Smith, 2002; Salpeter, 2003; Kuiper, Volman, & Terwel, 2008), **Internet literacy** (Karchmer, 2001; Livingstone, 2008; Leung & Lee, 2012), **network literacy** (McClure, 1994; Devlin, 1997; Ngulube, Shezi, & Leach, 2009; Welsh & Wright,

2010; Ezeani, 2011; Lai, 2011), or **cyberliteracy** (Gurak, 2001; Stiller & LeBlanc, 2006; Gregson, 2008)

- **digital literacy** (Gilster, 1997; Eshet-Alkalai, 2004; Jones & Flannigan, 2005; Jones-Kavalier & Flannigan, 2006; Buckingham, 2006; Jacobs, 2006; Merchant, 2007; Bawden, 2008; Hartley, McWilliam, Burgess, & Banks, 2008; Martin, 2008; Tomita, 2009; Buck, 2012) or literacies (Lankshear & Knobel, 2008; Aleixo, Nunes, & Isaias, 2012)
- **electronic literacy** (Reinking, 1994; Winkelmann, 1995; Selfe & Hawisher, 2002; Macleod, 2005; Godwin-Jones, 2006) or literacies (Warschauer, 2002), **eLiteracy** (Martin, 2003; Martin & Ashworth, 2004), or **e-literacy** (Pincas, 2004; Joint, 2005a; Beeson, 2006; Morris & Brading, 2007; Brandtweiner, Donat, & Kerschbaum, 2010)
- **ICT literacy** (Oliver & Towers, 2000; International ICT Literacy Panel, 2002; ETS, 2003; MCEETYA, 2005; KERIS, 2011; ACARA, 2012; Gomez & Elliot, 2013)
- **media literacy** (Aufderheide, 1993; McBrien, 1999; Soetaert & Bonamie, 1999; Bawden, 2001; O'Brien, 2001; Silverblatt, 1995, 2001, 2008; Buckingham, 2006; European Commission, 2007; Frankenhuis, Van der Hagen, & Smelik, 2007; Considine, Horton, & Moorman, 2009; Brandtweiner et al., 2010; Tyner, 2010; Welsh & Wright, 2010; De Abreu, 2011; Hoechsmann & Poyntz, 2012; Cooper, Lockyer, & Brown, 2013; Potter, 2013) or literacies (Westby, 2010)
- **new media literacy** (Jones & Flannigan, 2005; Plester & Wood, 2009; Stornaiuolo, Hull, & Nelson, 2009; Van Kruistum, 2013) or literacies (Jenkins, Purushotma, Clinton, Weigel, & Robinson, 2006; Williams & Zenger, 2012)
- **multi(-)media literacy** (Mayer, 2000, 2008; Warschauer, 2002, 2007; Hull, 2003; Hobbs, 2006; Zain & Lie, 2009; Aleixo et al., 2012)
- **multimodal literacy** (Jewitt & Kress, 2003; Walsh 2008, 2010; Alexander, 2008; Yamada-Rice, 2011; Rowsell, 2013) or literacies (Bowen & Whithaus, 2013)
- **visual literacy** (Debes, 1969; Considine, 1986; Sorapure et al., 1998; Branch, 2000; Chauvin, 2003; Yancey, 2004; Jones-Kavalier & Flannigan, 2006; Frankenhuis et al., 2007; Luce-Kapler, 2007; Felten, 2008; Westby, 2010; Cooper et al., 2013)
- **computer-mediated communication literacy** or **CMC literacy** (Warschauer, 2002, 2007; Aleixo et al., 2012), or **computer-mediated communication competence** (Spitzberg, 1997, 2006; Bubaš, Radošević, & Hutinski, 2003; Bunz, 2003)
- **textured literacy** (Yancey, 2004)
- **multiliteracies** (Cazden et al., 1996; Tyner, 1998; Cope & Kalantzis, 2000; Lewis & Fabos, 2000; Luke, 2000; Unsworth, 2001; Withrow, 2004; Kitson, Fletcher, & Kearney, 2007; Alexander, 2008; Williams, 2008; Lam, 2009; Mills, 2009; Stornaiuolo, Hull, & Nelson, 2009; Cole & Pullen, 2010; Westby, 2010; Cooper et al., 2013)

The list of literacy concepts does not end here, because "virtually any sphere of life now has its own literacy, or even set of literacies" (Martin & Ashworth, 2004:4). The term literacy has become a metaphor, a vague synonym, a generic referent, a catch-all term for 'competence', 'proficiency', 'skill', 'basic knowledge', or 'being functional' (Snavely & Cooper, 1997; Martin & Ashworth, 2004; Buckingham,

2006; Lankshear & Knobel, 2011; Hoechsmann & Poyntz, 2012). Indeed, a plethora of new literacies has emerged and at this point, "almost any knowledge and learning deemed educationally [or culturally] valuable can somehow or other be conceived as a literacy" (Lankshear & Knobel, 2011:21). The following examples bear witness to literacy having acquired a metaphorical use, covering a wide range of subjects and fields:

> *functional literacy, functional Internet literacy, branching literacy, hypermedia literacy, metamedia literacy, infomedia literacy, information literacy, digital information literacy, electronic information literacy, information technology (IT) literacy, technology literacy, emerging technology literacy, technological literacy, technoliteracy, silicon literacy, library literacy, networking literacy, online literacy, hypertextual literacy, hyper-literacy, weblog literacy, critical literacy, critical digital literacy, critical media literacy, critical multimedia literacy, critical technological literacy, critical multiliteracies, representational literacy, dialogic literacy, linguistic literacy, rhetorical literacy, epistemic literacy, health literacy, advertising literacy, story literacy, procedural literacy, game literacy, games literacy, gameplay literacy, video-game literacy, video literacy, film literacy, cinematic literacy, cine-literacy, television literacy, teleliteracy, photo-visual literacy, graphic literacy, audio literacy, oral literacy, design literacy, aesthetic literacy, verbo-visual literacy, gestural literacy, dance literacy, cultural literacy, cross-cultural literacy, socio-cultural literacy, multicultural literacy, subcultural literacy, local literacy, global literacy, situated literacy, transliteracy, biliteracy, pluriliteracy, consumer literacy, civic literacy, science literacy, scientific literacy, academic literacy, research literacy, data literacy, mathematical literacy, math literacy, numerical literacy, economic literacy, financial literacy, spatial literacy, socio-spatial literacy, geographic literacy, historical literacy, ancient literacy, agricultural literacy, environmental literacy, ecological literacy, food literacy, legal literacy, political literacy, government literacy, workplace literacy, occupational literacy, survival literacy, reproduction literacy, lateral literacy, tool literacy, resource literacy, socio-material literacy, publishing literacy, communication literacy, L2 literacy, emotional literacy, socio-emotional literacy, social literacy, social-structural literacy, sensory literacy, sexual literacy, palpatory literacy, ethical literacy, moral literacy.*

Though this inventory is long, it is not likely to be comprehensive, because the list of new literacies seems endless, even including "esoteric concepts such as moral literacy" (Koltay, 2011; Tuominen, Savolainen, & Talja, 2005:330). Literacy has become as an all-purpose word, indicating some kind of competence, to which any qualifier can be added.

   Not all scholars of new literacies are content with this development. Hoechsmann and Poyntz (2012), for example, admit that they are "reluctant to transpose the term literacy from its associations with alphabet-driven textual reading and writing to multimodal (text, image, sound) encoding and decoding" (15); they would prefer to write about 'mediacy' rather than media literacy (cf. 'numeracy' for numerical/mathematical literacy and 'informacy' for information literacy). Alas, the term 'mediacy' has never been widely used. Likewise, McMillan (1996) proposed to replace the, in his view, inappropriate term 'computer literacy' by 'comperacy', but this never caught on. Despite such criticisms, new literacies continue to be coined and literacy remains a dynamic concept, with definitions of new literacies that keep changing just as digital technologies keep changing.

5. Defining New Literacies

New literacies now cover a broad range of issues. Various definitions have been provided for each new literacy (see Appendix A at the end of this thesis): they are characterized by a diversity of perspectives. As Carrington (2005) writes, "In the shift to new digital technologies," there is a "growing difficulty in defining and delineating literacy" (468). Some descriptions of new literacies encompass a wide spectrum of competences; others have more restricted conceptualisations. Nonetheless, most definitions suggest that an individual has to develop a variety of skills, separate from traditional reading and writing, to acquire some new literacy.

Definitions of new literacies focus either or both on receptive literacy skills, analogous to (critical) reading or consuming information, or on productive literacy skills, i.e. writing or producing information. The new literacies focused on production are particularly relevant in the context of Web 2.0 – the new version of the World Wide Web, with a second generation of web-based applications. Web 2.0 tools, which include social media, allow for participatory involvement, collaboration, interactivity, and dialogue. Rather than being passive consumers of websites, users can actively create, edit, and share user-generated content (UGC) on the web: they can receive and produce, read and write, thereby "operat[ing] on both sides of the communication divide" (Crystal, 2006:216). Indeed, the internet alone requires literacy to be continually redefined (Coiro et al., 2008). More recent definitions of new literacies tend to recognize the significance of both consumption and production (Hoechsmann & Poyntz, 2012), so they take a broader view on literacy.

The conceptualisations of many new literacies have changed along with the technological innovations of recent decades (Leu et al., 2004). The notion of what constitutes computer literacy, for instance, has evolved and will keep evolving as computer technologies keep developing; therefore, Selber (2004) may have very well been right when he wrote, "There will never be a final word on computer literacy" (29). Tyner's (1998) following astute observation is also still applicable to the present-day situation: "As technology continues to impinge upon familiar textual/alphabetic literacy practices, literacy researchers and constituents for specific literacy modes are still groping toward workable definitions for the new version [or versions] of literacy" (61) – and continual technological developments greatly hinder the achievement of consensus among scholars. As Cole and Pullen (2010) put it, there will be "continual literacy morphology" (1): the notion of literacy will continue to transform. In her discussion of media literacy, Pailliotet (2000) paraphrases Bob Dylan, saying that "the times, they are *definitely* changing" (xxiii). Picking up on this theme, we can state that "the times, they *keep* a changing" – the literacy landscape will remain continually in flux.

Another relevant distinction that can be made regarding definitions of new literacies concerns their practicality. Some authors provide impressionistic accounts of new literacies, describing a general idea or awareness, whereas others are more explicit in listing specific skills, performances, or competences. For example, considering digital literacy, we can distinguish between 'conceptual definitions' and 'standardized operational definitions' (Lankshear & Knobel, 2008). Some definitions

highlight "mastery of ideas and […] careful evaluation of information and intelligent analysis and synthesis," while others list "specific skills and techniques that are seen as necessary for qualifying as digitally literate" (ibid., 2). So the focus is on understandings, critical thinking, or cognitive skills, or on practical, operational, functional, instrumental, technical skills.

The establishment of unanimously agreed definitions has been hindered by the fact that new literacies have been discussed, defined, and appropriated by researchers, theorists, and practitioners from diverse fields and disciplines, who have different approaches and theoretical frameworks (Coiro et al., 2008). Literacy has been discussed, among others, by educators, linguists, literary scholars, media specialists, communication specialists, sociologists, psychologists, instructional designers, artists, cultural critics, and librarians. In the context of visual literacy, Branch states that a common criticism of many definitions is that "[i]ndividuals have defined visual literacy from the perspective of one's own background and professional concerns" (382). Although this is quite understandable, it is also problematic, because disagreement on definitions can lead to ambiguity and confusion. Taking digital literacy as an example of the diversity of approaches to new literacies, Eshet-Alkalai (2004) claims that "indistinct use of the term causes ambiguity, and leads to misunderstandings, misconceptions, and poor communication" (94); of course, the same can be said for other new literacies.

Overarching concepts such as 'multiliteracies' and 'textured literacy' have been coined to describe a range of new literacies. These umbrella terms shelter a host of distinct but linked literacies. Some authors even see 'digital literacy', 'electronic literacy', and 'multimedia literacy' as synthesizing concepts. Others use plural terms, speaking, for instance, of 'digital literacies', thought of as including an array of interrelated digital literacies. The word 'literacy' itself is also used as an umbrella term, although not everyone is a proponent of this, because it may cause conceptual confusion (Kress, 2003).

Taking a closer look, several new literacies appear to be equivalent: different labels refer to roughly the same concept. This is the case, for instance, for web literacy, Internet literacy, network literacy, and cyberliteracy. The literacies that are not equivalent still have generic competencies in common. There is considerable overlap between descriptions of, for example, computer literacy, web/Internet/network/cyberliteracy, and ICT literacy, as well as between digital, media, and electronic literacy, and between multimedia and multimodal literacy too. Indeed, as Martin (2008) states, sometimes "the definitions of the different literacies are almost identical and only nuanced in different directions" (164). Not all terms have turned out to be equally popular: a case in point is 'e-literacy', a term that has not really caught on, perhaps because it is phonetically similar to 'illiteracy' (Bawden, 2001). We cannot predict if this confusion over terminology will persist, if even more terms for existing new literacies will be coined as technology keeps evolving and by people taking slightly different approaches, or if a consensus will eventually emerge (Hobbs, 2006; Bawden, 2008). Considering multimodal literacy, for example, its definition apparently remains unclear, seeing that one of the core questions of the first colloquium on multimodal literacies, held in July 2018, was "how can we define

and measure multimodal literacy?" (Eisenlauer, 2018). Still, the terms and definitions are not the most important: it is the ideas that matter. All those ideas have made the literacy landscape quite complex,[9] with old and new literacies coexisting in this complex digital world – but can they coexist in harmony or are they at odds?

6. The Coexistence of Old and New Literacies

The plurality of new literacies that has emerged alongside traditional literacy begs the question how people manage to deal with all these literacies. Old and new literacies can exist in three possible relationships: they can be complementary, oppositional, or mutually exclusive (Dressman et al., 2006; Jacobs, 2008b; Watt, 2010). An oppositional view holds that the growing importance of new literacies may cause youths to no longer see the point of learning traditional literacy skills and will no longer make an effort to do so. CMC may, therefore, damage traditional reading and writing. Next, a mutually exclusive view sees CMC as exclusive of school, and worries that when trying to transfer new literacies to an educational context, they will be "appropriated". Finally, a complementary view entails that old and new literacies are compatible and can exist in a harmonious relationship: besides the traditional literacy practices taught at school, youths can also learn new literacies focused on new digital technologies. CMC may thus encourage the development of new literacies. Jacobs (2008b) supports this complementary view, as she suggests that rather than seeing old/new, traditional/non-traditional, in-school/out-of-school literacies as dichotomies, we should see literacy practices as part of a repertoire, within which youths have the ability to acquire and maintain multiple literacies. Clearly, such a complementary relationship should be preferred. In Carrington's (2004) words, "The key to being literate in the new realities is to have a mastery of the most valued and useful genres and to be able to shift between them as required by context. [...] '[L]iteracies' refers to the ability to accumulate and demonstrate the practices necessary to interact effectively in the social, cultural and technological contexts of our lives" (219, 224). It is nowadays thus necessary to achieve multiple literacies, old and new, as well as, crucially, the capability of using these in the appropriate circumstances.

It is still very much an open question whether people, or in the context of this thesis: youths, are able to achieve a mastery of multiple literacies, both traditional and digital, and to use these effectively according to the demands of the context. The need to constantly switch between old and new literacies may create what Dowdall (2006) refers to as 'dissonance'. Such dissonance can occur, for example, when switching from a school-based context that requires conventional writing in adherence to the standard language, to an online leisure context that involves CMC writing. Youths may differ in their ability to switch between these literacies, which may cause some to experience more dissonance than others. Those experiencing little dissonance are 'easy switchers', who can effortlessly draw upon different literacies,

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[9] See Mills (2015) for a comprehensive and complex discussion of literacy theories in the digital age.

whereas for others it is more problematic to switch between literacies or registers. For easy switchers, old and new literacies exist in a complementary relationship, where the appropriate literacy is selected in each situation: such easy switchers are proficient both as digital communicators and as writers for school. For difficult switchers, in contrast, literacies "collide and clash" (153): they exist in what resembles an oppositional relationship, in which case youths may be digitally literate, having mastered both the technology and the register of CMC language, but may not fully acquire or care about acquiring traditional writing skills. This may surface as interference of textese in educational contexts. Whether such interference indeed occurs, i.e. whether evidence of an impact of 'CMC literacy' and its informal register on 'school literacy' and school writings, viz. essays and stories, can be found, will be explored in chapters 9 and 10 of this thesis. This will tell us whether old and new literacies are compatible or not in youths' communicative practices.

7. Conclusion

This chapter has shown that besides traditional literacy, there are numerous new literacies that are important in this computer-oriented, electronic, networked, cyber-, e-society nowadays. It seems a daunting task for youngsters to acquire so many new literacies. Still, the substantial overlap at the core of these new literacies may make it attainable to become literate in all of them. Moreover, today's youths are growing up in a world immersed with digital technologies and have been accustomed to ICTs as an integral part of their lives. This is why Prensky (2001) refers to them as 'digital natives', i.e. native speakers of the language of technological tools, such as computers, the Internet, mobile phones, and video games. They are "[c]onstantly connected," "live in an always-on world," and "live much of their lives online" (Tomita, 2009:185). Digitally-proficient youths have been said to process information differently from earlier generations: they prefer graphics over text, are accustomed to receiving information quickly, like to multitask and 'parallel process', and prefer random access, such as hypertext (Prensky, 2001). These characteristics facilitate the acquisition of new literacies for those born in this digital world, and have even changed – in combination with the affordances of print and screen – the traditional literacy skill of reading, from a focused and in-depth scrutiny of print texts to a *tl;dr* process of distracted skimming through texts on screens while multitasking online (Baron, 2015). Jones and Flannigan (2005) suggest that "[c]hildren learn these skills as a part of their lives, like language which they learn without realizing they are learning it" (3). Still, this does not mean that they should not be formally educated in new literacies, or as Prensky (2001) puts it, children should not only be taught 'legacy content' (including the traditional literacy practices of reading and writing), but also 'future content' (about digital and technological tools). Such a broad implementation of literacy education could to see to it that old and new literacies exist in a complementary rather than oppositional relationship, even for difficult switchers, who need to be taught how to 'flick the switch' (Spatafora, 2008), so that they can effectively use multiple literacies. Despite all these sensible suggestions about new literacies, the next chapter will show that the great debate about and empirical

research into the impact of written CMC on young people's literacy has remained focused on school literacy.

Chapter 3. Relations between Written CMC and Literacy: Prior Research

(based on a published paper).[10]

Abstract

This chapter starts with a discussion on the different perspectives on the impact of CMC on traditional literacy, which boils down to two opposing views. Despite attempts at nuancing the issue by those who hold a more positive view, the negative view has prompted severe criticism on CMC in popular media. Next, this chapter thoroughly discusses previous studies into the impact of CMC on traditional literacy, making a threefold distinction between speculative, attitudinal, and observational studies – which present theories and claims without scientific support, perceptions or attitudes of parties involved, and empirical evidence respectively. The latter are, in turn, divided into four kinds of observational studies, depending on their results: they report either a positive relation, a negative relation, conflicting findings (i.e. both positive and negative relations), or no significant relation at all. The limitations and mixed findings of previous research do not lead to a conclusion on the effects of written CMC on literacy, which gives all the more reason to conduct the research of the present thesis.

1. Perspectives on the Impact of CMC on Traditional Literacy: Two Opposing Views

The language of CMC has provoked widely differing sentiments. This chapter extensively discusses previous research into the relationship between written (text-based) CMC and literacy. The following questions will be addressed:

RQ1   What are people's perspectives on the impact of CMC on literacy?
RQ2. What do previous studies reveal about relations between CMC and literacy?
RQ3. How has literacy been operationalized in previous observational studies? How has CMC use been measured?
RQ4. How do these studies differ in methodology and participants?
RQ5. What are the limitations of these studies?

A broad distinction can be made between two contrasting views in the "*Gr8 Db8*" on the effects of CMC on standard language skills and traditional literacy (Crystal, 2008): those who believe that CMC has a negative impact and those who believe it

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[10] This chapter is an expanded and updated version of the following paper: Verheijen, L. (2013). The effects of text messaging and instant messaging on literacy. *English Studies*, *94*(5), 582–602.

has a positive impact. As Thurlow (2006) explains, "public discourse about emerging technologies [such as CMC] is [...] polarized by judgments of their being either 'all good' or 'all bad'" (668). Section 1.1 discusses the negative view, expressed by many parents, educators, and in popular media; section 1.2 discusses the positive perspective, especially held by some linguists.

1.1 The Negative View

An example of a vigorous opponent of textese is Warren (2008): he sees texting as a factor contributing to declining literacy, and contends that it seriously curtails language development:

> The use of (the sounds of) numbers to stand for words, or of letters to stand for words, dropped letters, substituted letters, and a general lack of punctuation, can all be identified as *retrograde steps*, precisely because meaning is becoming less clear as a result, and considerably more dependent on context for intended meaning to be attained. [...] Likewise, grammatical devices such as capital letters and apostrophes [...] are the finer nuances of language, and the removal of such signposting is to be lamented. (6–7) [italics added]

Warren particularly dislikes the lack of standardization in textese: he sees the orthographic irregularities as linguistic regression. Also note here that Warren takes a rather Anglocentric perspective, since it is cross-linguistically common for languages not to code for certain features (e.g. tense or aspect) and there is no evidence that this hinders intelligibility.

The increasing use of CMC by youths of increasingly younger ages has prompted many parents and teachers to worry about the influence of textese on their traditional literacy skills. For instance, the view of the American Federation of Teachers is as follows:

> Text and instant messaging are negatively affecting students' writing quality on a daily basis, as they bring their abbreviated language into the classroom. As a result of their electronic chatting, kids are making countless syntax, subject-verb agreement and spelling mistakes in writing assignments. … I constantly see the shortened words, terms and contractions typically found in text messaging dialogue used in students' formal writing assignments. … [M]any teachers believed that students' wide use of "text speak" was a key factor in their students' negative performance … [T]ext speak is a problem. (Ross, 2007:1)

This quote is a typical example of a negative opinion on CMC that refers to subjective, personal experiences rather than objective, empirical research. It characterizes concerns that exposure to and use of unconventional spelling in CMC may mask or even cause literacy problems, compromising reading, writing, and spelling abilities. A pervasive fear among the general public that CMC may adversely

affect traditional literacy, fuelled by reported incidents and anecdotes of intrusions of textese in schoolwork and examinations, has sparked off much negative media attention and criticism on CMC.

Criticism on CMC has been abundant in popular media. Thurlow (2006) conducted a critical review of a corpus of 101 newspaper articles about CMC and its language, published from 2001 up to 2005, from various English-language newspapers. He concluded that print media views on youngsters' language use in CMC are "overwhelmingly pessimistic" (677–8) in English-speaking countries. He identifies both statistical panic (about the rise and spread of CMC) and moral panic (about the impact of CMC on language, education, and even society). Thurlow reports that textese has been described as *aberrant, apocalyptic, criminal, depraved, execrable, frightening, infamous, jarring and abrasive, pointless*, and *reprehensible*. It is typically put in negative opposition to 'proper' language. Many articles expressed "an overriding sense of moral panic about declining standards of literacy" (678). They suggested that textese degrades traditional literacy skills and corrupts Standard English, even that it "signals the slow death of language" and poses a threat – not only to the linguistic fabric, but also to social progress (qtd. in ibid.). Using a similar method, Postma (2011) explored the treatment of textese in 217 Dutch newspaper articles, published between 2000 and 2010. About one third of the articles expressed moral panic about the degradation of Standard Dutch and literacy because of youths' great use of CMC. The concerns already noted by Thurlow over a decade ago thus occur in the Netherlands too.

Such concerns are exemplified by an article in *The New York Times*, where it is stated that teachers report alarmingly that today's 'generation text' is producing the "English adapted for the spitfire conversational style of Internet instant messaging" in their schoolwork as well, as exhibited by smileys, "shortened words, improper capitalization and punctuation, and characters like &, $ and @" (Lee, 2002:¶5,8). Criticism on textese has not only been passed in American newspapers, but in British newspapers too. An article in *The Guardian* by John Sutherland, an eminent emeritus professor of English literature, is a perfect example of this: first, Sutherland ridicules textese by presenting Hamlet's existential question in textese ("2B or 2b (not)=?"); then he writes it off as "snot-talk," "unimaginative," "bleak, bald, sad shorthand," "drab shrinktalk," and "linguistically … all pig's ear" (Sutherland, 2002:¶2,6,8); and finally he claims that it "masks dyslexia, poor spelling and mental laziness. Texting is penmanship for illiterates" (ibid.:¶9). Fears about the detrimental impact of CMC on literacy are not restricted to instant messaging (IMing) and texting (SMS): similar fears have been expressed about microblogging platforms and social networking sites (SNS), as blogs with titles such as "Are texting and tweeting making our students bad writers?" (Herron, 2013) and "Is Facebook making students terrible writers?" (Anon., 2013a) make clear. This second blog states the following: "Facebook has opened the door to abbreviations, shorthand typing, text lingo and emoticons. [...] Most teachers are complaining that this social networking communication, with lack of grammar and misspellings are seeping through student's [sic] school writings" (Anon., 2013a:¶3–4).

Shortis (2007) summarizes the negative media attention on CMC as "alarmist comment with exotica from a cabinet of textism curiosities" (22) which does not reflect actual textese. Unfortunately, Thurlow's and Postma's studies were both restricted to newspapers. This means that they do not include criticism on CMC on television or the Internet. As a result, it is unclear whether the general opinion expressed in metalanguage (i.e. talk about language) on CMC is similar for electronic media and print media.

1.2 The Positive View

Despite the negativity described above, others believe that rather than causing literacy to go to rack and ruin, CMC has several language-related benefits. First of all, the 'reinvention' of language in CMC, where one is not bound to the constraints of conventional spelling and grammar, may lead to creative, innovative language, to "playful use of language that enables creating a variety of graphic forms of the same word" (Plester, Wood, & Bell, 2008:142–3). Tagg (2011) notes that creativity is prevalent in textese, not just in terms of spelling variation but also in terms of e.g. idiom manipulation, a form of language play. Shortis (2007) feels that textese should not be seen as "the deficit practice of a moronic default," but as "a source of creativity, diversity and pragmatic cultural accomplishment" (23). This creativity can result in a wide variety of spellings for a single word: for example, *anything* can occur as *anything, nething, nethin, anyfing, anyfin, nefin, anyting, anytin*, or *netin* (Shaw, 2008:48). Variants may even occur within the linguistic repertoire of individual CMC users, because there is no need for them to be consistent as long as their message can be understood by the recipient. Kemp (2010) suggests that it is possible that "the language 'play' encouraged by extensive practice with textisms … helps to boost interest in language and thus scores on language tasks" (65). Text poetry and text message novels – poems and narratives written on and distributed by mobile phones – confirm that texting can result in "creative expressions of … engagement with language" (Plester, Wood, & Joshi, 2009:156). Mobile phone novels originated in Japan, where these *keitai* novels have become quite popular (Nishimura, 2011). The 'fun factor' of written CMC – using language without having to worry about spelling or grammar rules – may increase young people's motivation to read and write. This is acknowledged by a European Union expert group on literacy: "Digital tools provide a clear, strong motivation for writing, one that is particularly evident among young people" (European Commission, 2012:23). O'Connor (2005) says that students see CMC as recreational 'writing' rather than work. Crystal (2008b) states that "the human ludic temperament," our "drive to be playful," is what causes people to enjoy using textese (10). CMC may even have a positive effect on youths' attitudes towards other literacy activities (Van Dijk et al., 2016).

Secondly, it has been suggested that CMC provides youths with more exposure to written text and with extra opportunities and incentives to engage with written language, which may facilitate reading ease (receptive literacy) and writing proficiency (productive literacy). This sentiment is conveyed in the following quote: "Ga eens kijken hoe jongeren tegenwoordig hun tijd doorbrengen. Ze schrijven zich te pletter. Veel meer dan een generatie terug. Ze SMS'en, twitteren, forummen,

chatten, MSN'en bij het leven" (*Consider how youngsters are spending their time nowadays. They are writing their asses off. Much more than a generation ago. They text, twitter, forum, chat, and IM all the time*) (Cornelis, 2009:¶9). Sweeny (2010) also recognizes that CMC offers valuable writing practice to youths:

> Writing, for adolescents who live in an age of digital communication, has taken on new importance and plays a prominent role in the way they socialize, share information, and structure their communication. [...] Their writing uses the mediums of instant messaging (IM), text messaging (or texting), Twitter, and e-mail, as well as shared electronic documents and postings on blogs and social networking sites. (121)

Likewise, Kalantzis and Cope (2008) state that "we are witnessing a return to writing (emails, SMS messages, and the web as a written medium), albeit in new forms and requiring radically changing writing practices" (17). Lee (2011a) rightly states that notwithstanding their multimodal possibilities, new media "still involve extensive use of the written word" (110). Nicotra (2009) agrees that new communication technologies call for an expanded conception of writing. Cart (2007) mentions increased exposure to text, stating that "traditional print materials are no longer enough when assessing reading" (53): technology-based reading, such as in CMC, plays an important role in youngsters' lives nowadays, and the same can be said for technology-based writing. Therefore, he argues for a redefinition of the concept of reading: it should now include CMC-based reading – by the same token, the concept of writing should include CMC-based writing or 'e-writing' (Abdullah, 2003).

A third possible advantage of using CMC is that textisms may increase phonological or metalinguistic awareness, which are helpful for literacy development: CMC could help youths become more sensitive to the underlying (sound) structure of language, or to register differences between different writing genres. As an example of the former, phonological abbreviations (*fone* for *phone*) and letter/number homophones (*gr8* for *great*) reflect an understanding of the grapheme-phoneme (letter-sound) patterns of a language: users of textese "exploit the polyvalence of grapheme-phoneme correspondences that is inherent in most orthographic systems in playful, evocative or subversive ways" (Androutsopoulos, 2011:151). Vosloo (2009) explains that "[w]hile spelled incorrectly in a conventional sense, many textisms are phonologically acceptable forms of written English" or another language (3). Indeed, even in textese one's freedom to deviate from the standard language norms is not unlimited: CMC users are "bound to principles of English orthography which ensure that variation from the norm is recognizable and effective" (Tagg, 2011:225); too much idiosyncrasy may cause a lack of recognisability, which in turn causes problems of intelligibility and leads to unsuccessful communication. Fairon and Klein (2010) add to this that "De l'analyse du langage SMS à une meilleure perception du système graphique normé" (*Analysing text language can lead to a better perception of the system of writing norms*) and that texting is even "un atout pour l'enseignement de l'orthographe" (*an asset to spelling instruction*) (117,119). All these possible merits bring Tagliamonte and Denis (2008) to the conclusion that CMC is

unjustly thought of as "an inferior mode of communication" that is "filled with grammatical errors, incomprehensible words, and secret codes" (8): it is not linguistic ruin, but rather a "new linguistic renaissance" (27).

British linguist David Crystal is a proponent of textese, which he vigorously defends in his book *Txtng: the Gr8 Db8* (2008). He feels that the negative views on CMC expressed in the popular press are unfounded: "a huge popular mythology has grown up, in which exaggerated and distorted accounts of what youngsters are believed to do when they text has fuelled prophecies of impending linguistic disaster" (Crystal, 2008:7). In *Language and the Internet*, Crystal (2006) already made clear that he does not agree with doom-mongers who claim that "the relaxed standards of e-mails augur the end of literacy and spelling as we know it" (2). Following up on that point, Crystal asserts in *Internet Linguistics* (2011) that such linguistic worries caused by new technologies are based on myths, and that texting and IMing help rather than hinder literacy. According to Crystal, the language used in CMC will not have a lasting impact on 'older' varieties of languages. It does not radically deviate from the standard; it is only that its non-standard features, such as textisms, are so striking that we fail to notice its standard features. He sees textese not as a disaster, but as language in evolution.

Dutch linguist Marc van Oostendorp (2003) does not believe that CMC wreaks havoc on language either. He argues that, from a historical perspective, language has recurrently influenced technology rather than vice versa. Van Oostendorp argues that writing an effective text message requires a certain amount of virtuosity and creativity. He applauds CMC for being creative, direct, and personal – for casting off the yoke of standard language norms.

American linguist Naomi Baron expresses a moderately positive view on digital communication tools. In 2002, she still speaks of CMC as 'chaotic', as containing "devil-may-care spelling and punctuation" and "logical incoherence," and its users of having an attitude of "linguistic whatever-ism": a *laissez-faire* attitude, i.e. indifferent feelings, towards traditional linguistic conventions (Baron, 2002). Yet in 2005, Baron, in contrast to Sutherland, uses Shakespeare to argue that strict spellings norms should not be seen as a sacred cow: "even Shakespeare spelled his own name at least six different ways" (Baron, 2005:29), since orthographic conventions only became fixed and prescriptive in recent centuries – Standard English, in fact, only came to be institutionalized in the eighteenth century and it was only then that the denunciation of non-standard spelling truly commenced. Baron feels that textese is an empowering phenomenon and she asserts that "[t]he writing style commonly used in IMing, texting, and other forms of computer-mediated communication need not spell the end of normative language" (ibid.), provided that youngsters are instructed by their parents and teachers to use situationally appropriate language, so that they can distinguish between situations in which they can be creative in their language use and situations in which they are expected adhere to conventional spelling and grammar standards. Even more recently, she succinctly summarized it as follows: "Whatever is happening with language, we can't lay much of the blame on computers and mobile phones" (Baron, 2015:xi), seemingly convinced of no (or only a negligible) impact of CMC on language and literacy.

Along the same lines, Irish psychologists Francesca Farina and Fiona Lyddy (2011) state that "rather than signalling the demise of language, CMC and text language likely reflects the workings of a productive and flexible language system," but they still urge that "use of non-standard language in inappropriate contexts," i.e. use of textese in school writings, should be monitored (148). O'Connor (2005) makes the same point: "Students need to understand the importance of using the appropriate language in the appropriate setting, and that who one is writing for affects the way in which one writes." What ultimately underlies this is the concept of audience: making youths aware of which language to use when writing for a particular audience, such as their friends and family versus their teachers. Turner (2009) calls this "flipping the switch," switching between textese and standard language according to context. Presenting a case study of a girl who was a successful writer at school, despite being a "hardcore IM user" (205), Jacobs (2008b) similarly argues that it is possible to be proficient in both CMC and school writing, as long as one manages to separate the conventions of the two in one's repertoire of literacy practices (which she calls "creating separate worlds" (207)). This requires metacognitive awareness of register. Such awareness should restrict the unintentional intrusion of textisms into school writing. This includes careful and conscious writing decisions about choice of words, grammar, and spelling in each writing genre.

Who also does not believe that digital communication is ruining language is British linguist Caroline Tagg (2015). Tagg claims that adults' concerns about any negative impact of online communication on language and literacy are mostly based on misconceptions. She identifies three such beliefs which, according to her, are utterly mistaken: firstly, that all youths use many non-standard language forms in their written CMC; secondly, that textese consists of fixed abbreviations, functioning as a code language to which adults cannot have access; and thirdly, that textese and the standard language are in competition with each other. On the contrary, she contends that digital communication may be good for developing children's literacy skills, because they need linguistic awareness to be able to play with language through textisms. Tagg goes on to state that youths can have a command of several kinds of literacy ('multiliteracies'), can be proficient in several languages and language varieties ('heteroglossia'), and can employ these effortlessly (via a process called 'translanguaging'). Her views on CMC are thus not gloomy at all, at least not from a linguistic perspective.

Finally, Dutch linguist Elma Blom (2014) argues that textese or 'digi-talk' can improve children's cognitive abilities. Similar to the benefits reaped by bilingual children, switching between the registers of standard language and CMC language would train children's brains – provided that they are fully proficient in both registers. Therefore, she feels that youths should be stimulated to chat, tweet, text, and whatsapp after school.

2. Previous Studies into the Impact of CMC on Traditional Literacy

This section presents an overview of previous research that has sought to determine if and, if so, how literacy is affected by CMC: does CMC lead to corruption of the

language or rather to language enrichment? Should it be considered as a "modern scourge" or does it present an opportunity (Vosloo, 2009)? Should we regard textese as "linguistic ruin" or a resource (Farina & Lyddy, 2011)? Is it valuable or vandalism (Wood, Plester, & Bowyer, 2009)? Is CMC a "frNd" or foe of youngsters' literacy skills (Crystal, 2008b)? Is it a bane or a blessing (Dansieh, 2011)? Put in emoji, should it make us ☺ or ☹ (Spooren, 2011)? First, speculative studies are discussed, then attitudinal studies, and finally observational studies. It is shown here that the popular views that exist on this issue are unduly black-and-white.

2.1 Speculative Studies

Besides much speculation in the media, there are some speculative scientific publications which focus on CMC and literacy. This section discusses two such studies.

Craig (2003) focuses on three concepts relevant for the relation between IM and literacy – language play, plurality of literacies, and language evolution. He argues that (i) the language play used in textisms improves literacy skills, increases subconscious metalinguistic awareness and improves abilities to use language effectively; (ii) because human language processing capabilities allow us to develop multiple literacies independently of each other and to use them in their appropriate contexts, we should consider traditional literacy as an entity separate from and unaffected (rather than replaced) by IM literacy; and (iii) textisms are not inherently wrong: as language naturally evolves, these novel creations may eventually become part of the standard language. Craig concludes that IMing does not have a negative impact on literacy.

Mphahlele and Mashamaite (2005) note the increasing occurrence of textese in student writings in South Africa, which makes students "victim[s] of the SMS language in the hands of the educators as [they are] punished for wrong spelling" (162). They claim that CMC not only affects youngsters' spelling skills, but also their ability to assess when textese is allowed (in informal contexts) and when it is inappropriate (in more formal contexts).

2.1.1 Discussion of Speculative Studies

Both Craig (2003)'s positive view and Mphahlele and Mashamaite's (2005) negative view are wholly speculative. Craig's conclusion is not backed up by empirical evidence, and Mphahlele and Mashamaite's line of reasoning lacks evidence that students' spelling 'errors' were caused by their CMC use. Ultimately, such papers present interesting theories, but are not revealing about real-world effects, since they only present the viewpoint of the authors. Research into the perceptions of parties involved reveals much more about general attitudes on the possible effects of CMC on literacy. Such attitudinal studies are discussed in the next section.

2.2 Attitudinal Studies

This section extensively discusses attitudinal studies (surveys) that report on the perceived effects of CMC on literacy.

Adams's (2006, 2007) PhD thesis was a qualitative survey into adolescents' perceptions of the impact of IMing on school writing. A group of American junior high school students ($n = 8$), who reported being frequent IM users, was interviewed in a focus group, via email, and individually. All participants reported having encountered effects of IMing on either their own or others' writings, and on both writing *products* and the writing *process*. The perceived negative impact on writing products included textisms such as abbreviations and omission of capitalisation and punctuation, but participants claimed to usually correct these before submitting a school paper. This correction work was part of the changes in the writing process: the adolescents believed that although they are often multitasking while writing school papers at home, they wrote rough drafts at a faster pace because of IM, but then spent more time editing out textisms. Participants thought that IM negatively impacted writing conventions (spelling, grammar, punctuation, capitalisation), but positively impacted voice. Other writing traits (ideas and content, organisation, sentence fluency, word choice) received mixed views by the participants: they were thought to be affected both positively and negatively. The students felt that one type of school writing, namely note taking, was greatly facilitated by textese. It is interesting that Adams's study considered not only the mechanics of writing, but also higher-level writing skills, as well as different school writing genres.

Lenhart et al. (2008) report on a quantitative telephone survey conducted for the Pew Research Center's Internet and American Life Project. American parents and their children ($n = 700$) – adolescents between the ages of twelve and seventeen – were interviewed and asked, among other things, about the effects of CMC (emailing, IMing, texting, and social networking) on youths' writing process and the quality of their writings products. Nearly two-thirds of the surveyed adolescents acknowledged that textese occasionally slipped into their school assignments. They reported having used different types of textisms in schoolwork, namely incorrect punctuation and capitalisation (50%), acronyms (38%), and emoticons (25%). At the same time, a large majority of participants did not believe that modern communication tools hindered the quality of their school writings in any way: only 12% and 11% thought it had a positive and negative effect respectively. Parents expressed different opinions: nearly half of them thought it had no discernable effect on their children's writing, while 27% thought it had a positive effect and a similar percentage thought it had a negative effect. Still, Lenhart et al.'s conclusion that American "[p]arents are generally more positive than their teen children about the effect of computers and text-based communication tools on their child's writing" (2) is inaccurate: in fact, in comparison to the adolescents, more parents believed that CMC affects writing at all – they were just at odds about whether this effect is positive or negative.

Drouin and Davis's (2009) study included a quantitative survey into American university students' ($n = 80$, young adults with a mean age of 22) perceptions of the effect of texting on literacy. About half of the students who took part in the survey (both those who reported using textese and those who claimed not to use it) thought that textese hinders youngsters' ability to remember and potentially to use standard language. In other words, they felt that textese affects memory of Standard English

and may harm its use. The other half of the students thus did not think that texting had a negative effect on literacy. Since Drouin and Davis report such mixed views, their survey was not very illuminating.

For her master thesis, Freudenberg (2009) investigated South African adolescents' and teachers' views on the impact of texting and IMing on students' formal writing. She conducted a survey among high school students ($n = 88$) in the eighth and eleventh grade, which included first language (L1) and second language (L2) speakers of English, and among their teachers ($n = 7$). 58% of the students did not believe that texting and IMing affected their schoolwork, whereas 42% believed it had a negative effect: they struggled with spelling and used textisms such as abbreviations, acronyms, and shortenings in their school writings. 71.4% of the teachers reported having observed marked changes in the language of student writings, including the presence of textisms, since the boom in mobile phone ownership among youths. However, non-standard features identified by teachers in student writings cannot simply be attributed to the influence of textese: some may have been caused by L2 students' lower proficiency in English.

Spooren (2009) carried out an online survey among Dutch adolescents between the ages of fifteen and seventeen ($n = 112$), their parents ($n = 74$), and secondary school teachers ($n = 77$). He inventoried their perceptions of the impact of new media use (texting, IMing, and SNS) on writing and spelling skills, asking whether they felt that CMC improves adolescents' spelling or texts in general or causes them to write more frequently, creatively, or easily. Parents turned out to be the most pessimistic, while teachers were the most optimistic. The adolescents' opinions were somewhere in between: they were neutral about the effect of CMC on spelling, positive about its effect on writing better texts, and slightly negative about writing more frequently, more creatively, and more easily. This quantitative survey revealed that there was no consensus among Dutch youths, parents, and educators about the impact of CMC on writing; Spooren's most surprising result, which contrasts with many other attitudinal studies, were the optimistic Dutch teachers.

Mildren's (2010) master thesis was a quantitative survey among American adolescents in the seventh and tenth grade ($n = 123$), parents ($n = 112$), and teachers ($n = 50$) to gauge their perceived impact of texting on language and writing. 67% of the teachers, 40% of the parents, and only 11% of the students thought that texting affected adolescents' writing and communicating abilities. Unsurprisingly, the frequency with which respondents reported encountering textese in schoolwork was positively associated to their thoughts on textese affecting teens' ability to spell and write 'proper' English (for adolescents: *their own* schoolwork and *their own* ability). 75% of all respondents felt that youths accommodate their language to the communicative setting, switching from informal in texting to more formal at school. Frequently texting adolescents were more negative about their ability to switch between registers. Overall, this survey shows a lack of consensus about the impact of texting on writing, with youths being much less concerned than teachers. Mildren's most interesting finding, in my opinion, was that teachers who texted regularly themselves reported encountering less textisms in schoolwork, which suggests that teachers' own texting habits affected their perceptions.

Dansieh (2011) reports on a survey conducted among students (n = 400) and lecturers (n = 30) in Ghana to find out their opinions on the impact of texting on students' English writings. Most students were young adults between twenty and thirty years old and had English as their second language. About 24% of the students and 58.3% of the lecturers believed that textisms permeated students' academic writings. A large majority of the lecturers (82.4%) believed that texting harmed their students' writing skills, while nearly all other lecturers thought it may be harmful. Furthermore, 52% of the lecturers felt that textisms in academic work were bad, 33% that they posed reading problems, and 19% that they delayed grading. Dansieh's survey paints a negative picture of the effects of texting on Ghanaian youngsters' writing, but again I need to point out that the L2 factor cannot be ruled out: were these orthographic errors really caused by textese or by lower proficiency in English?

Geertsema, Hyman, and Van Deventer (2011) surveyed South African eighth- and ninth-grade educators, secondary school teachers of English (n = 22), to determine their perceptions of the impact of texting on students' school writings. A quantitative research approach was adopted. Most educators thought that textese negatively affected their students' writing skills. Students reportedly diverged from Standard English with respect to spelling, punctuation, and sentence length: teachers said to regularly encounter non-conventional spellings based on textese and incorrect use of punctuation marks, and to sporadically find shorter, simplified sentences. The use of textese was perceived to have a negative impact on students' academic achievement and their knowledge of Standard English. Still, since Geertsema et al. conducted their survey in South Africa, we need to wonder about whether English was participants' L1 or L2 and how this relates to the supposed impact of textese.

Rankin's (2011) qualitative study into the impact of textese on young adults' formal writing included a survey among American university students (n = 25). Her participants were interviewed individually and in focus groups about their perceptions of the effect of texting on writing ability. All participants felt that the use of textisms had, on the whole, a negative effect on students' spelling skills. Only two participants claimed to be able to differentiate without any difficulties between CMC and academic writing, so except for these two participants, students interviewed by Ranking claimed to have difficulties with switching between registers.

Tayebinik and Puteh (2012) investigated Malaysian university students' (n = 40) perceptions on the effects of CMC on their English language proficiency. A qualitative research design was used: the participants, who were between twenty and twenty-three years old, were interviewed individually. The students mentioned four negative effects of textisms on literacy: they believed it affected their formal writing skills (textisms in formal writing assignments), grammatical skills (iterative omissions or incomplete sentence structures), spelling skills (spelling confusion), and speaking skills (textisms in informal conversations). Tayebinik and Puteh's survey adds a new and interesting element to prior surveys, namely a perceived negative impact of CMC not just on writing, spelling, and grammar, but also on speaking!

Aziz et al. (2013) studied the impact of texting on Pakistani young adults' academic writing. Their study included a quantitative survey among university students (n = 50), between nineteen and twenty-five, and university teachers of

English (*n* = 15). Academic writings were believed to be affected by textese by 72% of the students and 100% of the educators. Students with negative perceptions identified the most affected linguistic area as spelling (83%) or punctuation (14%). Educators identified not just spelling (80%) and punctuation (13%) as being hurt the most, but also grammar and tenses (7%). Participants thus agreed that especially the spelling of students' English academic writings suffered from texting. This begs the question which language these Pakistani youths used in CMC: Urdu, English, or some other language?

Purcell, Buchanan, and Friedrich (2013) report on another survey conducted for the Pew Internet and American Life Project. They surveyed middle and high school teachers (*n* = 2,462) about the impact of digital tools on student writing. Besides this large-scale quantitative survey, they conducted focus groups, which both revealed American teachers' mixed sentiments. Several positive aspects were identified by the teachers, e.g. that digital tools facilitate collaborative writing, as well as creativity and personal expression in writing, and that they stimulate youths to write more frequently and in more different formats. However, concerns were expressed as well, namely that informal CMC language creeps into formal writing assignments, and that textisms hinder students' ability (and willingness) to write longer texts. Regarding the effects on spelling and grammar, 40% of the teachers believed CMC worsened them, whereas 38% believed CMC improved them, on account of automatic grammar- and spell-checkers. This survey by Purcell, Buchanan, and Friedrich (2013) is thus a valuable addition to Lenhart et al. (2008): all parties involved were now quantitatively surveyed.

Salem (2013) explored Kuwaiti adolescents' (*n* = 211) views on the impact of BlackBerry Messenger (BBM) and WhatsApp (WA) on their proficiency in English, their second language. He adopted a qualitative approach, by interviewing all participants: 118 intermediate school students, between eleven and fifteen years old, and 93 secondary school students, between sixteen and eighteen. Participants they felt that IMing via BBM and WA had a damaging effect on their English language use – in terms of vocabulary, spelling and grammar. However, Salem does not state which questions were asked, nor which percentage of participants had negative perceptions on the linguistic effects of CMC, so his report is woefully incomplete. Moreover, he seems rather biased, as he notes the following: "From my own experience as an English language teacher in the state of Kuwait, I noticed the overuse of text messaging shortcuts in the students' pieces of writing" (64) – such a statement casts doubt on the reliability of these results.

Yousaf and Ahmed (2013) conducted a quantitative survey among university students in Pakistan (*n* = 100) to establish what they perceived to be the effects of texting on their writing skills. Negative effects of texting that were mentioned were spelling errors in academic written work (reported by 66% of the students); writing difficulties (76%); and problems in written exams (54%). In line with Aziz et al.'s (2013) findings, the majority of these Pakistani young adults had a negative view: they thought that texting deteriorates their formal writing skills.

2.2.1 Discussion of Attitudinal Studies

Table 1 in Appendix B, at the end of this thesis, presents an overview of the important aspects of prior attitudinal studies. Overall, the findings of the fourteen surveys, as presented in Figure 1 per participant group, are negative: especially young adults and teachers express pessimistic views on the impact of CMC on literacy. Still, perceptions diverge: the source of these conflicts could lie in the diversity in methodologies and participants of the studies.
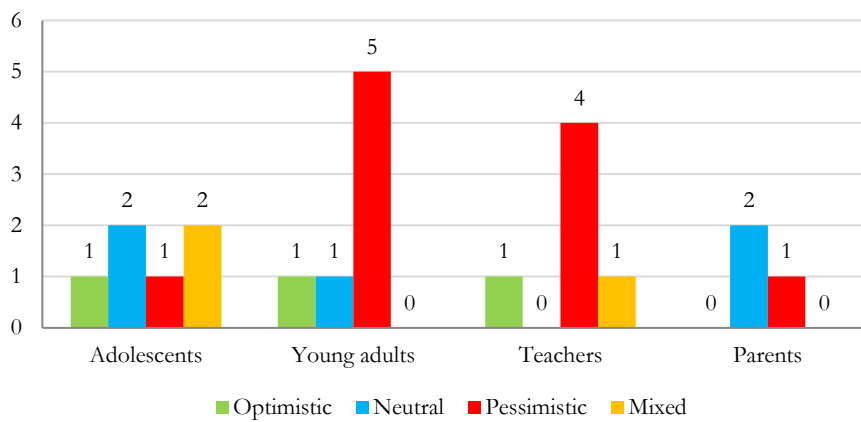
Figure 1. Attitudes expressed in survey studies into the impact of CMC on youths' literacy.[11]

Survey design. Figure 2 shows which research design the survey studies used. Nine studies were quantitative surveys (Lenhart et al., 2008; Drouin & Davis, 2009; Freudenberg, 2009; Spooren, 2009; Mildren, 2010; Dansieh, 2011; Geertsema, Hyman, & Van Deventer, 2011; Aziz et al., 2013; Yousaf & Ahmed, 2013), one study combined quantitative and qualitative methods (Purcell, Buchanan, & Friedrich, 2013), and only four studies were entirely of a qualitative nature, involving individual interviews (Adams, 2006/2007; Rankin, 2011; Tayebinik & Puteh, 2012; Salem, 2013), interviews in
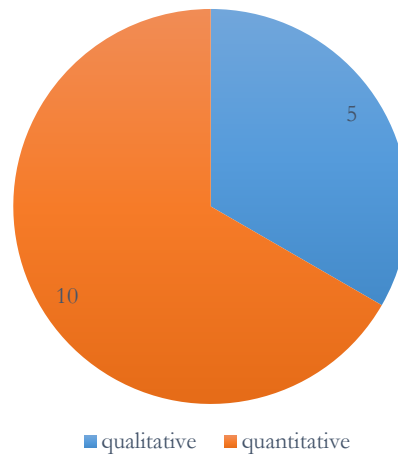
Figure 2. Survey design.

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[11] Because studies can include multiple participant groups, they can fall under multiple categories in Figure 1. This goes for the other descriptive figures in sections 2.2.1 and 2.3.5 too.

focus groups (Adams, 2006/2007; Rankin, 2011), and via email (Adams, 2006/2007). As a result, the **number of participants** also differed greatly, with qualitative studies ranging from 8 to 211 participants, and quantitative studies from 22 to 2,462. While quantitative studies reveal views of more people involved, qualitative studies can delve deeper into why they have such perceptions.

Medium. The medium/media that was/were surveyed differed as well, which is visualized in Figure 3, with most studies asking about the impact of text messaging (Lenhart et al., 2008; Drouin & Davis, 2009; Freudenberg, 2009; Spooren, 2009; Mildren, 2010; Dansieh, 2011; Geertsema, Hyman, & Van Deventer, 2011; Rankin, 2011; Tayebinik & Puteh, 2012; Aziz et al., 2013; Purcell, Buchanan, & Friedrich, 2013; Yousaf & Ahmed, 2013), several on instant messaging (Adams, 2006/2007; Lenhart et al., 2008; Freudenberg, 2009; Spooren, 2009; Tayebinik & Puteh, 2012), a few on social networking sites (Lenhart et al., 2008; Spooren, 2009; Purcell, Buchanan, & Friedrich, 2013), one on

Figure 3. Medium.

emailing (Lenhart et al., 2008), and one on blogging and microblogging (Purcell, Buchanan, & Friedrich 2013). Salem (2013) focused specifically on WhatsApp and BlackBerry Messenger, both mobile IMing applications. Furthermore, some studies used umbrella terms such as "text-based communication tools" (Lenhart et al., 2008), "new media" (Spooren, 2009), and "digital tools" (Purcell, Buchanan, & Friedrich, 2013). Attitudinal studies are most informative if a variety of currently popular social media are included in surveys.

Participant group. Another major aspect in which the studies differed (see Figure 4) was whose perceptions were queried. Most studies enquired after the perceptions of students' themselves on the impact of

Figure 4. Participant group.

CMC use on their own and/or other students' literacy skills, either secondary, middle or high school students (Adams, 2006/2007; Lenhart et al., 2008; Freudenberg, 2009; Spooren, 2009; Mildren, 2010; Salem, 2013), or university/polytechnic students (Drouin & Davis, 2009; Dansieh, 2011; Rankin, 2011; Tayebinik & Puteh, 2012; Aziz et al., 2013; Yousaf & Ahmed, 2013). Other researchers asked teachers for their opinions (Freudenberg, 2009; Spooren, 2009; Mildren, 2010; Dansieh, 2011; Geertsema, Hyman, & Van Deventer, 2011; Aziz et al., 2013; Purcell, Buchanan, & Friedrich, 2013), while yet other studies queried parents (Lenhart et al., 2008; Spooren, 2009; Mild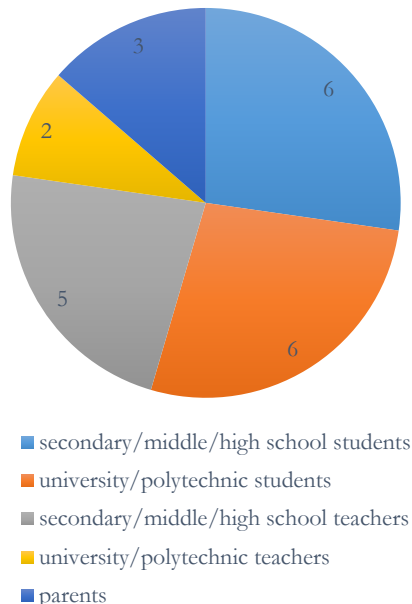ren, 2010). Interestingly, no studies involved primary school pupils or teachers. That the former were excluded makes sense, since primary school-aged children cannot be expected to have formed perceptions on such an issue, neither regarding their own nor regarding others' literacy skills. That the latter were excluded may, however, be considered a gap in the literature of attitudinal studies, since children are receiving mobile phones and using social media at increasingly younger ages worldwide, which makes it relevant to interview primary school educators about their perceptions of the impact of CMC on youths' literacy.

Participants' nationality. As shown in Figure 5, a next point of difference was the countries in which the data were collected, ranging from six studies conducted in the United States (Adams, 2006/2007; Lenhart et al., 2008; Drouin & Davis, 2009; Mildren, 2010; Rankin, 2011; Purcell, Buchanan, & Friedrich, 2013), two in South Africa (Freudenberg, 2009; Geertsema, Hyman, & Van Deventer, 2011), two in Pakistan (Aziz et al., 2013; Yousaf & Ahmed, 2013), and one in Ghana (Dansieh, 2011), Malaysia (Tayebinik & Puteh, 2012), Kuwait (Salem, 2013), and the Netherlands (Spooren, 2009). In other words, six attitudinal studies were conducted in America, four in Asia, three in Africa, and only one in Europe. The generalizability of each study is limited to the perceptions of people from these specific countries, which may greatly differ from those in other countries.

Figure 5. Participants' nationality.

Youths' age group. Corresponding to the differences in the participants whose perceptions were queried, there were of course differences between the age groups of the youths whose CMC use and literacy skills were asked about, as shown in Figure 6. The studies involving secondary, middle, or high school students and teachers explored views on the impact of CMC use on *adolescents'* literacy skills (Adams, 2006/2007; Lenhart et al., 2008; Freudenberg, 2009; Spooren, 2009; Mildren, 2010; Geertsema, Hyman, & Van Deventer, 2011; Purcell, Buchanan, &

Friedrich, 2013; Salem, 2013), while those involving university or polytechnic students and teachers explored views on *young adults'* literacy skills (Drouin & Davis, 2009; Dansieh, 2011; Rankin, 2011; Tayebinik & Puteh, 2012; Aziz et al., 2013; Yousaf & Ahmed, 2013). Corresponding to the complete lack of surveys involving primary school pupils or teachers, no studies explored views on the impact of CMC on *children's* literacy: this presents opportunities for further research, due to the increase of social media and mobile phones among children.

Youths' educational level. For most studies, it was unclear which

Figure 6. Youths' age group.

educational level the youths had whose CMC use and literacy skills were queried. Education was not explicitly mentioned, and could only be classified (as high) when university students were involved. This is a missed opportunity, since it would be highly interesting to find out if youths of diverse educational levels have different perceptions, and if teachers or parents of such youths differ in their perceptions of the impact of CMC on literacy.

Nature of participants' concerns. The writing aspects that are believed to be under threat are quite diverse. A large majority of surveys report on concerns for youths' command of writing conventions, i.e. lower-level writing skills such as spelling (13), textisms in school/formal writing (6), grammar (5), sentences [fluency, length, completeness] (4), punctuation (4), capitalisation (2), and vocabulary / word choice (2). Some studies do not specify which aspects of 'writing skills' (2) or 'writing difficulty' (1) are specifically feared for. Furthermore, communication skills (1) and writing productivity (1) are mentioned as possibly problematic aspects. Other studies mention the threat that CMC poses to specific writing genres and registers, such as formal writing (3) and standard language (1), which run the risk of getting mixed up with informal online writing and textese, and even speech is feared to be imbued with textisms (1). Only a few studies consider that higher-level writing skills might also be under threat, such as text quality (1), text ideas and content (1), and text organisation (1).

Nature of participants' optimism. The attitudinal studies have revealed several aspects of written literacy that people believe may be positively affected by CMC, such as writing creativity, personal expression in writing, writing frequency, writing ease, writing in different formats, voice, and specific kinds of higher-level writing skills such as note taking and collaborative writing. Yet these possible benefits are rather overshadowed by the commanding presence of negative sentiments.

Of course, perceived effects do not necessarily correspond to actual effects. People's judgements are inevitably less reliable than actual observations of behaviour,
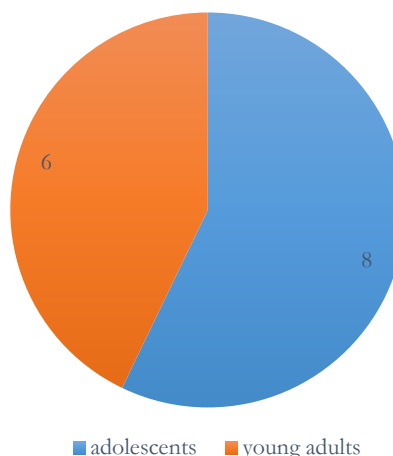
since it may be difficult to form an opinion and, moreover, virtually impossible to simply perceive the causality in the relationship between CMC use and literacy. In the next section, research that is more objective, namely observational studies into the impact of CMC on youth literacy, is discussed.

2.3 Observational Studies

Much prior research into relations between CMC and literacy skills is observational in nature: it presents empirical evidence.[12] The present section is a comprehensive discussion of such studies. Following Verheijen (2013), the studies have been categorized on the basis of whether they report a positive or negative relation, conflicting findings (so both positive and negative relations), or no significant relation at all.

2.3.1 Studies Reporting a Positive Relation

Neville's (2003) bachelor thesis examined the efficacy of textese and the relationship between texting and spelling. Her participants were 45 British girls in secondary school. They filled in questionnaires on mobile phone ownership and texting behaviour. They also completed a spelling test in which they were asked to write down not only the Standard English spelling of words, but also how they would spell them in a text message. In addition, their speed and accuracy of reading and writing text messages in textese and Standard English was measured, as follows: by typing two messages dictated to them into a mobile phone (using the multi-press mode),[13] one in Standard English and the other as if writing to a friend in textese, and by reading aloud two messages from a mobile phone, again, one in Standard English and the other in textese. Neville found that writing messages went significantly faster using textese, whereas reading messages went much faster when they were composed in Standard English, regardless of participants' usual texting frequency (number of messages sent per day): textisms caused faster writing and slower reading. She also found that spelling ability correlated positively with the speed of reading and writing text messages in both Standard English and textese: good spellers were quicker at reading and writing both types of message. Moreover, there were significant positive correlations between spelling ability and textism use (number of textisms used in textese writing) as well as textism understanding (number of textisms read accurately): good spellers used more textisms in composing text messages and made

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[12] In addition to the studies already discussed by Verheijen (2013), this chapter now also includes theses (bachelor, master, and PhD), studies on languages other than English, and studies published after Verheijen (2013) was submitted, as well as any studies that were overlooked.

[13] Alphanumeric keypads present a choice between two text entry modes: the 'multi-press' or 'multi-tap' mode, where a key is pressed one to four times to type the required letter, and the 'predictive' mode, where each key is pressed only once and predictive text input software (such as T9 or "text on nine keys"), which works with a built-in dictionary, suggests on the basis of frequency estimations what is the most likely word resulting from a particular sequence of key presses.

fewer errors in reading textisms. Neville concludes that her findings refute the idea that textese negatively affects children's or adolescents' linguistic ability, but these results can only be generalized to British female adolescents and their spelling skills.

Plester, Wood, and Joshi (2009) studied the relationship between textisms and literacy attainment with 88 British children. Their knowledge and use of textisms was measured by eliciting spontaneous text messages, where they were presented with different scenarios and had to pretend they were in different situations. The textisms density was established by calculating the ratio of textisms to the total number of words in the messages. Standardized tests were used to assess reading ability, non-word reading ability (alphabetic or orthographic decoding),[14] spelling ability, vocabulary knowledge, and phonological awareness. Although no significant correlations were found between textism use and spelling or non-word reading, positive correlations were found between textism density and reading, vocabulary, and phonological awareness. Even when controlling for individual differences in age, vocabulary, phonological awareness, non-word reading ability, short-term memory, and length of time of owning a mobile phone, the extent of children's textism use predicted their reading ability. Plester et al. thus suggest that "facility with text literacy is positively associated with [S]tandard English literacy" (158).

Kemp (2010) analysed 61 Australian university students' proficiency with textese and links with their literacy skills. Participants filled in questionnaires on their texting behaviour and read aloud text messages in Standard English and textese from a mobile phone and wrote dictated text messages in Standard English and textese on a mobile phone, which measured their reading and writing speed and accuracy. Reading accuracy was based on number of errors; writing accuracy was based on number of textisms. They also completed standardized spelling and reading tests, and experimental tasks assessing morphological and phonological awareness. Texting frequency (number of messages typically sent and received per day) was not correlated to any of the literacy measures, but faster and more accurate reading and writing of text messages (in Standard English and textese) were neutrally or positively correlated with literacy scores. Kemp concludes that students with better literacy skills are more efficient at composing and deciphering text messages or, conversely stated, those fluent with textisms have better literacy skills. There was hardly any intrusion of textisms into the Standard English messages, which suggests that students are capable of limiting their textism use to appropriate contexts.

Bushnell, Kemp, and Martin (2011) studied the relationship between texting and spelling with 227 Australian children. Questionnaires measured their texting-related behaviours and attitudes. Their knowledge and use of textisms was assessed with a translation task in which they had to rewrite a list of conventionally-spelled words as they would in a text message. Spelling ability was measured with a standardized spelling test. On average, the children wrote about half of the words as textisms and the rest in Standard English. Children who sent text messages in real

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[14] Non-word reading tests measure participants' accuracy of reading out non-existing words that follow the standard language morpheme-phoneme patterns. Reading non-words requires an ability to decode unfamiliar letter strings (Crumpler & McCarty, 2004).

life produced significantly more textisms, but even those who did not produced a considerable number of them. There was a significant positive correlation between spelling skills and the proportion of textisms produced (not with any other texting variables): the greater a child's spelling ability, the more textisms they produced. Bushnell et al. conclude that their results contradict claims of any detrimental impact of texting on spelling.

Durkin, Conti-Ramsden, and Walker (2011) explored the relationship between textism use and literacy in adolescents with and without specific language impairment (SLI). 94 participants – 47 of whom were "typically developing" (TD) and 47 had SLI – were interviewed about their texting frequency (sending and receiving messages), asked to send a spontaneous text message in reply to one sent by the experimenter, and assessed on their cognitive, language, and literacy abilities (spelling; reading efficiency and accuracy). Adolescents with SLI, who reported sending fewer text messages than their TD peers, were indeed less likely to send a reciprocal text message, and their messages were shorter and included fewer textisms than those of their TD peers. Participants with SLI who did not send a message in reply had significantly lower reading skills than those who did. Durkin et al. found significant positive correlations between literacy and textism density and the number of textism types used; the highest correlations were with spelling. Their study suggests that literacy skills are related to the choice to return a text message, the length of a message, and the use of textese. Adolescents with better literacy skills, regardless of whether they have SLI, are more likely to return a message, send significantly longer messages, and use more textisms and more different types.

In investigating associations between texting and literacy, Kemp and Bushnell (2011) also looked at the effects of texting method (predictive versus multi-press) and texting experience (texters versus non-texters). 86 Australian children read aloud text messages in Standard English and textese from a mobile phone and wrote dictated text messages in Standard English and textese on a mobile phone. Their literacy skills were measured with standardized tests of spelling, reading, and non-word reading. Children using the predictive mode turned out to be faster at writing and reading messages than those using the multi-press mode. Texting experience increased writing but not reading speed. Literacy scores did not differ significantly with texting method. Although the proportion of textisms used and literacy scores did not correlate, there were significant positive correlations between all literacy scores and textese reading speed and accuracy, as well as between spelling and reading scores and textese writing speed. Speculating on the direction of these relations, Kemp and Bushnell suggest that using textese "can reflect or even enhance children's traditional literacy abilities" (26). Children's Standard English was not overrun with textese: they used only few textisms in these messages.

Kreiner and Davis (2011) conducted two studies into the relationship between young adults' texting and IMing behaviour and their spelling skills, one with 64 and the other with 40 American university students. In both studies, participants filled in questionnaires about their texting and IMing practices, took a test measuring their knowledge of textisms (they were presented with a long list of textisms and had to indicate if they had seen and/or used them), and took a standardized spelling test.

Although spelling ability did not significantly correlate with any of the measures of texting or IMing frequency (text messages or instant messages sent or received daily) in either of the studies, it positively correlated with knowledge of textisms –referred to by Kreiner and Davis as *sensitivity* to textisms – in both studies. In addition, spelling ability was positively correlated with reaction time to identify 'real' textisms in the second study (this was not measured in the first study), so better spellers tended to respond more slowly to textisms, perhaps because they are more careful with spelling. Kreiner and Davis conclude that for young adults, better knowledge of textisms is linked to better spelling skills.

Plester et al. (2011) conducted a study into Finnish children's text messages and the relationship between their use of textisms and literacy ability. 65 Finnish children filled in questionnaires about their mobile phone use. Three methods were used for collecting text messages, yielding elicited and naturalistic data. All participants wrote text messages on paper in response to different scenarios (elicited text messages). These messages were then distributed among the participants, who wrote text messages in reply (elicited replies). 16 participants also submitted exact copies of the messages they had sent over a weekend (natural text messages). Literacy skills were assessed with standardized tests of reading (fluency, accuracy, and comprehension), non-word reading, spelling, and phonological skill; cognitive skills were assessed with tests of vocabulary, rapid serial naming, and short-term memory. For elicited text messages and elicited replies, Plester and colleagues found significant positive correlations between textism density and reading fluency, reading comprehension, phonological skill, and short-term memory, as well as with composite scores for reading [fluency, accuracy, comprehension, and non-word reading] and literacy [reading, spelling, and phonological skill], but not with spelling. For elicited texts, there was also a significant positive correlation between textism density and vocabulary. All this points towards a positive relationship between textism use and literacy. For natural text messages, there were no significant correlations with any of the literacy measures, but this may be due to the small sample size of only 16 participants.

Seeing that language prescriptivists consider textisms as particular kinds of misspellings, Powell and Dixon (2011) conducted an experiment to study the effects of exposure to textisms, misspellings, and 'correct' spellings on spelling performance. This operationalization of CMC use is quite different from that in other studies, but interesting nevertheless, since it yields insight into whether being exposed to (e.g. friends') textisms and other non-standard spellings can have an effect on youths' spelling ability, irrespective of their own use of textisms. The spelling ability of 94 British university students was assessed in pre- and post-tests before and after an exposure phase in which they were exposed to the same words as in the tests, but presented in three ways: as 'correctly' spelled words (e.g. *tonight*), as phonetically plausible misspelled words (e.g. *tonite*), or as textisms using a combination of letters and numbers (e.g. *2nite*). A no-exposure baseline condition was included to determine the effects of textisms, misspellings, and correct spellings relative to a potential test repetition effect. Spelling scores decreased from pre-test to post-test after exposure to misspellings, but improved after exposure to correct spellings and textisms. Powell

and Dixon conclude that exposure to textisms positively affects young adults' spelling performance.

Wood, Meachem et al. (2011) conducted a longitudinal study to determine the nature and direction of any association between textism use and literacy. Such a longitudinal method can reveal insights into the causality of the relationship. They measured the textism use of 119 British children by asking them to provide exact copies of the actual text messages they had sent within two days at the start [Time 1] and the end [Time 2] of the school year. Participants completed standardized pre- and post-tests on reading, spelling, verbal ability, phonological awareness, and phonological retrieval. Textism density correlated positively with reading and spelling, both concurrently and longitudinally. Moreover, textism use at Time 1 could predict unique variance in spelling ability at Time 2 (i.e. explain changes in spelling scores over the year) even after controlling for verbal ability, phonological awareness, and spelling ability at Time 1. Reversing the analysis revealed that reading and spelling ability at Time 1 could *not* predict unique variance in textism use at Time 2 (i.e. account for changes in textism use over the year). Wood and colleagues thus contest that good literacy skills make children better at using textisms or more prone to use them and suggest that, instead, there is a causal contribution of using textisms to Standard English spelling skills. However, this may be mediated by phonological retrieval skills, because when this was also controlled for, the relationship between textism use and spelling ability was no longer statistically significant.

Johnson (2012) explored the link between textisms and reading ability with 91 Australian children. Their comprehension of textisms was tested by translating common text abbreviations into Standard English. Standardized reading tests were also administered. Johnson found that children who were better at translating the textisms also had better reading fluency (speed) and sentence comprehension skills. Johnson's findings thus suggest a positive association between children's understanding of textisms and reading skills. Yet the external validity of this study is limited, because the translation task only involved five items, four of which were so-called initialisms, so these results cannot simply be generalized to textisms in general.

Van Dijk et al. (2016) studied the influence of textese on Dutch children's grammar and vocabulary skills and executive functions (cognitive abilities). 55 primary school children from grades 5 and 6 participated. Van Dijk and colleagues elicited text messages by (a) having the children reply to a message sent by the experimenter, as if they had received it from a friend, and (b) in response to an everyday scenario, again as if sending a message to a friend. They also collected naturalistic messages, by having the children copy actual text messages they had sent from their own mobile phones, as well as from WhatsApp chat groups with their classmates monitored by the researchers. All messages were analysed for two characteristics of textese, textisms and omissions, and the ratio of these features to the total number of words were calculated. The children completed a questionnaire measuring texting-related behaviours, e.g. asking them about their texting frequency (number of messages sent on a weekday and a weekend day). Their language skills were measured with standardized tests, of vocabulary and grammar performance in spoken language (sentence repetition task), and so were their executive functions

(selective attention, interference inhibition, visuo-spatial working memory, and verbal working memory). Reported texting frequency was not significantly related to vocabulary or grammar, but textism and omission ratios in the elicited messages correlated positively and marginally significantly with vocabulary and grammar scores, and textisms also with selective attention scores. Still, the only significant effect found in regression analyses was that the omission ratio was a positive predictor of children's grammar performance (even after controlling for other variables, such as age): the more words children omitted in their elicited text messages, the better they performed on the spoken grammar task. The authors hypothesize that omissions in textese train children's grammar system, because they have to use their grammar to decide which elements can be dropped. Since only a positive effect was found, Van Dijk and colleagues conclude that children may benefit from CMC.

2.3.2 Studies Reporting Conflicting Findings

Raval (2002) was possibly the first to conduct a (small-scale) study into the effects of CMC on literacy. For his bachelor thesis, he investigated the impact of experience with texting on 20 British children's literacy skills. His participants consisted of two groups, texters and non-texters, and both completed a spelling test and two writing exercises which imitated informal situations where they might normally text. No significant differences were found between the groups in terms of grammar or spelling 'errors', and textisms were absent from both groups' writings. Still, a difference between the groups was found: when asked to describe a picture or event, the texters wrote significantly shorter samples. Raval concludes that there is no cause for concern that texting damages spelling or grammar, because the children in his study were able to switch between Standard English for school purposes, and textese for informal social purposes. However, texting may affect the expressiveness of their writing, although it is debatable whether concision in writing is a positive or negative effect.

   Bouillaud, Chanquoy, and Gombert (2007) studied the relationship between spelling ability and textese – what they call 'cyber language' (the language used in 'cyberspace'). They had 144 French participants, divided over three age groups: children at primary school (CM2/7th), young adolescents at secondary school (5th), and somewhat older adolescents at secondary school (3rd). Participants filled in questionnaires on their use of different media: texting, IMing, online forums, and online chat rooms. Knowledge of textisms was tested with a textese-style dictation exercise, where they were asked to use as many textisms as possible. Spelling ability was tested with a traditional dictation test. The textese-style dictation showed that the adolescents, who according to the questionnaires made more use of new media, had more knowledge of textisms than the children (this knowledge increased with age) and their use of new media positively correlated with their knowledge of textisms. For the children, there was a positive correlation between knowledge of textisms and spelling ability, which leads Bouillaud et al. to conclude that children's spelling skills can benefit from textese. Yet for the somewhat older adolescents, they

found a negative correlation between use of new media and spelling ability. In short, the findings of this study diverged for different age groups.

Plester, Wood, and Bell (2008) report on two studies into the relationship between texting and literacy. In the first study, 65 British children translated sentences from Standard English into textese and vice versa. Plester et al. calculated an error score of spelling, grammar, and punctuation 'errors' in the Standard English writings and the textism density of the textese writings. A standardized test measuring verbal and non-verbal reasoning yielded participants' general literacy ability. There was a significant negative correlation between literacy skills and texting frequency (children who sent more text messages per day had lower literacy scores), but also a significant positive correlation between verbal reasoning ability and textism density (children who used relatively more textisms when translating into textese performed better in verbal reasoning). So, Plester et al.'s first study presents a mixed picture, with differing results for texting frequency and textism use. In their second study, 35 children translated an exchange from Standard English into textese and vice versa. Writing and spelling skills were assessed through standardized tests. There were significant correlations between spelling and writing ability and performance on the translation tasks: unsurprisingly, negative with the error score in Standard English, but also positive with textism density in textese. Both studies thus suggest that the knowledge and use of textisms is associated with better writing and spelling.

Winzker, Southwood, and Huddlestone (2009) investigated the effect of texting on the English writings of South African adolescents. Participants were 88 high school students: 51 had English as their L1 and 37 as their L2 (their L1 was Afrikaans). Questionnaires revealed that participants were avid users of texting, IM software on mobile phones, and textese. Their writings were examined for various features deviating from Standard English. They turned out to include mostly spelling and punctuation 'errors'; textisms occurred infrequently. Winzker et al. infer from this that textese has a modest negative effect on written schoolwork, but also that students can generally gauge when it is inappropriate to use textese. Fewer textisms occurred in writings by L2 students than in those by L1 students. The authors present two possible reasons: Afrikaans is less suitable for certain textisms (letter/number homophones) than English because only few Afrikaans letter/number words sound similar, and L2 participants may pay more attention to their spelling because writing in English is more difficult for them. Yet non-standard spelling and punctuation may also have been caused by factors unrelated to textese, such as general spelling difficulties or, in the L2 students' writings, L1 transfer.

Rosen, Chang, Erwin, Carrier, and Cheever (2010) report on two studies into the relationship between American young adults' textism use in various media and their quality of writing. The first study included 335 participants, the second 383. Questionnaires were used to assess frequency of texting, in terms of amount of time spent using a mobile phone per month and number of text messages sent per month; frequency of simultaneous IM chats; and use of textisms in texting, IM, and email. The participants of both studies wrote a formal text; those of the second study wrote an informal text too. It was not stated in the prompt that these should be written in Standard English or that textisms should be avoided. The quality of each writing

sample was rated with a scoring rubric. Use of textisms turned out to be quite low in both types of writing. Reported textism use correlated positively with quality of informal writing, but negatively with quality of formal writing. Frequency of simultaneous IM chats also correlated negatively with quality of formal writing. Rosen et al. use two theories to explain their results: (i) Salomon and Perkins's (1989) Low-Road/High-Road Transfer of Situated Learning Theory, where 'low-road transfer' entails that when two tasks are closely related, previously acquired skills are transferred semi-automatically and 'high-road transfer' that skills are used with more conscious effort, and (ii) Brown, Collins, and Duguid's (1989) idea that 'situated learning' (learning by doing) causes unintentional transfer of skills. These theories support the findings as follows: those who use more textisms in their daily communication unintentionally transfer these to their Standard English writings, particularly in writing similar to informal texting, in which case more low-road transfer occurs. Relations between textism use and writing were found to depend not only on type of writing, but also on educational level: participants with less education used more textisms in their writings. Rosen et al. were one of the first and few to include educational level as a factor in investigating this issue, which is an angle that deserves more attention.

Shafie, Azida Darus, and Osman (2010) investigated whether using textese affects Malaysian university students' academic writing in English. All 264 participants were taking English courses and their native language was Bahasa Malaysia. They were asked to provide exact transcriptions of all English text messages they had sent or received during the study, lasting one semester, so these were naturalistic data. Based on the textese in these messages, the textisms in participants' assignments and exams were located. These academic writings contained many grammar and spelling 'errors', but few textisms, and only in writings of students with a weaker proficiency in English. Shafie et al. conclude that students generally know how to differentiate between textese used in informal contexts and the standard language used in formal writing contexts. They add that the many spelling errors suggest that frequent use of textese may cause weaker students to forget the 'correct' spelling. However, we should consider that the spelling 'errors' may also be attributed to English not being participants' L1.

Coe and Oakhill (2011) aimed to explore the relationship between children's reading ability and texting behaviour by comparing better and poorer readers. Their participants were 41 British children, whose reading skills had already been assessed by means of a standardized test. They filled in questionnaires on their texting and IM practices. Then they completed two writing tasks: writing a spontaneous text message (on paper) in response to a scenario presented by the experimenter, and translating Standard English words into textisms. They also did a reading task to assess their orthographic decoding speed, by reading messages in Standard English and textese. Poor readers were found to spend significantly more time texting on a daily basis. Good readers, on the other hand, were not only better at reading Standard English messages, but also at reading messages in textese and at writing textisms: they read text messages at a higher speed and used more textisms in the text message writing task. Coe and Oakhill conclude that their findings contradict the popular assumption

that textese harms literacy: in fact, reading ability and knowledge and use of textisms were positively correlated. The picture becomes more complicated when considering that although a negative correlation was found between reading ability and frequency of mobile phone use in terms of amount of time spent using it per day, no significant correlations were found between reading ability and frequency of texting in terms of number of messages sent and/or received per day. This suggests that the poor readers either sent or received considerably longer text messages or, more likely, spent much more time composing and reading text messages – which indicates that writing ability may be a relevant factor, but this was not measured by Coe and Oakhill. Finally, no significant associations were found between reading ability and frequency of IMing.

Drouin (2011) examined the relationship between frequency of texting and accessing SNS, use of textese, and literacy in a sample of 152 American university students. They were asked in a questionnaire to self-assess their frequency of texting, accessing SNS, and use of textese on a scale. Their literacy skills were measured with standardized reading and spelling tests. Drouin found significant positive correlations between texting frequency and spelling and reading fluency, but not between frequency of SNS access and spelling or reading ability. In addition, she found significant negative correlations between reading accuracy and textese use on SNS and in formal emails (because textese may be causing students to 'forget' Standard English?), but not between any literacy measure and textese use in texting or informal emails. In other words, students who reported sending more text messages had higher reading and spelling scores, but students who used more textese in certain media revealed the opposite. This study tells us two things: (a) that texting frequency and textism use may have different relationships with literacy, and (b) that medium may be a relevant factor to further explore in the relationship between CMC and literacy.

Lee's (2011b) master thesis investigated the influence of texting and IMing ('messaging media') and traditional print media on language judgements. Her study differs from other studies in focusing on language *acceptability* rather than *ability*. She aimed to determine whether exposure to different media affects if people find words grammatical, since texting and IMing can be assumed to provide more exposure to textese, and print media to the standard language. Her participants were 33 Canadian university students. They filled in questionnaires measuring their exposure to texting/IMing and print media. Lee collected acceptability judgements for Standard English words; textisms; and novel, unusual, 'deviant' word forms.[15] Participants were presented with words in three ways: a Standard English paragraph, an IM dialogue, and a checklist. In addition, they completed a texting/IMing fluency task, in which they had to list as many textisms as possible, and a print media fluency task,

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[15] The 'deviant' forms that Lee tested were (a) compounds with incorrect spacing between morphemes; (b) non-compounds with incorrect exclusion of spacing between morphemes; (c) existing and novel words with derivational suffixes *-ity* and *–ness* violating selectional restrictions; (d) irregular verbs in past tense with double inflection, i.e. inflectional suffix *-ed* after irregular past tense forms; and (e) irregular plural nouns with double inflection, i.e. inflectional suffix *-s* after irregular plural forms.

in which they had to list the books, magazines, and newspapers they had read in the past year. Contrary to Lee's hypothesis, exposure to texting (but not IMing) negatively correlated with acceptability of deviant forms violating orthographic or morphological rules and with acceptability of some Standard English words. Instead of having more relaxed acceptability constraints, participants who received more text messages (in a month) had more rigid acceptability constraints. Lee speculates that students more exposed to texting may be more wary of accepting new word forms because most of their textese is restricted to the particular language used among 'generation text' peers, which she claims does not contain much linguistic variety (which, I believe, can be disputed). What is more, Lee describes this lower tolerance as a negative impact of texting on language acceptability. However, Lee's statement that rejecting 'deviant' forms is unfavourable is a rather subjective judgement: one could also argue that it reveals a higher regard for the orthographic and morphological rules of Standard English.

A study by Veater, Plester, and Wood (2011) included an exploration of the relationship between texting and literacy skills with 65 British children, 13 of whom had dyslexia. This study used naturalistic data: participants were asked to provide exact copies of the actual text messages they had sent over a weekend, for which the textism density was calculated. Participants were subjected to a standardized reading test and two tests assessing their phonological awareness, involving rhyme detection and non-word reading. Results revealed significant positive correlations between textism use and phonological awareness (both tests combined) and reading ability for the typically developing children, but not for the dyslexic children. Some significant positive correlations were found between different textism types and the literacy measures: for the typically developing children, for several textism types, but for the dyslexic children, only for one textism type. Veater and colleagues conclude that the near absence of associations between textism use and literacy among the dyslexic children may indicate that they do not have "a phonic approach to decoding text" (70). Still, the small participant sample of dyslexic children makes this conclusion rather tentative.

Wood, Jackson et al. (2011) conducted an intervention study with 114 British children to investigate the direction of any relation between texting and literacy.[16] This study differs from most other studies in that none of the participants had ever owned a mobile phone, a methodology which would only be feasible these days with very young children. A critical note: Wood and colleagues did not consider whether the children had ever had access to an IM program or had experience with other social media. Participants were divided into experimental and control groups. Children in the experimental group were given access to mobile phones which they could use just for texting in the half-term break and on weekends for ten weeks. Exact transcriptions of their text messages were made, which yielded naturalistic data. All children completed standardized pre- and post-tests on reading, spelling, non-word reading, phonological awareness and retrieval, and lexical retrieval. No significant differences were found between the texters and non-texters as regards

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[16] Preliminary results of this study were reported in Wood, Jackson, Plester, and Wilde (2009).

their literacy attainment during the study. This leads the authors to conclude that text messaging for several weeks does not affect literacy skills. Yet this might be attributed to the duration of the study (perhaps the intervention did not last long enough for any effect to emerge) or to the restricted access to mobile phones. Nonetheless, the experimental group revealed significant positive correlations between textism use and literacy development, and textism use could predict a significant amount of variance in spelling development. A positive correlation between texting frequency (number of messages sent and received during the intervention) and lexical retrieval skills was found too, which indicates that reading and composing text messages may enhance word-finding skills.

Wood (2013, reported in Wood et al., 2013) studied British children's and adolescents' mobile phone use in relation to their literacy abilities. Her participants were 106 primary school and 95 secondary school students, so 201 in total. They filled in questionnaires on their mobile phone behaviour. Their literacy skills were tested with a standardized spelling test and tasks measuring phonological awareness, phonological retrieval, and orthographic processing. Wood reports a complex array of results. Significant positive correlations between mobile phone dependency (both for frequency of carrying phones and for frequency of bringing phones to school) and orthographic processing and phonological retrieval contrasted with significant negative correlations between mobile phone dependency (frequency of phone carrying) and spelling ability, as well as between mobile phone dependency (importance of keeping phone charged) and phonological awareness (although the latter association was positive for just the secondary school children). Wood also found significant positive correlations between age of first phone acquisition and spelling ability and orthographic processing (after controlling for individual differences in verbal ability), so children who were older when they received their first mobile phone scored better on these literacy measures. Furthermore, the size of children's texting network correlated negatively with phonological awareness: children who reported texting fewer friends had more phonological awareness. Another result was a positive correlation between reported understanding of textisms and orthographic processing. No significant impact of keyboard type or of text entry method was found. Wood feels that the most important conclusions to be drawn from this study are the effects of age of first phone acquisition ("older is better than younger") and size of texting network ("smaller is better than larger") on literacy (67), but these are only a small selection of the results.

Drouin and Driver (2014) examined the relationship between young adults' texting behaviour, use of textese, and literacy skills. Participants were 183 American university students. They filled in questionnaires on their texting practices and provided exact transcriptions of the last five actual text messages they had sent, so both self-reports and naturalistic data were used. They also completed standardized tests of reading (accuracy and fluency), spelling, and vocabulary. Negative correlations were found between textism density and reading accuracy and spelling: However, there were no significant correlations between textism density and reading fluency or vocabulary, nor between texting frequency (number of messages sent per month) and any of the literacy measures. Some textism types were associated with

poorer literacy skills (e.g. omission of apostrophes and capitalisation, which Drouin and Driver delineate as 'negative textism categories', as errors and "lazy writing"), while others were associated with better literacy skills (e.g. accent stylizations and symbols, 'positive textism categories', reflecting creative language use and purposeful manipulation) (4). This terminology of 'positive' and 'negative' textism categories is indicative of what, in my opinion, is a misconception, namely that textisms can only be justified if they involve deviations from the standard orthography with letters (for reasons of language play, imitating speech, expressivity, or reduction); by contrast, omitting apostrophes and capitalisation is likewise effective in CMC, because it saves time and effort without hindering the clarity of the message. The relationship between literacy and density of textism types was moderated by the use of predictive texting in composing the message. Compared to participants who never used predictive texting, those who always used predictive texting used more positive textisms and fewer negative textisms (yet this was a non-significant trend!), probably because the predictive mode makes it more difficult to type certain textisms and can automatically correct capitalisation and punctuation. Therefore, it is important to consider the role of CMC users' technological preferences in studying its impact on literacy.

Grace, Kemp, Martin, and Parrila (2014) studied the associations between young adults' naturalistic texting behaviour and literacy skills in two studies. The first study included 150 university students from Canada, the second 86 from Australia. Participants filled in questionnaires to establish their texting experience (length of mobile phone ownership) and frequency (number of text messages sent daily) and opinions as to the appropriateness of using textisms when texting friends. They were requested to supply transcriptions of their last five actual text messages, from which their textism density could be calculated, and they completed standardized non-word reading and spelling tests. The Australian participants were administered several additional tests, of novel word reading, reading, phonological processing, and non-verbal reasoning, plus a questionnaire about their reading history (difficulties with literacy learning in primary school). Textism density correlated negatively with spelling for only the Canadians, whereas it correlated negatively with non-word reading for only the Australians. It also correlated negatively with phonological processing and reading history for the Australians. Length of phone ownership correlated negatively with spelling for only the Canadians, yet positively with novel word reading for the Australians. Texting frequency, in contrast, correlated negatively with novel word reading for the Australians. Ratings of the appropriateness of using textisms when texting friends correlated negatively with non-word reading for only the Australians, and with adult reading history: Australians who found it more appropriate to use textisms had lower non-word reading scores and reported to have had more literacy learning difficulties. Grace and colleagues conclude that their inconsistent findings suggest that textisms do not harm literacy, but rather that textism use depends on an interaction of various factors, including literacy skills (but also social and technological factors). Moreover, the relationship may be affected by opinions on the appropriateness of using textisms. What also becomes apparent in this study is the relevance of participants' nationality, since

strikingly different relations were found for Canadians and Australians. However, the correlations were weak and no plausible explanation for the different correlations between participants of different nationalities was apparent (mobile phone usage differences between Australian and Canadian students were small and mostly uncorrelated with the literacy measures), so these findings may also be due to chance, which suggests that what is more relevant is sample size.

Wood, Kemp, and Waldron (2014) conducted a longitudinal follow-up study on Wood, Kemp, Waldron, and Hart (2014, reported below in section 2.3.3), again investigating the relationship between texting and grammar skills. Participants were 210 of the British youths who participated in Wood et al.'s (2014) original study: 83 children, 78 adolescents, and 49 young adults. The text messages collected for Wood et al. (2014) were used again to measure the proportion of grammatical 'violations'; an additional set of naturalistic text messages, again sent within a two-day period, was collected one year later by having participants copy their actual messages. An IQ test, measuring general cognitive abilities, was administered, as well as several literacy tests: a standardized test of receptive grammar (testing understanding of spoken grammar), an orthographic choice task (testing written grammatical performance), an orthographic processing task, and a standardized spelling test. Results were inconsistent. Correlations showed several significant associations, both positive and negative, between the grammatical violation variables and the outcome variables, depending on the type of violation, the literacy test, and the participants' age group. Regression analyses revealed that the only significant predictor was young adults' use of 'ungrammatical' word forms, which positively predicted growth in orthographic choice making. Overall, no strong link between grammatical violations in texting and development of grammar skills was found. Wood and colleagues, therefore, stress the need to distinguish between accidental and deliberate grammatical 'transgressions' in text messages, i.e. between (a) genuine errors, due to lack of understanding and (b) intentional violations of standard language rules, to save time or effort, for social reasons, or for comic effect. Such a relevant distinction could also be applied in corpus analyses of social media messages, yet it should be noted that this is difficult to implement objectively, so results should be interpreted with care.

Waldron, Wood, and Kemp (2016) conducted a longitudinal study into the effects of predictive text use on the literacy skills of British children, adolescents, and young adults. Predictive text was defined as "the user inputs the first few letters of a word and the phone predicts and fills in the last letters" (3) – whether this includes corrective text too is unclear to me, and may have been unclear to participants too. Predictive text entry may expose users to more correct punctuation, capitalisation, and spelling as compared to other entry methods, because predictive software often autocorrects some 'errors' in these areas, but it does not ensure 'correct' grammar, since users can still omit words or use unconventional punctuation. 208 students (83 primary school, 77 secondary school, 48 university) participated in this study at Time 1, 190 (76, 67, 47) at Time 2. Again, participants were asked copy their actual sent text messages from two days prior to the study. These naturalistic messages were analysed for 'violations' of conventional grammar ("grammatical textisms") in terms

of punctuation and capitalisation and 'ungrammatical' word use, as well as for orthographic textisms. The absolute frequencies were divided by the total number of words in the messages, to compute ratios of grammatical and 'traditional' textisms. Participants also filled in questionnaires about their use of predictive messaging, and completed standardized tests of grammatical understanding, orthographic processing, and spelling ability. For adolescents, predictive text correlated negatively with spelling: adolescent users of predictive text made significantly more misspellings (genuine errors, as judged by the authors, so not deliberate textisms) when texting than non-users. Yet for young adults, predictive text correlated positively with grammar: young adult users of predictive text made significantly fewer grammatical violations when texting than non-users. In addition, predictive text was related to the frequency of some categories of grammatical violations in the text messages of both children and adolescents, but not of such violations overall. However, it has to be noted that all results on misspellings and textisms should be interpreted with caution, since it was, of course, difficult for the authors to distinguish between accidental mistakes and deliberate deviations. Predictive text use did not stay stable over the course of a year: many participants were 'digital shifters', changing in their (non-)use of predictive software. For the children and adolescents, consistency of predictive text use was unrelated to growth in any of the literacy measures, but for the young adults, it was negatively related to results on one of the grammatical understanding tasks, namely the pseudo-word orthographic choice task measuring morphological awareness. Waldron et al. thus conclude that predictive texting may degrade university students' morphological awareness.

2.3.3 Studies Reporting a Negative Relation

Rankin's (2011) PhD thesis was a qualitative study into the impact of texting on 25 American university students' academic writings, specifically on the spelling and grammar of their writings. In interviews, participants reported to frequently use textisms. Rankin observed them during an in-class writing assignment and analysed previous writings. Textisms were found to occur in both the rough drafts and the final drafts of their academic writing, as well as other misspellings and grammatical 'errors' which may, but need not be, caused by texting. Rankin concludes that the students could not fully differentiate between the informal writing style with language shortcuts used in texting and the Standard English expected from them in academic writing. Rankin concedes, though, that her participants had less-than-average academic writing skills, because they were all "admitted to the university through the Summer Developmental Program, meaning they were deficient in some area that denied them regular admission" (64), such as in grade point average or standardized test scores. If Rankin's study were replicated with higher educated students, results may very well have been less negative. We should thus be cautious of generalizing these results beyond lower educated students.

Cingel and Sundar (2012) conducted a study with 228 American children and adolescents to find out whether texting affects their grammar ability. Questionnaires asked participants about their texting behaviour, attitudes towards texting, and textism use. They completed a test to assess their grammar skills. Cingel and Sundar

found negative correlations between grammar ability and texting frequency (number of messages sent and received per day) and textism use (reported average number of textisms per message sent – note that this measure does not take message length into account, which makes this result difficult to interpret). A regression analysis revealed that textism use, but not texting frequency, was a significant predictor of grammar ability. Yet this was only the case for certain textism types: 'word adaptations' (initialisms, letter omissions, homophones) negatively predicted grammar ability, but 'structural adaptations' (changes in punctuation or capitalisation – similar to Drouin and Driver's (2014) 'negative textism categories') were not significantly predictive. A mediation analysis showed that the average number of word adaptation textisms sent by participants mediated the association between the number of word adaptation textisms received by participants and their grammar assessment score. Cingel and Sundar interpret these findings with two theories: (i) Social Cognitive Theory, which states that people "rely […] on observational learning for expanding their knowledge and guiding their behaviours" (1307) and (ii) Low-Road/High-Road Theory of Transfer of Learning (also cited by Rosen et al., 2010), which argues that "two tasks similar in nature [...] will involve an automatic [low-road] transfer of skills" and that "previously learned behaviors are used with a higher degree of forethought" via high-road transfer (1308–9). The observational learning paradigm can explain that youths learn to use textese in their own CMC by observing it in texts they receive. The transfer of learning theory can explain that they transfer this textese to their Standard English. Cingel and Sundar conclude that it is difficult for most children and adolescents to switch between the textese they use in CMC and the standard language expected from them at school. Still, the correlational nature of this study prevents any causal conclusions, so it need not be the case that using textisms negatively affects grammar skills; it is also possible that youths with poorer grammar skills are for some reason more prone to use textisms.

In De Jonge and Kemp's (2012) study into the relationship between texting and literacy, 52 Australian high school students and 53 Australian university students translated sentences from Standard English into textese. They also completed spelling, reading, and non-word reading tests, and experimental tasks measuring morphological and orthographic awareness. Results were "overwhelmingly negative" (63): texting/textism use (texting frequency in terms of number of messages sent per day, textism density, and number of textism types used) were significantly negatively associated with literacy scores for spelling, reading, non-word reading, and morphological awareness; and texting experience was moderately negatively associated with reading and non-word reading. Only correlations with orthographic awareness were non-significant. De Jonge and Kemp argue that texting may interfere with literacy development or provide an opportunity for those who are less literate to mask poor spelling.

Wardyga's (2012) PhD thesis explored the relations between texting frequency (which he calls 'text message volume') and performance on school writing tasks with 127 American young adults, college freshmen. He included gender as an additional independent variable. Students' writing skills were determined in two ways: based on their scores in a standardized writing test (part of the Scholastic Aptitude Test or

SAT) and their (non-standardized) grades for a writing course. Frequency of texting (number of messages sent and received per month, averaged over the two months before taking the SAT) was gauged via questionnaires. These self-reports were validated by having participants submit copies of their mobile phone bills. Strangely enough, whether this method, which includes the collection of very private, sensitive data, was ethically approved by any ethical testing committee is not discussed – although this does not affect the results, of course. Wardyga only found a significant negative relationship between female students' texting frequency and their SAT scores, for which he gives no satisfactory explanation, merely suggesting that it may have to do with females in high school are the most active texters.

Kemp, Wood, and Waldron (2014) conducted a study into 243 British youths' texting behaviours and their grammar skills. They operationalized grammar as including morphology, syntax, and punctuation and capitalisation. Whether the latter truly reflect grammatical competence is debatable, though: I would rather categorize them as orthographic conventions. 89 children at primary school, 84 adolescents at secondary school, and 70 young adults at university participated. Kemp, Wood, and Waldron investigated how their use of unconventional grammar in texting is connected with their knowledge of Standard English grammar conventions. Participants provided transcriptions of actual text messages they had sent within a two-day time span. The proportion of grammatical 'violations' (incl. missing/ unconventional punctuation, missing capitalisation, and word/grammar 'errors' – again, what the former two have to do with 'grammar' is debatable) in these naturalistic messages was calculated, by dividing the number of violations by the number of words per message. Participants filled in questionnaires about their texting behaviour (e.g. on frequency of texting, length of time of owning a mobile phone, use of predictive text) and were subjected to tasks measuring their grammatical knowledge: translating text messages with unconventional grammar into Standard English and completing a standardized grammar test, as well as an experimental grammar task (grammatical spelling choice task). For the children, there was a significant negative association between grammatical violations in texting and grammatical spelling choice. For the young adults, there was a significant negative association between grammatical violations in their text messages and the message translation task, leaving more grammar 'errors' uncorrected. For the adolescents, no significant associations were found. This leads Kemp et al. to conclude that some aspects of grammar ability and the use of grammatical 'transgressions' in texting may be linked, but the latter – whether accidental or deliberate – are not "a consistent sign" of poor grammar skills (1585): any negative relationship cannot be generalized across age groups or grammar tasks.

Wood, Kemp, Waldron, and Hart (2014) report on another investigation into the relationship between texting and literacy with British youths, with the same participants as in Kemp, Wood, and Waldron (2014). The 243 participants provided exact copies of the actual, naturalistic text messages they had sent within a two-day period prior to the study, which were analysed for 'ungrammatical' texting behaviour, including three kinds of grammatical 'violations': unconventional orthographic forms, punctuation and capitalisation 'errors', and word-based grammatical 'errors'.

In my opinion, (especially the first two of) these categories are not straightforward measures of grammatical competence. They then divided the number of errors by the total number of words in the messages, thus calculating the ratio of grammatical violations. Participants were subjected to assessments of grammatical understanding (of spoken and written grammar – the latter measured by a pseudo-word orthographic choice task), orthographic processing, and spelling ability. For the children and adolescents, grammatical violations in their texting did not correlate significantly with grammatical understanding, orthographic processing, or spelling ability. However, for the young adults, the occurrence of one type of grammatical violation, namely deviating punctuation and capitalisation (what Cingel and Sundar (2012) call 'structural adaptations'), correlated negatively with understanding of written grammar, an association that was still significant after controlling for individual differences in IQ (cognitive skills, verbal and non-verbal performance) and spelling ability: those with more violations had more difficulty choosing the grammatically correct orthographic representations of pseudo-words. Grammatical 'transgressions' in texting thus appear to be negatively linked to understanding of standard grammar or of conventional orthography for only young adults.

Vandekerckhove and Sandra (2016) studied the potential impact of informal CMC on Flemish adolescents' (and some young adults') school writings. They analysed writings by 736 secondary school students for spelling 'errors', i.e. orthographic deviations from Standard Dutch. These errors were categorised as 'classic mistake' or 'chat language interference' (i.e. textisms). Overall, relatively few spellings could be classified as textisms. It has to be noted, though, that the researchers were quite conservative in their labelling of errors as chat language interference – multiple error types that are nowadays likely to be caused, or at least aggravated, by informal CMC, were nevertheless labelled classic mistakes, since such an indirect impact could not be quantified. The amount of textisms in school writings very much depended on education: students with a lower educational level (vocational training) revealed more interference, especially in writings produced via digital tools, i.e. computer-typed assignments. Vandekerckhove and Sandra conclude that these youths have more difficulty in separating writing repertoires, that is, informal online and formal offline writing. Furthermore, the two kinds of errors (classic vs. chat language) correlated, but only weakly, so interference from CMC does not seem to considerably boost other spelling errors.

A longitudinal study was conducted by Simoës-Perlant, Gunnarsson-Largy, Lanchantin, and Largy (2018) with 90 French adolescents in the ninth grade, to measure the impact of IMing on spelling. For twelve weeks, they were exposed to pseudo-words and/or textese style-modified pseudo-words, and had to do exercises with these words. The participants were divided into three groups: group 1 was only exposed to the pseudo-words written on paper in standard writing, and only produced standard writing on paper; group 3 was both exposed to the pseudo-words on paper in standard writing and to the modified pseudo-words in 'digital writing' (i.e. textese), and produced both standard writing on paper and textese in IMing; group 2 had the same exposure/production as group 1 for the first six weeks, and the same exposure/production as group 3 for the last six weeks. These three groups

were each divided into two subgroups, namely poor and good spellers, based on their performance in a standardized spelling test. All adolescents completed either a Standard French dictation test or a textese dictation test in the pre- and post-test (before and after the 3 months of exposure), with real words similar to the pseudo-words in the exposure phase, to test their spelling skills, randomized over the participants. They also completed a dictation test of pseudo-words in the post-test. The results for the *real* words in the post-test did not significantly differ between the three groups. Yet for the *pseudo*-words in the post-test, a significant difference was found between the good and bad spellers in the second group. Therefore, Simoës-Perlant et al. conclude that textese threatens the spelling performance of adolescents who are already poor spellers, but only when their spelling is not yet consolidated. This conclusion is in line with their findings, but their method – including both exposure to and production of pseudo-words resembling either Standard French or textese, in two different experimental groups and a control group – is exceedingly complex, and limits the ecological validity of this study.

2.3.4 Studies Reporting No Significant Relation

Massengill Shaw, Carlson, and Waxman (2007) conducted an exploratory investigation into the relationship between texting and spelling with 86 American university students. These young adults completed questionnaires on their texting practices and standardized spelling tests. Massengill Shaw et al. found no significant correlation between texting frequency (number of messages sent per day) and spelling, neither perceived nor actual spelling ability.

Drouin and Davis (2009) studied the effect of textese on literacy with 80 American university students. Experimental methods were used to measure their textism use in different contexts (by writing formal vs. informal spontaneous emails in response to a scenario provided by the experimenter), textese proficiency (by translating Standard English sentences into textese), familiarity with textese (by translating textese sentences into Standard English), and misspellings of target words commonly abbreviated in textese such as *you're*, *to*, *two*, and *too* (by recording spelling 'errors' for these words in translating into Standard English). Standardized tests assessed their reading and spelling skills. There were no significant differences between users and non-users of textese in their literacy scores or 'misspellings' of words regularly abbreviated in textese. Drouin and Davis' findings are inconsistent with student perceptions: although many students believed texting to negatively affect literacy, no relations were found.

Spooren (2009) studied the relationship between online chat and writing quality with Dutch adolescents. 35 participants filled in questionnaires on their use of texting, IMing, and SNS and completed a writing task. The writings products were analysed offline at the global, lexical, grammatical, and textual level; the writing process was studied online too. Regression analyses were used to explore whether participants' intensity of using CMC could predict the quality of their writings, yet this did not turn out to be the case. Spooren's findings suggest that concerns about CMC affecting Dutch youths' literacy skills are unnecessary.

Dürscheid, Wagner, and Brommer (2010) compared Swiss adolescents' school writings to their out-of-school digital writings. They quantitatively analysed 953 school writings (essays) of secondary school students and 1148 of their CMC writings for writing features of textual coherence, lexis, morphosyntax, orthography, and typography. No impact of adolescents' informal digital writing, which contained some salient CMC characteristics, was found on the essays. What is more, Dürscheid et al. found that an orientation towards the standard language in written CMC did not indicate a greater adherence to standard language norms in school texts. They also qualitatively analysed nine students' writing portfolios, but these were neither indicative of interference from informal, digital to school writing.

Gann, Bartoszuk, and Anderson (2010) examined the association between texting and spelling ability, with 62 American university students and 44 adults from the surrounding community. Questionnaires were used to ascertain participants' frequency of texting (number of messages sent daily) and use of textisms. A custom-made spelling test measured their spelling skills. Results showed no effects of texting frequency or reported use of textisms on spelling performance: the number of correctly spelled words did not significantly differ between those who texted or used textisms and those who did not. Gann et al.'s study found no evidence of associations between texting practices and adults' spelling.

Radstake's (2010) master thesis explored the relationship between spelling and new media use. Her participants were 352 Dutch adolescents at different levels of secondary education: lower secondary professional education ('vmbo'), higher general secondary education ('havo'), and pre-university education ('vwo'). Participants completed questionnaires on new media (texting, IMing, email, and SNS), about the amount of time they used such media for social purposes, to keep in touch with family and peers. Their spelling ability was assessed with a standardized test. New media use did not significantly correlate with spelling ability and could not predict spelling ability in a regression analysis. Radstake thus found no relations between new media use and the spelling skills of Dutch adolescents from different educational levels.

To study the relationship between spelling and textism use in IMing, Varnhagen et al. (2010) conducted a naturalistic study with 40 Canadian adolescents, who were asked to collect all their actual IM chats for one week. A random one hundred-word sample from each participant was used for analysis. Participants completed a spelling test administered via an IM program: they typed words after having listened to recordings of single words and context sentences. Of course, all spell-checkers were disabled. Spelling ability turned out not to be related to textism use, but only to true spelling 'errors'. This brings Varnhagen et al. to the conclusion that IMing does not affect adolescents' Standard English spelling.

For his PhD thesis, Dixon (2011) investigated the relationship between youths' intensity of using Facebook and their writing efficacy. 293 American students from a community college participated, among whom native and non-native speakers of English. Questionnaires determined their engagement with Facebook in two ways – amount of time spent on Facebook per day and number of Facebook friends. Their academic writing success was measured in three ways – self-reported writing

confidence, self-reported writing grades, and scores on writing samples. The samples, obtained from 189 students, were scored for content ("focus and development," "introductions and conclusions"); organisation ("arrangement of paragraphs," "transitions between ideas"); style ("language, tone," "phrasing and sentence structure"); and mechanics ("grammar, punctuation and formatting") (73). Neither measure of engagement with Facebook correlated significantly with any of the measures of writing success. The extent to which college students use Facebook apparently does not affect their academic writing success. Yet Dixon's measures of engagement are somewhat flawed: the measure of time spent per day on Facebook does not distinguish between writing posts and playing games or reading others' posts, and the measure of Facebook friends does not truly reflect intensity of use – one can have many such friends, for instance as a status symbol, without engaging with them via CMC.

In their study into the impact of texting on Pakistani students' academic writing, Aziz et al. (2013) analysed the orthography of essays produced in class by 50 university students. The texts were examined for the occurrence of two 'SMS features' – texting abbreviations and omission of punctuation. Spelling was not affected at all: no textisms were found. Yet capitalisation and, in particular, punctuation marks were frequently omitted (or misused) in the essays, especially commas and full stops. However, the authors do not only attribute this to texting, but rightly suggest that other factors may be at play, such as students' carelessness or inadequate knowledge of punctuation rules – possibly, in turn, due to insufficient training, feedback, or emphasis by teachers. Aziz and colleagues conclude that their study "has demystified the myth that SMS [has] disastrous effects on language in general and students' writing proficiency in particular" (12890). In contrast, they argue that students revealed an awareness of different writing contexts, and an ability to switch between the informal register of texting and the formal register of academic writing. Nevertheless, punctuation remains a cause for concern, although the role of CMC herein is unclear.

Bernicot, Goumi, Bert-Erboul, and Volckaert-Legrier (2014) conducted a longitudinal intervention study in 2009–2010 with 49 French children, which lasted for twelve months, assessing the impact of texting on their writing and spelling skills. None of the participants had ever owned or used a mobile phone. 19 children, the experimental group, were given free access to mobile phones for the duration of the study (though quite old-fashioned ones, with alphanumeric keypads set in the multi-press mode of text input); the control group consisted of 30 other children who had no access to mobile phones. This method resembles that of Wood, Jackson, et al. (2011), but Bernicot et al.'s intervention lasted much longer (12 months vs. 10 weeks), increasing the chances of finding a significant impact of texting on the writing measures. They had two such measures. All participants took a standardized spelling test after nine months. In addition, non-standardized school writing grades were gathered before the data collection and twice during the collection. Even though the intervention lasted for a year, Bernicot et al. found no differences between the texters and non-texters in their writing or spelling performance at any of the testing moments. That children's school writing skills were unaffected by their

text messaging might be because of the small sample size of the study. Still, the authors interpret these null results in a positive way and suggest that texting can be beneficial, by providing extra writing practice for children.

Besides analysing the attitudes of Canadian and Australian young adults on the appropriateness of textese in different contexts, Grace, Kemp, Martin, and Parrila (2015) investigated the intrusion of textese into the Australian youths' formal school writings. 303 written exams of 153 university students were analysed for the presence of textisms. They found only very few textisms creeping into the exams – 117 textisms (0.02%) to a total of 533,500 words written, many of which (43) were used by only one student. Several textism types distinguished in previous studies did not occur in the exams at all, e.g. initialisms, combined homophones, accent stylisations, and extra capitalisation. This led Grace and colleagues to the reasonable conclusion that most students are not just able to evaluate in which contexts textisms are (in)appropriate, but are also able and willing to avoid them in school writings. Understandably, symbols such as "+" and "&" were not included in the analysis, since these can represent time-saving writing as a consequence of timed exam conditions rather than reflecting textese, yet it is a missed opportunity that Grace et al. did not count the number of misspellings in their corpus of exams, because this may have yielded more interesting results – although misspellings, obviously, cannot simply be attributed to the impact of CMC.

Rathje (2015) explored whether the use of new media affects Danish adolescents' school writings. She compared 10 students' text messages and Facebook messages, updates, and comments with their essays. Both were analysed for the occurrence of one type of orthographic reduction (a typical CMC language feature), namely verbal short forms, which may be used for reasons of economy or orality. The Facebook messages contained significantly more verbal reductions: in fact, the essays hardly contained any. Rathje thus did not find any relations between CMC use and the orthography of Danish adolescents' formal writings. A point of criticism is that her analysis was quite restricted, since only *verbal* reductions were studied and no other textisms.

Sánchez-Moya and Cruz-Moya (2015b) conducted an exploratory experiment on the impact of WhatsApp on spelling, but they had a rather different approach. They appear to have been the first researchers to empirically investigate this issue with WhatsApp, yet their study was very limited in that they conducted no statistical analyses. Their participants were 15 Spanish adolescents and 15 Spanish adults. They were presented with a text that contained five traditional misspellings and five textese-driven 'language errors', such as missing capitalisation or extra punctuation. The adolescents turned out to identify more errors overall than the (highly educated) adults, especially regarding the errors based on textese. This suggests that youths may be more aware of register differences between CMC language and the standard language than adults. Sánchez-Moya and Cruz-Moya's study thus gives no evidence of any relationship between CMC and literacy, since participants' CMC use was not measured. Nevertheless, it is relevant in the debate about CMC and literacy, because they measured participants' ability to correct textese-driven 'language errors' – a

method that is very similar to the grammaticality judgement task used in the experimental study of the present thesis (see chapter 10).

Finally, Ouellette and Michaud (2016) conducted a correlational study into Canadian young adults' use of text messaging and textese and their language and literacy skills. They measured 51 university students' textism use and 'misuse' of capitalization and punctuation (densities), by analysing ten of their recently sent naturalistic text messages and with a timed translation task, in which they had to translate Standard English sentences into textese. This task was also used to measure their speed of writing text messages, i.e. fluency with textese. Their texting frequency was gauged via self-reports. The students also completed standardized tests of spelling, reading, non-word reading (decoding), and vocabulary. Despite their thorough methodology, no significant correlations were found between any of the texting measures and any of the literacy skills. Ouellette and Michaud attribute this to the increased use of corrective and predictive technology in digital messaging.

2.3.5 Discussion of Observational Studies

An overview of the most important elements of earlier observational studies into the impact of CMC on literacy is presented in Table 2 in Appendix C, presented at the end of this thesis. The findings of the 50 studies discussed above, as presented in Figure 7 per age group, exhibit a decidedly mixed pattern of results: some found a positive association, some a negative association, others conflicting results (both positive and negative associations), and still others found no statistically significant association at all. This indicates that it is a highly complex issue in which various factors are at play. The inconsistent findings of prior research can, again, be contributed to the many differences in methodology and participants.
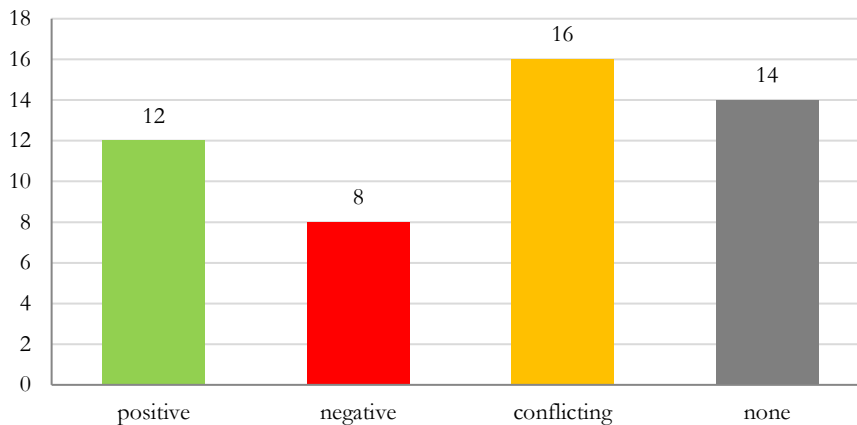

Figure 7. Findings of observational studies into the relations between CMC use and literacy.

Research design. As can be seen in Figure 8, an overwhelming majority of prior studies had a *correlational* research design (*n* = 37). Correlational or cross-sectional analyses are inherently limited, since they do not warrant conclusions about the causality between two variables. They cannot establish, when a positive or negative correlation was found, that this was a unidirectional effect of CMC on literacy. It may also be vice versa: a one-way effect of literacy on CMC, as suggested by Grace et al. (2013) and by Kemp (2010), who notes that in case of a positive association, youths with better literacy skills may "better employ these strengths to create and decipher textisms" than those with weaker

Figure 8. Research design.

literacy skills (65). The effects between CMC and literacy may also be reciprocal: for instance, Durkin et al. (2011) hypothesize that the positive relationship they found is bidirectional, that better literacy skills affect the ability to use textisms and that more frequent use of CMC at the same time helps develop literacy skills. Another option is that there are cognitive factors at work, such as participants' IQ or verbal ability – what Kemp (2010) calls "an underlying level of linguistic or general intelligence" (65): a correlation does not necessarily imply causation, because a third variable may account for it. In correlational studies, all this remains conjecturing.

Only a number of prior studies have looked into the direction of the relationship: a pure *experiment* (Powell & Dixon, 2011), an exploratory experiment (Sánchez-Moya & Cruz-Moya, 2015b), two experimental studies using *intervention* (Wood, Jackson et al., 2011; Bernicot et al., 2014), and five studies with a *longitudinal* design (Wood, Meachem et al., 2011; Wood, Kemp, & Waldron, 2014; Waldron, Wood, & Kemp, 2016; Bernicot et al., 2014; Simoës-Perlant et al., 2018). The experimental studies indicate that textisms may affect literacy rather than the other way around, but again their results were mixed.

Six prior observational studies were *corpus* studies, which analysed school or academic writings for the presence of textisms (Winzker, Southwood, & Huddlestone, 2009; Dürscheid, Wagner, & Brommer, 2010; Shafie, Azida Darus, & Osman, 2010; Rankin, 2011; Grace et al., 2015; Vandekerckhove & Sandra, 2016). Corpus analyses reveal interesting but, again, limited insight into the relation between CMC and literacy, since they show to what extent non-standard orthography is present in formal writing, but cannot conclusively prove that these orthographic deviations were caused by CMC.

Future observational studies should, ideally, be of an experimental nature, because longitudinal studies with a control group of non-users of CMC are unfeasible
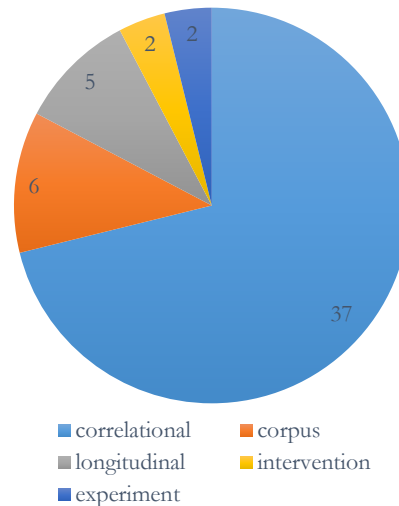
in this digital age in which practically all youths are heavy users of social media. The present thesis tackles this challenge by conducting both a correlational study (chapter 9) and a study with experimental intervention (chapter 10).
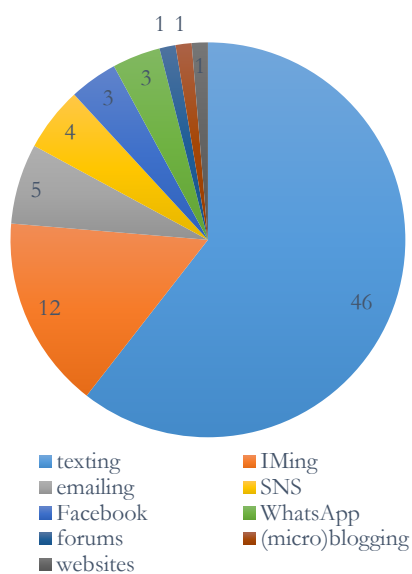
Figure 9. Medium.

Medium. Although an overwhelming number of the studies focused on text messaging (46), as Figure 9 shows, there was still some diversity in the media that were included in prior observational studies. Instant messaging was included in 12 studies. Emailing (5) and social networking sites (4) were both studied to a much lesser extent. Some CMC modes have barely been investigated in relation to literacy at all: Facebook was included in only three studies and was the focus of two of those (Dixon, 2011; Rathje, 2015), while IMing with the currently very popular mobile phone application *WhatsApp Messenger* (3) has only been considered in a handful of recent studies in Spain, Belgium, and the Netherlands (Sánchez-Moya & Cruz-Moya, 2015b; Vandekerckhove & Sandra, 2016; Van Dijk et al., 2016). Furthermore, Bouillaud, Chanquoy, and Gombert (2017) mention online forums, and Vandekerckhove and Sandra (2016) use the term 'chat language', which may include texting, IMing, WhatsApp, and Facebook chat. One study focused specifically on predictive texting (Waldron, Wood, & Kemp, 2016), i.e. using predictive software. Blogging and websites were only included by Dürscheid, Wagner, and Brommer (2010); microblogging platforms such as *Twitter* were not mentioned at all. It is a clear limitation of prior observational research that a large majority focuses only on texting. Ideally, observational studies should include a range of social media, since these may have diverging effects on youths' literacy skills: we cannot simply pool different media together in terms of their impact on literacy. This thesis overcomes this limitation by including various social media, both in the studies on language use in Dutch youths' written CMC (presented in part 1, chapters 5–7) and in those on the relations between their CMC and school writings (part 2, chapters 8–10). The corpus studies in chapters 5, 6, 7, and 8 examine two CMC modes that used to be popular in the Netherlands (MSN chat, SMS) and two that are still popular (Twitter, WhatsApp); the correlational study in chapter 9 includes many CMC modes in a long survey; and the experimental study in chapter 10 focuses on the currently most used CMC mode by Dutch youths, WhatsApp (Van der Veer et al., 2018).

Operationalization of literacy. The studies greatly differed in the way in which they operationalized literacy (see Figure 10). Many studies employed direct

measures of literacy, measuring spelling, grammar, writing, or reading. The most frequently measured literacy skill was spelling (accuracy), which was included in 41 of the 50 studies discussed here. Reading measures were used seventeen times, including fluency/efficiency/ speed, accuracy/word recognition, comprehension, history, and novel word reading. Measures of writing (quality, efficacy, speed, accuracy, expressiveness/conciseness) occurred twelve times, those of grammar (accuracy, understanding, 'grammatical spelling') nine times. Besides such direct operationalizations of literacy, various indirect operationalizations were also used, measuring integral components of literacy – skills underpinning literacy skills. This includes measures of non-word reading or *decoding* (alphabetic/ orthographic/phonological (9)); *awareness* (phonological awareness/skill

Figure 10. Operationalization of literacy.

(7), orthographic awareness (1), morphological awareness (2)); *processing* (phonological processing (1), orthographic processing (4)); *retrieval* (phonological retrieval (3), lexical retrieval (1)); and *reasoning* (verbal reasoning (1), non-verbal reasoning (2)). *Cognitive skills* (vocabulary (5), short-term memory (2), rapid serial naming (1), executive functions (1)) were used as literacy-related measures or controlled for as confounding variables (Plester, Wood, & Joshi, 2009; Wood et al., 2014). One study did not measure language ability, but rather language acceptability. Although these indirect measures are relevant for literacy, any impact of CMC on such measures is less probable than on direct literacy skills. In the present thesis, literacy is thus operationalized in terms of a direct measure, namely writing quality. The types of tests that were used to measure these literacy skills can broadly be divided into standardized tests, customized tests (such as an adapted or newly created spelling test or writing task), and experimental tasks; standardized tests were used most frequently. These tests disregard the new literacies discussed in the previous chapter: they are exclusively focused on traditional literacy – which makes perfect sense, seeing that the fears held by many adults about the damaging effects of CMC are all about such traditional literacy skills. In line with this conservative research tradition, but upgrading the operationalization of literacy, this thesis uses custom-made tests, specifically tailored to measuring the quality of school writings.

Measurement of CMC use – general measures. Computer-mediated communication, especially texting, was measured in various ways as well. A broad distinction can be made between general CMC use measures (shown in Figure 11)
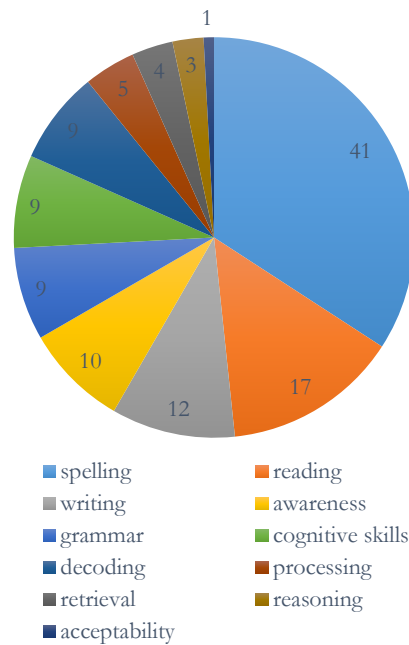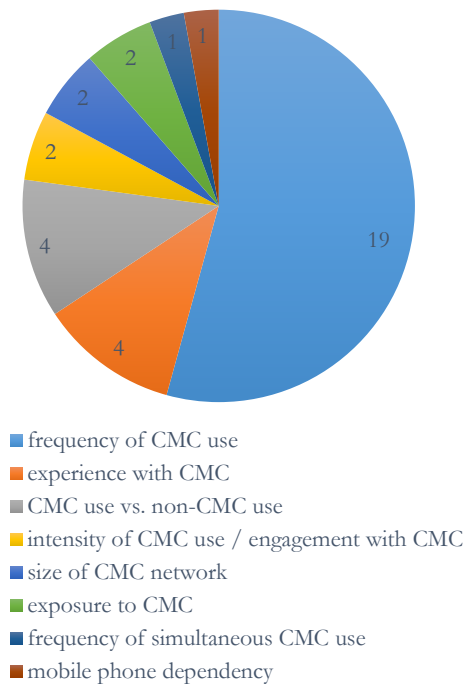
Figure 11. Measurement of CMC use, general measures

and textism measures. A few studies contrasted the literacy skills of CMC users, such as 'texters', with those of non-users of CMC, e.g. 'non-texters' (*CMC use vs. no CMC use*, Raval, 2002; Kemp & Bushnell, 2011; Wood, Jackson et al., 2011; Bernicot et al., 2014). Many studies measured *frequency of CMC use*, in terms of the reported number of messages sent (and received) per day, week, or month, the amount of time spent per day using CMC, or participants' rating on a scale (ranging from 'never' to 'very frequently') (Bouillaud, Chanquoy, & Gombert, 2007; Massengill Shaw, Carlson, & Waxman, 2007; Plester, Wood, & Bell, 2008; Gann, Bartoszuk, & Anderson, 2010; Kemp, 2010; Radstake, 2010; Rosen et al., 2010; Coe & Oakhill, 2011; Drouin, 2011; Durkin, Conti-Ramsden, & Walker, 2011; Kreiner & Davis, 2011; Wood, Jackson et al., 2011; Cingel & Sundar, 2012; De Jonge & Kemp, 2012; Wardyga, 2012; Grace et al., 2014; Kemp, Wood, & Waldron, 2014; Ouellette & Michaud, 2016; Van Dijk et al., 2016). A measure used by several studies was *experience with CMC*, in terms of length of time of owning a mobile phone or CMC software, or age of first acquiring a mobile phone or CMC software (De Jonge & Kemp, 2012; Wood, 2013; Grace et al., 2014; Kemp, Wood, & Waldron, 2014). Another measure was *exposure to CMC*, where the number of messages received per time unit were queried (Lee, 2011b) or where participants were exposed to CMC messages in a longitudinal design (Simoës-Perlant et al., 2018). Other studies measured *intensity of CMC use* or *engagement with CMC*, which were assessed in terms of the amount of time spent per day using CMC or a particular medium (Spooren, 2009; Dixon, 2010). Both *size of CMC network*, counting e.g. number of friends on social networking sites (Dixon, 2010; Wood, 2013) and *frequency of simultaneous CMC use*, in particular IM chats (Rosen et al., 2010) could also be classified as measures of intensity of CMC use. One study considered *mobile phone dependency*, operationalized as frequency of carrying one's mobile phone, frequency of bringing it to school, and importance of keeping it charged (Wood, 2013). In the correlational study of this thesis (see chapter 9), an extensive survey includes all measures discussed in this paragraph – except for CMC use vs. no use, as our participants all used CMC, supplemented by some other measures (*variety of CMC use*, *mobile phone ownership*, *use of predictive or corrective software in*

CMC) and by textism measures. Chapter 10, in contrast, only includes CMC use vs. no CMC use, because half of the participants chatted via WhatsApp immediately before their literacy skills were measured via two writing tasks, while the other half of the participants were not allowed to use CMC during that brief time period and carried out a control task instead.

Measurement of CMC use – textism measures. Many observational studies measured CMC use by focusing on textisms in computer-mediated messages (Figure 12). The most frequent of these measures was simply *use of textisms*, in terms of textism density (the ratio of textisms to the total number of words in the messages) and/or number of textism types used, which was included in 31 of the 50 studies (Neville, 2003; Plester, Wood, & Bell, 2008; Drouin & Davis, 2009; Plester, Wood, & Joshi, 2009; Winzker, Southwood, & Huddlestone, 2009; Dürscheid, Wagner, & Brommer, 2010; Gann, Bartoszuk, & Anderson, 2010; Rosen et al., 2010; Shafie et al., 2010; Varnhagen et al., 2010; Bushnell, Kemp, & Martin, 2011; Coe & Oakhill, 2011; Drouin, 2011; Durkin, Conti-Ramsden, & Walker,

Figure 12. Measurement of CMC use, textism measures

2011; Kreiner & Davis, 2011; Plester et al., 2011; Rankin, 2011; Veater, Plester, & Wood, 2011; Wood, Jackson et al., 2011; Wood, Meachem et al., 2011; Cingel & Sundar, 2012; De Jonge & Kemp, 2012; Aziz et al., 2013; Drouin & Driver, 2014; Grace et al., 2014; Grace et al., 2015; Rathje, 2015; Ouellette & Michaud, 2016; Waldron, Wood, & Kemp, 2016; Vandekerckhove & Sandra, 2016; Van Dijk et al., 2016). Other textism measures include *knowledge of textisms* (Bouillaud, Chanquoy, & Gombert, 2007; Drouin & Davis, 2009; Plester, Wood, & Joshi, 2009; Bushnell, Kemp, & Martin, 2011; Coe & Oakhill, 2011; Kreiner & Davis, 2011), *understanding of*, *comprehension of* or *familiarity with textisms* (Neville, 2003; Drouin & Davis, 2009; Johnson, 2012; Wood, 2013), *identification of textisms*, measured in reaction time (Kreiner & Davis, 2011), *exposure to textisms* (Powell & Dixon, 2011), *fluency* or *proficiency with textese* (Neville, 2003; Kemp, 2010; Kemp & Bushnell, 2011; Ouellette & Michaud, 2016), and, finally, *use of grammatical textisms* or *'violations'* (Kemp, Wood, & Waldron, 2014; Wood, Kemp, & Waldron, 2014; Wood et al., 2014; Waldron,
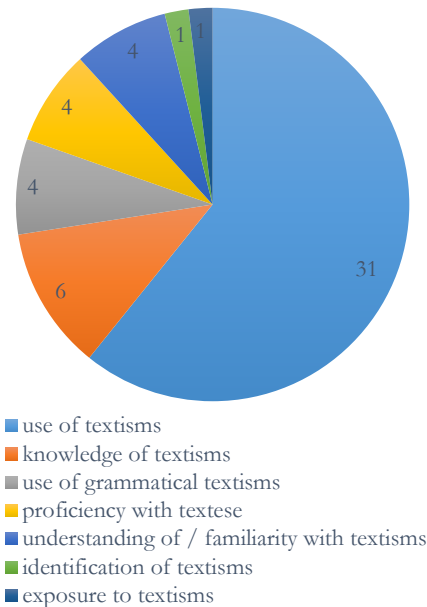
Wood, & Kemp, 2016).[17] These measures were based on self-reported data, experimentally elicited data, or naturalistic data. The survey study of this thesis (chapter 9) asks participants about their use and understanding of textisms in CMC: the CMC use measures discussed in the previous paragraph and these two textism measures together result in eleven CMC variables assessing different aspects of CMC usage through self-reported data.

        Measurement of CMC use – data collection. The data for measuring CMC use were collected through self-reports, experimental elicitation, naturalistic collection, and once a standardized test. *Self-reports* were gathered through surveys – mostly questionnaires, but also interviews (Durkin, Conti-Ramsden, & Walker, 2011; Rankin, 2011). They were used to gauge frequency of CMC use, experience with CMC, exposure to CMC, intensity of CMC use or engagement with CMC, size of CMC network, frequency of simultaneous CMC use, mobile phone dependency, and use of textisms. Studies that measure CMC-related behaviour with self-reports may yield results that do not completely accurately reflect real world trends, because participants may answer questions inaccurately (due to faulty recall or, worse, dishonesty). Self-reports crucially depend on two things: participants' accurate memories of their CMC behaviour and their honesty in reporting their behaviour even if they do remember (Kreiner & Davis, 2011). Grace et al. (2014) agree that making an accurate estimate of one's own frequency of using CMC or textisms is an "inherently difficult task" (3); there is a genuine risk of over- or underestimation. This raises some doubts as to the validity of such studies. On the other hand, self-reports are widely used, very practical, and their reliability has been vigorously defended (Spector, 1994), so such studies cannot simply be disregarded. The correlational study in chapter 9 uses self-reports to measure CMC use via comprehensive surveys.

        Experimental measures of CMC use differed in their manner of eliciting CMC messages. Knowledge and use of textisms were measured by translating messages, sentences, or single words from standard language into textese, by writing textese at the experimenter's dictation, or by writing spontaneous CMC messages in response to a scenario or in reply to a message composed by the experimenter(s) or by other participants. Understanding of or familiarity with textisms was measured by translating messages, sentences, or single words from textese into standard language. Proficiency with textese was operationalized as speed of reading or writing textese, measured by reading aloud messages in textese and by writing textese at dictation. In

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[17] Another study on the impact of CMC on literacy is that by Proudfoot (2011), but she measured CMC use variables that diverged so much from the research questions of the present thesis, that I have excluded it from this overview. She studied the relationship between adolescents' literacy skills and their *use of self-regulation* during texting. Her participants were 250 South African high school students, aged 12–19. Their use of self-regulatory strategies (goal setting, strategic planning, self-recording, self-evaluation, and self-reaction) was determined via a questionnaire. Spelling ability was tested with a standardized test measuring 'spelling age'; writing skills were established on the basis of an academic grade. Proudfoot reported that self-regulation in texting was positively related to writing skills (participants who made more use of such strategies had higher writing grades), but not to spelling ability.

one study (Powell & Dixon, 2011), exposure to textisms was used as an experimental prime. Data elicited through translation or dictation have the advantage of providing control over message length and content, but spontaneously elicited data are less artificial. Experimental elicitation also differed in the use of materials, whether participants had to produce their messages with paper and pencil or by typing on a mobile phone or computer. Handwritten CMC messages are not naturalistic and may not be fully representative of participants' customary CMC practices. Experimental data elicited in typed spontaneous messages are to be preferred, but even these may still not be an accurate reflection of participants' actual CMC practices. For example, significantly more textisms have been observed in experimentally elicited than naturalistic text messages (Grace, Kemp, Martin, & Parrila, 2012).

Naturalistic data are actual CMC messages sent by participants in non-experimental conditions. They were used to measure use of textisms (Shafie, Azida Darus, & Osman, 2010; Varnhagen et al., 2010; Powell & Dixon, 2011; Veater, Plester, & Wood, 2011; Wood, Jackson et al., 2011; Drouin & Driver, 2014; Grace, Kemp, Martin, & Parrila, 2014; Ouellette & Michaud, 2016; Van Dijk et al., 2016; Waldron, Wood, & Kemp, 2016) or use of grammatical 'violations' in CMC (Kemp, Wood, & Waldron, 2014; Wood, Kemp, & Waldron, 2014; Wood et al., 2014; Waldron, Wood, & Kemp, 2016). Such observations can be considered the most accurate measure of linguistic behaviour in CMC, because they have the highest ecological validity. However, natural messages are more difficult to compare, since their length and content vary. Plus, it may be pragmatically difficult to obtain such data, because of privacy or cost-related reasons. Wood et al. (2013) point out that "ethics committees – as well as parents and school staff – often have qualms about having children sending messages from their own phones," particularly if the participants are children (83). Natural messages should preferably be collected by having participants send their authentic CMC messages directly to the experimenter(s) (as did Varnhagen et al., 2010), but are generally collected by having participants copy their messages verbatim from their mobile phone. Although Kemp, Wood, and Waldron (2014), who used this latter method in multiple studies, claim that "[p]revious experience has shown that participants can complete this task well when the importance of accurate transcription is emphasised" (1590), the reliability of the data is still somewhat diminished, because participants' own transcriptions cannot be trusted to be entirely accurate. In the present thesis, naturalistic data are used for the corpus studies into Dutch youths' language use in CMC, but not for measuring use of textisms in the correlational study, because the corpus studies revealed that youths are rather hesitant to share their private social media messages, which would have hindered the data collection of the correlational study – in all likelihood, we would have collected fewer data and had a longer collection period.

A *standardized test* was used in a study by Kreiner and Davis (2011) to measure use, knowledge, and identification of textisms. This Text Abbreviations Test is a list of 100 textisms, for each of which participants had to indicate whether they had used or seen them; identification was measured in terms of reaction time to the textisms.
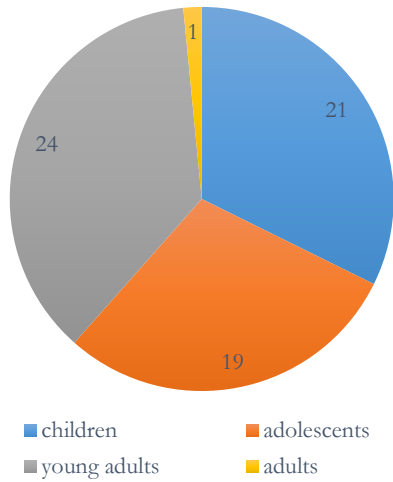
Figure 13. Participants' age group.

Participants' age group. Prior studies differed in which youths they included as participants, as can be seen in Figure 13. This ranged from children, aged 8-13, (21), to adolescents, around 13 to 17 years old, (19) to young adults, between 18 and max. 30, (24), and one study included 'older' adults (Sánchez-Moya & Cruz-Moya, 2015b). Literacy skills cannot be assumed to be similar for youths of different ages, since they may use CMC differently and are at different stages of their literacy development – children are still very much in the early stages of developing their literacy skills, while the skills of young adults have become more consolidated. Figure 14 presents an overview of the findings per participant group. This shows that within all three age groups, results were mixed. It also shows that findings for children were overall more positive than for adolescents and young adults, which confirms that youths cannot be simply lumped together. Therefore, it is important to distinguish between different age groups when investigating the impact of CMC on literacy. More studies contrasting youths of different age groups, as did Kemp, Wood, and colleagues (Bouillaud, Chanquoy, & Gombert, 2007; De Jonge & Kemp 2012; Kemp, Wood, & Waldron, 2014; Wood, 2013; Wood, Kemp, & Waldron, 2014; Wood et al., 2014; Waldron, Wood, & Kemp, 2016), would greatly contribute to exploring this issue. Accordingly, the present thesis distinguishes between adolescent (13-17) and young adult (18-23) participants.
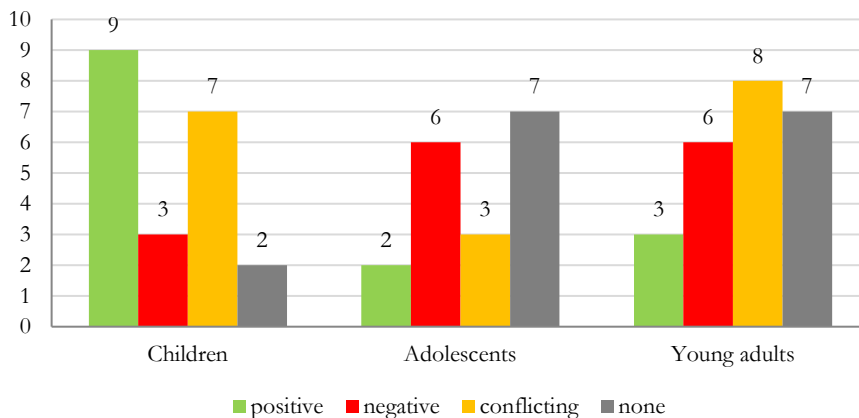
Figure 14. Findings of observational studies, per age group.

The **number of participants** in prior observational studies ranged from 10 to 736; the correlational study of this thesis (chapter 9) had 400 participants of different age groups, and the experimental study (chapter 10) even 500.

Participants' nationality. Figure 15 shows that the countries in which the data were collected were quite diverse. Most studies had British participants (15), the second most frequent nationality was American (11), and several studies were conducted with Australian participants (7). Four studies included youths from Canada, three from the Netherlands and France, and two from Switzerland. Participants of other countries, including Belgium (Flanders), Spain, Finland, Denmark, South Africa, Pakistan, and Malaysia, were all unique.[18] Studies have thus been conducted in a variety of continents and countries, but there seems to be a bias: the vast majority of previous research, namely 37 studies, was conducted with participants from English-speaking countries, the results of which may not be valid for and cannot simply be generalized to different linguistic contexts. There is evidence for cultural differences in CMC behaviour between people from different countries (Cougnon & Francois, 2011; Grace et al., 2014). These differences may affect any relationship between CMC and literacy, so findings from different countries should be considered separately. The correlations between CMC and literacy have only marginally been researched for languages other than English. The only empirical studies so far that have looked into this issue in the Netherlands are those by Spooren (2009), who found no significant relations between the intensity with which Dutch adolescents use CMC and the quality of their school writings; Radstake (2010), who neither found any significant correlations between Dutch adolescents' new media use and their spelling skills; and Van Dijk et al. (2016), who found that the use of omissions in text messaging could positively predict children's grammar skills. The present thesis further delves into this topic in the Dutch context.

Figure 15. Participants' nationality.

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[18] Another study excluded from this overview is Hsu (2013), who investigated the relationship between textism use and literacy skills of dyslexic and typically developing children in Taiwan. This study is not relevant for this thesis, because Chinese is a non-alphabetic language with a different script than Dutch, and any impact can thus in no way be transposed to the Dutch context.

Participants' educational level. Similar to the attitudinal studies, for most observational studies it was not clear which educational level the youths had whose CMC use and literacy skills were tested, so we could again only classify it when participants were university students. Exceptions are studies by Radstake (2010), Rosen et al. (2010), and Vandekerckhove and Sandra (2016), who included education as an independent variable in their research. The latter two studies found that CMC may have different effects on young people with less education than on those who have received more education. Another drawback of prior studies is that most studies with young adults used university students as participants. These students may not be representative of young adults in general: due to their high educational level, their CMC practices may not be typical of the population of young adults and their literacy skills can be expected to be high – at least "in the average to above-average range" (Wood et al., 2013:48). We should be careful not to generalize results from participants with a particular educational background across all youths, and should rather distinguish between multiple educational levels. Since educational level has been found to be a relevant factor in the relationship between CMC use and literacy, future research should focus more on this possible moderating variable.

Miscellaneous participant characteristics. Other differences between participants that may play a role in determining the results concern their mother tongue, gender, and use of technology. *Mother tongue.* It is likely to make a difference whether the language in which participants communicate via CMC is their L1 or L2, a distinction that was made by Winzker, Southwood, and Huddlestone (2009), who studied the school writings of English first- and second-language speakers. Writing and reading CMC messages in a particular language may very well differ for native speakers and non-native speakers. This makes it important to distinguish between participants using CMC in their mother tongue and those using it in a foreign language or lingua franca. *Gender.* There may be a gender effect: boys and girls may have different habits of using CMC (as found in Herring & Zelenkauskaite, 2009). For instance, research has found that females use more textisms than males (Plester et al., 2009). This may lead to a different impact on literacy. Indeed, Wardyga (2012) only found a negative relation between texting frequency and writing for female participants. In consideration of such possible gender differences, researchers should aim for gender-balanced participant samples, or even include gender as an additional independent variable. Samples dominated by one gender may only be relevant for just that gender, as for Neville (2003) who only had female participants. *Technology.* Finally, it should be taken into account that the technology which participants use in CMC may affect their results. For CMC via mobile phones, such as texting and WhatsApp, this concerns the keyboard type (hardware) as well as the text entry method (software) used by participants: textisms may be used more frequently when using the more laborious multi-press mode on an old-fashioned alphanumeric keypad than when using the predictive mode on an alphanumeric keypad (Kemp & Bushnell, 2011) or a QWERTY or touchscreen keyboard (Grace et al., 2014; Waldron, Wood, & Kemp, 2016). A technological issue that may also affect the impact of CMC on literacy, and has yet to be explored, is participants' habits of using grammar- or spell-checkers.

3. Conclusion

What this review has made most clear is that prior attitudinal and observational studies differed greatly in their methodologies, especially the operationalization of literacy and the measurement of CMC use, and in their participants, particularly regarding age group, which makes it extremely difficult to draw any definitive conclusions at this point. Many factors may moderate the relationship between CMC and traditional literacy. What is more, previous studies had some limitations. Many studies had participants from English-speaking countries, whose results cannot simply be generalised to the Dutch context. Furthermore, most of the studies conducted only correlational analyses, which give no insight into the causality of relationship. Finally, most studies focus only on text messaging, while there are many other CMC modes nowadays, and SMS is no longer the most popular medium for written CMC in the Netherlands. Nonetheless, we can conclude that survey studies report predominantly pessimistic views, especially when young adults and teachers are queried, while observational studies are somewhat more positive, especially when children are involved. Given the fact that more prior studies found positive relations between CMC and literacy than negative relations, this would suggest that the popular claim that social media have deleterious effects on literacy may be untrue. However, this conclusion is very tentative, especially when we bear in mind that the majority of previous studies had conflicting findings and considering the limitations of pior research.

Part 2.

Language Use in Dutch Youths' Written CMC

Part 2.1 Data Collection

Chapter 4. Collecting Facebook Posts and WhatsApp Chats: Corpus Compilation of Private Social Media Messages

(published).[19]

with Wessel Stoop

Abstract

This paper describes the compilation of a social media corpus with Facebook posts and WhatsApp chats. Authentic messages were voluntarily donated by Dutch youths between 12 and 23 years old. Social media nowadays constitute a fundamental part of youths' private lives, constantly connecting them to friends and family via computer-mediated communication (CMC). The social networking site Facebook and mobile phone chat application WhatsApp are currently quite popular in the Netherlands. Several relevant issues concerning corpus compilation are discussed, including website creation, promotion, metadata collection, and intellectual property rights / ethical approval. The application that was created for scraping Facebook posts from users' timelines, of course with their consent, can serve as an example for future data collection. The Facebook and WhatsApp messages are collected for a sociolinguistic study into Dutch youths' written CMC, of which a preliminary analysis is presented, but also present a valuable data source for further research.

Key words: computer-mediated communication; social media; new media; Facebook; WhatsApp; corpus compilation; data collection

1. Introduction

Increasingly more youths around the world, including the Netherlands, are in the habit of using social media such as SMS text messaging, chat, instant messaging, microblogging, and networking sites in their private lives on a regular and frequent basis. This has raised worries among parents and teachers alike that the informal, non-standard lingo used by youngsters while communicating via social media may have a (negative) impact upon their traditional literacy skills, i.e. writing and reading (Thurlow, 2006; Postma, 2011). Before studying the possible effect of unconventional language use in social media on literacy, it is paramount to know what that language actually looks like. Yet little is known so far about the exact linguistic manifestation of Dutch social media texts, in terms of key features of writing such as orthography (spelling), syntax (grammar and sentence structure), and lexis (vocabulary). As such, a linguistic analysis into Dutch youths' written computer-

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mediated communication is an urgent matter for research. To conduct such a study, an up-to-date corpus of social media texts is of the utmost importance. This paper describes the compilation of such a social media corpus, specifically of WhatsApp chats and Facebook posts. Ultimately, the corpus can help to answer the following questions: how does Dutch youths' language use on WhatsApp and Facebook differ from Standard Dutch? And how do WhatsApp and Facebook messages differ, linguistically speaking, from other new media genres, such as SMS text messages and tweets?

First, we collected WhatsApp chats. These are private online chats, which involve typed spontaneous communication in real time between two or more users of the mobile phone application WhatsApp Messenger. This instant messaging client, whose name is a contraction of 'what's up' and 'application', was released in 2010 and has since then enormously gained in popularity among Dutch smartphone users. It was acquired by the Facebook company in 2014. Secondly, we have started collecting status updates, both public and non-public, posted on Facebook timelines. This social networking service was created in 2004. Its name comes from the 'face book' directories that are often given to university students in the United States, who were the initial members of this social network. The personal Facebook timeline was introduced in 2011, when the format of users' individual profile pages was changed. In this paper, we describe the collection of these two datasets. To the best of our knowledge, this is the first social media corpus with Dutch WhatsApp and Facebook messages.

2. Related Work

The corpus compiled for this project is an addition to existing corpora of computer-mediated communication, in particular SoNaR ('STEVIN Nederlandstalig Referentiecorpus'), a freely available reference corpus of written Dutch containing some 500 million words of text that was built by Dutch and Belgian computational linguists (Sanders, 2012; Treurniet & Sanders, 2012; Treurniet, De Clercq, Van den Heuvel, & Oostdijk, 2012; Oostdijk, Reynaert, Hoste, & Schuurman, 2013). SoNaR contains a variety of text sources, including some social media genres, namely online chats, tweets, internet forums, blogs, and text messages. However, two media that are currently very popular in the Netherlands are lacking, that is, Facebook and WhatsApp. As such, there is a great need for the texts collected in the present project.

The creation and analysis of CMC corpora is currently an active research area. Yet most projects explore language data that are publicly available, which are relatively easy to obtain, such as from Twitter, Wikipedia, discussion boards, or public social networking profiles. CMC corpora with non-public language data are still sparse: they are more time-consuming and difficult to obtain, because they require active participation of contributors. The following pioneering projects are in the vanguard of private social media message collection.

A notable project similar to our WhatsApp data collection is the 'What's up, Switzerland?' project (Dürscheid & Frick, 2014; Stark et al., 2015a), a follow-up of the 'Sms4science' project (Stark et al., 2015b). Researchers from four universities

study the language used in Swiss WhatsApp chats. For this non-commercial large-scale project, over 838,000 WhatsApp messages (about 5 million tokens) by 419 users were collected in 2014. Contact with the project's coordinators provided us with information about the set-up of their data collection; this served as an inspiration for our own collection. A related project is 'What's up, Deutschland?' (Siebenhaar et al., 2016), conducted by researchers from seven German universities. They collected over 376,000 WhatsApp messages by 238 users in 2014 and 2015. Similar to our current project, the 'What's up' projects compare WhatsApp chats to SMS text messages, and several features are investigated, e.g. linguistic structures, spelling, and emoticons/emoji.

Our Facebook data collection is comparable to that of the DiDi project (Frey, Stemle, Glazniek, 2014; Frey, Glazniek, Stemle, 2015). The DiDi corpus comprises German Facebook writings by 136 voluntary participants from the Italian province of South Tyrol (around 650,000 tokens). The corpus was collected in 2013. It contains not just status updates, but also comments on timeline posts, private messages, and chat conversations. The data and corresponding metadata were acquired by means of a Facebook web application. Their linguistic analysis focuses, among other things, on the use of dialects and age-related differences in language on social network sites.

3. Creation of Websites

We created two websites to gather WhatsApp chats and Facebook posts (see http://cls.ru.nl/whatsapptaal and http://cls.ru.nl/facebooktaal), where youths could donate their own WhatsApp and Facebook messages to science. The data thus represent authentic, original, unmodified messages that were composed in completely natural, non-experimental conditions. Besides the home page, the websites contain the tabs 'Prizes', 'Instructions', 'Consent', 'FAQ', 'About us', and 'Contact'. These pages present, respectively, information on the prizes youths can win by contributing their social media messages to the research project, instructions on how they can submit their messages, consent forms that they should sign for us to be allowed to use the data, frequently asked questions, brief info about ourselves (the researchers), and a contact form.

The main difference between the two websites for gathering social media data is that the WhatsApp collection website includes an 'Instructions' page with extensive explanations on how to submit WhatsApp chats depending on one's mobile phone type (Android, iPhone, or Windows Phone), whereas the Facebook collection website prominently features a button for donating messages. This difference stems from the technical possibilities of submitting messages: while WhatsApp chats can be sent via email from one's mobile phone (to an email address created specifically for the purposes of this data collection, whatsapp-taal@let.ru.nl), Facebook posts cannot easily be submitted by users themselves, so we retrieved them by means of a self-built application.

4. Creation of Application

To automatically retrieve posts from volunteering youths' Facebook timelines, we created a Facebook app – a piece of software that has access to data stored by Facebook via the Facebook Graph API (application programming interface, https://developers.facebook.com/docs/graph-api). In practice, this means that users only have to click on a button on our website, telling the app to make a connection to Facebook, to collect their posts, and to save them in our database.

To protect the privacy of its users, Facebook has installed two layers of security with which the app needed to deal. The first layer entails that the volunteering user needs to allow the app access to every piece of information it collects. Facebook calls this allowance of access to personal data a 'permission'. Two permissions were required for our purpose, user_birthday (to make sure that we collected posts of youths of the intended ages) and user_posts. Users grant these permissions directly after they click the button on our website: a pop-up window appears which first asks them to log in to Facebook and then explains to what the app will have access if they proceed.

The second security layer entails that Facebook itself needs to allow the app to ask for permissions. During development, the app only worked for a predefined set of Facebook users for testing purposes; users that were not part of this set could not grant any permissions and thus donate their data with the app. To make the app available to all Facebook users, it had to be manually reviewed by a Facebook employee. Our app was accepted only after making clear that it is of value to Facebook users because it enabled volunteering users to effortlessly donate their Facebook posts without having to manually copy and paste these one by one. The source code of the app can be found at https://github.com/Woseseltops/FB-data-donator. It can easily be adjusted to make another app that collects other user data in a similar way.

5. Promotion of Websites

The websites for collecting social media messages were promoted through free publicity in Dutch media. It attracted quite some media attention, which resulted in newspaper publications, both regional (*de Gelderlander*) and national (*AD.nl*), radio interviews on regional (*RTV Noord-Holland*, *Studio 040*) and national (*De Taalstaat*, *NPO Radio 1*, *3FM*, *Radio FunX*) stations, and television interviews on regional (*NimmaTV*) and national (*Rtl4*) TV. University and student magazines reported on the data collection too (*Vox*, *ANS*). In addition, it was advertised in the digital newsletters of *Onze Taal* (the Dutch society for language buffs) – *Taalpost* for adults and *TLPST* for adolescents. The data collection was also promoted via the Radboud University's web pages and by researchers via social media channels, in particular Twitter and Facebook. We further promoted it during lectures and master classes for young audiences, i.e. students in secondary and tertiary education. Our aim was to promote the websites nationwide, in order to gather a representative sample of messages from young people throughout the country.

In order to stimulate youths to contribute their social media messages to our project, we decided to raffle off prizes – gift certificates at the value of 100, 50, and 20 euros. With respect to WhatsApp, individual contributors' odds of winning a prize increased as they sent in more chat conversations. We felt that this raffle was necessary to stimulate youths to donate their private messages to the corpus. Importantly, it was emphasized on the websites that only those contributors who completely filled in the consent form stood a chance of winning the prizes. This was made explicit to motivate youths to give their informed consent.

6. Metadata

All WhatsApp chats and Facebook posts in our social media corpus are accompanied by a substantial amount of sociolinguistic information. Via the websites, the following metadata were obtained: name, place of residence, place and date of birth, age, gender, and educational level, as well as date and place of submission. These parameters are useful for sociolinguistic research, since they enable one to study the language use of different social groups in WhatsApp and Facebook.

7. IPR Issues and Ethical Approval

Intellectual property rights (IPR) were obtained by consent of both the Facebook company and individual contributors of Facebook and WhatsApp messages, since it is key to safeguard the authors' rights and interests (Treurniet et al., 2012:2270). For underage contributors, between 12 and 17 years old, written consent was also gained of one of their parents or guardians. By signing the consent web form, contributors declared the following:

- to have been informed about the purpose of the study;
- to have been able to ask questions about the study;
- to understand how the data from the study will be stored and to what ends they will be used;
- to have considered if they want to partake in the study;
- to voluntarily participate in the study.

Additionally, parents or guardians also declared:
- to be aware of the contents of their child's messages;
- to agree with their child's participation in the study.

Participants and their parents/guardians gave full permission for their (child's) submitted messages (i) to be used for scientific research and educational purposes; (ii) to be stored in a database, according to Radboud University's rules, and to be kept available for scientific research, provided they are anonymised and in no way traceable to the original authors; and (iii) to be used in scientific publications and meetings. If messages appear in publications or presentations, no parts that may harm the participants' interests will be made public.

Furthermore, ethical approval was obtained from our institution's Ethical Testing Committee (ETC). For the WhatsApp chats, it was crucial for the ETC that messages of conversation partners were deleted, since they have not given consent for the use of their messages. Accordingly, interlocutors' WhatsApp messages were immediately discarded. This procedure was explained on the FAQ page of the websites. In accordance with the ETC's further guidelines, we added downloadable information documents on the home pages.

8. Current Corpus Composition

The collection period of WhatsApp messages lasted from April until December 2015; the collection of Facebook messages started in December 2015. Up to the time of writing, over 332,000 tokens of WhatsApp chats have been collected from youths between the ages of 12 and 23, which compares to the SoNaR subcorpora with texts by youths up to 20 years old from the Netherlands as follows – 44,012 tokens in the SMS corpus (6.08% of the total number of tokens of that corpus); 219,043 in the chat corpus (29.7% of total); and 2,458,904 in the Twitter corpus (10.6% of total). The scale of this corpus makes it suitable for fine-grained (manual) linguistic studies; it is not intended as a training data set for large-scale computational research.

We excluded chain messages from our corpus. Also excluded were any visual or audio materials: since the study that prompted the data collection is completely linguistic in nature, images, videos, and sound files were not gathered, so the corpus is wholly textual rather than multimodal. Another deciding factor in asking contributors not to add media files when sending their WhatsApp conversations from their smartphones is that adding them may prevent mails from arriving due to an exceeded data limit. More importantly, issues of copyright and privacy protection would make any inclusion of pictures, videos, or sounds highly problematic. The messages are stored as one WhatsApp chat conversation per file. Table 1 shows demographic details on the data collected so far, focusing on the age and gender distribution.

Table 1. Composition of WhatsApp dataset.

| | Contributors | | Conversations | | Words | |
	#	%	#	%	#	%
Adolescents	11	32.4	83	38.6	63,217	19.0
Young adults	23	67.6	132	61.4	269,440	81.0
Male	12	37.5	71	33.0	98,201	29.5
Female	22	68.8	144	67.0	234,456	70.5
Total	34	100	215	100	332,657	100

For the WhatsApp dataset, a relatively small number of youths (34) have contributed large quantities of data. At the time of writing, the number of contributors of Facebook posts was already considerably greater – 94, who together contributed 171,693 words. This difference may stem from the submission procedure: while users were asked to submit WhatsApp chats via separate emails, which required

taking several steps on their mobile phones, they could easily submit all their Facebook posts with the click of a button. Young adults (18-23 years old, avg. age 20.1) submitted many more WhatsApp messages than adolescents (12-17, avg. age 14.4), not only in terms of number of contributors, but also in terms of number of conversations as well as words. The average age of all contributors was 18.3. In terms of gender, a higher percentage of WhatsApp chat contributors are female, with about two thirds girls versus one third boys (a distribution similar to that for donated text messages as reported in Treurniet & Sanders, 2012). This corresponds to the percentages of words and conversations that were submitted by male versus female contributors.

9. Preliminary Data Analysis

This section presents the first findings of a linguistic corpus study of Dutch youths' WhatsApp chats. Their language use in social media often differs from Standard Dutch, in various dimensions of writing. A striking orthographic feature of written CMC are textisms: unconventional spellings of various kinds. We conducted a quantitative register analysis into the frequency of textisms, and investigated how the independent variable age group affects this linguistic feature by distinguishing between WhatsApp messages of adolescents and young adults. The following textism types were found (presented here with Dutch examples):

- textisms with letters:
  - initialism: first letters of each word/element in a compound word, phrase, sentence, or exclamation, e.g. *hvj* (*hou van je*), *omg* (*oh mijn God*)
  - contraction: omission of letters (mostly vowels) from middle of word, e.g. *vnv* (*vanavond*), *idd* (*inderdaad*)
  - clipping: omission of final letter of word, e.g. *lache* (*lachen*), *nie* (*niet*)
  - shortening: dropping of ending or occasionally beginning of word, e.g. *miss* (*misschien*), *wan* (*wanneer*)
  - phonetic respelling: substitution of letter(s) of word by (an)other letter(s), while applying accurate grapheme-phoneme patterns of the standard language, e.g. *ensow* (*enzo*), *boeiuh* (*boeien*), *okeej* (*oké*), *egt* (*echt*)
  - single letter/number homophone: substitution of word by phonologically resembling or identical letter/number, e.g. *n* (*een*), *t* (*het*), *4* (*for*)
  - alphanumeric homophone: substitution of part of word by phonologically resembling or identical letter(s)/number(s), e.g. *suc6* (*succes*), *w88* (*wachten*)
  - reduplication: repetition of letter(s), e.g. *neeee* (*nee*), *superrr* (*super*)
  - visual respelling: substitution of letter(s) by graphically resembling nonalphabetic symbol(s), e.g. *Juli@n* (*Julian*), *c00l* (*cool*)
  - accent stylisation: words from casual, colloquial, or accented speech spelled as they sound, e.g. *hoezut* (*hoe is het*), *lama* (*laat maar*)
  - inanity: other, e.g. *laterz* (*later*)
  - standard language abbreviations, e.g. *aug* (*augustus*), *bios* (*bioscoop*)

- textisms with diacritics:
  - missing, e.g. *carriere* (*carrière*), *ideeen* (*ideeën*), *enquete* (*enquête*)
- textisms with punctuation:
  - missing, e.g. *mn* (*m'n*), *maw* (*m.a.w.*), *ovkaart* (*ov-kaart*)
  - extra, e.g. *stilte-coupé* (*stiltecoupé*)
  - reduplication, e.g. *!!!!!, ??, ...*
- textisms with spacing:
  - missing (in between words), e.g. *hahaokeeedan* (*haha oké dan*)
  - extra (in between elements of compound words), e.g. *fel groen* (*felgroen*)
- textisms with capitalisation:
  - missing (of proper names, abbreviations), e.g. *tim* (*Tim*), *ok* (*OK*)
  - extra, e.g. *WOW* (*wow*)

Figure 1 shows the results for the textisms, separating adolescents from young adults. The frequencies shown here have been standardized per 10,000 words, because the total number of words differs per age group in the WhatsApp dataset. The figure makes clear that textisms with letters were by far the most frequent in the WhatsApp chats. It also shows an age-based distinction: while textisms with diacritics, capitalisation, punctuation, and spacing occurred with more or less similar frequencies in the WhatsApp messages of the two age groups, those with letters were used much more by adolescents. Their greater use of orthographic deviations may be attributed to a desire to rebel against societal norms, including the standard language norms, and to play with language: the most non-conformist linguistic behaviour is said to occur around the ages of 15/16, when the 'adolescent peak' occurs. Young adults, on the other hand, may feel more social pressure to conform to norms set by society, also those about language.
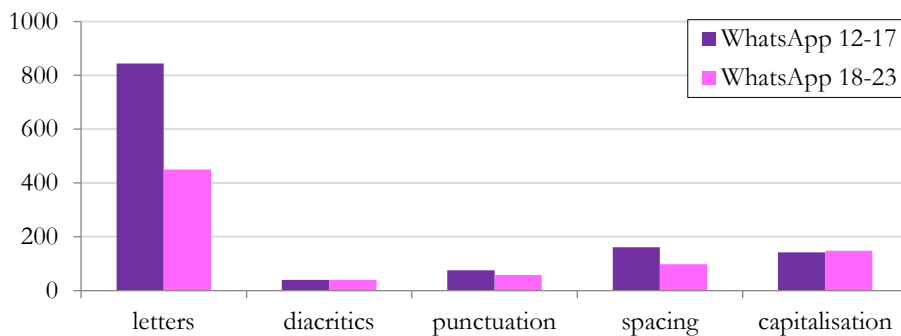
Figure 1. Five types of textisms in WhatsApp dataset.

This preliminary analysis is part of a larger in-depth linguistic study of a broad range of linguistic features in WhatsApp chats. These focus on orthography (misspellings, typos, emoticons, symbols), syntax (omissions; complexity), and lexis (borrowings, interjections; diversity, density). Other lexical features that may be

interesting for online youth communication are, for example, swearwords, intensifiers, and hyperbolic expressions. The WhatsApp data will be compared to the Facebook data, as well as to instant messages, text messages, and microblogs of the SoNaR corpus. This can reveal to what extent deviations from the standard language norms in CMC depend not just on individual user characteristics such as age, but also on genre characteristics.

10. Conclusions

The central role currently played by CMC in (especially) youths' lives makes social media corpora quite valuable for state-of-the-art sociolinguistic research. This paper discussed the compilation of such a corpus in the Netherlands. WhatsApp chats and Facebook posts were contributed by Dutch youths from 12 to 23 years old. This paper has made clear that a data collection method of voluntary donations, with the added incentive of a prize raffle, can yield a fair amount of data if sufficient public attention is obtained through e.g. media coverage. We have presented websites created for this purpose, and have explained how such websites can be promoted. The importance of collecting metadata and obtaining written consent and ethical approval have been stressed. Crucially, the application we created to gather Facebook posts, beside the process of gaining consent from the Facebook company, can serve as a model for future corpus builders.

11. Future Work

Eventually, if the WhatsApp and Facebook data are processed in a similar fashion as the rest of SoNaR, they can be incorporated into the corpus together with their metadata. This would require format conversion, tokenization, and anonymisation: the data should be (a) converted into the FoLiA xml-format, which was developed for linguistic resources, (b) tokenised by UCTO, a tokeniser adapted for social media, and (c) anonymised, if possible automatically, so that they contain no personal/place names, (email) addresses, telephone numbers, or bank accounts. Such additional processing was beyond the scope of the present project, but particularly data anonymisation is essential if the WhatsApp chats and Facebook messages are shared with the wider scientific community and become available for further research into social media texts. It would also be useful to apply part-of-speech tagging to this corpus. Moreover, we recognize the need for multimodal social media corpora: the next step in sociolinguistic social media research may be to focus on multimodality, given the increased options for incorporating visual materials (photographs, emoji, videos, etc.) and the use thereof in computer-mediated communication. The number of contributors so far suggest that youths remain hesitant to donate their private, often intimate, social media messages to science, despite significant gift certificates; perhaps a larger corpus could be obtained by even more publicity or even greater prizes. Nonetheless, albeit monomodal and of modest scale, the present corpus with its metadata can be a vital resource and an example of how social media texts can be collected for linguistic, sociological, or other research.

Acknowledgements

Part 2.2 Data Analysis

Chapter 5. Out-of-the-Ordinary Orthography: The Use of Textisms in Dutch Youngsters' Written Computer-Mediated Communication

(published).[20]

Abstract

Recent decades have seen an explosive growth in computer-mediated communication (CMC). Since the language used in CMC can deviate from standard language conventions, concerns have been expressed that CMC may degrade youths' reading, writing, or spelling skills. However, before studying the possible impact of CMC on traditional literacy, the ways in which 'CMC language' differs from the standard language need to be established. This article discusses the first findings of an ongoing corpus study examining the register of written CMC of Dutch youngsters between the ages of twelve and twenty-three, revealing how their CMC language differs from Standard Dutch in various dimensions of writing. The focus here is on a salient orthographic feature, namely the use of textisms (unconventional spellings). A range of CMC modes was investigated, including instant messages (MSN and WhatsApp), text messages, and microblogs. It is shown that the extent to which CMC users deviate orthographically from the standard language and the degree to which they use particular textism types depends both on CMC mode and on individual user characteristics such as age.

Key words: computer-mediated communication (CMC); writing; register; orthography; spelling; corpus study

1. Introduction

Computer-mediated communication (CMC) has been defined as "the practice of using networked computers and alphabetic text to transmit messages between people or groups of people across space and time" (Jacobs, 2008a:470). Simply put, it is communication that takes place via modern communication tools, such as personal computers, mobile (smart) phones, and tablets. Since CMC is used more and more nowadays by even young children, groups such as parents, teachers, and the popular media are afraid that it may have a detrimental impact on youths' literacy skills. Such concerns have been documented for English-speaking countries (Thurlow, 2006) and the Netherlands (Postma, 2011). A *Daily Mail* article by Humphrys (2007), titled "I h8 txt msgs: How texting is wrecking our language," expresses this widespread fear about the language used in CMC. Humphrys describes texters as:

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vandals who are doing to our language what Genghis Khan did to his neighbours eight hundred years ago. They are destroying it: pillaging our punctuation; savaging our sentences; raping our vocabulary. And they must be stopped. (¶15)

Some linguists, on the other hand, argue for the positive effects of CMC. They mention the creative, innovative use of written language; increased motivation to read and write; more exposure to written text and extra opportunities to engage with writing; and greater phonological and metalinguistic awareness, that is, sensitivity to the underlying (sound) structure of language (since certain types of abbreviations used in CMC reflect an understanding of grapheme-phoneme patterns). In sum, opinions about CMC and its impact on literacy vary greatly. As Swartzlander (2010:9) put it, CMC has caused "a tsunami of anxiety, excitement, paranoia, enthusiasm, fear and fascination."

Before we can study if and if so, how, CMC affects youths' reading or writing skills, we need to establish the ways in which their 'CMC language' differs from the standard language norms. The present article addresses this question by discussing the first results of a larger corpus study into the register of CMC writing produced by Dutch youngsters.

2. Background

2.1 The Landscape of Computer-Mediated Communication

A prerequisite for studying the register of CMC is to establish what belongs to the domain of computer-mediated communication. CMC is an umbrella term covering an array of new/social media. Figure 1 presents a classification of CMC modes (based on Merchant, 2007; Herring, 2012; Van Dijck, 2013), along with popular examples.

A well-known CMC mode is text messaging, also known as texting and SMS (Short Message Service). There is also online chat, of which there are two kinds: chatting in web-based chat rooms and instant messaging (IM). IM can occur through four kinds of technologies: using a mobile app (e.g. *WhatsApp*, *Telegram*) or a desktop application (formerly *MSN Messenger*, now *Skype text chat*), through a social networking site (*Facebook Messenger*), and within an online gaming network or virtual world (*World of Warcraft*, *Second Life*). Another CMC mode, widely used for both personal and professional purposes, is emailing. CMC also occurs through social networking sites or SNS (*Facebook*, *MySpace*), microblogging platforms (*Twitter*, *Tumblr*), and visual media sharing platforms or VMSP (*YouTube*: video, *Vimeo*: video, *Instagram*: photo/video, *Flickr*: photo/video, *Pinterest*: photo). Furthermore, CMC includes blogging and online forums or discussion boards.[21] All this shows that CMC covers a broad range of computer-mediated genres. These CMC modes differ in their

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[21] One could argue that web pages and wikis are part of CMC as well, but I have excluded them from my classification, because their main function is not transmitting interpersonal messages but conveying information.

medium variables. Characteristics and constraints of the CMC modes analysed in this study are summarized in Table 1.
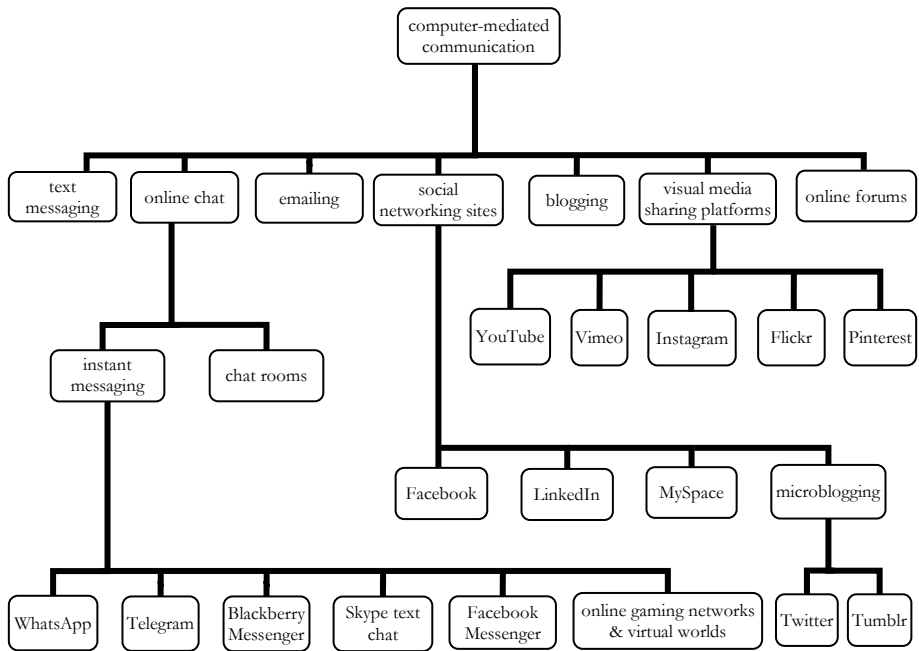
Figure 1. Classification of computer-mediated communication.

Table 1. Medium variables of four CMC modes.

Characteris-tic	MSN	SMS	Twitter	WhatsApp
Message size limit	no	yes > max 160 characters[i]	yes > max 280 characters[ii]	no
Synchronicity of communi-cation	synchronous > real time	asynchronous > deferred time	asynchronous> deferred time	synchronous > real time
Visibility	private	private	public (private)[ii]	private
Level of interactivity	one-to-one /some-to-some: group chat	one-to-one, (one-to-many: broadcast message)	one-to-many, (one-to-one: direct message/DM)	one-to-one /some-to-some: group chat
Technology	computer	mobile phone (computer)	mobile phone / computer	mobile phone (computer)

[i] Except for concatenated text messages, linked together when the limit is exceeded.
[ii] The character limit was increased from 140 to 280 characters in November 2017 (Sulleyman, 2017).

2.2 The Language of Computer-Mediated Communication

CMC language, which can differ markedly from the standard language, has been described with numerous terms, including 'text/SMS/IM/chat/Internet/cyber language/speak', 'text talk', 'textish', and 'textese'. There are various reasons for CMC users to disregard standard language conventions. First of all, because efficiency comes first: effective CMC requires speed rather than correctness (Silva, 2011). Another reason is that some CMC modes are limited in message size, which makes brevity crucial: tweets (microposts sent via Twitter) are limited to 280 characters (formerly 140), text messages used to be limited to 160.[22] Furthermore, orthographic deviations are frequently used to increase expressiveness: they can compensate for paralinguistic features that are present in speech but lack in writing – i.e. prosody, such as stress and volume, and kinesic features, so gestures and facial expressions (Thurlow & Brown, 2003). Finally, deviating from the standard spelling and grammar is seen as playful and cool by many young people: they mark in-group belonging and are part of youth culture (Bergs, 2009).

Previous research has identified several features characteristic of CMC language, where the writing is affected by the brevity, speed, and creativity of CMC. In terms of orthography, CMC language includes emoticons/smileys, such as :D indicating great joy and ;-) symbolising a wink, and abounds with 'textisms', i.e. spellings deviating from the standard language (see section 3.2 for examples). Textisms are not just used in CMC in English, but also, for example, in German (Bieswanger, 2006; Bergs, 2009), French (Rúa, 2005; Anis, 2007; Fairon & Klein, 2010), Italian (Pietrini, 2001; Herring & Zelenkauskaite, 2009), Spanish (Rúa, 2005; Alonso & Perea, 2008), Portuguese (Silva, 2011), Finnish (Plester et al., 2011), and Swedish (Hård af Segerstad, 2002). A syntactic feature of CMC language is the omission of function words, such as articles, pronouns (especially first-person singular), conjunctions, auxiliary and copular verbs, and prepositions (Crystal, 2006; Frehner, 2008; Herring, 2012). For example, the sentence "will leave hotel 3 Feb," in which a personal pronoun, article, and preposition have been omitted, is a perfectly acceptable and understandable CMC variant of "I will leave the hotel on 3 February." A lexical feature is the use of borrowings (Crystal, 2008; Frehner, 2008; De Decker & Vandekerckhove, 2012): CMC in languages other than English often contains English words and textisms, such as *lol* (for *laughing out loud*) and *btw* (*by the way*).[23] Graphically speaking, CMC language stands out for the addition of images, videos, or other multimedia; for the use of colour; and for the inclusion of hyperlinks. Whether these features also occur in Dutch CMC has not been systematically

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[22] Originally, textese was used in text messages to achieve the economy required not only by the confines of the 160-character limit, but also a small screen and an alphanumeric keypad with several letters assigned to each key. These technological constraints are no longer valid in this era of smartphones, in which concatenation of text messages allows us to compose longer messages, screens have grown enormously in size, and mobile phones include touch screen (QWERTY) keyboards.

[23] These borrowings are likely to stem from the role of English as the online lingua franca, where it has long been the language of choice on websites and in chat rooms.

analysed yet. The present paper, focusing on the orthographic feature of textisms, is the first step of such an analysis.

What catches the eye in computer-mediated messages are deviations from the standard language. Still, this does not mean that CMC language is entirely riddled with opaque abbreviations and rebuses. Crystal (2006:128) rightly points out that the "graphological deviance" in CMC messages is not universal. In fact, the extent to which and manner in which CMC users deviate from the standard language depends on diverse factors. The first of these is individual user characteristics, such as age, gender, regional background, ethnic background, familiarity with CMC, and personal preferences. Secondly, it depends on situational factors, such as discourse topic, (relationship with the) recipient of the message, and communicative intent. It is also subject to particulars of the medium: CMC modes differ in message size limits, synchronicity, visibility, level of interactivity, and technology (as shown in Table 1). All these factors make CMC language stylistically diverse. This paper looks into the effects of both medium and user age on Dutch CMC language, by investigating writings of four CMC modes (MSN, SMS, Twitter, WhatsApp) and two age groups (adolescents, young adults).

3. Methodology

The method employed in this study is a register analysis, investigating how Dutch CMC writings deviate from Standard Dutch. The research is of a quantitative nature: the frequencies of a large set of linguistic features were charted. This paper focuses on the most striking orthographic feature of CMC, namely textisms. It was also investigated how the independent variables age group and CMC mode affect this linguistic feature.

3.1 Materials

The corpus of CMC writings used for this study contains instant messaging conversations, text messages, and microblogs. MSN chats, SMS texts, and tweets were obtained from SoNaR ('STEVIN Nederlandstalig Referentiecorpus', see Sanders, 2012; Treurniet et al., 2012; Treurniet & Sanders, 2012; Oostdijk et al., 2013). SoNaR is a reference corpus of contemporary written Dutch, including a variety of text sources, both conventional text types and texts from new media. SoNaR includes texts from the Netherlands and Flanders; Flemish texts were excluded in this study. Since the texts in SoNaR are accompanied by metadata on e.g. age, gender, and residency, it was possible to select texts by adolescents (12-17) and young adults (18-23).[24] The SoNaR texts were supplemented with WhatsApp chats, which were voluntarily donated by youths between twelve and twenty-three. Instructions on how to submit one's chats were presented on a website (http://cls.ru.nl/whatsapptaal/); gift certificates were raffled off among

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[24] These groups were chosen so that they match the age groups of participants who will partake in later studies in my PhD project about the impact of computer-mediated communication on literacy.

contributors. All texts were written under non-experimental conditions between 2009 and 2015. Specifics can be seen in Table 2.

Table 2. Overview of selected CMC writings.

CMC mode	Year(s) of collection	Age group	Mean age	No. of tokens	No. of chats /contributors[i]
instant messaging: MSN	2009-2010	12-17	16.2	45,051	106
		18-23	19.5	4,056	21
		total		49,107	127
text messaging: SMS	2011	12-17	15.4	1,009	7
		18-23	20.4	23,790	42
		total		24,799	49
micro-blogging: Twitter	2011	12-17	15.9	22,968	25
		18-23	20.6	99,296	83
		total		122,264	108
instant messaging: WhatsApp	2015	12-17	14.0	55,865	11 / 84
		18-23	20.4	140,134	23 / 132
		total		195,999	34 / 216
		grand total		**392,169**	

[i] Number of chats: MSN, WhatsApp; number of contributors: SMS, tweets, WA.

3.2 Classification

A comprehensive taxonomy of the different textism types that occur in Dutch CMC was made on the basis of Thurlow and Brown's (2003) and Plester, Wood, and Joshi's (2009) classifications of textisms in English CMC. A less exhaustive version of this taxonomy can be found in Verheijen (2013). It is presented here with Dutch examples:

- initialism (alphabetism, acronym): first letters of each word/element in a compound word, phrase, (elliptical) sentence, or exclamation, e.g. *sv* < *samenvatting* ('summary'), *hvj* < *hou van je* ('love you'), *omg* < *o mijn God* ('oh my God');
- contraction: omission of letters (mostly vowels) from middle of word, e.g. *vnv* < *vanavond* ('tonight'), *grtjs* < *groetjes* ('greets'), *idd* < *inderdaad* ('indeed');
- clipping: omission of final letter of word (mostly silent *-n* or *-t*), e.g. *lache* < *lachen* ('laugh'), *truste* < *trusten* ('good night'), *nie* < *niet* ('not');
- shortening (truncation): dropping of ending or occasionally beginning of word, e.g. *eig* < *eigenlijk* ('actually'), *wan* < *wanneer* ('when'), *knuf* < *knuffel* ('hug');
- phonetic respelling: substitution of letter(s) of word by (an)other letter(s), while applying accurate grapheme-phoneme patterns of the standard language:
  - a.   abbreviation, e.g. *fyn* < *fijn* ('nice'), *ff* < *effen* ('for a sec'), *nix* < *niks* ('nothing');
  - b.   replacement, e.g. *ofso* < *ofzo* ('or something'), *jonguh* < *jongen* ('boy'), *owk* < *ook* ('also');
  - c.   extension, e.g. *heej* < *hé* ('hey'), *okee* < *oké* ('okay'), *errug* < *erg* ('very');

- <u>single letter/number homophone</u>: substitution of entire word by phonologically resembling or identical letter/number, e.g. *k* < *ik* ('I'), *n* < *een* ('a'/'an'), *t* < *het* ('it'), *4* < *for*;
- <u>alphanumeric homophone</u> (rebus): substitution of part of word by phonologically resembling or identical letter(s) and/or number(s), e.g. *suc6* < *success* ('good luck'), *w88* < *wachten* ('wait'), *btje* < *beetje* ('little');
- <u>reduplication</u>: repetition of letter(s), e.g. *zoooo* < *zo* ('so'), *neeeee* < *nee* ('no'), *superrr* < *super* ('super');
- <u>visual respelling</u>: substitution of letter(s) by graphically resembling non-alphabetic symbol(s) (special characters or numbers), e.g. *Juli@n* < *Julian* ('Julian'), *m%oi* < *mooi* ('pretty'), *c00l* < *cool* ('cool');
- <u>accent stylisation</u>: words from casual, colloquial, or accented speech spelled as they sound, e.g. *hoezut* < *hoe is het* ('how are you doing'), *kweenie* < *ik weet het niet* ('I don't know'), *lama* < *laat maar* ('never mind');
- <u>inanity</u>: "nonsensical transmogrification" of word (Craig 2003:120), e.g. *plezierhr* < *plezier* ('fun'), *helaasje* < *helaas* ('too bad'), *laterz* < *later* ('later');
- <u>standard language abbreviation</u>: abbreviation that is part of the standard language, e.g. *aug* < *augustus* ('August'), *bios* < *bioscoop* ('cinema'), *info* < *informatie* ('information');
- unconventional use of spacing, punctuation, diacritics, and capitalisation.

Example (1), an excerpt from an MSN dialogue, illustrates how textisms were classified (all textisms are in bold):[25]

(1)   **hoooooooooooowj**
       keb net de film klein beetje **gmonteerd**, ziet er strak uit **jonguh**!:D
       keb uhm in **zwartwit oude film style** staan nu is **eg fat**
       mja ben wieder weg
       kom **strx** nog **trug**
       mzzzzzzzzl

This fragment contains the following textisms:
- *hoooooooooooowj* < *hoi*: phonetic respelling (extension) + reduplication of letter;
- *keb* < *ik heb*: accent stylisation;
- *gmonteerd* < *gemonteerd*: contraction;
- *jonguh* < *jongen*: phonetic respelling (replacement);
- *keb* < *ik heb*: accent stylisation;
- *uhm* < *hem*: phonetic respelling (replacement);

- *zwartwit oude film style < zwart-witoudefilmstyle*: omission of hyphen + overuse of spacing;
- *eg < echt*: phonetic respelling (abbreviation) + clipping;
- *fat < vet*: phonetic respelling (replacement);
- *strx < straks*: contraction + phonetic respelling (abbreviation);
- *trug < terug*: phonetic respelling (abbreviation);
- *mzzzzzzzzl < mazzel*: contraction + reduplication of letter.

As can be seen, a single textism can include multiple textism types, as is the case for *hoooooooooooowj*, *zwartwit oude film style*, *eg*, *strx*, and *mzzzzzzzzl*; these have been coded for all types present. Multiple words can also represent one textism, as with *zwartwit oude film style*, where elements of a compound word are separated with spaces.

3.3 Procedure

Textisms have been identified and classified manually. After initial data coding, all the data were checked to make sure no textisms were overlooked and to filter out any possible misclassifications. The results presented here concern the total number of textisms and the number of textism types.[26] Figures and tables show the frequencies standardized per 10,000 tokens, because the subcorpora differ in their total amount of tokens (as shown in Table 2 above). Statistical tests were conducted on the unstandardized, raw frequencies

4. Results and Discussion

Figure 2 shows the results for all textisms per CMC mode – instant messages (MSN and WhatsApp), text messages (SMS), and microblogs (tweets).
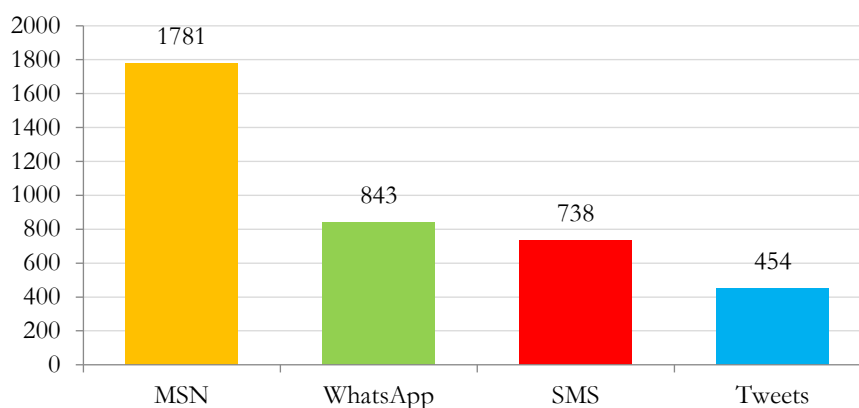
Figure 2. Total no. of textisms, per CMC mode, standardized per 10,000 tokens.

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[26] The sum of textism types has also been computed, where textisms such as *strx*, which belong to two types, are counted twice. Since the sum is higher than the total number of textisms, it was chosen to report the latter here, so as not to exaggerate textism use in the CMC writings.

The graph makes it clear that CMC modes diverge in frequency of textisms. A Pearson chi-square test, setting off the number of textisms to the number of words not classified as textisms each CMC mode, weighted by the unstandardized frequencies, confirms that there was a significant association between CMC mode and total number of textisms (χ^2 (3, n = 392,169) = 8110.93, p < .001). The genre of MSN contains the most textisms and so deviates most from Standard Dutch in terms of orthography, whereas writings from microblog Twitter contain the least textisms. This is confirmed by the standardized residuals, which show that in MSN chats, significantly more textisms occurred than expected (z = 72.8) and significantly fewer non-textisms (z = -21.9); on Twitter, significantly fewer textisms occurred than expected (z = -45.9) and significantly more non-textisms (z = 13.8); and in SMS, significantly fewer textisms occurred than expected (z = -5.2). The number of non-textisms did not deviate from expected in SMS (z = 1.6) and as many textisms and non-textisms occurred as expected in WhatsApp chats (z = 1.6 and z = -0.5 respectively). The distributions of textism types within the CMC modes are shown in Figure 5 (standardized per 10,000 tokens) in Appendix A to this paper. This reveals which types are principally responsible for the differences observed in Figure 2: phonetic respellings, clippings, missing spaces, and contractions occur with much higher frequencies in MSN chat than in the other genres. These results support the view that we should not approach CMC as one way of communicating (Hård af Segerstad, 2002; Dürscheid, 2016). Rather, each CMC mode is a unique mode of communication with its own orthographic conventions, caused by a complex interplay of medium variables (see Table 1).

Results show that Dutch youngsters' text messages and tweets contain fewer textisms than their instant messages. This might, in part, be attributed to the fact that these two CMC modes are asynchronous, with messages exchanged sequentially over time, which provides users with more time to edit their writing and to filter out textisms. Instant messaging, by contrast, is (near-)synchronous,[27] which makes it direct, immediate, and rushed: users have to respond rapidly to keep up with the conversational pace in order to maintain the floor, which gives them less time to revise their writing and check their spelling.

The lower frequency of textisms in tweets might be caused by their public character: most tweets are 'one-to-many', either visible for everyone to read or for one's entire list of followers. The presence of this larger audience may possibly constrain tweeters to adhere more to standard language norms, so as to avoid being chided for their spelling. Tweets where fierce criticism is passed on "spelling errors" in CMC language illustrate this point; examples (2)–(3) are from adolescents and (4)–(10) from young adults. Metalinguistic terms here are, for instance, *correct schrijven* ('correct writing') in (3), *typvouten/typfouten* ('typos') in (4) and (6), *taalfouten en incorrecte zinnen* ('language errors and incorrect sentences') in (5), and *spelfouten* ('misspellings') in (9). Instant messages and text messages, on the other hand, are sent only to

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[27] In reality, CMC cannot be as completely synchronous as spoken interaction, because of the time that inevitably passes between typing and receiving a message. Therefore, it has also been called quasi- or near-synchronous (Hård af Segerstad, 2002).

selected recipients, usually friends and family, who may be less prone to point out their communication partner's deviations from the standard language, in order not to harm their relationship.

(2)   @roderickmathieu Ellende schrijf je dus met dubbel L. Iets met #incapabele mensen en #opvoeden
('@roderickmathieu *Ellende* is written with double L. Something about #incompetent people and #education')

(3)   "@TOBIASGROOT: WAAROM KAN NOG STEEDS NIEMAND HET WOORD 'SOWIESO' CORRECT SCHRIJVEN?!" dat is zo'n groot irritatie-factor
('"@TOBIASGROOT: WHY IS EVERYONE STILL UNABLE TO WRITE THE WORD '*SOWIESO*' CORRECTLY?!" that is such a big factor of annoyance')

(4)   (a)   @brigadierREUSEL hij vertelt, stam + t. ;)
('@brigadierREUSEL *hij vertelt*, stem + t. ;)')
        (b)   @orkestmagic typvouten zijn uit den boze.
('@orkestmagic typos are absolutely forbidden.')

(5)   ik snap dat ze blij zijn, maar zijn al die taalfouten en incorrecte zinnen nodig? 'KADDAFI GEDOOD' http://t.co/vJQeFiFF #nuandroid
('i get that they are happy, but are all those language errors and incorrect sentences necessary? 'KADDAFI KILLED' http://t.co/vJQeFiFF #nuandroid')

(6)   @mrlkrmr nog steeds typfouten? je hebt nu geen excuus meer hè :P
('@mrlkrmr still typos? you no longer have an excuse eh :P')

(7)   @IzJoen Ik wordt? Met dt? Ff serieus man, laat je testen op dyslexie ofzo...
('@IzJoen *Ik wordt*? With dt? Seriously man, have yourself tested for dyslexia or something...')

(8)   (a)   Fluorizerend. TIS GVD FLUORESCEREND
('*Fluorizerend*. ITS *FLUORESCEREND* GODDAMNIT')
        (b)   "Muggenbulden". Word gek hier
('"*Muggenbulden*". Going crazy here')
               "Ik heb niks geruikt". Het wort steeds gekker
('"*Ik heb niks geruikt*". Its going too far')
        (c)   "dan maar een keer m'n rug versjouwen". Niemand kan er tegenwoordig noch Nederlands.
('"*dan maar een keer m'n rug versjouwen*". No one can write Dutch anymore nowadays.')

(9)   @milouvangaans van jouw spelfouten krijg ik nog veel meer stress!
('@milouvangaans your misspellings cause me even more stress!')

(10)   @silvertje Ik scheldt?! #foei ;-)
('@silvertje *Ik scheldt*?! #shameonyou ;-)')

Figure 3 shows the results for all textisms per age group, separating adolescents between the ages of 12 and 17 from young adults between 18 and 23. It

reveals that age affects the frequency with which textisms are used in CMC writings: taking all CMC modes together, adolescents use many more textisms than young adults. The relationship between age group and total number of textisms was significant (χ^2 (1, n = 392,169) = 5085.77, p < .001). Indeed, the standardized residuals tell us that adolescents' CMC contains significantly more textisms than expected (z = 56.4) and significantly fewer non-textisms (z = -17.0), whereas young adults' CMC contains significantly fewer textisms than expected (z = -38.5) and significantly more non-textisms (z = 11.6). This can also be expressed with an odds ratio, setting off the odds of textisms in adolescents' CMC against the odds of textisms in young adults' CMC: (16146 / 108747) / (16504 / 250772) = 2.26, so the odds that a word is a textism are more than 2 times higher when produced in adolescents' CMC than when produced in young adults' CMC. Figure 6 (standardized per 10,000 tokens) in Appendix B to this paper shows how different textism types are represented in CMC by youths from the two age groups. Again, the bulk of the differences in Figure 3 is brought about by only some of the textism types, namely phonetic respellings, clippings, contractions, missing spaces, and reduplications of letters, which were all used much more by adolescents than young adults. At this point, we can only speculate about what causes this age effect, but it is possible that young adults regard (certain kinds of) textisms as somewhat childish. This is evident in the comments made by participants in Wood et al.'s (2011) study that using textisms was considered immature. Similarly, Grace et al. (2014) suggest that young adults' lower use of textisms may be occasioned by social pressure not to come across as immature.
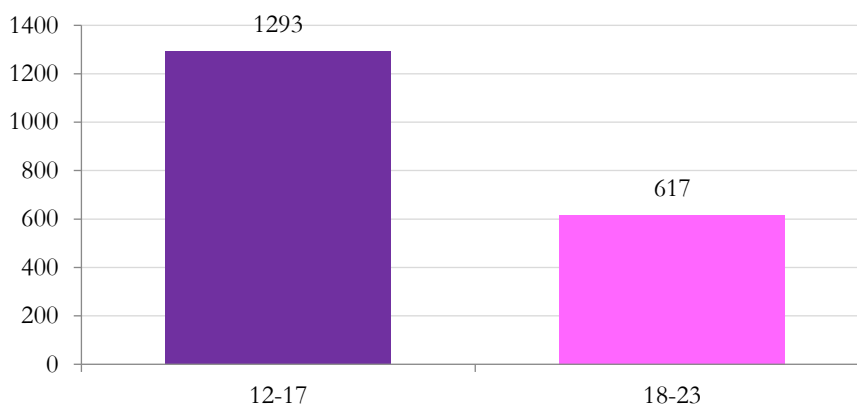
Figure 3. Total no. of textisms, per age group, standardized per 10,000 tokens.

Exploring the strength of the associations between textisms and the independent variables, the correlation turned out to be somewhat stronger for CMC mode (Cramer's V = 0.14) than for age group (Cramer's V = 0.11), which means that CMC mode had a slightly greater impact on the occurrence of textisms.
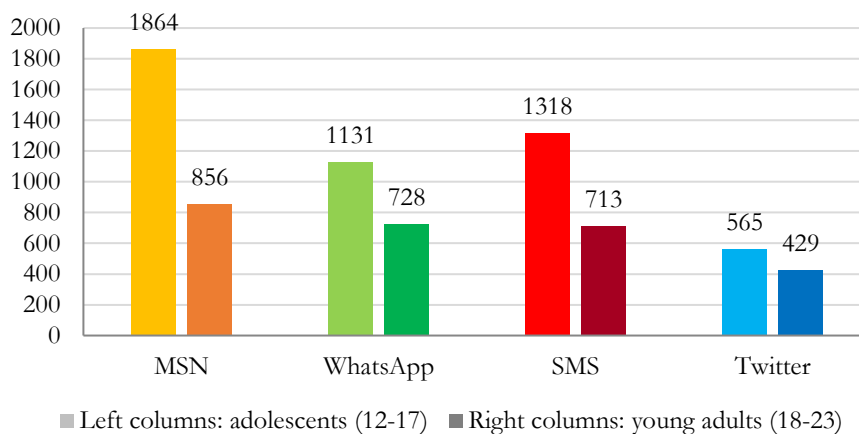
Figure 4. Total no. of textisms, per CMC mode and age group, standardized per 10,000 tokens.

The results for all textisms, distinguishing between CMC modes as well as age groups, are presented in Figure 4. In all four CMC modes, textisms are used more by adolescents than young adults. A three-way loglinear analysis produced a final model that retained all effects, with a likelihood ratio of $\chi^2 (0) = 0$, $p = 1$. This indicated that the highest-order interaction (CMC mode $\times$ age group $\times$ textisms) was significant (χ^2 (3, $n = 392,169$) = 97.48, $p < .001$). The difference is quite large for instant messages (MSN and WhatsApp) and text messages, but smaller for microblogs, mostly because adolescents use fewer textisms in tweets.

Examples (11)–(18) present MSN chats, WhatsApp chats, SMS text messages, and tweets by adolescents and young adults. These examples reflect the continuum shown in Figure 4: most textisms (again, all are in bold) are used by adolescents on MSN, while the lowest number of textisms is used by young adults on Twitter.

(11)   mwa **tvalt** mee hoor, **tis** altijd **IETSJE** minder **snapje**, maar **keb strxx ff wrongturn gdraaid**, **nouja tis gwoon** goed **omtkijke**, je denkt niet van **hmmm** geen goede kwaliteit **ofsow snapje**, **tis gwoon** goed **ma** ligt **natuurluk owk** aan je film

(12)   **tineke** wist het ook niet blijkens haar **meel** van vorige week

(13)   **K** weet **nie** of **k** zielig vind of **nie**

(14)   Die hartjes heeft iedereen **volgensmij ivm** valentijn :)

(15)   **Heeeeeeeeeee** jarige**!!!** Happy birthday! Ik hoop dat je een leuke verjaardag krijgt ;^) Xx Love you **skot**

(16)   Hey. Ik ben waarschijnlijk pas om 2 uur in **Dordt**.. De trein reed net voor m'n neus weg -_-

(17)   @bernoutjee **IK HEB EEN KOEKIEMONSTER SHIRT GEKOCHT** :D

(18)   Ben benieuwd naar bijeenkomst met schoolbesturen **vlgde** week. En uiteraard ook naar debat in #raad024 op 16 november. #schoolwijzer

In the MSN instant message by an adolescent (11), the majority of words are textisms, representing various types. The MSN message produced by a young adult (12) shows omission of capitalisation with a proper name (*tineke* < *Tineke*) and a phonetic respelling (replacement) (*meel* < *mail*). The WhatsApp message by an adolescent (13) contains the same single letter homophone (*k* < *ik*) and the same clipping (*nie* < *niet*) twice. Example (14) is a WhatsApp message by a young adult, which reveals omission of spacing (*volgensmij* < *volgens mij*) and a standard language abbreviation with missing periods (*ivm* < *i.v.m.*). The text message by an adolescent (15) contains reduplication of letters and omission of a diacritic (*Heeeeeeeeee* < *Hê*) and reduplication of exclamation marks (*!!!*), as well as an accent stylisation (*skot* < *schat*). The text message (16) and tweet (18) written by young adults only contain contractions (*Dordt* < *Dordrecht*, *vlgde* < *volgende*). The tweet by an adolescent (17) obviously contains overuse of capitalisation. The variety in CMC language becomes apparent through these examples.

Table 3. Top 5 textism types (per 10,000 tokens), per CMC mode and age group.

MSN	SMS	Twitter	WhatsApp
Adolescents (12-17)			
1. phonetic respelling (542)	phonetic respelling (218)	missing capitalisation (98)[28]	phonetic respelling (173)
2. clipping (299)	missing capitalisation (198)	reduplication of letter (90)	contraction (152)
3. missing spacing (248)[28]	standard language abbreviation (178)	phonetic respelling (60)	reduplication of letter (131)
4. missing capitalisation (195)	contraction (119)	standard language abbreviation (53)	missing capitalisation (114)
5. contraction (162)	single letter homophone (119)	extra capitalisation (53)	single letter homophone (98)
Young adults (18-23)			
1. missing capitalisation (375)	missing capitalisation (171)	missing capitalisation (75)	missing capitalisation (138)
2. standard language abbreviation (254)	standard language abbreviation (95)	standard language abbreviation (54)	phonetic respelling (94)
3. reduplication of letter (64)	phonetic respelling (78)	initialism (42)	reduplication of letter (81)
4. missing diacritic (64)	missing diacritic (57)	phonetic respelling (37)	standard language abbreviation (75)
5. phonetic respelling (59)	single letter homophone (48)	reduplication of letter (35)	single letter homophone (62)

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[28] Capitalisation that was missing sentence-initially or in hashtags was excluded from the counts, as well as missing spaces after punctuation marks and in hashtags (so included were only capitalisation omitted from proper names and abbreviations, and spaces omitted between words), because they mainly depend on software settings (automatic capitalisation of sentences or insertion of spaces) rather than on users' intentional choices.

Table 3 above shows the top five textism types (again standardized per 10,000 tokens), separated per age group and CMC mode. It shows the age impact on youths' preferences for particular textisms types: adolescents and young adults prefer to use different types. Young adults mostly omit capitalisation, which is no great deviation from Standard Dutch, and they use many standard language abbreviations, which are typical of CMC language but are nevertheless part of Standard Dutch. This age group thus exhibits a more conventional attitude towards orthography. With adolescents, phonetic respellings are quite popular. These represent a kind of word play, since they involve creative experimentation with the existing grapheme-phoneme patterns of the language. This may be attributed to the so-called adolescent peak (Holmes, 1992), which entails that youths are most non-conformist in their linguistic behaviour around the ages of fifteen and sixteen.

5. Conclusions

As part of an ongoing corpus study into the register of CMC language, the results observed thus far allow us to draw several conclusions. In terms of orthography (which is, according to Crystal (2006), most distinctive of CMC language), the written CMC of Dutch youngsters from twelve to twenty-three years old greatly deviates from Standard Dutch. The CMC modes analysed here deviate to different extents, instant messages from MSN containing the most textisms and microblogs from Twitter the least, which confirms the impact of CMC mode. The impact of age group has also been detected: adolescents between twelve and seventeen use many more textisms in CMC than young adults between eighteen and twenty-three. This occurs across the board in CMC writings, but the difference is greater for instant messages and text messages than for tweets. Moreover, adolescents and young adults prefer to use different textism types: while adolescents use many playful, self-invented spellings, young adults achieve the brevity and speed required in CMC by employing many standard language abbreviations. All this suggests that youths' written CMC clearly deviates from Standard Dutch, at least where orthography is concerned. This shows the potential of interference of youngsters' informal CMC register with their more formal school register – an issue which will be addressed in future studies part of this project into the impact of CMC on literacy.

6. Future Research

Of course, linguistic features from other dimensions of writing, namely syntax and lexis, need to be added to this register analysis, to determine whether Dutch youngsters' CMC writings deviate from Standard Dutch in more than just orthography. In addition, data from other CMC modes which are not in SoNaR, but are at present very popular among Dutch youths need to be collected and analysed, such as WhatsApp and Facebook. Ultimately, this will yield linguistic writing profiles which characterise the language of various CMC modes. The CMC writings can then also be compared to samples of school writings produced by youngsters of similar ages, to explore the differences between these registers. It would also be interesting

to interview youths to discover why they believe they use (specific types of) textisms; such self-reports could add valuable insights to this corpus study.

It is fascinating to observe that Dutch youngsters' orthography in their CMC writings can deviate from the standard language to a considerable extent and yet despite these deviations, the message being communicated largely remains understandable. Only on certain occasions communication breaks down, as is evident in the MSN conversation in (19), where the omission of spacing in and shortening of *erma* cause some textism confusion:

(19) heb het **erma** is over;)   ('talk about it sumtime **orso**;)')
      ?   ('?')
      erma?   ('**orso**?')
      aaaaaah   ('aaaaaah')
      haha   ('haha')
      ja ik heb het er over:P   ('yes I'll talk about it:P')
      sorry   ('sorry')
      er maar   ('**or something**')
      :P   (':P')
      ;)   (';)')

This example shows that too much idiosyncrasy in orthography can impair the recognisability of a word, thereby causing problems of intelligibility and leading to unsuccessful communication. So although the use of textisms by youths is, on the whole, creative and cost-effective, their freedom to deviate from standard language norms is not unlimited.

Acknowledgements

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Appendix A. **Figure 5**. Textism types, per CMC mode.
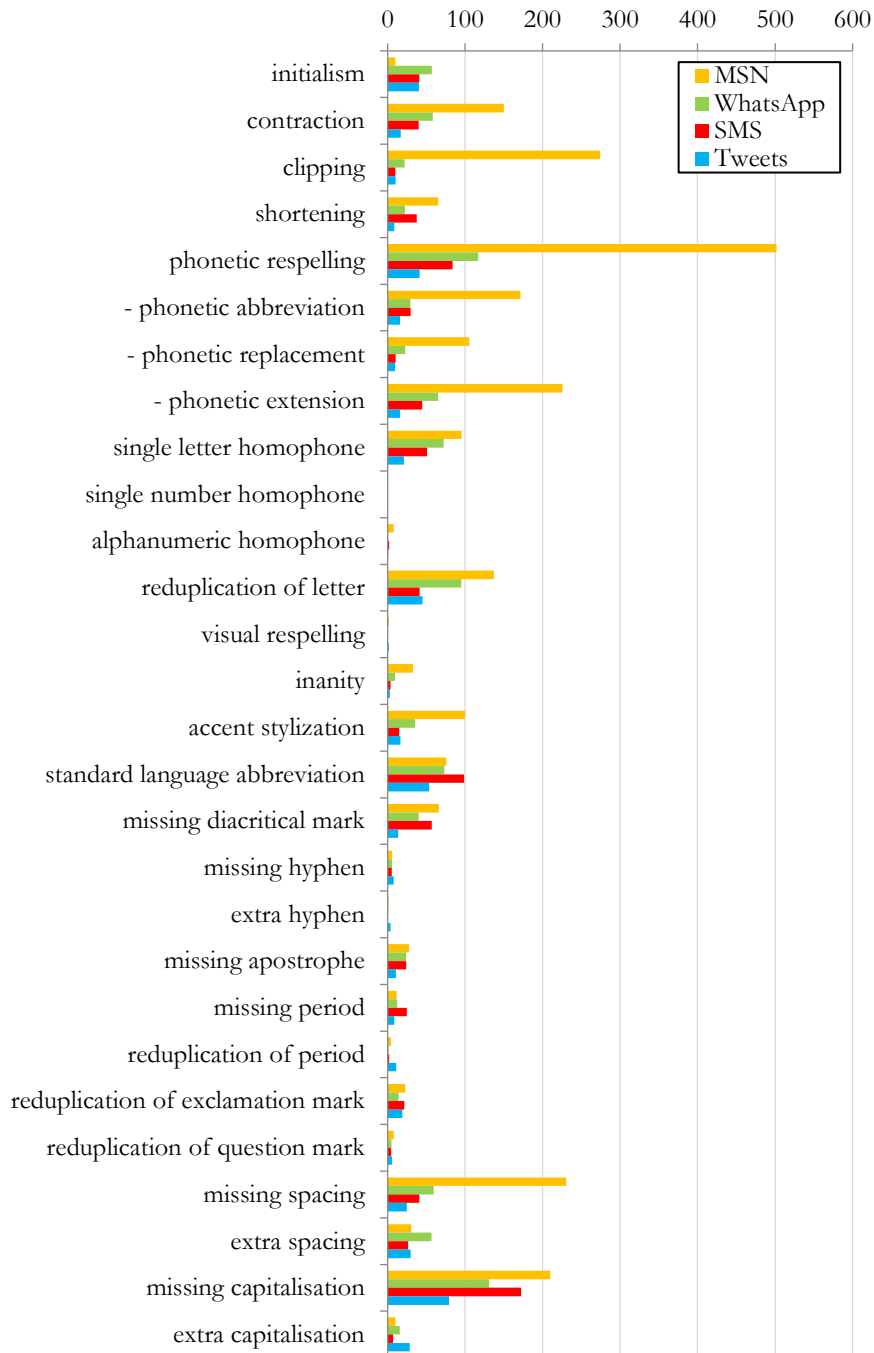
Appendix B. **Figure 6**. Textism types, per age group.
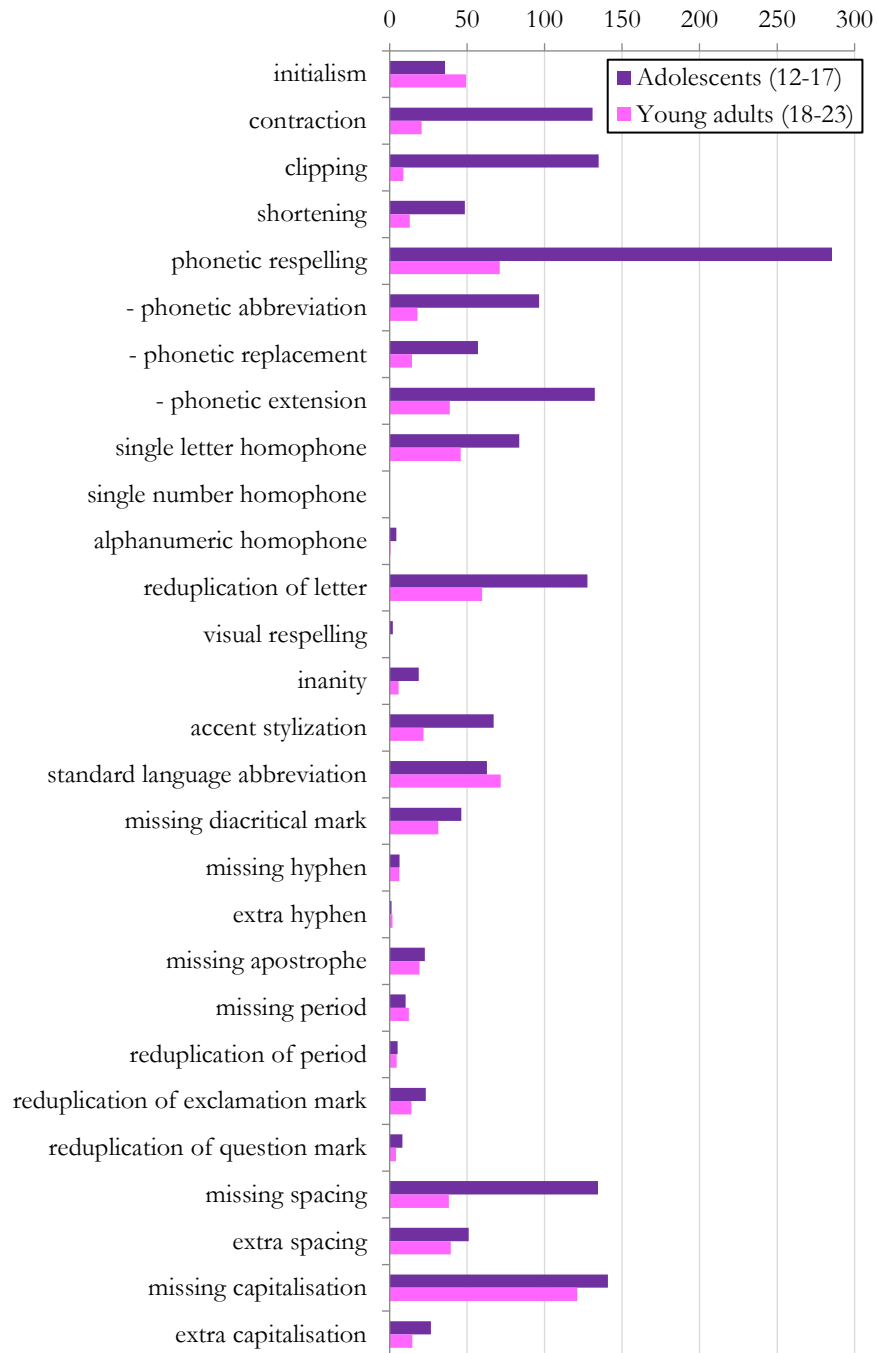
Chapter 6. Orthographic Principles in Computer-Mediated Communication: The SUPER-functions of Textisms and Their Interaction with Age and Medium

(published).[29]

Abstract

Online messages often diverge from the standard language orthography: so-called textisms have become an indispensable part of youths' written computer-mediated communication (CMC). This paper presents an in-depth corpus study of texts from four new media produced by Dutch youths: MSN chats, text messages, tweets, and WhatsApp messages. It is demonstrated that Dutch informal written CMC, as in other languages, is implicitly governed by orthographic principles. Relative frequencies of textism types in the corpus show how textisms are effectively used by Dutch youths. Textism types are classified here in terms of forms, operations, and, crucially, functions – the 'SUPER-functions': textisms can make orthography more Speechlike, Understandable, Playful, Expressive, or Reduced. Moreover, this study proves that preferences for textism types greatly depend on age group and medium. New media have their own combination of characteristics and constraints, while adolescents and young adults appear to have different perceptions on language use and spelling.

Key words: computer-mediated communication (CMC); new media; social media; writing; orthography; spelling; youth language

1. Introduction

Dutch youths have massively embraced new media. They send a great many messages via computer-mediated communication (CMC) in their everyday lives and are often reluctant, when forced by parents or teachers, to put their mobile phones away. CMC is defined here as communication between (groups of) people that occurs through the use of electronic devices such as computers, mobile phones, and tablets. Mainstream examples are text messaging, instant messaging, microblogging, and social networking sites. In informal communication via new media, orthographic and grammatical standard language norms appear to be loosened: youngsters often use forms of written language that diverge from Standard Dutch. Their new media writings contain all kinds of unconventional spelling, abbreviations, and colloquialisms: these prototypical features of digital writing are referred to as 'textisms', i.e. "neographical transformations" from conventionally spelled words

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(Anis, 2007:88). 'CMC language' is heterogeneous – the spelling of a single word can be transformed in diverse ways. At first glance, this orthography may seem completely irregular, with "randomly spelt words having nothing to do with what was learnt at school" (Frehner, 2008:11)..[30] Orthographic deviations are the most distinctive features of the language used in CMC (Crystal, 2006).

Many parents and educators have expressed worries that such textisms may cause youngsters to 'forget' how to write according to the standard language rules, as taught at school: they fear a degradation of writing. Yet it has been compellingly argued by linguists that spelling deviations in CMC in various languages are in fact "functional, principled and meaningful" (Tagg, Baron, & Rayson, 2014, among others; Anis, 2007; Dürscheid & Stark, 2013; Grace, 2013; Reinkemeyer, 2013). New media writings showcase an "extended orthographic palette" of meaning-making potential (Shortis, 2007:21), which goes far beyond the standard, 'correct', or 'official' spelling as has been explicitly codified in formal dictionaries such as, for Dutch, *Het Groene Boekje* by Van Dale, a renowned Dutch dictionary publisher. Still, there is a dearth of knowledge on the principles behind and functionality of textisms in *Dutch* written CMC, on how and why language in new media writings differs from the codified Standard Dutch orthography. Neither has it been studied whether the use of certain types of textisms depends on social factors such as the writer's age group or on the medium used for communication.

The present corpus study was conducted in order to find out just how textisms are used in various kinds of CMC by Dutch youths of different ages. This study started from the premise that textisms are cross-linguistically guided by a set of orthographic principles: that transformations from the standard language orthography in CMC do not involve randomness, but regularities. So, as Dürscheid and Stark (2013) already convincingly argued for Swiss text messages and Lanchantin, Simoës-Perlant and Largy (2015) for French instant messages, it is not the case that "anything goes" as regards orthography in CMC language. Of course, all orthographic 'norms' in CMC are implicit, as opposed to the standard norms, which are explicit and prescriptive. Formal texts call for "an explicitly codified orthographic norm," while informal CMC texts "lack a codified orthography, but still have implicit spelling conventions, such as internet chats and SMS messages" (Rutkowska & Rössler, 2012:227–8). These conventions or principles probably guide non-CMC as well, but are weighted much higher in CMC. Detailed linguistic analysis of a corpus of Dutch new media texts was manually carried out regarding the formation of textisms with certain orthographic elements, the edit operations that underlie their creation, and the functions they can fulfil. This paper aims to answer two questions:

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[30] Throughout this paper, the term orthography refers to the conventions for writing a language, including norms of spelling, punctuation, and capitalisation. Note, however, that within the field of grapholinguistics 'orthography' is a rather more complex concept, see Neef (2015) for an elaborate problematisation.

RQ1. Which textism types – classified according to their form, the edit operation involved, or function served – are typical of Dutch youths' new media writings?
RQ2. How do medium and age group affect the use of different textism types in terms of forms, operations, and functions?

The answers to these questions will shed light on the implicit orthographic principles, diverging from the Standard Dutch spelling norms, which have emerged in Dutch youths' new media writings.

2. Background

2.1 Technological Innovations, Folk-linguistic Concerns

The effects of computer-mediated communication "as a force in language change" were discussed long before the rise of new media such as texting and microblogging, in a time when emailing and mobile phones were still novel: an article published as early as 1984 speculates that "the use of the computer as a linguistic medium will affect the very shape and functioning of traditional language itself" (Baron, 1984:119). Since then, the language of CMC has given rise to widely differing sentiments: it has generated considerable controversy. Worries of language decline or impoverishment caused by the emergence of new communication technologies are not a new phenomenon: the arrival of the printing press, telegraph, telephone, and broadcasting technology likewise generated great anxiety and linguistic controversy (Crystal, 2006). They were all seen, in turn, as posing threats to the standard language. Thurlow and Brown (2003) have contended that emerging communication technologies have always sparked off "excessive hype and hysteria about the kinds of cultural, social and psychological impacts each new technology is likely to have" (n.p.), including an impact on conventional linguistic practices. Tagg (2015) also notes that "new technologies throughout history have always [...] engendered concern and distrust" (1) – concerns about "the linguistic and social status quo" (3), fears of language corruption. This is in line with what Bergs (2009) has called the 'complaint tradition', a "tradition to complain publicly about the state of the language and the misuse of linguistic elements" (64). Folk-linguistic concerns about CMC language can be seen as the repetition of "an old complaint about language decay and moral panic" (Shortis, 2007:22). In this time-honoured tradition, the state of the standard language and how it is affected by technological innovations – in this case, new media – is a great source of critique in the Netherlands.

2.2 Criticism on CMC Language in the Netherlands

Media treatment of the language used in new media writings was explored by Postma (2011), who studied 217 Dutch newspaper articles published between 2000 and 2010. His critical discourse analysis revealed that statistical panic was expressed in about one third of the articles. Postma notes that CMC language has been characterized with a plethora of negative descriptions, such as (translated from Dutch) 'gibberish',

'language deficiency', 'language deterioration', 'language corruption', 'depraved', 'vulgarizing', 'it hurts my eyes', 'an eyesore', 'an abomination', 'a negative influence', and 'a threat to the Dutch language'. Roughly one third of all the articles conveyed a sense of moral panic about declining literacy and the corruption of Standard Dutch due to new media use.

Public discourse on this subject does not appear to have changed much since the previous decade. Similar alarmist statements were made more recently about communication via the mobile application *WhatsApp Messenger*, a currently popular social medium in the Netherlands. In a 2013 news item, a principal claimed that WhatsApp messages contain bad language use, deliberate spelling errors, and unnecessary abbreviations (Schmidt, 2013). A 2015 language blog discussed whether WhatsApp language should be considered language corruption or language enrichment (Pelkman, 2015). Similarly, an entire chapter was dedicated to WhatsApp language in a book about abbreviations in Dutch, in which the author stressed that whenever WhatsApp language or SMS language gets media attention, the question is asked directly whether this is a violation of 'proper' Dutch (Bennis, 2015). In an article from 2016 on the website of national newspaper AD, it was suggested that computer-mediated communication among teens in WhatsApp is complete chaos (Baars, 2016). In that same year, an article about Dutch language education in newspaper *De Volkskrant* spoke about messy WhatsApp language (Stoffelen, 2016). Social media are still severely criticized these days for their supposed impact on language, as exemplified by a blog on WhatsApp language. This blog was prompted by an email by a college teacher, who warned his students not to use WhatsApp-like manners in emails, with which he claimed to be confronted more and more often (Seuren, 2017). WhatsApp language is a hot topic of interest among Dutch youths, which appears, for instance, from a recent website by primary school children discussing this phenomenon (Koopmans, Steneker, & Spoelstra, 2017). All this makes clear that criticism on CMC language remains fierce in the Netherlands – it is just the CMC mode under critique that changes every few years.

This paper aims to dispel widespread fears that CMC contains a hotchpotch of unnecessary orthographic aberrations degrading the Dutch language. I argue that Dutch new media writings are no different from such writings in other languages, in that they are not filled with orthographic anarchy: textisms are not chaotic, but rather to a great extent organised transformations from the Standard Dutch orthography. We can identify implicit principles on how they are formed, which edit operations are involved in creating them, and which functions they fulfil. More importantly, this study shows that media, which each have their own characteristics, and age groups, which determine youths' perceptions on language use, are crucial in determining the types of textisms that are preferred.

3. Methodology

3.1 Collecting a New Media Corpus

A preliminary corpus of writings from three new media was compiled by selecting texts from SoNaR, a large existing reference corpus of written Dutch ('STEVIN

Nederlandstalig Referentiecorpus', Oostdijk et al., 2013) with a treasure-trove of hitherto linguistically unanalysed CMC data. Nearly all instant messages (MSN chats, via the Internet application MSN Messenger), text messages (SMS), and microblogs (tweets, sent via microblog Twitter) written by youths between the ages of twelve and twenty-three were selected from SoNaR. Only some new media texts by youths of the intended ages did not qualify for inclusion in the corpus for this study. Firstly, two subcorpora of instant messages by Dutch youths that SoNaR contains besides MSN, namely ChatIG and Bonhoeffer, were excluded, because (a) the ChatIG data were not recent enough, from 2004-2006 and (b) both subcorpora were produced in a non-naturalistic setting (at school) under forced conditions. Also excluded were text messages of some contributors who were Dutch according to the metadata, but by all appearances were Flemish – as judged from Flemish vocabulary and place names in the messages. Retweets were excluded in order to ensure that the corpus contains only writings by contributors of the desired ages and nationality. Those created with the Twitter ReTweet feature had already been filtered out of SoNaR, but I also filtered out those where contributors copied and pasted someone's message and typed "RT" in front of it. When people added their own message before or after the retweet (separated by //, | |, <<, or •), this part was included.

A distinction was made between writings by adolescents, from 12 to 17 years old, and young adults, 18-23 years old, to examine whether orthographic deviations depend on age group. Since the SoNaR corpus was compiled by other researchers, I had to make do with the new media data available therein. These data were not as balanced as one would hope: the number of tokens and the number of chats or contributors are unevenly distributed among the media and age groups – SoNaR contains few MSN chats between young adults and even fewer text messages by only a small number of contributing adolescents. When I carried out my analysis, it was impossible to collect additional, more recent MSN and SMS data to improve the balance of the corpus, because MSN Messenger no longer existed (it was discontinued in 2013) and SMS was no longer in vogue among Dutch adolescents. However, fortunately this was not an issue for the statistical analyses, since relative frequencies were computed, standardized per ten thousand tokens.

It was possible, though, to supplement the SoNaR texts with texts from another medium. The medium chosen was WhatsApp, because this had become quite popular in the Netherlands and was poignantly lacking from SoNaR. WhatsApp messages were gathered especially for the present project, via a website with instructions on how youths could voluntarily donate their messages (Verheijen & Stoop, 2016). Specifications of the final corpus are shown in Table 1. It amounts to nearly 400,000 tokens,[31] and offers a wealth of information on linguistic variation from standard written Dutch.

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[31] A token was taken as a sequence of characters between spaces, so tokens are mainly words, but can also be isolated punctuation marks or emoticons.

Table 1. Corpus of Dutch youths' new media writings.

Medium	Year(s) of collection	Age group	Mean age	# tokens	# chats or contributors[i]
instant messaging: MSN	2009-2010	12-17 (both)[ii]	16.2	45,051 (3,745)	106 (9)
		18-23	19.5	4,056	21
		total		49,107	127
text messaging: SMS	2011	12-17	15.4	1,009	7
		18-23	20.4	23,790	42
		total		24,799	49
microblogging: Twitter	2011	12-17	15.9	22,968	25
		18-23	20.6	99,296	83
		total		122,264	108
instant messaging: WhatsApp	2015	12-17	14.0	55,865	11 / 84
		18-23	20.4	140,134	23 / 132
		total		195,999	34 / 216
		grand total		**392,169**	

[i] No. of chats: MSN, WhatsApp; no. of contributors: SMS, tweets, WhatsApp.
[ii] MSN chats between youths of both age groups were used as training data for the manual coding.

3.2 Compiling a Taxonomy of Textisms

To map out the orthographic deviations in Dutch youths' computer-mediated communication, I drew up a comprehensive taxonomy of textism types. Tables 2 and 3 show this taxonomy, of which a less exhaustive version was presented in Verheijen (2013). Twelve types with deviations in letters were distinguished (see Table 2), as well as eight types with deviations in diacritics, punctuation, spacing, and capitalisation (Table 3). Textism types were identified on the basis of the changes that occur in relation to the conventional spelling. They are based on existing taxonomies (Thurlow & Brown, 2003; Crystal, 2008; Frehner, 2008; Plester, Wood, & Bell, 2008; Drouin & Davis, 2009; Plester, Wood, & Joshi, 2009; Winzker, Southwood, & Huddlestone, 2009; Kemp, 2010; Rosen et al., 2010; Varnhagen et al., 2010; Durkin, Conti-Ramsden, & Walker, 2011; Geertsema, Hyman, & Van Deventer, 2011; De Jonge & Kemp, 2012), but have been adapted to fit the CMC language of Dutch youths. Please note that these categories are not mutually exclusive, so one textism may belong to multiple types (e.g. *gwees* < *geweest*: contraction + clipping, *evaaaa* < *Eva*: omission of capitalization + reduplication of letter, *owja* < *o ja*: phonetic respelling (extension) + omission of spacing).

Table 2. Textisms with deviations in letters.

Type	Definition	Dutch examples
initialism ('alphabetism', 'acronym')	first letters of each word/element in a compound word, phrase, (elliptical) sentence, or exclamation	*sv < samenvatting* ('summary') *hvj < hou van je* ('love you') *omg < o mijn God* ('oh my God')
contraction	omission of letters (mostly vowels) from middle of word	*vnv < vanavond* ('tonight') *grtjs < groetjes* ('greets') *idd < inderdaad* ('indeed')
shortening ('truncation')	dropping of ending or occasionally beginning of word	*eig < eigenlijk* ('actually') *wan < wanneer* ('when') *knuf < knuffel* ('hug')
clipping	omission of only final letter of word (mostly silent *-n* or *-t*)	*lache < lachen* ('laugh') *truste < trusten* ('good night') *nie < niet* ('not')
phonetic respelling: abbreviation, replacement, extension	substitution of letter(s) of word by (an)other letter(s), while applying accurate grapheme-phoneme patterns of the standard language[i]	*nix < niks* ('nothing') *jonguh < jongen* ('boy') *owk < ook* ('also') *errug < erg* ('very')
single letter /number homophone	substitution of entire word by phonologically resembling or identical letter/number	*k < ik* ('I') *n < een* ('a'/'an') *4 < for*
alphanumeric homophone ('rebus')	substitution of part of word by phonologically resembling or identical letter(s) and/or number(s)	*suc6 < success* ('good luck') *w88 < wachten* ('wait') *btje < beetje* ('little')
reduplication ('flooding')	repetition of letter(s)	*zoooo < zo* ('so') *neeeee < nee* ('no') *superrr < super* ('super')
visual respelling	substitution of letter(s) by graphically resembling non-alphabetic symbol(s) (special characters or numbers)	*Juli@n < Julian* ('Julian') *m%oi < mooi* ('pretty') *c00l < cool* ('cool')
accent stylisation	words from casual, colloquial, or accented speech spelled as they sound	*hoezut < hoe is het* ('how are you doing') *kweenie < ik weet het niet* ('I don't know') *lama < laat maar* ('never mind')
inanity	miscellaneous spelling deviations: "nonsensical transmogrification" of word (Craig 2003:120)	*plezierhr < plezier* ('fun') *goewd < goed* ('good') *laterz < later* ('later')
standard language abbreviation	abbreviation that is part of the standard language	*aug < augustus* ('August') *bios < bioscoop* ('cinema') *info < informatie* ('information')

[i] An alternative spelling from the word's 'graphematic solution space' (Neef, 2015).

Table 3. Textisms with deviations in diacritics, punctuation, spacing, or capitalisation.

Type	Dutch examples
missing diacritic	*carriere* < *carrière* ('career')
	ideeen < *ideeën* ('ideas')
	enquete < *enquête* ('survey')
missing punctuation: apostrophe, period (in abbreviations), hyphen	*mn* < *m'n* ('my')
	maw < *m.a.w.* ('in other words')
	ovkaart < *ov-kaart* ('public transport card')
missing spacing – in between words (not before or after punctuation marks)[i]	*weetje* < *weet je* ('you know')
	hahaokeeedan < *haha oké dan* ('haha okay then')
missing capitalisation – of names, abbreviations (not sentence-initial)[i]	*tim* < *Tim* ('Tim')
	mb < *MB* ('MB': megabyte)
extra hyphen	*stilte-coupé* < *stiltecoupé* ('silent compartment')
	pannenkoeken-huis < *pannenkoekenhuis* ('pancake restaurant')
extra spacing – in between elements of compound words	*fel groen* < *felgroen* ('bright green')
	museum plein < *museumplein* ('museum square')
extra capitalisation	*WOW* < *wow* ('wow')
	SUPERTOF < *supertof* ('great')
reduplication of punctuation: exclamation mark, question mark, period	*!!!!! < !*
	?? < ?
	.... < ...

[i] See section 3.5 for an explanation as to why these were excluded.

3.3 Coding the Data

All textisms were identified and coded manually. Words could also be classified as belonging to two or more textism types. In order to increase the reliability of the results, all the data were checked twice by the first coder, the author. Moreover, a subset of the data (over 10,000 tokens; a random sample of at least 1,000 per age group per medium) was also coded independently by a second coder, who beforehand took part in two training sessions with the first coder to get a full grasp of the codebook. The intercoder reliability for this subset of the data was measured with Cohen's $\varkappa$. It was calculated per linguistic feature, to ensure acceptable levels of reliability (except for the omissions, which were only coded by a single coder). The overall intercoder reliability of recognition of textisms was $\varkappa = .92$; the average intercoder reliability for all textism types was $\varkappa = 0.85$. For textisms with deviations in letters, the average was $\varkappa = 0.85$; for textisms with deviations in diacritics, punctuation, spacing, or capitalisation, $\varkappa = 0.84$ (see Table 4).

Table 4. Reliability coefficients per textism type.

Linguistic features	Kappa	Linguistic features	Kappa
initialism	.73	missing diacritic	.87
contraction	.88	missing apostrophe	.93
shortening	.94	missing period	1.0
clipping	.90	missing hyphen	.54
phonetic respelling:		missing spacing	.86
abbreviation	.90	missing capitalisation	.89
replacement	.86	extra hyphen	-
extension	.87	extra spacing	.71
single letter/no. homophone	.95	extra capitalisation	.95
alphanumeric homophone	.67	reduplication of '!'	.91
reduplication	.91	reduplication of '?'	.92
visual respelling	-	reduplication of '.'	.67
accent stylisation	.80		
inanity	.80	avg. deviations in	.84
standard lang. abbreviation	.89	diacritics, punctuation,	
avg. textisms with deviations in letters	.85	spacing, capitalisation	

As explained above, the results reported here have been standardized per 10,000 tokens, because the total number of tokens differs per medium and age group in the corpus.

3.4 Classifying the Textism Types

Textism types were classified according to their form, the operations involved in their creation, and the functions they serve. The classifications are presented in Tables 5, 6, and 7 below. Other classifications can be found in earlier studies on written CMC in different languages (Werry, 1996; Thurlow & Brown, 2003; Shortis, 2007; Panckhurst, 2009; Silva, 2011; Combes, Volckaert-Legrier, & Largy, 2014; Tagg, Baron, & Rayson, 2014; Kirsten Torrado, 2014).

Table 5. Formal classification of textism types.

Forms	Types
letters	initialism, contraction, clipping, shortening, phonetic respelling, single letter/number homophone, alphanumeric homophone, reduplication, visual respelling, accent stylisation, inanity, standard language abbreviation
diacritics	missing diacritic
punctuation	missing punctuation (apostrophe, period, hyphen), reduplication of punctuation (exclamation mark, question mark, period), extra hyphen
spacing	missing spacing, extra spacing
capitalisation	missing capitalisation, extra capitalisation

Although textisms with changes from the standard language norms in letters are the most salient in new media writings, textisms represent a broader phenomenon. They can also involve deviations from the standard with other orthographic elements, namely diacritics, punctuation, spacing, or capitalisation. These are distinguished in the formal classification, as presented in Table 5.

Furthermore, there are certain patterns in the edit operations that underlie the creation of textisms, which have already been observed in other languages. As is shown in Table 6, there are textisms of omission, substitution, and addition (all the logically possible options – in Levenshtein's (1966) terms, deletions, reversals, and insertions), in which orthographic elements are left out, replaced, or added. Note that not all textisms of omission lead to shorter messages – missing diacritics and capitalisation can only save time, not space, and that not all textisms of addition lengthen messages, witness extra capitalisation.

Table 6. Operational classification of textism types.

Edit operations	Textisms created by...	Types
omission	leaving out orthographic elements	initialism, contraction, clipping, shortening, standard language abbreviation, missing diacritic, missing punctuation, missing spacing, missing capitalisation
substitution	replacing orthographic elements by other elements	phonetic respelling, single letter/number homophone, alphanumeric homophone, visual respelling, accent stylisation
addition	adding orthographic elements	reduplication of letter, inanity, reduplication of punctuation, extra hyphen, extra spacing, extra capitalisation

Finally, textisms can fulfil a number of functions. Three of these were recognized earlier, first in the context of SMS text messages by Thurlow and Brown (2003, 'sociolinguistic maxims') and later also by Androutsopoulos (2011, 'themes' of digital writing), Thurlow and Poff (2013, 'maxims' of text message style), De Decker (2015, 'principles' of chatspeak), and Vandekerckhove and Sandra (2016, 'maxims' of texting and online chat). I distinguish five functions: the 'CC5-functions' or 'SUPER-functions' of textisms, as shown in Table 7.[32] Textisms can make the orthography in computer-mediated communication more **S**peechlike, **U**nderstandable, **P**layful, **E**xpressive, or **R**educed.

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[32] It is pertinent to point out that writers may not always be fully conscious of these functions in their use of specific textisms.

Firstly, speechlike textisms are used to write words in alternative spellings that are in accordance with how they are pronounced in spoken language, specifically casual and/or colloquial speech (cf. Androutsopoulos's (2011) 'conceptual orality', Vandekerckhove & Sandra's (2016) 'speech maxim'), i.e. to achieve phoneticism and informality. Phoneticism is the use of phonetically transparent letter-sound correspondences as licensed by the standard language orthography in new orthographic environments. It has also been called 'phonological approximation', 'phonetic writing', and 'phoneticised respelling' (Thurlow & Brown, 2003; Silva, 2011; Thurlow & Poff, 2013; Kirsten Torrado, 2014). This is in line with McWhorter's (2013) characterisation of text messaging as "a way of talking with your fingers." Since their spelling is unconventional but the grapheme-phoneme patterns of Standard Dutch should be applied accurately, youths who use such textisms are "accurate listeners who can detach themselves from their orthographic knowledge formally learnt in schools" (Silva, 2011:151): speechlike textisms require phonological awareness.

Secondly, textisms are used for reasons of understandability, to enhance clarity and text comprehension. Making the word structure of (long) compound words more explicit with additional hyphens or spaces, thereby increasing morphological transparency, can help receivers understand messages and facilitate the reading. However, not all extra spacing improves the transparency of a text. Such textisms may also arise due to interference of the English language, where elements of compounds words are regularly separated by spaces. What can also play a role is the predictive software that is often used on mobile phones. After typing the first letters of a compound word, the software may suggest the first element of the compound after which, if selected, a space is often automatically inserted, so that elements of the compound are separated by spacing.

Thirdly, playful textisms involve linguistic creativity: these are used because youths may enjoy playing with language. They regard intentional deviations from the standard language as cool. This emerges, for instance, in leetspeak or 1337, an online writing style with lots of visual respellings. According to the Urban Dictionary, an Internet-based dictionary of youth slang, "The point of 1337 is to replace all the letters with symbols, and is quite fun to play with": the fun factor is essential here.

Fourthly, textisms can be used to make the orthography more expressive, to convey phonological stress or semantic nuances. By exploiting the orthographic possibilities of digital writing, textisms can express what in spoken language is voiced by paralinguistic cues or prosody (intonation, rhythm, stress, volume). Thurlow and Poff (2013) refer to this as 'paralinguistic restitution'. This theme involves the 'semiotics of compensation' (Androutsopoulos, 2011) or the 'compensation maxim' (Vandekerckhove & Sandra, 2016): textisms can compensate for expressive cues that are present in speech, but not in conventional writing.

Fifthly, for the purposes of conciseness and curtailment, reduction-based textisms[33] can be used to reduce the number of letters, characters, or keystrokes.

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[33] CMC language also contains grammatical features of reduction, i.e. the omission of function words. These surpass the scope of this paper, which focuses solely on orthographic features.

Shortening the message form in such a way can speed up communication, minimize the physical effort required for composing a message,[34] and, in some new media, prevent exceeding the character limits. This has also been referred to as 'linguistic economy' (Androutsopoulos, 2011), 'brevity and speed' (Thurlow & Poff, 2013), and the 'speed maxim' (Vandekerckhove & Sandra, 2016). In CMC, orthographic brevity and velocity tend to overrule standard language norms: that is why McWhorter (2013) writes about an online "cult of concision."

Table 7. Functional classification of textism types.

SUPER-functions	Corresponding CC5-functions	Textisms used for...	Types
Speechlike	**C**asualness & **C**olloquialism	phoneticism, informality	clipping, phonetic respelling (abbreviation, replacement, extension), single letter/number homophone, alphanumeric homophone, accent stylisation
Under-standable	**C**larity & **C**omprehension	morphological transparency	extra hyphen, extra spacing
Playful	**C**reativity & **C**oolness	language play, fun	visual respelling, inanity
Expressive	**C**ompensation & **C**ues	phonological stress, semantic nuances	reduplication of letter, reduplication of punctuation, extra capitalisation
Reduced	**C**onciseness & **C**urtailment	orthographic brevity, velocity	initialism, contraction, shortening, standard language abbreviation, clipping, phonetic abbreviation, single letter/number homophone, alphanumeric homophone, missing diacritic, missing punctuation, missing spacing, missing capitalisation

Note: for the comprehensibility of the analysis, the textism types have been assigned to their most evident category/ies. Of course, in reality they can be used for more purposes, e.g. they can all serve an additional function of language play or informality: in other words, these functions are not mutually exclusive.

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[34] Such textisms may reduce the keystroke effort, but not necessarily the mental effort: in fact, for fluent writers who know the standard spelling of a word by heart, it might be easier to simply reproduce what they have learnt than to create a different, reduced orthography. Likewise, writers may be somewhat burdened with mental effort in their pursuit of adhering to implicit social in-group norms regarding the textism usage.

3.5 Delimiting the Definition of Textisms

Five other kinds of deviations occurring in the new media corpus have not been incorporated into the textism classifications presented here:

- misspellings: apparently genuine failures to spell words according to the codified standard language rules which are heavily frowned upon by language prescriptivists (only 'errors' with *d/t*, *ei/ij*, *is/eens*, *jou/jouw*, *n* connecting compound elements, obsolete spelling, and with borrowings);
- typos: failures to press the correct key or incorrect predictions by predictive software, as judged from the linguistic context, as well as the proximity of letters on a keyboard;
- missing spaces after punctuation, sentence-final markers, or sentence-initial capitalisation, as well as extra spaces before punctuation;
- emoticons: symbols composed of typographic characters, representing faces expressing emotions, e.g. :-), :D, :(, :P, ;) ;
- symbols, e.g. *&* for *and*, *<3* for *love*, *x* for *kiss*.

Emoticons and symbols, while frequently considered to be textisms, were excluded as they involve typography rather than orthography (Amaghlobeli, 2012). Misspellings, typos, missing spaces after punctuation marks, extra spaces before punctuation marks, missing sentence-final markers, and missing sentence-initial capitalisation were excluded because of a lack of demonstrable motivation and intentionality for using these orthographic deviations on the part of the writer, as opposed to the textisms in my taxonomy. Misspellings and typos, if classified correctly, can be assumed to be honest mistakes and as such do not reflect any spelling principles. Missing spaces after punctuation marks, extra spaces before punctuation marks, missing sentence-final markers, and missing sentence-initial capitalisation were not included because they largely depend on the software used and users' personal settings of this software (automatic capitalisation of sentences, automatic insertion of spaces, automatic addition of periods), so the presence or lack thereof does not reflect orthographic principles, but rather technological selections (which can, of course, lead to new 'norms').

4. Results

This section presents the results of the corpus analysis. Tables 8, 10, and 12 show the relative frequencies; Tables 9, 11, and 13 show the rank orders of those frequencies. Figures 1, 3, and 5 present the results per medium; Figures 2, 4, and 6 present them per age group. Statistical tests (loglinear analyses) were conducted on these results with IBM SPSS Statistics to determine their significance.

4.1 Formal Classification

Table 8. Relative frequencies for the formal classification (per 10,000 tokens).

Category	MSN		SMS		Twitter		WhatsApp	
	12-17	18-23	12-17	18-23	12-17	18-23	12-17	18-23
letters	1542	449	872	404	333	242	844	450
diacritics	66	64	59	57	21	12	40	40
punctuation	84	39	129	80	66	66	76	57
spacing	279	59	159	63	62	53	161	98
capitalisation	206	375	238	177	151	98	142	149

Table 9. Rank order for the formal classification (per 10,000 tokens).

	MSN		SMS		Twitter		WhatsApp	
	12-17	18-23	12-17	18-23	12-17	18-23	12-17	18-23
1	letters (1542)	letters (449)	letters (872)	letters (404)	letters (333)	letters (242)	letters (844)	letters (450)
2	spacing (279)	capitalisation (375)	capitalisation (238)	capitalisation (177)	capitalisation (151)	capitalisation (98)	spacing (161)	capitalisation (149)
3	capitalisation (206)	diacritics (64)	spacing (159)	punctuation (80)	punctuation (66)	punctuation (66)	capitalisation (142)	spacing (98)
4	punctuation (84)	spacing (59)	punctuation (129)	spacing (63)	spacing (62)	spacing (53)	punctuation (76)	punctuation (57)
5	diacritics (66)	punctuation (39)	diacritics (59)	diacritics (57)	diacritics (21)	diacritics (12)	diacritics (40)	diacritics (40)

Tables 8 and 9 make clear that, on the whole, the most frequent textisms in the corpus are those with letters. Textisms with punctuation and diacritics occurred with the lowest relative frequencies. Yet there was quite some variation across age groups and media. The second most frequent formal textism category was capitalisation for young adults in all media, as well as for adolescents in SMS text messages and tweets; it was spacing for adolescents in MSN and WhatsApp, followed by capitalisation in third place. A loglinear analysis shows that the three-way interaction medium × age × formal class was significant (χ^2 (12) = 178.71, p < .001). This means that the occurrence of textism types of certain forms depends on the age of the writer as well as the medium in which the writing was produced, and the combination of these variables. Figure 1 reveals that adolescents used more textisms of all forms than young adults. This was, in fact, the case in all media except for textisms with capitalisation in MSN and WhatsApp (and, just barely, with punctuation in Twitter). This dominance depended on the form of the textisms, i.e. the orthographic element involved: the difference was by far the greatest for textisms with letters. Figure 2 makes clear that textisms with letters, diacritics, spacing, and capitalisation occurred most on MSN and least on Twitter. Textisms with punctuation occurred most on

SMS (though only slightly more than on MSN), least on WhatsApp (though only slightly less than on Twitter).
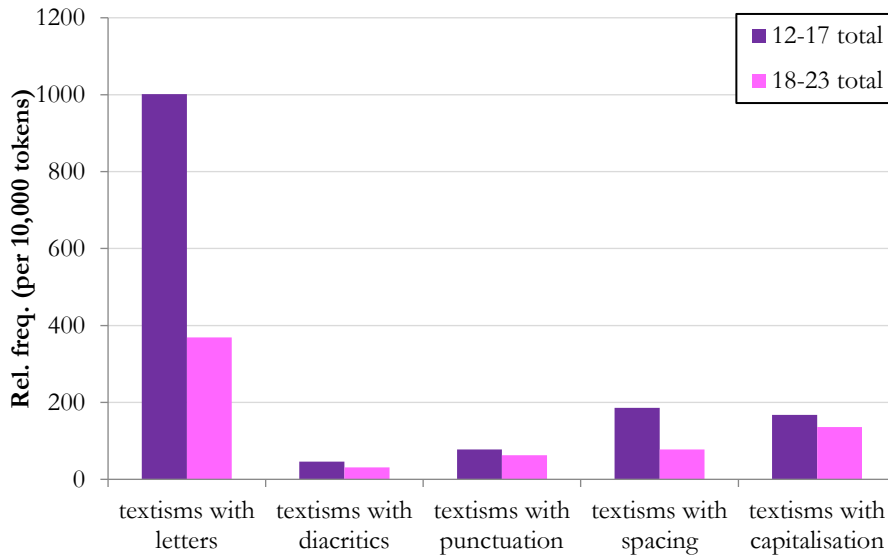
Figure 1. Distribution of the formal classification per age group.
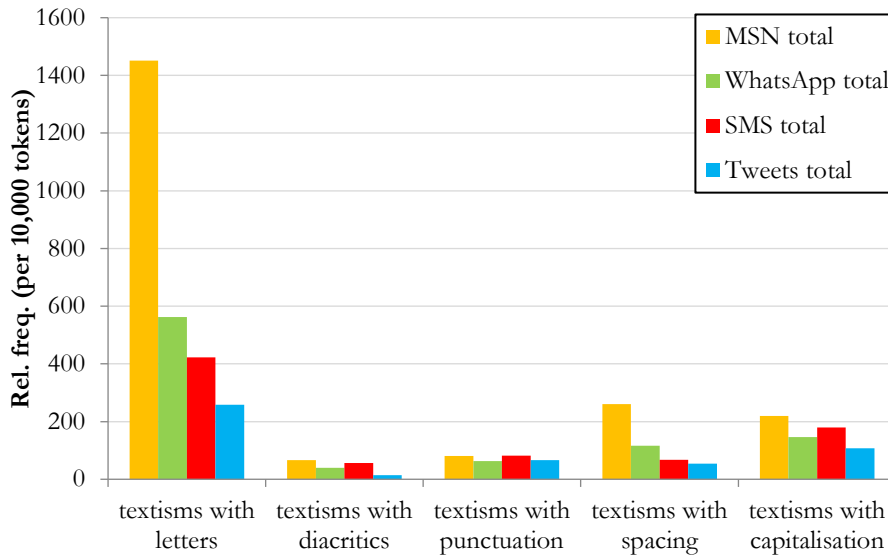
Figure 2. Distribution of the formal classification per medium.

4.2 Operational Classification

Table 10. Relative frequencies for the operational classification (per 10,000 tokens).

Category	MSN		SMS		Twitter		WhatsApp	
	12-17	18-23	12-17	18-23	12-17	18-23	12-17	18-23
omission	1156	789	862	537	315	264	652	446
substitution	763	89	377	142	109	75	323	187
addition	258	108	218	101	208	131	288	162

Table 11. Rank order for the operational classification (per 10,000 tokens).

	MSN		SMS		Twitter		WhatsApp	
	12-17	18-23	12-17	18-23	12-17	18-23	12-17	18-23
1	omission (1156)	omission (789)	omission (862)	omission (537)	omission (315)	omission (264)	omission (652)	omission (446)
2	substitution (763)	addition (108)	substitution (377)	substitution (142)	addition (208)	addition (131)	substitution (323)	substitution (187)
3	addition (258)	substitution (89)	addition (218)	addition (101)	substitution (109)	substitution (75)	addition (288)	addition (162)

Tables 10 and 11 show that the majority of textisms in the corpus involve the edit operation of omission. Across age groups and media, there was considerable variation. In SMS text messages, WhatsApp messages, and MSN chats by adolescents, textisms with addition occurred least frequently, but in tweets and MSN chats by young adults, textisms with substitution were least frequent. A loglinear analysis proves that the three-way interaction medium × age × operational class was significant (χ^2 (6) = 126.54, p < .001). How frequently textism types created with certain edit operations occur in new media writings is thus dependent on the combination of the text's medium and writer's age. Figure 3 shows that textisms involving all operations were used more by adolescents than young adults. Taking a closer look, this turned out to be true in all four media. These differences were dependent on the edit operation underlying the textisms: the difference was relatively greatest for textisms of substitution, smallest for textisms of addition. Figure 4 reveals that textisms of all operations occurred most on MSN. Textisms of omission and substitution occurred least on Twitter; those of addition least in SMS, but also with a low frequency for Twitter.

Figure 3. Distribution of the operational classification per age group.
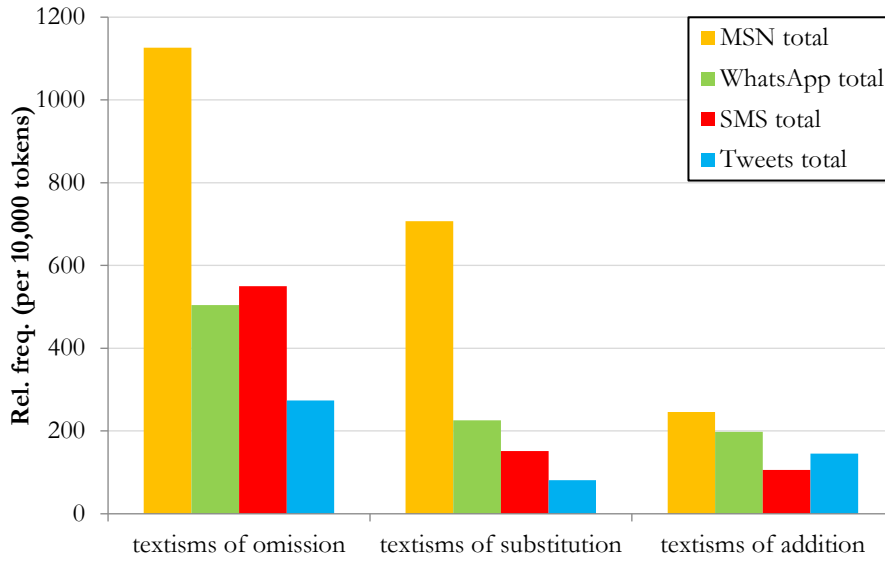
Figure 4. Distribution of the operational classification per medium.

4.3 Functional Classification

Table 12. Relative frequencies for the functional classification (per 10,000 tokens).

Category	MSN		SMS		Twitter		WhatsApp	
	12-17	18-23	12-17	18-23	12-17	18-23	12-17	18-23
speechlike	1060	89	446	149	118	83	376	196
understandable	32	30	50	26	27	35	79	48
playful	37	2	10	3	11	3	12	9
expressive	191	76	159	72	178	93	196	105
reduced	1454	809	1051	615	344	304	809	527

Table 13. Rank order for the functional classification (per 10,000 tokens).

	MSN		SMS		Twitter		WhatsApp	
	12-17	18-23	12-17	18-23	12-17	18-23	12-17	18-23
1	reduced (1454)	reduced (809)	reduced (1051)	reduced (615)	reduced (344)	reduced (304)	reduced (809)	reduced (527)
2	speechlike (1060)	speechlike (89)	speechlike (446)	speechlike (149)	expressive (178)	expressive (93)	speechlike (376)	speechlike (196)
3	expressive (191)	expressive (76)	expressive (159)	expressive (72)	speechlike (118)	speechlike (83)	expressive (196)	expressive (105)
4	playful (37)	understandable (30)	understandable (50)	understandable (26)	understandable (27)	understandable (35)	understandable (79)	understandable (48)
5	understandable (32)	playful (2)	playful (10)	playful (3)	playful (11)	playful (3)	playful (12)	playful (9)

Tables 12 and 13 reveal that textisms for reduction occur most frequently in the corpus, while those for playfulness occur most infrequently. Once again, variation across media and age groups occurred. In SMS text messages, WhatsApp messages, and MSN chats by young adults, the order was reduced > speechlike > expressive > understandable > playful. Tweets and MSN chats by adolescents had two classes reversed. In tweets, expressive textisms were more frequent than speechlike ones. In MSN chats by adolescents, more textisms were used for playfulness than for making the writing more understandable. The three-way interaction medium × age × functional class was proven to be significant by a loglinear analysis (χ^2 (12) = 1032.90, p < .001), so the relative frequency of textisms with certain functions in new media writings is subject to both the writer's age group and the medium used. Figure 5 shows that adolescents used textisms of all functions more than young adults. They even did so in all media, with the minor exception of textisms for understandability on Twitter. This divergence depended on function: the difference was relatively greatest for speechlike textisms. Figure 6 shows that speechlike, playful, expressive, and reduced textisms occurred most on MSN; only textisms for understandability occurred most on WhatsApp. Speechlike and reduced textisms occurred with lowest

frequencies on Twitter; understandable, playful, and expressive textisms with lowest frequencies on SMS, but again also with low frequencies for Twitter.
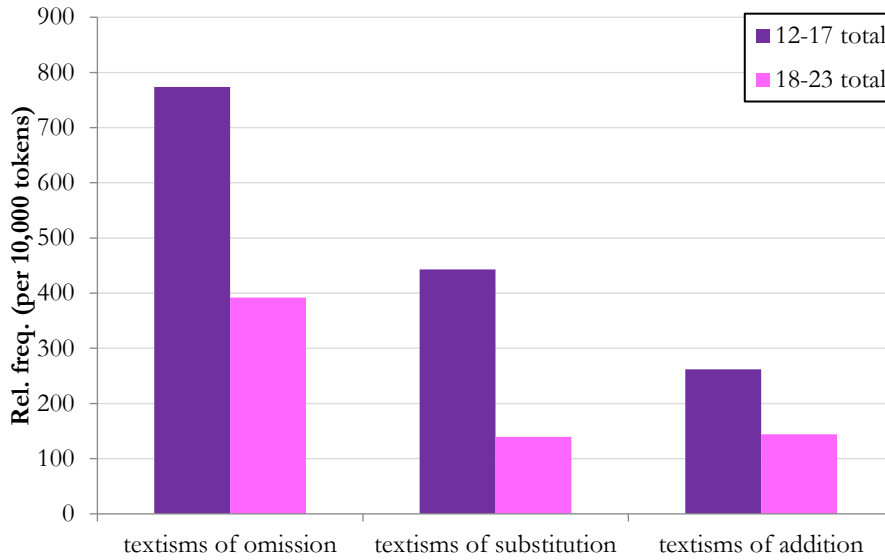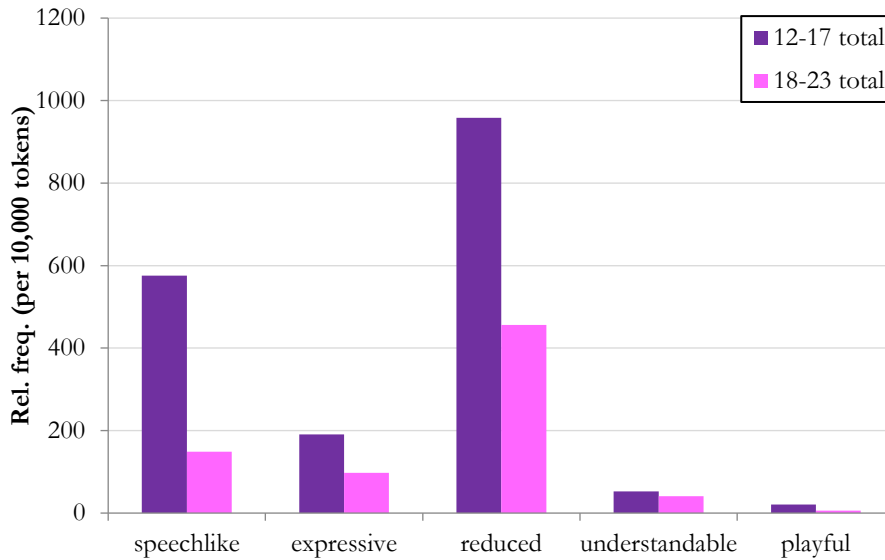
Figure 5. Distribution of the functional classification per age group.
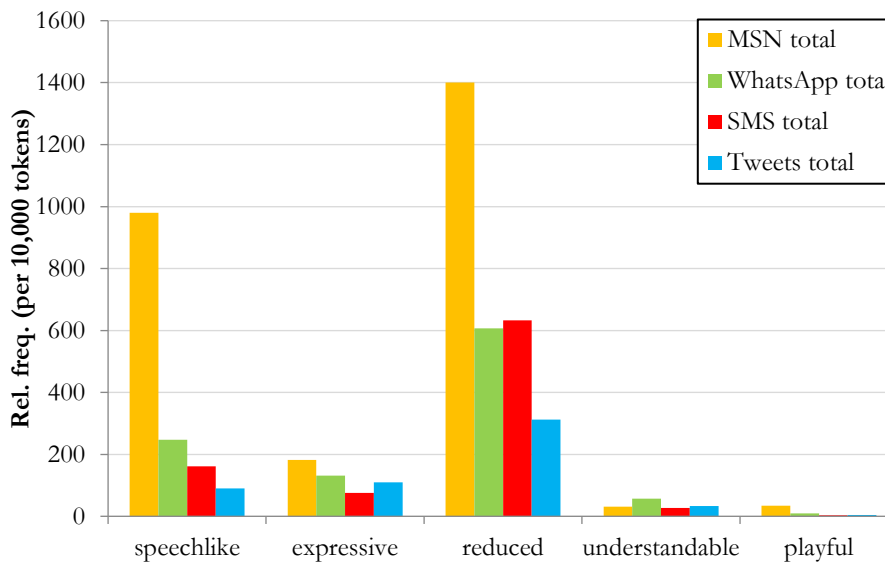
Figure 6. Distribution of the functional classification per medium.

5. Discussion

This rather large-scale manual corpus analysis of orthographic deviations in Dutch youths' new media writings was based on the various types of textisms that occur in those writings, and classifications of these textisms in terms of forms, edit operations, and functions. Across all four media and both age groups, textisms with letters turned out – perhaps unsurprisingly – to be the most frequently used category in terms of form, textisms of omission in terms of operations, and textisms for reduction (for conciseness & curtailment) in terms of functions. On the other end of the scale, infrequently used textisms in terms of form were those with punctuation and diacritics, and in terms of functions those to make the writing more understandable (for clarity & comprehension) and playful (for creativity & coolness). In short, the regular omission of letters in Dutch youths' written CMC provides them with orthographic brevity and velocity, whereas they only rarely diverge from the standard language norms in diacritics or punctuation,[35] or merely for language play. From a formal perspective, this makes perfect sense, since any given text obviously contains more letters than diacritical or punctuation marks, so there is much more room for deviation in letters. From an operational perspective, this means that youths' language use in CMC is aimed at communicating effectively: omissions can save time and effort (and often also space), if understood by one's interlocutor. From a functional perspective, finally, effective communication is also key, because reductions minimize keystroke effort and maximize efficiency. The fun factor is apparently least important – although textisms that are used to fulfil other functions could, of course, simultaneously also be used for fun. This confirms earlier findings by De Decker (2015), who found that in Flemish youths' CMC, functional features such as abbreviations and acronyms occurred more frequently than playful spelling manipulations. Likewise, Marrón Fernández de Velasco's (2015) analysis of English YouTube comments revealed that most non-standard spelling appeared to be used for language economy, to reduce keystrokes and increase typing speed. What is more, my analysis has revealed statistically significant three-way interactions for medium × age × formal/operational/functional classes. Medium and age have thus been proven to significantly affect the relative frequencies with which textism types of different classes occur in Dutch youths' written CMC.

5.1 Age Effects

As for age group, textisms of all forms, operations, and functions were used more by adolescents than young adults *for the four media taken together*. The overwhelmingly greater use of textisms by adolescents as compared to young adults can be postulated to depend on their different perceptions on language use. Adolescents may – consciously or unconsciously – be more non-conformist and rebel against societal norms, including the standard language norms. Orthographic deviations in new media writings can implicitly function as an in-group code; this CMC language has covert prestige (Labov, 1966). Textisms can signal adolescents' group identity: their

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[35] Note that this excludes, as stated in section 3.5, missing sentence-final punctuation marks.

use can subtly create a sense of group belonging. As Silva explains, "those who know it are part of the group while those who do not are excluded" (Silva, 2011:152). The most rebellious linguistic behaviour has been identified around the ages of fifteen, sixteen years: this has been called the adolescent peak (Holmes, 1992). Young adults, on the other hand, may feel more social pressure to conform to the explicit rules set by society, also those about language: Standard Dutch, as codified in many dictionaries, still has overt prestige. As part of their transition into adulthood, youths may very well feel that certain textism types are less appropriate in communication with their peers or older adults, if they want to be taken seriously. They may be more aware of how unconventional language use, even in informal CMC, can be perceived by their interlocutors. Alternatively, adolescents may simply be less knowledgeable about the standard orthography rules.

The age-related linguistic variation found here for Dutch written CMC has also been found for Flemish: De Decker (2015) and Hilte, Vandekerckhove, and Daelemans (2016) report that adolescents (13-16 years old) use all kinds of chatspeak features (including reduplication of letters, grapheme reductions, leetspeak) and expressive markers (incl. reduplication of letters and punctuation, extra capitalisation) more often than older teenagers (17-20) in their online talk (see also Peersman et al., 2016). My study confirms these findings for Dutch digital writing: textisms that increase expressivity were used more by adolescents, as well as textisms that make CMC more speechlike and reduced, and, though with smaller differences from young adults, those that heighten understandability and playfulness.

When considering *the individual media*, adolescents also used more textisms of all forms, operations, and functions than young adults, with only a few exceptions: textisms with punctuation in tweets, for understandability on Twitter, and with capitalisation in MSN and WhatsApp. The first exception, for deviations in punctuation in tweets, differed only marginally; the relative frequencies of young adults and adolescents were very close (66.37 vs. 65.74). The second exception, regarding textisms for understandability (morphological transparency) on Twitter, was not large either: young adults used somewhat more additional hyphens and spaces in tweets than adolescents (35.25 vs. 26.56), because of the function of understandability, the intrusion of English spacing conventions, and/or the technology of predictive software. The final exception means that young adults used more deviating capitalisation in WhatsApp (148.57 vs. 141.77) and, especially, MSN (374.75 vs. 205.99). Closer analysis reveals that this is not due to the addition of extra capitalisation (which was, in fact, much less used by young adults, both overall as well as in all four individual media), but by the greater omission of capitals in names and abbreviations in MSN chats in particular, for example in the use of 'ok' – the standard language abbreviation that should be in full capitals according to the Standard Dutch spelling, capitals which are often omitted.

5.2 Medium Effects

As for medium, textisms of many forms, operations, and functions occurred most in MSN, *for the age groups taken together*. In other words, the medium of MSN chats deviates the most from Standard Dutch orthography. Although the present corpus

study does not allow us to pinpoint the reasons with any certainty, this is probably due to the characteristics of the new media, as presented in Table 14 below (see also Verheijen, 2015) – synchronicity, visibility, level of interactivity, and technology. Such factors were also recognized by De Decker (2015) and Hilte et al. (2016), who found a similarly large impact of medium in Flemish written CMC. Like WhatsApp, MSN is a (near-)synchronous medium: in instant messaging, communication takes place almost in real time, approaching a spoken conversation. This stimulates users to respond rapidly. In the often fast-paced chats on MSN (and WhatsApp), adhering to the standard orthography is likely to be of less importance than replying quickly, which would lead to more deviations from the standard language – even, for example, to more textisms of omission than in SMS and on Twitter, despite their message size restrictions. Deviations which, moreover, need not be avoided for fear of being criticized by many people, since MSN is a private medium. Messages are sent to selected recipients ('one-to-one' or 'some-to-some'), often family and friends, who are presumably less critical of their interlocutor's deviating orthography in order not to damage their relationship, since criticism on spelling can be considered a face-threatening act and thus be harmful to interpersonal relationships, according to *face negotiation theory* (Ting-Toomey & Kurogi, 1998). Furthermore, the higher relative frequencies of textisms in MSN chats may result from the complete lack of predictive software that was available on computers, whereas communication via the other three media usually takes place via mobile phones with predictive dictionaries as the default setting – dictionaries that, of course, adhere to the standard language orthography.

Table 14. Variables of four new media.

Characteristic	Options	MSN	SMS	Twitter	WhatsApp
Message size limit	yes (max. no of characters)		✓ (160) i	✓ (140 > 280)	
	no	✓			✓
Synchronicity of communication	(near) synchronous	✓			✓
	asynchronous		✓	✓	
Visibility	public			✓	
	private	✓	✓	(✓) ii	✓
Level of interactivity	one-to-one	✓	✓	(✓) ii	✓
	one-to-many		(✓) iii	✓	
	some-to-some	✓ iv			✓ iv
Technology	mobile phone		✓	✓	✓
	computer	✓	(✓)	✓	(✓)

i Except for concatenated text messages: messages linked together when the limit is exceeded. ii direct message. iii broadcast message. iv group chat.

The only textisms that did not occur most frequently in MSN chats were for understandability or with punctuation. Yet textisms with punctuation were only just more frequent in SMS than in MSN (81.86 vs. 80.44), so the difference was minor.

This leaves us to explain the frequency of textisms for understandability (i.e. with extra hyphens or extra spacing), which were more frequent in WhatsApp than MSN (57.25 vs. 31.36). A first reason for this might be that the WhatsApp data were collected some years later than the other texts: perhaps the influence of the English language and its spacing conventions for compound words has grown in the Dutch language (or, at least, in Dutch online youth language), even in this short time span. This redundant use of spaces is a salient element of what has pejoratively been called the "English disease," i.e. the increasing visibility of the English language in the Dutch language (Dings, 2010; Vandekerckhove & Sandra, 2016). The second possible reason has to do with technology. WhatsApp is mostly used on mobile phones, which now often have a predictive dictionary as the default: this tends to introduce extra spacing within compound words, while MSN was used on personal computers, for which predictive dictionaries were not available.

When we take the two age groups together, textisms of eight of the thirteen forms, operations, and functions occurred least on Twitter, while textisms of four of those thirteen occurred least in SMS text messages. Of the media that were studied, tweets thus contain the least deviations from Standard Dutch orthography. This even goes for textisms of omission and for reduction, notwithstanding the strict message size limit which was then set at 140 characters for tweets, which requires communicating economically. The lower relative frequencies of textisms on Twitter may have to do with other characteristics of this medium, as shown in Table 14 – visibility, level of interactivity, and synchronicity. Communication in Twitter is typically public and 'one-to-many', so tweets can be read by a large audience, either all tweeters or all of one's followers. This might discourage users to deviate greatly from the standard language in their tweets. This microblogging platform is a favourite stomping ground for language prescriptivists to vent their feelings on grammar or spelling 'errors' – in fact, for people to complain in general, not just about perceived language deterioration, but also, for example, about companies and politicians through negative electronic word-of-mouth (NeWOM) or negative indignation (Pfeffer, Zorbach, & Carley, 2014). The following tweets from my corpus (1)–(2) contain explicit disapproval of spelling deviations from Standard Dutch (with censure of *criterea* instead of *criteria*, and *locatie* with a *k* instead of a *c*):

(1)   Als universiteit een promotievideo voor je applicatie maken en dan consequent criteria als criterea spellen. #studietimer #owd11
       ('When a university makes a promotional video for their application and then consistently spells criteria as criterea. #studietimer #owd11')
(2)   Zeg #POWNEWS. Is het niet locatie. Met een C
       ('Hey #POWNEWS. Isn't it location. With a C')

This contrasts with the privacy of text and instant messages, which are sent between two people (one-to-one) or among a limited group of people (some-to-some): the smaller size of the possible audience in these media decreases the chances of language criticism and might make CMC users less hesitant to deviate from the standard language norms. In fact, such private media may even stimulate the creation of a

group language which differs from the standard language, to enhance social bonds and in-group affiliation (Zappavigna, 2012). The low occurrence of textisms on Twitter and in SMS might also be attributed to their asynchronous nature. Communication takes place in 'deferred time', making these media less conversational: replies to text messages and tweets are often only sent after some time has passed. This gives users an opportunity to unhurriedly edit their orthography and filter out any possibly unwanted textisms, although of course it remains conjecture whether users indeed make use of this opportunity.

Although they were also infrequent on Twitter, there was one form of textism that was not least frequent on Twitter or SMS, but on WhatsApp: those with punctuation. This class contains missing (apostrophes, periods except sentence-final, hyphens), reduplicated (exclamation marks, question marks, periods), and extra (hyphens) punctuation. Detailed scrutiny of the data reveals that this low frequency in WhatsApp is not because of fewer missing punctuation marks, but because of fewer reduplicated punctuation marks: periods, question marks, and especially exclamation marks are less often repeated in this medium, as compared to the other media. Again, we can only speculate as to why this is the case, but what may be relevant here is the rise of emoji between the 2009-2011 and 2015 collection periods (and afterwards). These ideograms have become very popular and are used in various ways, such as to visually enrich typed text and to convey emotions (Danesi, 2017). Both emoji and punctuation can compensate for a lack of paralinguistic cues like stress and intonation (Evans, 2017) – elements that are present in speech, but absent in writing. Emoji can make digital communication more expressive (Novak, Smailovic, & Mozetič, 2015), as repeated punctuation can, so they meet similar purposes. Reduplication of punctuation might thus occur less frequently in the WhatsApp data than in the data from the other media, collected earlier, because emoji are booming.

6. Conclusions

This paper has presented a corpus study of nearly 400,000 words of Dutch youths' written computer-mediated communication, covering four new media (MSN chat, SMS text messaging, Twitter, and WhatsApp) and two age groups (adolescents, 12-17 years, and young adults, 18-23). The analysis of textisms in this new media corpus makes clear that the orthographic deviations in Dutch youths' CMC, similar to those in CMC in other languages, are not random 'violations' of the Standard Dutch orthography. Though they might not be aware of it, youths use textisms of specific forms, with specific edit operations, and for specific functions. Dutch CMC language is implicitly governed by orthographic principles, so to regard textisms simply as pointless orthographic 'errors' is a short-sighted view.

These principles have been uncovered by classifying the textism types in terms of forms (letters, diacritics, punctuation, spacing, capitalisation) and edit operations (omission, substitution, addition), but also, importantly, functions. Five functions of textisms have been identified, the 'CC5-functions' or 'SUPER-functions': they can make orthography more Speechlike (for Casualness and Colloquialism),

Understandable (for Clarity and Comprehension), Playful (for Creativity and Coolness), Expressive (for Compensation and Cues), or Reduced (for Conciseness and Curtailment).

Analysis of the relative frequencies in the corpus of these classes of textism types reveals how textisms are used effectively by Dutch youths. They have been shown to most frequently omit letters to achieve orthographic brevity and velocity. In Dutch youths' written CMC, the most important of the SUPER-functions is thus reduction of the keystroke effort. The aforementioned *Het Groene Boekje*, a benchmark for Standard Dutch spelling, has the (debatable) slogan "Correct language is vital for successful communication." This paper has shown that where new media writings are concerned, a variation on this theme is, in fact, true. 'Correct' or standard language is *not* vital for successful *computer-mediated* communication. On the contrary, although the majority of spellings still conform to the standard orthography, it is 'incorrect' or non-standard language that has been proven to be vital for effective written computer-mediated communication among youths.

In addition, this study has shown that the writer's age group and the text's medium significantly affect the relative frequencies with which textism types of different classes are used in Dutch youths' new media writings. Textisms were overall used much more by adolescents and in MSN chats, followed by WhatsApp messages, whereas they were used less by young adults and in SMS and particularly tweets. Each medium has its own unique combination of characteristics and constraints, while adolescents and young adults to a certain extent reveal differing perceptions on the importance of standard language and orthography. MSN is a near-synchronous, private, one-to-one or some-to-some, computer-based medium; Twitter, by contrast, is a public, one-to-many, asynchronous medium. Adolescents are quite non-conformist in their language use in CMC; young adults are somewhat more conventional in comparison.

The present study proves that Dutch youths pragmatically use textisms of various types as orthographic adaptations to deal with the possibilities and confines of different new media, as well as with the discursive demands of computer-mediated communication within their age group.

7. Limitations and Suggestions for Further Research

Considering the limitations of this study, it has to be noted that the functional classification of textisms is somewhat problematic, since a corpus study cannot, of course, provide conclusive evidence for why people use certain textisms. Yet asking them what their reasons are would be unreliable, because people may not be fully aware why they use a specific orthographic form in a specific context. The approach taken in the present study is preferable, as it is more objective than self-assessment. Nevertheless, we cannot be sure about writers' intentions: for example, though it is assumed that abbreviations such as 'initialisms' are generally used because they are quicker to type or help to keep a message within a character limit, some youths might use them to make their message more casual. A single textism can thus be used for multiple purposes, so the five SUPER-functions are not mutually exclusive. An

additional function of textisms, not part of the classification applied here, is that all textisms may be used to conform to in-group usage norms, and to deliberately deviate from the standard language norms to help shape youths' identity. However, this cannot be determined based on written output. To keep the analysis as objective as possible, all textism types have been assigned to the category/ies that was/were most evident on the basis of their form.

Another limitation of the present study is that although the demographic variable of age was included in the analysis, other social variables such as contributors' educational background and gender were not included or controlled for. Unfortunately, this was impossible in the current study, since the education and gender of contributors to the (already existing) SoNaR corpus were unknown. These demographic variables were only known for the WhatsApp data, specifically gathered for the present study, which was insufficient to include them in the analyses. Significant linguistic differences in written CMC due to gender and education have been found in other studies (e.g. Baron, 2004; Schwartz et al., 2013; Hilte et al., 2016, 2017), so these variables deserve further exploration in future corpus-linguistic research.

Other potential variables that could be explored, if such data were known, include the interlocutor (their profile and users' relationship with them), the conversational topic and goal, as well as any software (e.g. autocorrection) used in producing the CMC. Adding such variables would allow us to more fully explore the language variability in youths' online messages.

Furthermore, some medium characteristics could be operationalized differently in future studies. In the present study, contrasts were posited in technology between written CMC on mobile phones and computers, as well as between synchronous and asynchronous CMC – distinctions that were still very much relevant for the time the data from the first three media were collected (2009-2011). Yet recent developments in the technological properties of smartphones, as well as youths' increased continuous access to smartphones, have blurred the lines between text messaging and instant messaging or online chat, making such distinctions overly simplistic for future studies. Future research could, instead, focus on possible linguistic variation between WhatsApp messages produced via the mobile app and those produced via the web app 'WhatsApp Web', used on desktop/laptop computers.

A final drawback is the comparison of the four media, for three of which (MSN, SMS, Twitter – from the SoNaR corpus) slightly older data were used, collected in 2009-2011, while one (WhatsApp) represents more recent data, collected in 2015. These differences in collection period, although only a few years apart, limit the validity of the comparison. Considering that youth languages, including online youth language, are dynamic, it is possible that differences between the WhatsApp data and the other three media may not only be caused by medium characteristics and constraints, but also by longitudinal changes in Dutch youths' written CMC. Further research is needed to compare how their CMC differs in concurrent, recent new media data. Yet this could not include MSN chat, SMS text messaging, or Twitter: while Dutch youths used all these media some years ago, the former no

longer exists, the second has become obsolete, and the latter is no longer popular among Dutch youths.

Future studies could include data from the currently popular social media *Snapchat* or *Instagram* (Van der Veer et al., 2018), although Snapchat data would be extremely difficult to collect due to its ephemeral nature (snaps and chats are by default "automatically deleted once they've been viewed or have expired," Snap Inc., 2018) and finding sufficient textual Instagram data would prove a challenge since this medium focuses on sharing visual content (i.e. photos and videos), to which textual content can be added but is only of marginal importance (Instagram, Inc., 2018). It is even possible that in a few years from now, WhatsApp has become a superseded medium. The fast-moving nature of new media, rapidly replacing each other, ensures that we will not run out of possibilities for analysing online linguistic variation any time soon.

Despite these limitations, the current study has presented an original contribution to existing research on written CMC, through a thorough, illuminating analysis of the interplay between the forms, operations, and functions of textisms; the medium of the text; and the age group of the writer in Dutch youths' new media writings.

Acknowledgements

Chapter 7. WhatsApp with Social Media Slang?
Youth Language Use in Dutch Written Computer-Mediated Communication

(published).[36]

Abstract

Communication via new media or social media, i.e. computer-mediated communication (CMC), is now omnipresent. The 'CMC language' that youngsters use in such media often diverges from the 'official' spelling and grammar rules of the standard language. Many parents and teachers are thus critical of CMC language, because they view Standard Dutch as a strict norm. Yet among youths it enjoys a certain status, and is regarded as playful, informal, and cool. So an interesting power conflict exists between the overt prestige of the standard language and the covert prestige of CMC language among youngsters. To determine how Dutch youths' language use in computer-mediated messages differs from Standard Dutch, an extensive register analysis was conducted of about 400,000 tokens of digital texts, produced by youths of two age groups – adolescents (12-17 years old) and young adults (18-23 years old), in four social media – SMS text messages; instant messages, viz. MSN chats and WhatsApp messages; and microblogs, namely tweets. This corpus study focuses on various linguistic features of four writing dimensions: orthography (textisms, misspellings, typos), typography (emoticons, symbols), syntax (omissions), and lexis (borrowings, interjections). The results suggest that the variables of age and medium are of crucial importance for (Dutch) youths' online language use.

Key words: social media; computer-mediated communication (CMC); youth language; writing; WhatsApp

1. Introduction[37]

The use of social media has increased massively in recent years, both worldwide and in the Netherlands. Communication via these new media is called 'computer-

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[36] Verheijen, L. (2017). WhatsApp with social media slang? Youth language use in Dutch written computer-mediated communication. In D. Fišer & M. Beißwenger (Eds.), *Investigating Computer-Mediated Communication: Corpus-Based Approaches to Language in the Digital World* (pp. 72–101). Ljubljana: Ljubljana UP. http://www.ff.uni-lj.si/sites/default/files/Dokumenti/Knjige/e-books/investigating.pdf.

[37] This chapter is a translated, extended, revised, and updated version of a Dutch conference paper by the author: Verheijen, L. (2016). De macht van nieuwe media: hoe Nederlandse jongeren communiceren in sms'jes, chats en tweets. In D. van de Mieroop, L. Buysse, R. Coesemans, & P. Gillaerts (Eds.), *De macht van de taal: Taalbeheersingsonderzoek in Nederland en Vlaanderen* (pp. 275–293). Leuven / Den Haag: Acco.

mediated communication,' abbreviated to CMC. This has been defined as "the practice of using networked computers and alphabetic text to transmit messages between people or groups of people across space and time" (Jacobs, 2008a:470). A growing number of communication tools are now at our disposal on computers, mobile phones, and tablets, and their users appear to get younger by the day. In informal CMC, young people often use what can be called 'CMC language' (in Dutch: '*digi-taal*'). The definition of this, as used in this paper, is as follows:

> CMC language is a digitally written language variant that is especially used by youths in informal communication via new media, and is characterized, to a greater or lesser extent, by deviations from the standard language norms at different levels of writing, such as spelling, grammar, and punctuation.

In fact, CMC language is an umbrella term which encompasses great variation in itself, depending on various characteristics such as the user who composed the text, the circumstances under which it was written, and the medium that was used to produce it (see section 1.2). So even though language use in CMC has several prominent linguistic peculiarities, computer-mediated texts do not always display the same features to the same extent. Yet because CMC language overall diverges markedly from the standard language, this has caused feelings of resistance among some people, particularly from older generations, as it is feared that these new media pave the way to 'language corruption' or 'language deterioration'. Such sentiments are based, however, on superficial observations, anecdotal evidence, and personal experiences with CMC – not on empirical research. To find out whether these fears are in any way justified, a systematic register analysis was conducted of digital texts composed in four new media, namely SMS text messaging, instant messaging via MSN Messenger, microblogging on Twitter, and instant messaging via WhatsApp Messenger, written by Dutch youths from two age groups, i.e. adolescents and young adults.

The research question that is central to this paper is as follows: how does the language used by Dutch youths in these social media differ from Standard Dutch? In addition, the following question is addressed: is this language dependent on age group and/or medium? In other words, is the linguistic variation within written CMC by youths from the Netherlands dependent on social and medium-related factors?

1.1 New Media

Research into new media requires clarity about what this term encompasses. In this day and age, numerous new media exist. Two relatively 'old' new media are text messaging and email, which first became popular two decades ago. Online chats are of a similar vintage, and two main kinds exist: chat rooms hosted on the Internet and instant messaging services, with the latter occurring via four kinds of technologies: mobile phone applications (e.g. *WhatsApp Messenger*, *Telegram*), Internet applications (*Google Hangouts*, *Skype*, formerly *MSN Messenger*), social networking sites (*Facebook chat*), and online gaming networks or virtual worlds (*World of Warcraft*, *Second Life*).

Other new media include social networking sites (*Facebook*, *Google+*) and platforms for sharing visual media (*YouTube*, *Instagram*, *Pinterest*). Blogs and microblogs (*Twitter*, *Tumblr*) are also forms of new media. The concept further includes online forums or discussion boards (*4chan*, *FOK!forum*, *VIVA Forum*). This list indicates that new media are extremely varied, and thus the communication that takes place via these various platforms can also be surmised to be rather diverse. That is, each of these media differ in multiple characteristics that may affect the language used in CMC. Table 1 gives an overview of the various media analysed in this paper.

Table 1. Characteristics of four new media.

Medium characteristics	Instant messaging: MSN	Text messaging: SMS	Microblog: Twitter	Instant messaging: WhatsApp
message size limit	no	yes (max 160 characters)[i]	yes (max 280 characters)	no
synchronicity of communication	near-synchronous (real-time)	asynchronous (deferred time)	asynchronous (deferred time)	near-synchronous (real-time)
visibility	private	private	public or private (direct message)	private
interactivity	one-to-one or some-to-some (group chat)	one-to-one, sometimes one-to-many (broadcast message)	one-to-many, sometimes one-to-one (direct message)	one-to-one or some-to-some (group chat)
technology	computer	mobile phone (computer)	mobile phone or computer	mobile phone (computer)
communication channel	multimodal	textual or multimodal[ii]	multimodal	multimodal

[i] With the exception of concatenated text messages, in which messages are joined if the limit is exceeded.
[ii] The use of emoticons (see section 2.2) in SMS is textual, because they are composed of typographic characters. Smartphones, however, allow the use of emoji in SMS (but not in the present corpus): this leads to multimodality, because emoji are small images.

1.2 Computer-Mediated Communication

Certain attributes of CMC language, on various levels of writing, have cross-linguistically emerged from previous research. As for orthography, CMC language or

'textese' is prototypically known for the use of unconventional, non-standard spelling, 'textisms'; that is, transformations of conventionally spelt words.[38] As for typography, emoticons are a key novel feature of such communication (e.g. Silva, 2011). Moreover, a frequently mentioned syntactic attribute is the omission of words, in particular function words, leading to elliptical constructions, or in case of the omission of larger constituents, to sentence fragments (Ferrara et al., 1991; Werry, 1996; Hård af Segerstad, 2002; Crystal, 2006; Frehner, 2008; Bergs, 2009; Winzker, Southwood, & Huddlestone, 2009; Herring, 2012; Wood, Kemp, & Plester, 2013; Frick, 2017). A lexical attribute is the use of many English borrowings (Crystal, 2008; Frehner, 2008; De Decker & Vandekerckhove, 2012). Graphical attributes are, for example, the use of hyperlinks and the incorporation of images, sound files, or videos; there can be multimodality, a "blending of graphic with grapheme" (Carrington, 2004:218), a mixing of modes.[39]

CMC language thus tends to deviate from the standard language, a phenomenon that has roots in five main functions. Firstly, efficiency and speed are of great importance when communicating via new media, and tempo thus overrules 'correctness': textisms can function as shortcuts to reduce writing time. In addition, some media are limited in message size. For example, a single text message can only contain up to 160 characters (incl. spaces), and a tweet no more than 280 and until November 2017, 140 characters (Sulleyman, 2017), so succinctness is crucial in these media. Secondly, words are often typed in computer-mediated messages as they are pronounced in informal spoken language (phonetic writing), to make the writing more like casual speech. Deviations from the standard language can, furthermore, increase expressivity: they can compensate for the lack of paralinguistic and prosodic elements in written (digital) language, such as stress, intonation, and volume, as well as the lack of body language, such as gestures and facial expressions. Androutsopoulos (2011:149) summarizes these three principles as economy, orality, and compensation. Fourthly, some non-standard orthography makes online messages morphologically more transparent and, therefore, easier and quicker to understand. Lastly, many youths like to be creative and original when communicating via new media, and such playing with language can contribute to their social identities. We can infer from this that many deviations in CMC language are functional: they are often resourceful, practical adaptations for which youths, in the context of the current study, make optimal use of the linguistic possibilities of written CMC in order to reach their communicative goals, despite the technological limitations of new media and the pragmatic limitations of written language.

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[38] The terms 'textese' and 'textism' are obviously derived from the phrase 'text messaging,' but these unconventional spellings also occur in CMC via other media.

[39] Bergs (2009) rightly stresses that not all these deviations from the standard language were first invented during communication via new media. Some features of CMC language were already present in earlier writing genres, such as telegrams, postcards, informal personal letters, and newspaper headlines. For example, omitting function words, which matter less for understanding a message, resembles writing in telegram style ("telegraphese"), where being sparing of one's words was also crucial.

Still, Crystal (2006) is right when he remarks that "the graphological deviance noted in [new media] messages is [...] not universal" (128): digital texts diverge from the standard language to different extents and in different ways. Such differences stem from a variety of factors (Herring, 2001; Hård af Segerstad, 2002; Crystal, 2006; Crystal, 2008; Drouin & Davis, 2009; Proudfoot, 2011):[40]

- user characteristics, such as age, gender, region, ethnic background, familiarity with textisms, personal preferences;
- situational characteristics, such as conversational topic, (social distance to) intended audience or receiver of the message, communicative intent;
- medium characteristics, such as a possible message size limit, (a)synchronicity, interactivity, visibility.

All this makes CMC language stylistically diverse. That is why, as Hård af Segerstad (2002) rightly argues, CMC should not be regarded as "one single mode of communication" (234). Rather, each new media user determines their own unique way of communicating every time they compose a digital message, depending on their personal profile, the medium they use for communication, and various situational features.

1.3 Polarization and Prestige

CMC language has evoked a range of sentiments. A so-called 'Gr8 Db8' (great debate) exists about CMC language and its impact on reading, writing, and spelling (Crystal, 2008), and it has become quite polarized. On the one hand, the language used in new media is negatively described by critics, with terms such as 'language corruption', 'modern scourge', 'linguistic ruin', 'vandalism', 'foe of literacy' and 'bane', while on the other hand, positive terms are used by those who are optimistic about the linguistic potential of CMC, such as 'language enrichment', 'opportunity', 'resource', 'valuable', 'frNd of literacy' and 'blessing'.

Dutch youths' CMC language is thus, as it were, embroiled in a power conflict with Standard Dutch. The standard language has overt prestige, because it is openly esteemed by many as the norm (Labov, 1966): 'official' Dutch is dominant within the Netherlands. Although what used to be known as 'Civilized Dutch' (in Dutch: '*Algemeen Beschaafd Nederlands*') is nowadays perhaps less used in spoken language, for one reason due to the rise of 'Polder Dutch' ('*Poldernederlands*': a speech variant that has increased in popularity in the last decades, especially among young highly-educated women; Stroop, 2010), many people still regard Standard Dutch as a strict norm in its written form. They consider the 'incorrect' and inconsistent language use in social media as a detrimental influence on their beloved language. The following reactions by parents and teachers, prompted by an article about 'language errors' by youths, illustrate this:

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[40] Many of these factors are not exclusive to new media texts: they also explain (in part) other forms of language variation.

"Got the feeling that language deterioration has been going on for years […], particularly among youths, and is getting worse. Some seem to just enjoy communicating in a kind of semi-slang. Maybe also caused by modern communication tools WhatsApp, Facebook etc...in which it is not so important whether something is spelled correctly as long as it is understood by friends."

('*Heb het idee dat er al jaren […] taalverloedering is, met name onder jongeren, en steeds erger wordt. Sommigen lijken het ook gewoon leuk te vinden om in een soort semi-straattaal te communiceren. Misschien ook veroorzaakt door huidige communicatiemiddelen Whatsapp, Facebook etc…waarin het niet zo van belang is of iets juist gespeld is als het maar door vrienden begrepen wordt.*') (TN, 2014)

"Social media such as Facebook and WhatsApp definitely affect language deterioration"

('*Sociale media zoals Facebook en Whatsapp hebben zeker invloed op taalverloedering*') (Robin F., 2014)

The following example from a public Internet forum shows similar concerns. A contributor is convinced that social media "cause language corruption": they "sometimes get the impression that with the advent of Facebook & Co, the Netherlands spontaneously became dyslexic collectively" (social media '*leid[en] tot taalverloedering (krijg soms de induk dat met de komst van Facebook & Co Nederland spontaan collectief dyslectisch is geworden)*') (w00t00w, 2015). Another forum participant shares this critical outlook and when comparing language use in old and new media, he observes, "With newspapers and publishers, contributors could hardly afford to make a spelling error back then. With social media, this does not matter anymore at all" ('*Bij kranten en uitgevers konden de inzenders zich toen nauwelijks een spelfoutje permitteren. Bij de sociale media maakt dat nu allemaal geen bal meer uit*') (EricMM, 2015). In short, non-standard language use on social media is criticized openly and often, and in various contexts. The overt prestige of Standard Dutch is also clear from the success of non-academic publications about language 'errors,' such as the immensely popular books and online communities of *Taalvoutjes* (Bogle & Hollebeek, 2013), in which Dutch 'language errors' are made fun of.

By contrast, unconventional CMC language enjoys covert prestige among many youths, who value this non-standard language variety. They consider it as playful, informal, and cool. The use of CMC language is thus part of youth culture (Bergs, 2009), may express humour, rebelliousness, and youthfulness (Shaw, 2008), and is often used to mark one's social identity (Wood, Kemp, & Plester, 2013). In this way, CMC language bears resemblances to so-called street language (in Dutch: '*straattaal*'), an urban youth language which is spoken in the streets, particularly in multi-ethnic cities, and is characterized by influences from immigrant languages and American slang. That, too, is an informal youth language which deviates from Standard Dutch, and is therefore regarded with suspicion by many (older) people,

whereas many youths consider it as fashionable and cool.[41] Street language and CMC language foster a sense of belonging to a group and help youths create their own social space (De Rooij, in Truijens, 2009), and this covert prestige of CMC language also reveals itself through creativity with language in new media, such as novels and poetry written in the form of text messages or tweets. This paper examines the linguistic characteristics to which Dutch youths' CMC language owes its covert status. Put differently, this work investigates in which ways this language variant diverges from Standard Dutch, and whether these divergences are dependent on the variables of medium and age group.

2. Materials and Methodology

2.1 Data Collection

For this register analysis of new media messages produced by Dutch youths, texts written in three media were selected from SoNaR ('*STEVIN Nederlandstalig Referentiecorpus*', Oostdijk et al. 2013), an existing reference corpus of written Dutch, while additional texts from one further medium, WhatsApp, were also collected. The WhatsApp messages were gathered especially for the present study: a website was created with instructions on how Dutch youths could voluntarily contribute their authentic (private) messages by sending them to a specific email address (Verheijen & Stoop, 2016). Data collection was promoted via diverse national and regional media, and an added incentive for young people to donate their messages was a prize raffle among all contributors with the chance to win gift certificates.

Table 2. Corpus of new media texts for analysis.

Medium	Year(s) of collection	Age group	Mean age	# tokens	# chats or contributors
Instant messaging: MSN	2009-2010	12-17	16.2	45,051	106
		18-23	19.5	4,056	21
		total		49,107	127
Text messaging: SMS	2011	12-17	15.4	1,009	7
		18-23	20.4	23,790	42
		total		24,799	49
Microblogging: Twitter	2011	12-17	15.9	22,968	25
		18-23	20.6	99,296	83
		total		122,264	108
Instant messaging: WhatsApp	2015	12-17	14.0	55,865	11 / 84
		18-23	20.4	140,134	23 / 132
		total		195,999	34 / 216
		grand total		**392,169**	

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[41] Just like CMC language, street language is a heterogeneous phenomenon. CMC texts from different media and by different users are distinct; likewise, there are different kinds of street language, which cannot be simply lumped together in any formal analysis.

The final corpus used for this study contains 392,169 tokens of instant messages (MSN chats and WhatsApp messages), text messages, and tweets, composed by youths aged 12 to 23. These were divided into two age groups: adolescents (between the ages of 12 and 17) and young adults (18 up to 23 years old). The specifics of the corpus, and the distribution of tokens over the media and age groups, are shown in Table 2. To be clear, messages in the different media – not only those in the added WhatsApp component, but overall – came from different individuals, so the corpus was not longitudinal. Due to the distribution of new media texts in SoNaR, the corpus is unfortunately imbalanced for the independent variables of medium and age group, but this does not skew the tables and figures presented below, because the frequencies of the linguistic features have been normalized (or standardized) per 10,000 words.

2.2 Data Coding

The new media texts were examined quantitatively for various linguistic features that have been found in prior research, carried out on languages other than Dutch, to be relevant for CMC: the orthographic features of textisms, misspellings, and typos; the typographic features of emoticons and symbols; the syntactic feature of omissions; and the lexical features of borrowings and interjections.

The following spelling deviations of Standard Dutch have been classified in the analysis as textisms (adapted from Plester, Wood, & Joshi, 2009; see also Verheijen, 2013):

- **initialism**: first letters of each word/element in a compound word, phrase, (elliptical) sentence, or exclamation (cf. Daniëls' (2009) 'lettero'), e.g. *hw* < *huiswerk* ('homework'), *gmj* < *goed, met jou* ('fine, how are you'), *hjb* < *houd je bek* ('shut up'), *wtf* < *what the fuck*
- **contraction**: omission of letters (mostly vowels) from middle of word (cf. Daniëls' (2009) 'shortje'), e.g. *ltr* < *later* ('later'), *hzo* < *hoezo* ('why'), *sws* < *sowieso* ('in any case')
- **clipping**: omission of final letter of word (mostly silent *-n* or *-t*), e.g. *morge* < *morgen* ('tomorrow'), *bes* < *best* ('rather'), *naa* < *naar* ('to')
- **shortening**: dropping of ending or occasionally beginning of word, e.g. *miss* < *misschien* ('maybe'), *opdr* < *opdracht* ('assignment'), *ns* < *eens* ('some time')
- **phonetic respelling**: substitution of letter(s) of word by (an)other letter(s), while applying accurate grapheme-phoneme patterns of the standard language (resulting in abbreviation, replacement, or extension), e.g. *sgool* < *school* ('school'), *meel* < *mail*, *owkeej* < *oké* ('okay')
- **single letter/number homophone**: substitution of entire word by a phonologically resembling or identical letter/number, e.g. *k* < *ik* ('I'), *m* < *hem* ('him'), *2* < *too/to*
- **alphanumeric homophone**: substitution of part of word by phonologically resembling or identical letter(s) and/or number(s), e.g. *opdr8* < *opdracht* ('assignment'), *id* < *idee* ('idea'), *hh* < *haha*
- **reduplication**: repetition of letter(s) (cf. De Decker's (2015) 'flooding' and Darics' (2013) 'letter repetition'), e.g. *cooool* < *cool*, *doeii* < *doei* ('bye'), *jaaa* < *ja* ('yes')

- **visual respelling**: substitution of letter(s) by graphically resembling non-alphabetic symbol(s) (special characters or numbers), e.g. *w00t* < *woot*, *j@n* < *Jan*
- **accent stylisation**: words from casual, colloquial, or accented speech spelled as they sound, e.g. *hoessie* < *hoe is het* ('how are you'), *das* < *dat is* ('that's'), *eik* < *eigenlijk* ('actually')
- **inanity**: miscellaneous spelling deviations, e.g. *eeyz* < *ey*, *duz* < *dus* ('so'), *chilliej* < *chill*
- **standard language abbreviation**: abbreviation that is part of the standard language,[42] e.g. *jan* < *januari* ('January'), *uni* < *universiteit* ('university'), *min* < *minuut* ('minute')
- unconventional use of spacing, punctuation, diacritics and capitalisation (incl. 'all caps,' i.e. entire words or utterances typed in capital letters).

In the classification of 'misspellings,' only a number of distinct spellings deviating from Standard Dutch have been coded, and these are deviations that are strongly denounced by prescriptivist linguists or language users. These concern 'spelling errors' with *d/t*, *ei/ij*, *is/eens*, *jou/jouw*, *n* (the letter *n* used to connect two words in Dutch, or final *n*), obsolete spelling, and with borrowings. Only a select group of deviations has thus been classified as 'misspelling'; the rest has been interpreted as textism, despite the fact that these are also regarded as 'incorrect' by those who hold the standard language as the norm for all writing.

The analysis only contains manifest typos (typing errors), where the writer clearly intended to type another word, given the context. Such deviations often differed by only one letter, e.g. *hey boek* ('thy book') instead of *het boek* ('the book').

Emoticons – a portmanteau word of the words 'emotion' and 'icon' – are understood to mean symbols composed of typographic characters (punctuation marks, letters, and/or numbers) which represent facial expressions with emotions, such as :-) (a smiling face, or 'smiley') to indicate joy. These help to express the writer's feelings. Both Western variants, which should be understood by tilting one's head, and Asian/Japanese variants, which can be interpreted at face value (e.g. ^^ and -_-), have been included, although the latter (also called 'kaomoji') only occurred rarely in the present corpus. Emoticons do not include the nowadays popular emoji – which, in the new media analysed here, only occur in WhatsApp: these small, standardized images are not part of typography.

The symbols encountered in this new media corpus are as follows: *&* (and), + (and, plus), = (is, equals), <, >>, --> (arrow), € (euro, money), <3 (heart), *X* or *x* (kiss), *K* or *k* (kiss), *(K)* or *(k)* (kiss), *o* (hug, as in xoxo), *(L)* or *[L]* (love), *(H)* or *(h)* (heart or cool), *(A)* or *(a)* (angel), *(Y)* or *(y)* (yes, okay), and * (correction, emphasis, or action).

All omissions have been coded and subsequently classified on the basis of the part of speech of the omitted elements: articles, subject pronouns (personal or

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[42] Of course, standard language abbreviations do not deviate from the 'official' spelling; after all, they are included in dictionaries that codify Standard Dutch. Yet these abbreviations were still included in the present analysis of textisms, since they are also typical of the succinctness and speed of CMC.

demonstrative pronouns that function as the grammatical subject), other pronouns (personal/demonstrative pronouns with another grammatical function, such as object or possessive pronouns), auxiliary verbs, copula verbs, lexical verbs, combinations of subject pronoun and verb (plus possibly object pronouns), conjunctions, prepositions, and other elements (e.g. adverbs). Further analysis of these types of omissions was outside the scope of this paper.

The following lexical elements have been classified as borrowings: borrowed words, borrowed phrases, borrowed sentences, borrowed interjections, and borrowed textisms. Words that originate from other languages, but have now been officially acknowledged as part of Standard Dutch, have not been coded. The criterion used to objectively determine whether a word has been acknowledged as part of Standard Dutch was inclusion in the *Dikke Van Dale Online* dictionary, an authority among Dutch lexicons.

Interjections are expressions or utterances that do not constitute a grammatical constituent of a sentence, but stand on their own. They are mainly used to express sentiment or to imitate sounds, for example onomatopoeias conveying laughter.

These features were identified and classified entirely manually. To increase the reliability of the results, all data were checked twice by the first coder (the author). Moreover, a subset of the data ($n = 10,010$ tokens, a random sample of at least 1,000 from each subcorpus) was also coded independently by a second coder, who before this process began took part in two training sessions with the first coder to get a full grasp of the codebook. The intercoder reliability for this subset of the data was measured with Cohen's $\varkappa$. It was calculated per linguistic feature, to ensure acceptable levels of reliability (except for the omissions, which were only coded by a single coder). Values ranged from 0.68 to 0.92 (see Table 3); the average intercoder reliability was $\varkappa = 0.83$.

Table 3. Reliability coefficients per linguistic feature.

Linguistic features	Kappa
textisms	.92
misspellings	.70
typos	.68
emoticons	.98
symbols	.85
omissions	-
borrowings	.82
interjections	.83

2.3 Data Analysis

The results reported here have been separated for medium and age group and normalized per 10,000 words, because the total number of words analysed differs per medium and age group. The results have also been subjected to statistical testing with IBM SPSS Statistics, through seven loglinear analyses and one chi-square test.

The loglinear analyses were performed on the raw frequencies, taking into account the total sample sizes. A hierarchical model was used for these analyses, containing all the lower-order interactions and main effects of the interactions examined. Seven of the eight linguistic features – textisms, misspellings, typos, emoticons, symbols, borrowings, and interjections – were treated as variables in their own loglinear analyses. Textisms, for instance, were a variable in one analysis (NB: it was thus *not* the case that 'linguistic feature' was a variable in an overall analysis and the different features, such as textisms and misspellings etc., were its levels). For each of the seven linguistic features analysed with loglinear analyses, a separate analysis was conducted with the following variables: 'medium' (MSN, SMS, Twitter, or WhatsApp), 'age group' (adolescent or young adult), and 'linguistic feature' (feature present or absent), which were all weighted by the raw frequencies. The raw frequencies of 'feature absent' were computed as follows: the total number of words per medium and age group, minus the raw frequency of linguistic feature per medium and age group, e.g. for textisms in MSN by adolescents: 45,051 - 8,398 = 36,653. As an example, Table 4 shows what the SPSS data file for the statistical analysis of textisms looked like:

Table 4. Example data file for loglinear analysis: textisms.

Medium	Age group	Linguistic feature	Raw frequency
MSN	adolescent	textism	8398
MSN	adolescent	no textism	36653
MSN	young adult	textism	347
MSN	young adult	no textism	3709
SMS	adolescent	textism	133
SMS	adolescent	no textism	876
SMS	young adult	textism	1696
SMS	young adult	no textism	22094
Twitter	adolescent	textism	1298
Twitter	adolescent	no textism	21670
Twitter	young adult	textism	4255
Twitter	young adult	no textism	95041
WhatsApp	adolescent	textism	6317
WhatsApp	adolescent	no textism	49548
WhatsApp	young adult	textism	10206
WhatsApp	young adult	no textism	129928

Since the number of instances in the corpus that are *not* omissions cannot be computed (in theory, any number of omissions can exist; irrespective of the total number of words per subcorpus), instead of a loglinear analysis, a chi-square test was conducted on the standardized frequencies of the omissions.

3. Results

The following tables show the findings of the corpus study: Table 5 presents the normalized frequencies and Table 6 the results of the statistical tests.

Table 5. Normalized frequencies of the linguistic features (per 10,000 words).

Linguistic features	Instant messaging: MSN		Text messaging: SMS		Micro-blogging: Twitter		Instant messaging: WhatsApp	
	12-17	**18-23**	**12-17**	**18-23**	**12-17**	**18-23**	**12-17**	**18-23**
textisms	1864	856	1318	713	565	429	1131	728
misspellings	24	27	20	6	16	11	25	13
typos	40	22	79	41	29	16	138	58
emoticons	691	237	198	356	216	196	84	102
symbols	17	5	268	237	25	20	39	22
omissions	519	316	357	480	391	424	621	493
borrowings	131	72	149	77	150	115	195	145
interjections	560	333	317	253	179	114	485	304

Table 6. Results of the statistical tests of the linguistic features.

Linguistic features	Interaction medium × age group × linguistic feature (DF = 3)		Interaction medium × linguistic feature (DF = 3)		Interaction age group × linguistic feature (DF = 1)	
	χ^2	Sig.	Partial χ^2	Sig.	Partial χ^2	Sig.
textisms	97.48	***	3574.71	***	1121.06	***
misspellings	5.61	n.s.	17.84	***	30.02	***
typos	5.68	n.s.	676.18	***	305.62	***
emoticons	174.43	***	3711.52	***	12.14	***
symbols	9.41	*	1461.77	***	36.74	***
omissions	75.14	***	-		-	
borrowings	5.67	n.s.	173.01	***	91.36	***
interjections	3.71	n.s.	1692.75	***	457.63	***

Note: n.s.: non-significant, $p > .05$; significant * $p < .05$, *** $p < .001$.
DF: degrees of freedom.

3.1 Orthography

3.1.1 Textisms

The statistical test reported in Table 6 shows that the three-way interaction medium × age group × textisms was significant (χ^2 (3) = 97.48, $p < .001$). Analysis of the normalized frequencies demonstrates that textisms were used more by adolescents

than young adults in all media, but that this difference was dependent on medium: it was greatest in MSN chats, in which textisms occurred most, and smallest in tweets, in which they occurred least.
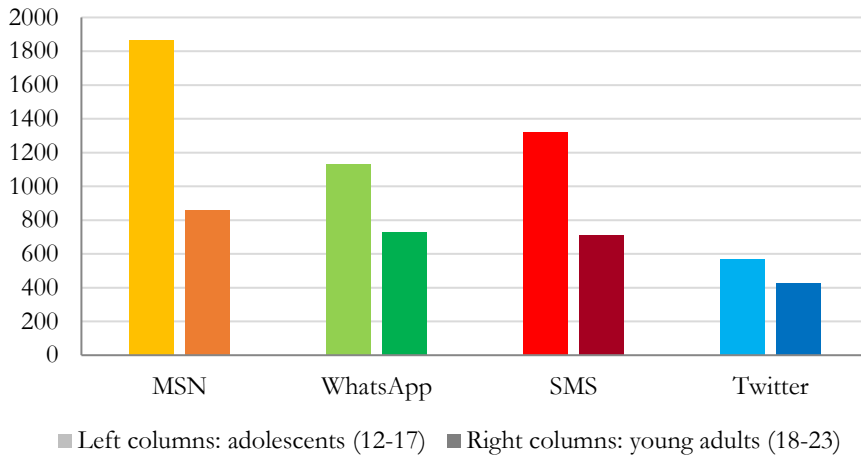
Figure 1. Normalized frequencies of textisms.

3.1.2 Misspellings

It is apparent from the analysis that the two-way interactions medium × misspellings and age group × misspellings were significant (partial χ^2 (3) = 17.84, p < .001, partial χ^2 (1) = 30.02, p < .001). Misspellings occurred more in MSN chats than in the other media. They were produced more by adolescents than young adults, except in MSN.
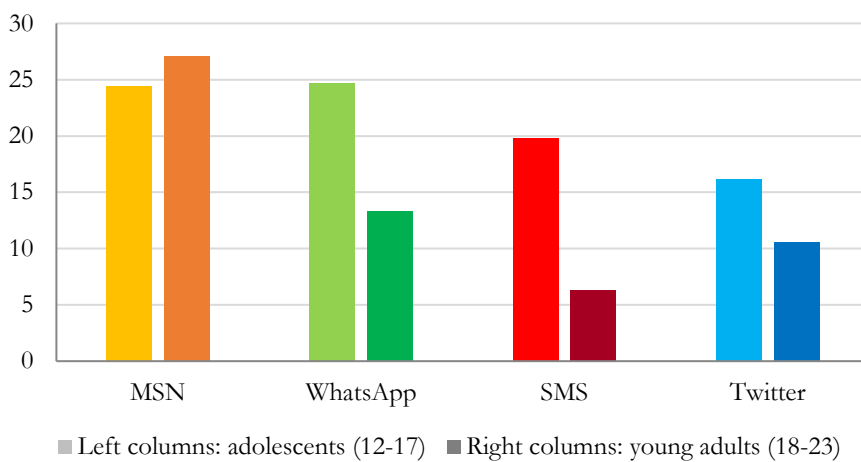
Figure 2. Normalized frequencies of misspellings.

3.1.3 Typos

The statistical tests show that both two-way interactions, namely medium × typos and age group × typos, were significant (partial χ^2 (3) = 676.18, p < .001, partial χ^2 (1) = 305.62, p < .001). More typos occurred in WhatsApp messages and then SMS text messages, than in the other two media. Adolescents made more typing errors than young adults in all four media.

■ Left columns: adolescents (12-17)   ■ Right columns: young adults (18-23)
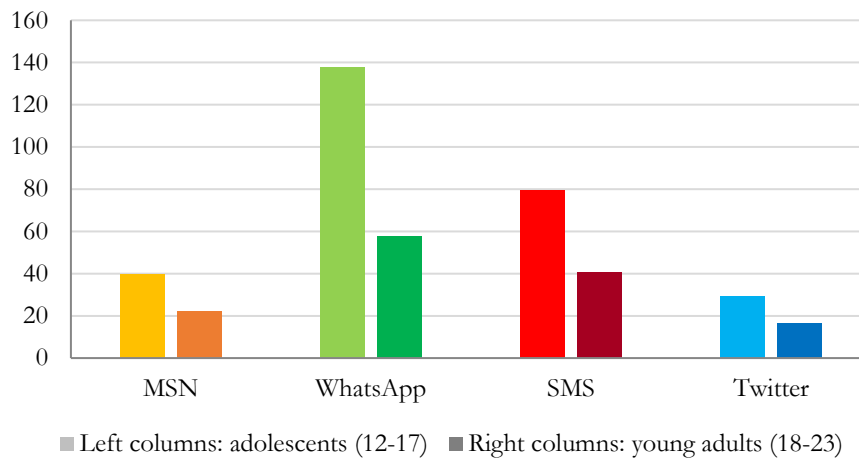
Figure 3. Normalized frequencies of typos.

3.2 Typography

3.2.1 Emoticons

Statistical tests reveal that the three-way interaction medium × age group × emoticons was significant (χ^2 (3) = 174.43, p < .001). In MSN chats, in which emoticons were most frequent, adolescents used many more of these than young adults. The situation was reversed for SMS text messages, in which it was young adults who used more emoticons. The frequencies of emoticons in WhatsApp, in which emoticons were used least, and on Twitter were close together for the two age groups.
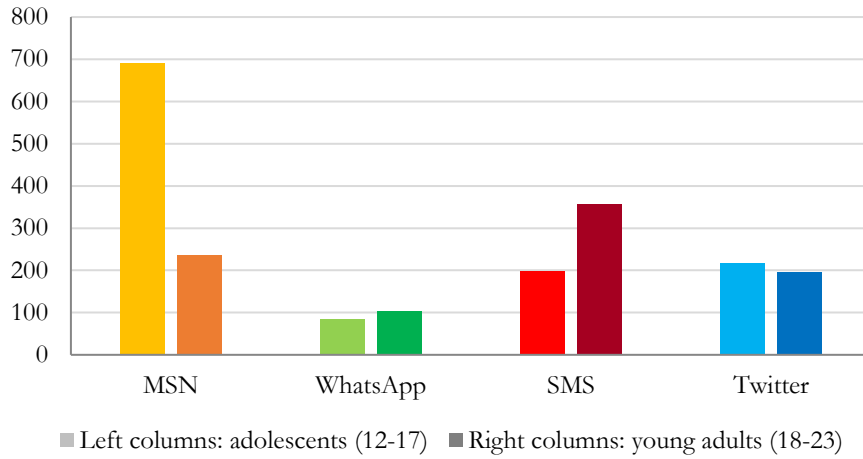
Figure 4. Normalized frequencies of emoticons.

3.2.2 Symbols

Statistical testing shows that the three-way interaction medium × age group × symbols was significant (χ^2 (3) = 9.41, $p < .05$). Symbols were used much more in SMS text messages than in the other three media, and they were used somewhat more by adolescents than young adults across all media, but this age difference was relatively larger in MSN chats in comparison to the other media.
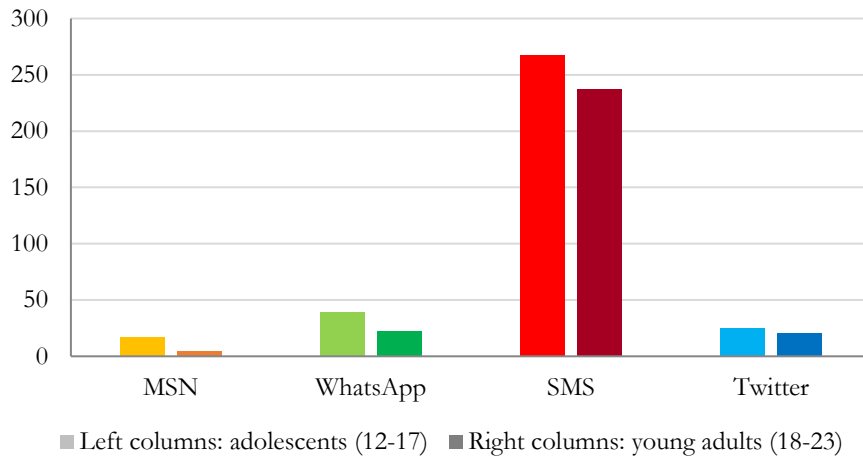
Figure 5. Normalized frequencies of symbols.

3.3 Syntax

3.3.1 Omissions

The three-way interaction medium × age group × omissions turned out to be significant (χ^2 (3) = 75.14, p < .001). Adolescents used more omissions than young adults in WhatsApp messages and MSN chats, while young adults used more in SMS text messages and tweets.

Left columns: adolescents (12-17)   Right columns: young adults (18-23)
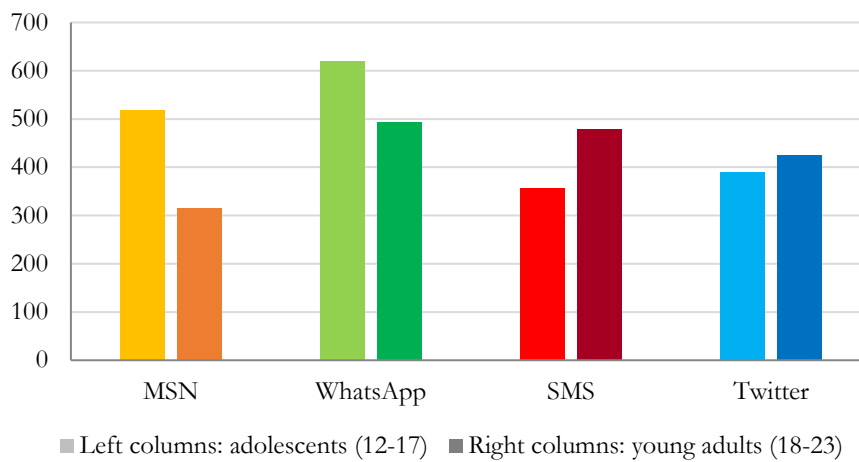
Figure 6. Normalized frequencies of omissions.

3.4 Lexis

3.4.1 Borrowings

Statistical testing reveals that the two-way interactions medium × borrowings and age group × borrowings were significant (partial χ^2 (3) = 173.01, p < .001, partial χ^2 (1) = 91.36, p < .001). Adolescents used more borrowed words, phrases, sentences, or textisms than young adults in the four media. Borrowings occurred most in WhatsApp, then on Twitter, and less frequently in SMS and MSN.
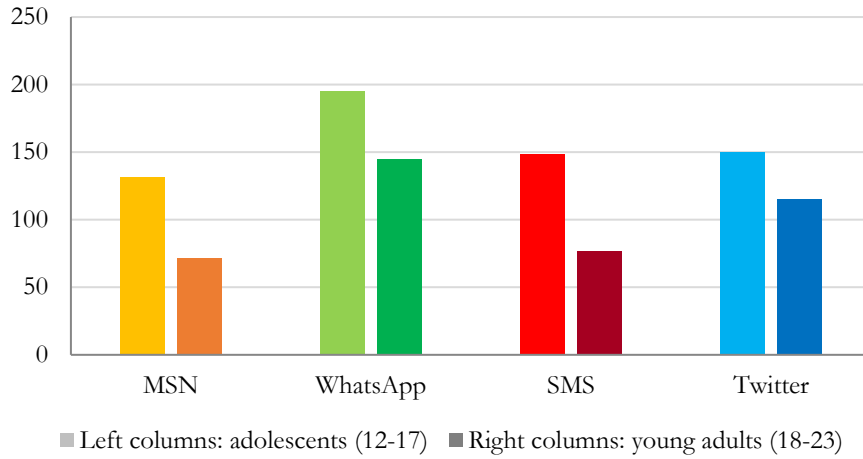
Figure 7. Normalized frequencies of borrowings.

3.4.2 Interjections

Both two-way interactions medium × interjections and age group × interjections proved to be significant (partial χ^2 (3) = 1692.75, p < .001, partial χ^2 (1) = 457.63, p < .001). Interjections were used more by adolescents than young adults in all four media. They occurred most in MSN chats and least in tweets.
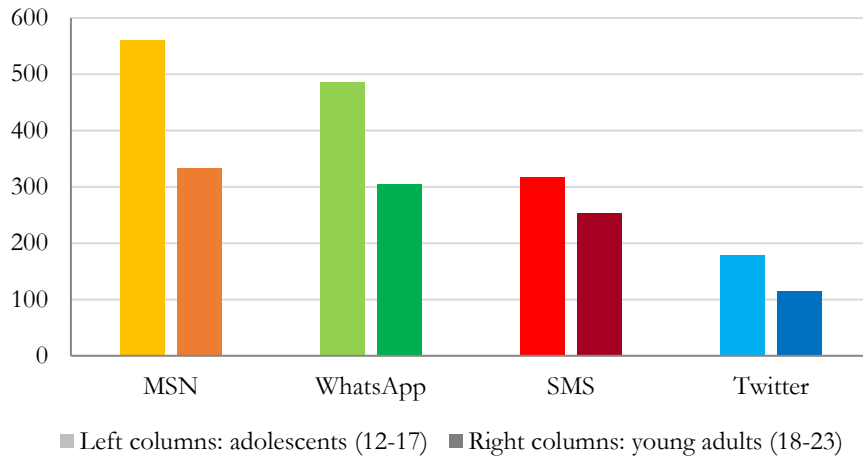
Figure 8. Normalized frequencies of interjections.

4. Discussion

The results for the linguistic features that were analysed in this corpus study together form the linguistic profiles of four new media and two age groups. These profiles ensue from the user characteristic age, and the various characteristics of the media examined.

4.1 Age

The results show that age plays a distinct role in the use of CMC language. This is consistent with findings by Hilte et al. (2016), who studied a corpus of Flemish computer-mediated messages and concluded that, in comparison to older youths (between 17 and 20 years old), adolescents (aged 13-16) more frequently used linguistic features of expressiveness deviating from the standard language. This was found, among other things, for reduplication of letters and punctuation, excessive use of capitalisation, emoticons, certain symbols (typographic kisses and hugs), and certain interjections (the onomatopoeic rendering of laughter) – each of these have been confirmed by the present study, with the exception of kisses, which in the present corpus were used more by young adults. Likewise, De Decker (2015), who also conducted a corpus study of Flemish CMC, observed that features such as 'flooding' (reduplication of letters), 'grapheme reductions' (phonetic abbreviations), and 'leetspeak' (incl. alphanumeric homophones and visual respellings) were used more by 13-to-16-year-olds than by 17-to-20-year-olds, as was the case in the present study. Adolescents were also found to diverge more from the standard language spelling in the Flemish written CMC studied by Peersman et al. (2016).

The overall greater linguistic deviance of adolescents in CMC may be explained as follows. Teenagers, especially in puberty, are generally more non-conformist and innovative in their linguistic behaviour than adults (Eckert, 1997; Androutsopoulos, 2005). The most rebellious language behaviour is said to occur around the ages of 15-16, when youths feel the greatest pressure to rebel against the norms set by society, a period known as the adolescent peak (Holmes, 1992). Young adults, on the other hand, feel a greater need to comply with the rules of the standard language, which has overt prestige in society. They start to feel social pressure not to appear immature, and so use Standard Dutch to conform to societal norms.

This may explain why adolescents made significantly more use of textisms, typos, and symbols in all four media, and of misspellings in three media (all except MSN). In contrast, the young adults made a greater effort not to diverge from the standard language with regard to orthography and typography. The adolescents also used significantly more emoticons in MSN chats, whereas the young adults used more in SMS text messages. There appears to be no straightforward explanation for the lower frequency of emoticons in text messages by adolescents; it is possible that one or some of the contributors of text messages used very few emoticons, so an analysis of individual differences between the contributors could perhaps clarify this, especially given the rather low number of contributors of SMS text messages in the younger age group. Adolescents also diverged more from the standard language in terms of lexis: in all four media, they used relatively more borrowings, which are not

(yet) part of Standard Dutch, and interjections, which are characteristic of informal spoken language, but not for written standard language.

The results for the omissions were more complicated. The frequency of omissions was much higher with adolescents in MSN and WhatsApp, while it was higher with young adults in SMS and on Twitter. This is likely to be the result of a complex interaction between this linguistic feature with the variables age group and medium, as discussed below.

4.2 Medium

The medium used is also found to play a large role in CMC language use. Such an impact of medium was already noted a decade ago by Ling and Baron (2007), who linguistically compared American college students' text messaging and IMing. In fact, additional chi-square tests showed that medium appears to have a greater effect than age group for all aspects except for misspellings (Cramer's V of .012 versus .013), for which the association was about equally strong. The Cramer's V scores were higher for medium than age group for all other linguistic features – textisms (.144 vs. .114), typos (.038 vs. .027), emoticons (.124 vs. .053), symbols (.086 vs. .008), borrowings (.020 vs. .015), and interjections (.079 vs. .061). This is in line with results reported by De Decker (2015) and Hilte et al. (2016), which show that medium was a significant determinant of the frequency of 'chatspeak' features and expressive markers in Flemish youths' CMC, even more so than age. Multiple medium characteristics play a part here (see Table 1), namely limitations in message size, (a)synchronicity, visibility, interactivity, and technology. These characteristics can either encourage or discourage deviations from the standard language.

The first characteristic concerns limitations in message size. SMS text messages and tweets are limited in number of characters, as opposed to MSN chats and WhatsApp messages. The message size limit in SMS (up to 160 characters) and on Twitter (a maximum of 280, formerly 140) requires considerable succinctness in communication. This can explain the higher frequency of omissions in SMS text messages and tweets by young adults. Young adults apparently attempt to fill their text messages and tweets with as much information as possible without exceeding the message size limit, which they can achieve by means of omissions: leaving out nonessential elements, often function words. The lower frequency of omissions in adolescents' SMS text messages and tweets, in comparison with those sent by young adults, suggests that the latter more carefully formulate their utterances to be as concise as possible. The absence of a message size limit in MSN Messenger and WhatsApp provides young adults with the space needed to conform more to the norms of the (written) standard language with regard to syntactic completeness. This characteristic also partly explains the lower frequency of interjections in SMS and on Twitter, as the character limitations in these media mean that nonessential words, such as interjections, are elided. The lack of such a limit in MSN chats and WhatsApp, by contrast, offers plenty of space for the use of interjections.

Another difference between the new media lies in synchronicity, i.e. the simultaneity of communication. Instant messaging is a (near-)synchronous medium: the communication takes place in practically real-time, which puts users under more

pressure to respond quickly. The speed inherent in instant messaging is conducive to deviations from the standard language, because the high pace of communication provides little time for spelling or grammar checks. SMS and Twitter are asynchronous, so more time passes between the exchange of messages. These media offer time to edit messages and reflect upon one's words. This may explain the high frequency of misspellings in MSN chats and WhatsApp messages, and of textisms in MSN chats, in comparison to the other media. It also helps to explain the high frequency of interjections in MSN and WhatsApp: the near-synchronous communication in instant messaging makes these written media resemble a spoken conversation, in which interjections are common (although, of course, the conditions for verbalisation and mutual awareness in written CMC are not the same as those in spoken language). The asynchronous communication in SMS and on Twitter endows these media with more of the characteristics of written language. Synchronicity is also related to omissions. The higher frequency of omissions in adolescents' MSN chats and WhatsApp messages, in comparison to their SMS text messages and tweets, is inconsistent with the aforementioned limit on message size in SMS and on Twitter. This finding can be attributed to the synchronicity of instant messaging, which causes users to communicate in ways similar to informal speech – with many sentence fragments and omitted words. Young adults use this synchronicity slightly less eagerly: in MSN and WhatsApp, they also imitate an informal conversation, but take somewhat more time than adolescents to write syntactically more complete sentences; they are not pressed for time, because there are no limits on the message size.[43]

New media also differ in terms of visibility and interactivity, two characteristics that are strongly linked. Communication in MSN chats, SMS text messages, and WhatsApp messages is private and typically one-to-one (interaction between two people), and so visible for a small number of selected interlocutors, whereas communication on Twitter is usually public and one-to-many, so it can be read by a greater number of people. Tweets are more often aimed at informing a wider audience rather than sending personal messages. The public character of tweets discourages users to diverge from the standard language norms, in contrast with the privacy of the other three media. This may explain the low frequency of textisms, misspellings, and typos in tweets. The high frequency of symbols in SMS, notably of hearts (<3) and kisses (esp. *X* and *x*) to conclude SMS text messages, reflects the personal character of this medium. In addition, this characteristic can explain the high frequency of emoticons in especially the MSN chats written by adolescents and SMS text messages by young adults. This may well result from the one-to-one (or sometimes some-to-some, in MSN) private communication taking place via these media, in which emoticons are regularly used to convey the writer's feelings and to

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[43] The distinction between synchronous and asynchronous CMC and IMing (online chat), originally on computers, versus text messaging, on mobile phones, has become somewhat blurred due to smartphone chat apps such as *WhatsApp* and *Telegram* (Bergs, 2009; Vandekerckhove & Sandra, 2016). Messages sent via such mobile IM software are usually responded to immediately, resulting in a fast-paced IMing conversation, but may also be replied to at a later time.

avoid misunderstandings about the sentiment behind an utterance, as opposed to the generally one-to-many public communication of tweets, which require fewer emoticons because their content is often more neutral and less focused on emotions. The lowest frequency of emoticons in WhatsApp probably has a completely different cause: in this medium, the pragmatic functions of emoticons are also fulfilled by emoji.[44]

Furthermore, the characteristic of visibility may explain the high frequency of English borrowings in tweets in particular. The English language currently enjoys prestige among Dutch youths, and using English words is thus seen as 'hip' and 'cool' among this group. That is why they are frequently used in tweets, whose public nature allows a large audience to witness how 'cool' the writer is. Yet this does not explain the high frequency of borrowings in WhatsApp messages, which may, in fact, be caused by a temporal development: perhaps the use of English words has become even more popular between the times of collecting the SoNaR data and the WhatsApp data.

Finally, new media are used on different technological devices. MSN Messenger was a chat program for computers; text messages and WhatsApp messages are usually sent via mobile phones; while tweets are sent from either computers or mobile phones. These devices differ as to their keyboards and possibilities of using a predictive dictionary. The frequency of textisms in SMS text messages, tweets, and WhatsApp messages, and of misspellings in the former two media, may be lower because mobile phones, from which these messages are usually sent, often contain a predictive dictionary (which users can choose to utilize or not, to their own liking): when typing the first letter(s), the software 'guesses' the rest of the word. The words in the digital dictionaries that are used for this are spelt according to the standard language orthographic rules, which decreases the chance of textisms. However, such a predictive dictionary was not used with MSN chats. Moreover, the frequency of typos in SMS text messages may be higher than otherwise because of the small keypads on mobile phones, which increase the risk of typos.[45] A computer keyboard, as was used with MSN chats, has larger keys and thus presents a lower risk of typos. Typos also seem to be more affected by technology than synchronicity, seeing that the asynchronous communication of SMS does offer sufficient time for checking and correcting typos. Finally, the frequency of omissions in WhatsApp as compared to MSN – both near-synchronous media which encourage omitting some elements to achieve a conversational writing style – can also be explained by technological differences. The frequency of omissions is even higher in WhatsApp, perhaps because the small keyboards of mobile phones provide users

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[44] Emoji could not be coded in the present study due to the file format in which WhatsApp messages were contributed to the corpus.

[45] Mobile phones can have an alphanumeric keyboard, with which three or four letters and a number are assigned to a single key, or a (possibly touchscreen) QWERTY keyboard, which is comparable to a computer keyboard, but much smaller. This is likely to affect the risk of typos, but unfortunately there was no information available about the devices with which the new media texts in the corpus were produced.

with an extra incentive to omit parts of speech, whereas the large computer keyboards used for MSN did not.[46]

5. Conclusions

It can be concluded from the results of this corpus study that, as expected, the language Dutch youths use when they communicate via social media indeed diverges from Standard Dutch on several writing dimensions, namely orthography, typography, syntax, and lexis. As for orthographic peculiarities, this CMC language is overall characterized by textisms (which include deviations in letters as well as in spacing, diacritics, punctuation, and capitalisation), misspellings, and typing errors. Typographic features are symbols and emoticons – as well as emoji in WhatsApp, but those concern visuals rather than typography. Regarding syntax, CMC language deviates from the written standard by its many omissions. Characteristic of the vocabulary of CMC language are borrowings, especially English ones, and interjections.

More importantly, this register analysis clearly shows the effects of medium and age group on the frequency with which certain linguistic features occur in computer-mediated messages. All interactions between medium (MSN, SMS, Twitter, and WhatsApp) and each of the linguistic features were highly statistically significant, due to an interplay of different medium characteristics. This was also the case for all interactions between age group (adolescents, young adults) and the linguistic features. Factors such as age and especially medium, whose impact was even greater, thus make sure that 'CMC language' is not a homogeneous language variant – rather, it encompasses various registers. The present study thus emphasizes the crucial importance of the variables age and medium for online language use, as attested in (Dutch) written computer-mediated communication, and once more confirms that youths' online writings offer a wealth of linguistic diversity.

6. Limitations and Suggestions for Further Research

A drawback of this study is that the collection periods for different parts of the corpus were not the same. The SoNaR texts were collected between 2009 and 2011, thus quite some years ago. The WhatsApp messages are more recent, collected in 2015. It is not inconceivable that Dutch youths' CMC language has changed somewhat between these collection periods; after all, language is subject to change, and this is particularly true for youth languages, which are dynamic and constantly evolving. This means that differences found between the WhatsApp data and the data from the other three media might be attributed not just to the characteristics of the various media, but also (partly) to temporal developments. Analysis of more recent data would, therefore, be a welcome addition to the current study.

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[46] The higher frequency of omissions in WhatsApp may also have to do with the great use of emoji in this medium, which can replace (mostly content) words, thereby creating elliptical constructions (Frick, 2017).

It would also be interesting to expand the analysis in terms of age groups, with the addition of digital texts written by children (for instance, aged 6-11 years). Yet due to practical and ethical considerations, collecting such private texts from young children could pose a real challenge. Besides expanding the corpus in age, it could also be enlarged in terms of medium. The study reported here has examined four well-known new media, while of course there are many more, and those that are popular among young people change very rapidly. Future research could thus analyse other media. It would be valuable to complement this register analysis with, for example, Facebook posts. In fact, these were already collected by the author between December 2015 and May 2016, so such an analysis would be a viable option for a future study.

Online language variability among new media could also be studied more in depth by including even more media characteristics into the research design, e.g. focusing on the software used to compose the messages, such as whether or not it includes predictive dictionaries, autocorrection, or spelling checkers. Additional user or situational characteristics, such as (the users' relationship with / profile of) the conversational partner and the communicative purpose of the interaction, would also be exciting ways to expand the analysis.

As a concluding suggestion, one more possibility for future corpus-linguistic studies into CMC would be to include an extra independent variable, besides age and medium, with an obvious choice being gender. Other research suggests that there are differences between girls and boys in the use of several linguistic features of digital writing (e.g. Wolf, 2000; Baron, 2004; Parkins, 2012; Hilte et al., 2016). This could be further explored for Dutch computer-mediated messages, to gain an even more nuanced picture of the registers that exist within CMC language.

7. Extended Outlook: Future Research

Given that the language with which Dutch youths communicate via social media clearly diverges from Standard Dutch, chances are that this informal CMC language interferes with their more formal 'school language.' However, prior research does not provide a conclusive answer as to whether this is indeed the case. Therefore, this open issue will be investigated in future studies of the author's ongoing (doctoral) research project into the impact of CMC on literacy. As such, the present corpus study is only a first step in studying Dutch youngsters' written CMC. The next steps will dig deeper into the possible relation between Dutch youths' social media use and their writing skills. This will be examined in both a correlational study and an experimental study. The former to see if any evidence for a relationship can be found, the latter to explore the causality of this relationship (if it exists at all), and thus whether it is indeed CMC that affects literacy, and not vice versa. In this extended outlook, let me briefly outline the design of these two studies.

Youths who will participate in the correlational study will be tested at school, so in an educational setting. They will first write an essay – with the text genre of expository discussion – to measure their formal writing skills. Subsequently, they will fill in questionnaires about their social media use. The essays will be analysed for

several measures of writing quality, namely lexical richness, syntactic complexity, formality, and writing productivity. It will then be examined whether participants' CMC use (in terms of frequency, variety, intensity, use of textisms, etc.), as self-reported in the surveys, correlates with the writing quality of their essays. This work will thus study whether participants' private online writing habits are related to the quality of the 'offline' texts they write at school.

The experimental study will use social media as the experimental prime. All school classes that participate will be divided into two groups: an experimental group, who will communicate via WhatsApp together during the priming phase, and a control group, who will spend that time on a control task, namely colouring mandalas. All participants will then write stories – with the genre of narrative storytelling – to test their productive writing skills, which will again be analysed for several measures of writing quality. Next, they will complete a grammaticality judgement task (GJT), to test their receptive grammar and spelling skills: they will be presented with sentences in which they have to spot and correct 'language errors,' i.e. deviations from Standard Dutch. It will then be measured whether the immediately preceding use of WhatsApp has a direct impact on the writing quality of the experimental groups' stories or on their performance on the GJTs.

Both studies will involve youths from different educational levels and age groups, to find out if these are mediating factors in the potential impact of Dutch youths' informal written CMC on their more formal writing skills. We hypothesize that writers of a younger age group or lower educational level could experience a greater extent of interference of social media on their school writings. Irrespective of what these future studies will find, it is nevertheless important to point out to all youngsters, no matter their age or education, that the informal digital language they use in computer-mediated messages and the standard language are different variants (registers) of Dutch – variants they ought to keep separate and employ effectively depending on the context.

Acknowledgements

Part 3.

Relations between Dutch Youths' Written CMC and School Writing

Chapter 8. Linguistic Characteristics of Dutch Computer-Mediated Communication: CMC and School Writing Compared

(published).[47]

Abstract

Computer-mediated communication has become essential in many youths' lives. Because language in CMC frequently deviates from standard language norms, it is feared to harm youngsters' traditional literacy skills. To determine if and, if so, how social media affect their writing skills, we first need to establish how CMC actually differs from the standard language. This paper presents findings of a study comparing CMC texts and school essays by youths from the Netherlands. Linguistic analyses were done with T-Scan, software specifically designed for Dutch texts. A range of lexical measures (lexical diversity, 'special' words, lexical density, ellipses) and syntactic measures (dependency lengths, subordinate clauses, sentence length, D-level) were studied. Results reveal that in comparison to their school writings, Dutch youths' computer-mediated communication is syntactically less complex, contains more omissions, and is lexically more diverse, different, and dense. These youths thus employ different registers in the writing contexts of CMC and school.

Key words: computer-mediated communication; social media; writing; register; literacy

1. Introduction

Most youths' daily lives are nowadays filled with computer-mediated communication. Instant messaging, texting, and other social media are essential for them to keep in touch with friends and family. In computer-mediated messages, it is key to communicate effectively, expressively, and informally. As a result, CMC writings frequently differ from standard language conventions (e.g. Thurlow & Brown, 2003; Crystal, 2008; Frehner, 2008; Cougnon & Fairon, 2014). Notable differences are non-standard orthography and syntax, as in '*fyi i'll B @home l8er 2night, u OK with that? car broke down* ☹'. This sentence contains abbreviations, omissions, an emoticon, and lacks capitalisation and punctuation at the appropriate places. Such deviations in CMC from the 'official' language norms are a source of worry for many parents and language teachers: they fear it damages youths' traditional literacy skills.

This paper presents a study that is part of my PhD project into the impact of CMC on literacy. In order to determine whether and, if so, how youths' social media use affects their writings at school, it is imperative to first investigate what youths' CMC actually looks like and how it differs from the standard language. The main goal of this study is to explore in what ways the informal language used by Dutch youths in CMC differs from their more formal school writings. These questions were analysed by means of a manual analysis, as well as an automatic analysis; the present paper focuses on the latter.

2. Methodology

2.1 Materials

For my study into Dutch written CMC, I used a corpus of CMC texts by youths between 12 and 23 years old, with MSN chats, SMS, tweets, and WhatsApp chats. These social media represent four CMC genres: instant messaging with an internet application, text messaging, microblogging, and instant messaging with a mobile phone app. The first three genres were selected from SoNaR ('STEVIN Nederlandstalig Referentiecorpus'), a reference corpus of written Dutch (Treurniet & Sanders, 2012; Oostdijk et al., 2013). WhatsApp chats were gathered especially for the purposes of my project, via a website where youths could voluntarily donate their messages, http://cls.ru.nl/whatsapptaal/. Table 1 shows specifics of the CMC corpus. For comparison, I also collected school writings. These were written by youths of similar ages as the CMC texts, of different educational levels. Table 2 shows more details on the school essays.

Table 1. CMC texts.

Genre	Years of collection	Age group	# words	# chats or contributors[i]
MSN	2009-2010	12-17	45,051	106
		18-23	4,056	21
SMS	2011	12-17	1,009	7
		18-23	23,790	42
Twitter	2011	12-17	22,968	25
		18-23	99,296	83
WhatsApp	2015	12-17	55,865	11 / 84
		18-23	140,134	23 / 132
Total	2009-2015	12-23	392,169	

[i] # chats: MSN, WhatsApp; # contributors: SMS, Twitter, WhatsApp.

Table 2. School essays.

Educational level	Years of production	Age group	Grade	# words	# texts
lower secondary, professional (*vmbo*)	2013-2014	± 14-15	3rd	50,143	128
higher secondary, pre-university (*vwo*)	2013-2014	± 14-15	3rd	50,070	153
lower tertiary (*mbo*)	2012-2014	± 17-18	2nd	39,793	137
higher tertiary (*uni*)	2012-2014	± 18-19	1st	50,175	169
Total	2012-2014	± 14-19		190,181	587

2.2 Method

A quantitative corpus study was conducted. For the first part of the analysis, frequencies of several linguistic features were counted manually in the CMC texts. Yet this paper focuses on the second/automatic part of the analysis, comparing the CMC texts to school writings with T-Scan – software specifically designed for Dutch texts (Pander Maat et al., 2014). On the basis of theoretical considerations, a range of relevant lexical and syntactic measures were selected. It was hypothesized that CMC texts, compared to school essays, are lexically more diverse, different, and dense; contain more omissions; and are syntactically less complex. Independent *t*-tests were conducted to compute whether differences were significant; one-tailed probability values are reported here.

3. Results and Discussion

3.1 Lexical Analysis

The measure of textual lexical diversity (MTLD) is the average length of sequential word strings in a text that maintain a type-token ratio (TTR) above a specified threshold (McCarthy & Jarvis, 2010). The MTLD depends on the TTR, which is calculated by dividing the number of types (different words) by the number of tokens (total number of words). Although the TTR is a classic measure, the MTLD is more reliable, because it is insensitive to text length. A higher MTLD value indicates more lexical diversity: more different words or *differently spelled* words. On average, the CMC writings had a higher lexical diversity ($M = 119.62$, $SE = 14.39$) than the school writings ($M = 76.10$, $SE = 2.23$), $t(10) = -2.08$, $p < 0.05$. Figure 1 shows that the MTLD was higher in the CMC texts, with the exception of WhatsApp chats by 12-17-year-olds.[48] The higher lexical diversity depends on the orthographic variation in written CMC, due to textisms (unconventional spellings, deviating from the standard language norms), misspellings ('errors', as judged by linguistic prescriptivists), and

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[48] This apparent exception can be attributed to the frequent repetition of chain messages and certain words in a spam-like manner by one contributor; excluding this outlier, the MTLD would be 92.70 – higher than the school essays, as hypothesized.

typos (incorrect key presses or false predictions by predictive software). This confirms the hypothesis that CMC is lexically more diverse.
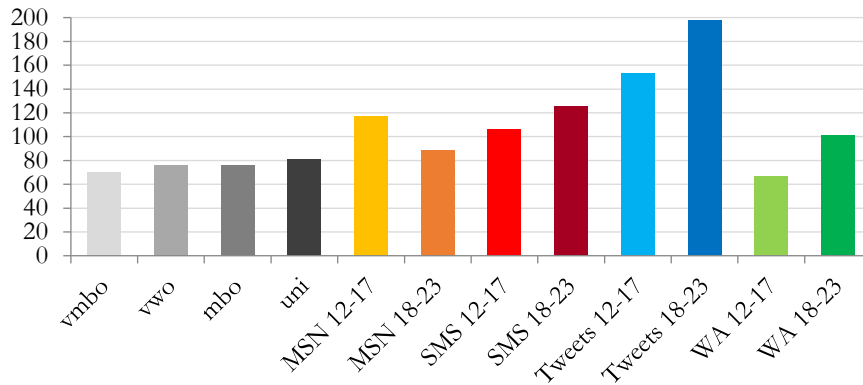
Figure 1. Measure of textual lexical diversity (MTLD).

T-Scan computes the density of 'special words', measured per one thousand words. This includes names, loanwords, numbers, Roman numerals, and times. On average, the CMC writings had a higher density of 'special words' (M = 140.77, SE = 33.20) than the school writings (M = 28.58, SE = 4.02), t(10) = -3.35, p < .01. Figure 2 illustrates this and shows that there is much variation between CMC genres. The greater frequency of 'special words' is because of textisms, misspellings, typos, and URLs in CMC – character strings that T-Scan cannot recognize as words, since they deviate orthographically from Standard Dutch and are not listed in any standard dictionaries. Tweets in particular include many URLs and 'words' of the format *@username*, within messages in response to another user's tweet (replies) or messages directed at another user (mentions). This higher density endorses the hypothesis that CMC is lexically more different from the standard language.
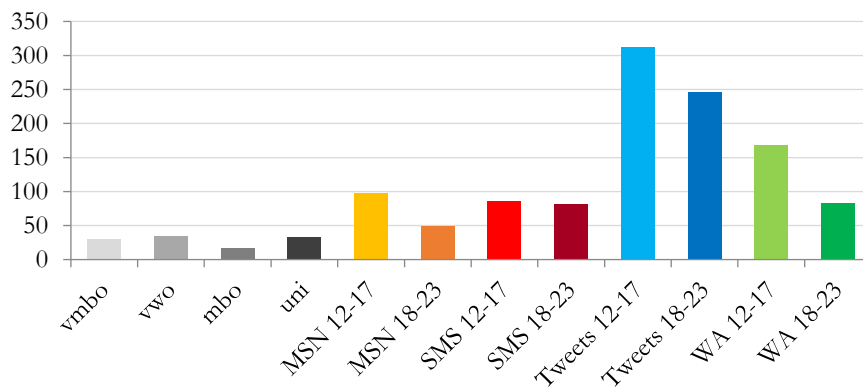
Figure 2. Density of 'special words'.

The third lexical measure that was selected is lexical density. This is the number of content words (nouns, verbs, adjectives, and adverbs) per one thousand words (e.g. Johansson, 2008). When a text has a high lexical density, it contains many content words and few function words. On average, the CMC writings had a higher lexical density ($M = 531.70$, $SE = 9.28$) than the school writings ($M = 481.31$, $SE = 2.68$), $t(10) = -3.71$, $p < .01$, as shown in Figure 3. This is due to the frequent omission of function words in CMC, which is known for its concise writing style, somewhat similar to that of telegrams or newspaper headlines. The findings from T-Scan thus support the hypothesis that CMC is lexically denser.
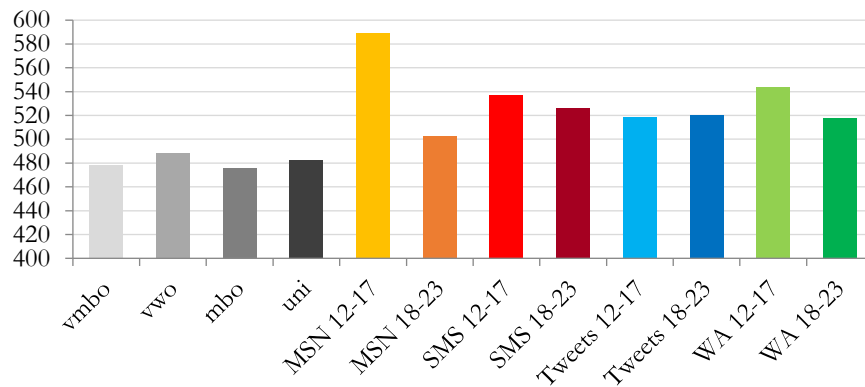
Figure 3. Lexical density.

Another interesting measure is the density of elliptical constructions, quantified as the number of finite verbs without a subject per one thousand words. On average, the CMC writings had a higher density of ellipses ($M = 25.86$, $SE = 3.17$) than the school writings ($M = 8.60$, $SE = 1.18$), $t(10) = -5.10$, $p < .001$. Figure 4 shows that the CMC writings of all genres contained more elided subjects (though just barely for MSN chats by 18-23 year olds). This backs up the abovementioned results on lexical density: informal written CMC contains fewer function words than formal school essays, at least partly due to the frequent omission of grammatical subjects.
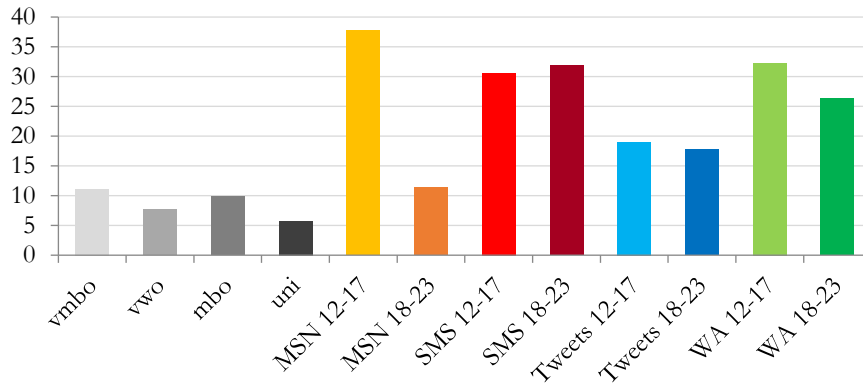
Figure 4. Density of ellipses.

3.2 Syntactic Analysis

One measure of syntactic complexity is the average of all dependency lengths per sentence. The dependency length is the distance between a head (of a sentence or phrase) and its dependent, such as a finite verb and the subject or an article and the corresponding noun. T-Scan expresses the distance in number of words that need to be skipped from head to dependent. Texts with a higher average dependency length contain more discontinuous structures, making them syntactically more complex and more difficult to process for readers (Gibson, 2000). On average, the CMC writings had a lower average of all dependency lengths per sentence ($M = 0.63$, $SE = 0.06$) than the school writings ($M = 1.59$, $SE = 0.10$), $t(10) = 9.04$, $p < .001$. It is clear from Figure 5 that the CMC texts of all genres had lower average dependency lengths, no matter what the writer's age or educational level. This supports the idea that CMC is syntactically less complex.
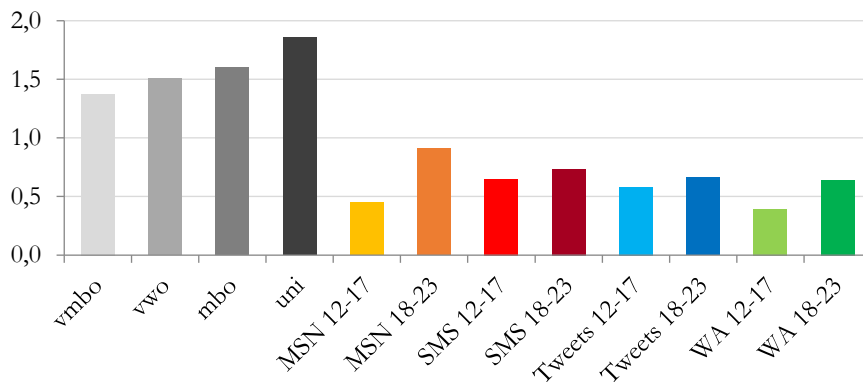
Figure 5. Average of all dependency lengths per sentence.

T-Scan also measures the average number of subordinate clauses per sentence. It includes both finite (relative, adverbial, and complement clauses) and infinitival subclauses. A higher density of subclauses is indicative of greater syntactic complexity. On average, the CMC writings had a lower average no. of subordinate clauses per sentence ($M = 0.14$, $SE = 0.02$) than the school writings ($M = 0.80$, $SE = 0.06$), $t(10) = 10.21$, $p < .001$. Figure 6 clearly shows that the CMC texts overall contained fewer subordinate clauses. Again, the lower syntactic complexity of CMC is confirmed by T-Scan.
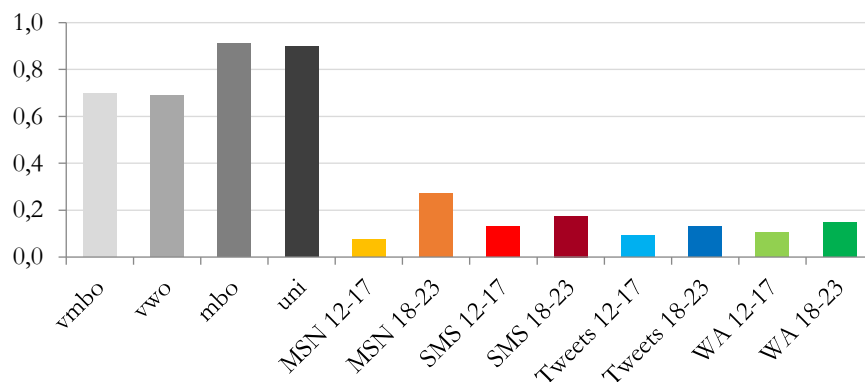
Figure 6. Average no. of subordinate clauses per sentence.

Another complexity measure provided by T-Scan is the average sentence length, which is measured in number of words. A higher average sentence length indicates more syntactic complexity. On average, the CMC writings had a lower average sentence length ($M = 6.55$, $SE = 0.28$) than the school writings ($M = 16.33$, $SE = 0.79$), $t(10) = 14.76$, $p < .001$. Figure 7 shows that the texts of all four CMC genres contained much shorter sentences than the school essays, irrespective of the writer's educational level or age. Once more, the hypothesis is confirmed.
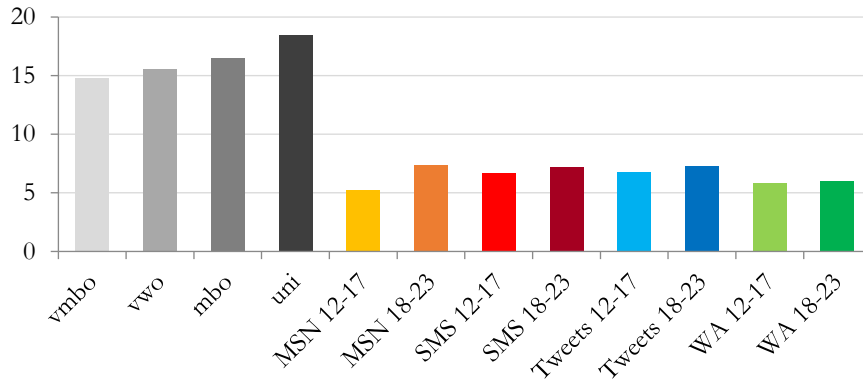
Figure 7. Average sentence length.

A final relevant syntactic measure is the so-called D-level. The D-level of a text is determined on the basis of a classification and rank order of sentence types in eight increasingly complex developmental levels, in the order in which children learn these constructions (Rosenberg & Abbeduto, 1987; Covington, 2006). The assumption is that a higher D-level value suggests more syntactic complexity. On average, the CMC writings had a lower D-level ($M = 0.88$, $SE = 0.08$) than the school writings ($M = 2.87$, $SE = 0.10$), $t(10) = 15.51$, $p < .001$. The CMC texts of all four genres had lower D-levels, as can be seen in Figure 8. This result is in line with the proposed hypothesis on syntactic complexity.
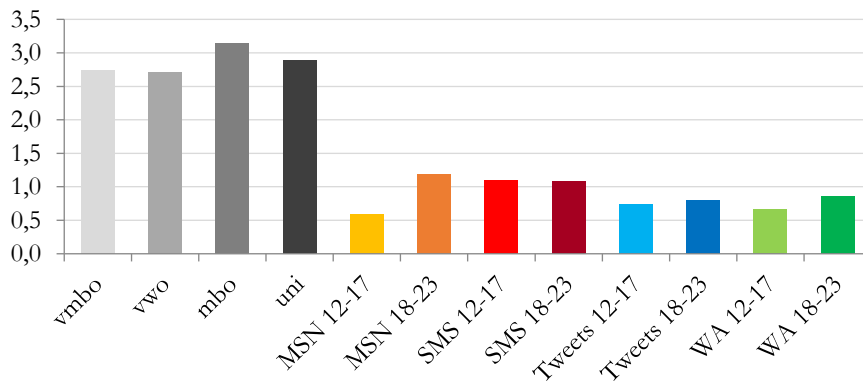
Figure 8. D-level.

4. Conclusion

To conclude, the lexical and syntactic analysis of CMC texts of four social media support my hypothesis: in comparison to school writing, CMC is lexically more diverse, different, and dense, while syntactically it contains more omissions and is

less complex. This proves that Dutch youths in secondary and tertiary education employ a different register in informal computer-mediated communication than in texts written in more formal settings. These results are hopeful: perhaps deviations from the standard language in youngsters' CMC do not cause great interference with their traditional writing skills after all – they might be quite capable of keeping the registers separate, as societal norms expect them to do.

5. Future Work

A limitation of the present study is that the materials compared here, i.e. CMC discourse and texts written at school, were not produced by the same writers. In addition, they have been collected over a relatively long time span, of six years. For a more precise answer to the question if and, if so, how CMC use affects school writing, I plan to conduct research in which (a) social media data and school texts of the same students are collected and analysed and (b) additional information about writers' use of CMC and social media (in terms of frequency/intensity) are gathered through surveys. Future work will include one more genre, namely posts from the social networking site Facebook. Furthermore, it unfortunately exceeded the scope of this paper to closely examine variation between texts of different genres, educational levels, ages; this may also be explored further. Still, this study can serve as a fruitful basis for analyses on the impact of written computer-mediated communication on young people's literacy skills.

Acknowledgements

Chapter 9. Relationships between Dutch Youths' Social Media Use and School Writing

(submitted)

with Wilbert Spooren and Ans van Kemenade

Abstract

Many youths are hooked on social media nowadays. Because computer-mediated communication (CMC) often deviates from standard language norms, it is feared to hurt literacy. A large-scale empirical study was conducted to examine whether the use of social media affects school writings. 400 Dutch youths of different educational levels and ages participated; the data of 338 youths were used. We analysed whether relationships could be found between their self-reported social media use, as measured via extensive questionnaires, and the writing quality of their essays. Demographic variables were also taken into account. We found more positive than negative associations between participants' CMC use and their school writing skills. Results revealed that passive engagement with CMC, by heavy reliance on mobile phone and consumption of social media messages, might hinder writing skills, but active and creative language production in CMC – via various genres, from an early age, with many people, and including textisms – might help develop writing skills. Educational level turned out to be a relevant demographic factor in relationships between CMC and literacy: lower educated youths' school writing was most at risk of being affected, but could also benefit most from social media. The present study thus suggests that social media are not merely negatively associated with school writing.

Key words: computer-mediated communication (CMC); social media; writing; literacy; youth language

1. Introduction

Should texting be considered a threat to youth literacy? This paper contributes to the debate about the potential damaging impact of social media on writing skills. We report on a correlational study with the aim of establishing to what extent Dutch youths' social media use, as self-reported in questionnaires, impacts on their texts written in an educational setting. This is the first large-scale, systematic survey study that has been conducted in the Netherlands to explore relationships between written computer-mediated communication (CMC, i.e. sending typed messages via digital tools) and school writings of Dutch youngsters, of different age groups and educational levels. The present study aims to find out if social media are indeed harmful for their formal writing skills.

Social media are a crucial part of young people's lives nowadays: they constantly send online messages to each other via social media. In April 2017, the four most widely used social media worldwide (ranked by number of active users) were Facebook, WhatsApp, YouTube, and Facebook Messenger (Statista, 2017a). Market leader Facebook has nearly reached two billion monthly active users. In the Netherlands, two very popular social media are currently WhatsApp and Facebook, both with over ten million Dutch users in 2017 (Van Overbeeke, 2017). Especially popular among younger users are newer social media platforms such as Snapchat and Instagram (Van der Veer et al., 2018). The number of social media users that are daily active continues to increase in the Netherlands (Statista, 2017b).

The following online chat between two Dutch youths (with the English translation in brackets) is typical of CMC:

(1) A (a) hey maaaarrreehhhhh ik moet weer verder leren :(
                ('hey buuuuttteehhhhhm I have to get back to studying :(')
        (b) dit was even fijne afleiding maar het moet toch maar weer
                ('this was a nice distraction but I have to get at it again')
     B (c) okee! is goed! studeer ze en doe je best en tot vanavond! toch?
                ('okay! good! good luck studying and do your best and see you tonight! right?')
     A (d) haha dankje iig :P
                ('haha thanx NEway :P')
        (e) nee, tentamen is morgen dus geen Caphé voor mij vanavond
                ('no, exam is tomorrow so no Caphé for me tonight')
        (f) :(
     B (g) helaasch
                ('too badz')
        (h) maar ach, morgen ben je klaaaaar
                ('but hey, tomorrow you'll be dooooone')
        (i) party!
                ('party!')
     A (j) jeej 3 achter elkaar :D
                ('yay 3 in a row :D')
     B (k) 3?
        (l) tentamens?\
                ('exams?\')
     A (m) neej, parties :D
                ('nope, parties :D')
     B (n) oooh
                ('oooh')
        (o) beter :P
                ('[that's] better :P')

The CMC messages in example (1) contain many deviations from standard language norms on spelling and grammar, i.e. from Standard written Dutch (and standard 'written to be spoken' Dutch, as in news broadcasts). These include emoticons, phonetic respellings, letter repetitions, unconventional abbreviations, typos, English borrowings, non-standard use and omission of punctuation, omission of capitalisation, multiple instances of ellipsis (of articles and pronouns), and sentence fragments. Because such deviations are characteristic of so-called 'CMC language' or 'textese' (in Dutch '*digi-taal*'), some people worry that written computer-mediated communication may affect writing in other, more formal, settings. This is beautifully illustrated by articles by Woronoff (2007), titled 'Cell phone texting can endanger spelling', who warns us that "This habit forming menace [of texting] can influence kids to spell incorrectly or get confused about the correct usage," and Clark (2012), who reports that texting causes bad grammar and punctuation in school exams. The next paragraphs make it clear that such views are still entertained these days.

Criticism of CMC language has been around since new media became popular. Over a decade ago, Thurlow (2006) already wrote about the overwhelmingly negative media attention to new media language in British and American newspapers, but such negativity can also be found in Dutch popular media. For example, in that same year, an article in national newspaper *de Volkskrant* reported that four Dutch schools decided to ban MSN and SMS language, because according to the principal, "[t]he use of these languages is bad for the [students'] development of Dutch" (ANP, 2006). [49] A few years later, a bluntly negative view on text messaging was presented in newspaper *Spits*: "The fact is that the Dutch language is still doing badly. [...] [S]pelling is no longer important at secondary school and SMS language causes Dutch to degenerate even more" (Seunis, 2009). An even more pessimistic opinion was expressed in an online article in which the "most annoying" grammar and spelling errors on social media were listed. They were introduced as follows: "On social media such as Facebook and Twitter, everyone babbles away, without anyone even thinking about any form of spelling. These errors make our blood boil" (Broeren, 2012). Such views are still held, as appears from another article in *de Volkskrant* from 2016: "On their phones, students type uncritically in messy WhatsApp language, says [a] Dutch teacher … 'They are using language in a different way and that is slowly emerging in essays. Many students … have difficulty with sentence structure and their spelling is horrid. It is often painful to watch'" (Stoffelen, 2016).

The examples above featuring MSN, SMS, Twitter, Facebook, and WhatsApp testify that no new medium has been spared criticism for its supposedly detrimental effect on language and writing skills. [50] A 2013 forum discussion underscores that the language varieties used in these media are perceived by the general public as closely akin: "M: is that what's called whatsapp/twitter language? :') Just sms language :{w" "D: Msn language!" (Anon., 2013b). This viewpoint is shared by the following author:

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[49] All quotes in this section have been translated from Dutch.
[50] Throughout this paper, the relationship between (new) medium and genre is assumed to be quite straightforward: in this case, they coincide.

> And today's teenagers do the same things via other channels. They continue the MSN language invented by the previous generation via WhatsApp and Facebook chat: *W8 ff, brb, OMG, hvj, hjb* and *lmfao* have far from disappeared from the language, much to the chagrin of language purists. (Van Lier, 2012)

In short, these kinds of textese all describe similar phenomena, within similar contexts: spelling and grammar diverging from the standard language in computer-mediated communication via some kind of social media – same game, different name.

2. Theoretical Background

2.1 Transfer between Registers

The starting point of our approach was the premise that Dutch CMC language and Standard Dutch represent two different registers of the same language. Youths nowadays need to be proficient in both registers and be able to employ them according to the demands of the writing context: CMC language within the context of informal social media, and conventional standard language within more formal situations, such as educational contexts. Van Dijk et al. (2016) agree, stating that "children using textese have at least two registers available: textese and a more formal register of conventional writing suitable for school. … [C]hildren have to decide when which register is appropriate, in other words, they have to switch between registers" (5). These youths can be considered 'bilingual' to the extent that while bilinguals frequently code-switch between two spoken or written languages, users of CMC language switch between two written variants of one language. Like learning two languages, as in second language acquisition (SLA), today's youths acquire two registers. They should have the ability to select the suitable register (i.e. the target) and to suppress the alternative, non-suitable register. In making that selection, they may sometimes use elements of a written variant that are 'inappropriate' in the context of writing: one register may interfere with the other. Such deviations from a target language, based on features of another language in which a speaker/writer is proficient, are called linguistic interference (Richards, 1984; Lems, Miller, & Soro, 2017). It has to be noted, though, that the term 'interference' is not uncontroversial as regards to referring to any kind of language transfer (Gass & Selinker, 1992) or crosslinguistic influence (Jarvis & Pavlenko, 2008); our use of this term here, therefore, specifically refers to negative transfer (Odlin, 1989).

In a classic paper, Weinrich (1953) defines interference as deviations from the norms as a result of one's familiarity with more than one language – or, in this case, more than one register. Interference can occur in any direction (Jarvis & Pavlenko, 2008), irrespective of which language was learnt first: although youths will have begun to acquire the register of the standard language before they learnt the register of CMC language, once the latter language variant becomes relevant in their daily language use, it can still affect the former. Such interference from the second language/register to the previously acquired language/register, so from L2 (in this

case, CMC language) to L1 (here, the standard language), is termed borrowing transfer (Odlin, 1989), backward transfer (Su, 2001), or reverse transfer (Gass & Selinker, 2008). Transfer between a bilingual's two languages – in this case, a youth's two registers – is prominent in productive language skills (Vildomec, 1963). Since school writing tasks involve language production, interference of written CMC in school tasks could be imagined. These effects of one language or register on another are especially tricky when one or both of the registers is still developing, because they may hinder advances during this vulnerable state of development.

Odlin (1989:144) suggests that language transfer may be constrained by formal education and discouraged by 'linguistic focusing'. Since higher educated youths have received more formal education in more linguistically 'focused' social contexts (with teachers who stress the importance of the standard language), we can hypothesize that their greater linguistic awareness makes them more likely to adhere to linguistic norms and, accordingly, less susceptible to interference from CMC language. This contrasts with their lower educated peers, who have received less formal education in more 'unfocused' contexts: they will have less linguistic awareness and are thus less concerned of distinctions between the standard language and other registers. Moreover, language transfer may depend on age: older learners should be more aware of the distinctions between different languages or registers (Odlin, 1989). For the present study, we can hence hypothesize that young adults' L1 (standard language) is more entrenched and robust, and consequently less vulnerable to interference than the L1 of younger learners of CMC. We thus expect the demographic factors of educational level and age group to affect any associations between social media use and literacy. The present paper studies if today's youths are proficient 'bilinguals' or if they reveal interference in switching between registers, and whether youths with certain educations or of certain ages are more affected by transfer than others.

2.2 Relationship Written CMC and Literacy Skills

Many previous studies have explored the possible relation between social media use and literacy skills. Overviews of such studies were compiled by Verheijen (2013) and Zebroff (2017). Verheijen (2013), focusing on research into the effects of texting and instant messaging on literacy, tentatively concludes that since more prior studies report positive relationships between CMC and literacy than negative relationships, "the popular claim that texting and IMing have a detrimental effect on literacy skills is actually ungrounded" (596). However, she emphasizes that prior research nevertheless shows a mixed pattern of results due to various differences in their methodology and populations. Correlations between CMC and literacy are likely to vary depending on their operationalization of literacy, namely the domain tested (reading, writing, grammar, spelling) and their manner of testing this domain (via standardized tests, customized tests, or experimental tasks). Many studies even assessed literacy via indirect measures of processes underlying literacy skills, such as morphological awareness, phonological retrieval, orthographic decoding, and verbal reasoning. Finding correlations also depends on their measurement of either CMC use or textism use, and on which kind of data these measurements were based: self-

reported data, gathered via questionnaires or interviews; experimental data, retrieved by elicitation; or naturalistic data, by collecting actual CMC messages. Any relationship between CMC and literacy may also be moderated by participants' age group, educational level, nationality, gender, mother tongue, and use of technology (mobile phone type, keyboard type, predictive software, etc.), which differed greatly among studies.

Moreover, these previous studies had some limitations. First of all, they mostly had participants only from English-speaking countries: the results of this linguistically rather homogeneous language community are not necessarily transposable to and valid for different linguistic contexts. For instance, the main language used in CMC is not the same as the language of education in many African countries (e.g. Winzker, Southwood, & Huddlestone, 2009). If social media messages are written in one's L1 and school writings in one's L2, the impact is bound to differ from when those texts are produced in the same language. Another drawback is that they tended to focus just on text messaging, which by now is already a somewhat outdated medium, at least in the Netherlands. Finally, Wood, Kemp, and Plester (2013) are critical of prior studies which measure the impact of CMC on separate processes involved in literacy:

> [T]here is a danger that by defining and studying these processes separately we are at risk of missing the sum of their parts. [...] It may be the case that individually assessing the relationships between texting and literacy variables is of limited value, as the real impact is evidenced in the production of connected text of the kind assessed by schools and universities and needed in the workplace. The analysis of how texting impacts on the act of producing a written composition needs to be the next phase of work in this area. (94)

The present study attempts to address these weaknesses by using Dutch-speaking participants, by including a variety of written CMC modes, and by operationalizing literacy as the quality of school writings: we analyse how the use of various social media, gauged via extensive surveys, affects Dutch youths' more formal writing products in several aspects of text quality.

2.3 Writing Quality of Schoolwork

Although in this day and age with multimodal and digital texts, the status of traditional literacy may well have changed (Walsh, 2008; Lems, Miller, & Soro, 2017), educational policies still require youths to be able to produce writings of good quality. Writing quality is a multifaceted notion, which can only be suitably operationalized within the context of the writing: the quality of a text depends on various contextual factors, such as the communicative intent of the writer, the intended audience of the text, and the anticipated circumstances in which the text will be read (Spooren, 2002, 2009), as well as, crucially, the text genre (Louis, 2012).

Such factors together determine the effectivity and appropriateness of language use in written communication. In school-directed text production, the

intended audience is obviously first and foremost the teacher and writings are produced in order to develop youths' writing skills and/or satisfy the demands of the educational curriculum. In social media, however, the audience often consists of friends or family, and messages are produced for personal communication. As such, the context of school writings determines that these are expected to conform to the standard language norms on spelling and grammar and require knowledge of conventions, whereas the context of social media texts allows them to diverge from these norms. We will further discuss writing quality from a different perspective, that of readability, in the next section.

2.4 Readability Formulas and Digital Tools

Despite the importance of contextual factors in determining writing quality, several researchers have proposed models for objective analysis. For example, the CCC model developed by Renkema (2000) takes three criteria into account, namely correspondence (of writer's goals with reader's needs), consistency (in e.g. lay-out or style) and correctness (of genre conventions or syntactic/orthographic rules). Text quality is closely connected to text difficulty or readability. Traditional assessments for English include the Flesch Reading Ease formula (Flesch, 1948, based on only average sentence length and number of syllables per word), the Flesch-Kincaid Grade Level formula (Kincaid, Fishburne, Rogers, & Chissom, 1975, idem), the Gunning Fog Index (Gunning, 1952, based on avg. sentence length and percentage of words of at least three syllables), the Automated Readability Index (ARI, Senter & Smith, 1967, based on avg. word length and avg. sentence length), the Coleman-Liau Index (Coleman & Liau, 1975, idem), and the Dale-Chall Reading Grade Score (Chall & Dale, 1995, based on sentence length and number of uncommon words in the text). For Dutch, traditional readability formulas are the Flesch-Douma formula (Douma, 1960), the Readability Index Brouwer ('*Leesindex Brouwer*', Brouwer, 1963), and CLIB and CILT (Staphorsius, 1996). These are known for their predictive validity, but their construct validity has been disputed, so if the factors they measure actually determine readability is unclear. Van Oosten, Tanghe, and Hoste (2010) evaluated such formulas and concluded that "a better readability prediction can be achieved by means of a greater range of features" (781).

Recent research has shown that models established via digital tools, specifically natural language processing (NLP) tools which include linguistic features of e.g. text comprehension and processing, may be more effective in determining the readability of writings than traditional formulas based on simple surface features of syntactic complexity and lexical sophistication (De Clercq et al., 2014; Crossley et al., 2017). One of the most sophisticated computational tools available today for the assessment of English texts is the Coh-Metrix (McNamara, Graesser, McCarthy, & Zhiqiang, 2014). The present study uses digital software called T-Scan (see section 3.3.2), which is similar but suitable for Dutch texts, to determine the writing quality of texts via a diverse set of linguistic features.

Having motivated the issues surrounding our central topic, this study aims to empirically determine whether alarmist views on CMC language are justifiable. Are

new media 'dumbing down' the Dutch youth or could they in fact be stimulating their writing skills? Since this poignant question has not been resolved by prior research, we intend to make a contribution to the ongoing debate about the impact of informal written CMC on youths' literacy. A prerequisite for the existence of a causal connection between CMC use and literacy skills is, of course, a correlation between the two. This paper investigates whether any correlations exist between Dutch youngsters' social media use, as measured through self-report surveys, and the quality of texts they write at school. In addition, we explore the possible moderating impact of three demographic variables on any relationship between social media use and school writing, namely education (lower, higher) and age (adolescents, young adults), which are likely to affect any relationship between CMC and literacy (Rosen et al., 2010; Wood, Kemp, & Waldron, 2014), and gender (boys, girls). The following research questions are, therefore, at the heart of this paper:

> RQ1. Is there any relationship between Dutch youths' CMC use and their school writing skills?
> RQ2. If so, do age group, educational level, and/or gender affect this relationship? If so, how?

Given the mixed findings of previous research, we have not formed a hypothesis regarding the first research question on whether a relationship can be found at all. Regarding the second research question, we hypothesize that *if* a relationship between CMC use and writing skills is found, it will be more salient with 'high-risk' groups, i.e. participants of a younger age or with a lower education, who might run a higher risk of exhibiting interference of CMC language on their school writings. Youths with a lower educational level receive teaching that is quite different from that in higher levels, with much less focus on developing literacy skills and a greater focus on acquiring practical skills: they have not been exposed to the writing culture that prevails in higher (secondary and tertiary) educational levels. Consequently, lower educated youths are less accustomed to formal writing and having to switch between registers, which makes it quite possible that written CMC causes more problems in their school writings than in those of higher educated youths, who we expect to be better able to use different language variants "according to the demands of the context" (Dowdall, 2006:153). As for younger writers, they have been using social media from a younger age, during a phase when their literacy skills were still developing. This also makes it more likely for interference to crop up in their school writings. These two demographic groups are thus expected to display more difficulty in separating the registers of informal CMC and formal school writing.

3. Methodology

We carried out a correlational study with participants of different educational levels and ages, who wrote essays to test their productive school writing skills and filled in questionnaires to measure their CMC use.

3.1 Participants

A total of 400 youths from several secondary and tertiary educational institutions (all in Nijmegen) participated, with informed consent. The data were collected between September 2015 and March 2016. Participants were tested in an educational setting. The participants in secondary school and those in lower tertiary education were tested during Dutch class, whereas those in higher tertiary education volunteered outside of class and were reimbursed for participation with a € 5 gift certificate. The latter were students of different faculties and studies, including biology, communication and information sciences, literary and cultural studies, American studies, and English language and culture. Data of 338 youths were used for the final analyses.[51] The adolescents ($N = 251$, data used of $N = 189$) were in the third grade, around 14 years old (for $N = 189$: $\bar{x}$ age = 14.0, range 12-16; 98 male, 91 female), whereas the young adults ($N = 149$) were around 20 years old ($\bar{x}$ age = 20.0, range 17-28; 76 male, 72 female). An overview of these participants is shown in Table 1.

Table 1. Overview of participants (excl. 62 from 'havo', see footnote 51).

		Educational level		
		lower	higher	Total
Age group	adolescents (secondary education)	56 'vmbo'	133 'vwo' (74 'atheneum', 59 'gymnasium')	189
	young adults (tertiary education)	96 'mbo'	53 uni	149
	Total	152	186	338

Note: '*vmbo*': 'voorbereidend middelbaar beroepsondersijs', lower secondary professional education; '*mbo*': 'middelbaar beroepsondersijs', intermediate vocational education; '*vwo*': 'voorbereidend wetenschappelijk onderwijs', pre-university education; '*atheneum*': ± grammar school; '*gymnasium*': ± grammar school with classics.

After administering the surveys, at the end of the testing session, underage participants were given a document with information about the study and the researchers' contact information to take home to their parents or caretakers, so that they could contact us if they objected to their child's participation; however, none did so. Finally, they were thanked for participating in the study. If there was time left, participants were informed about the goal of the study and its place within the context of the first author's PhD research.

3.2 Data Collection

Two types of data were collected: participants' school writing skills were measured via essays (section 3.2.1) and their CMC use via questionnaires (section 3.2.2).

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[51] The 62 participants with education *havo*, adolescents with an intermediate educational level, were eventually omitted from the analyses. They were not part of the original research design and were tested for pragmatic reasons (availability), but turned out to add an unexpected and undesirable imbalance to the analysis.

3.2.1 Measuring School Writing Skills: Essays

Each participant first wrote an essay in class. It is important that this writing task was produced in a rather formal setting, since attention devoted by youths to the writing quality of their texts is likely to be smaller in an informal setting. The writing genre under analysis was that of expository discussion: essays were chosen because they exemplify a typically formal genre that students often have to produce in educational settings, both in secondary and tertiary education. Since our aim was to explore the effects of social media on youths' school writing, it was key that the task involved a distinctive school writing genre: therefore, a genre such as email – which is not just part of writing within an educational, more formal context (using standard language), but also of personal, more informal communication (possibly with CMC language) – was deemed unsuitable for our current research purposes.

Participants were instructed to write a text of roughly half a page, about one of four topics: drinking alcohol before the legal drinking age, the impact of violent games, testing make-up on animals, or illegal downloading of music and films. These topics were chosen to appeal to the interests of many participants, of both males and females as well as adolescents and young adults. Before deciding upon the final set of topics, these were discussed with teachers to make sure that they would be appropriate and interesting for participants of different ages and genders.

Consultation with teachers informed us beforehand of the fact that not all classes at all schools that participated had access to computers or laptops, and since consistency in data collection was deemed important, we decided to ask all participants write their essays by hand. Afterwards, these were converted to digital form (typed out exactly as written) for the purposes of computer analysis.

3.2.2 Measuring CMC Use: Questionnaires

After writing an essay, participants filled in a questionnaire. This contained questions on demographic information (name, place of residence, place and date of birth, age, gender, education, mother tongue, other languages) and 43 questions on CMC use. These questions represented 11 'CMC variables', which are based on various earlier sources on CMC use and literacy (Drouin & Davis, 2009; Plester, Wood, & Joshi, 2009; Spooren, 2009; Kemp, 2010; Rosen et al, 2010; Bushnell, Kemp, & Martin, 2011; Coe & Oakhill, 2011; Drouin, 2011; Kreiner & Davis, 2011; Plester et al., 2011; Cinger & Sundar, 2012; Drouin & Driver, 2014; Grace et al., 2014; Kemp, Wood, & Waldron, 2014; Wood, 2013), but were adapted to fit the present study. Of course, measuring social media use via surveys is limited in that the accuracy of answers entirely depends on participants' honesty and ability to self-asses their daily habits. Ideally, it would be desirable to collect data by observing actual behaviour. However, the validity of self-report measures has been well advocated (Howard, 1994; Spector, 1994), so for pragmatic reasons, we used questionnaires. The following variables were included in our survey:

- Variety of CMC use
- Frequency of CMC use
- Exposure to CMC

- First experience with CMC
- Intensity of CMC use
- Use of textisms in CMC
- Understanding of textisms in CMC
- Mobile phone ownership
- Mobile phone dependency
- Use of predictive or corrective software in CMC

(See Appendix A to this paper for definitions and explanations of all these variables.)

3.3 Data Analysis

The data were analysed in four phases. First, the questionnaires were subjected to reliability analyses (section 3.3.1). Then, the writing quality of the essays was determined with T-Scan (section 3.3.2) and a subsequent principal component analysis (section 3.3.3). Finally, the results of the questionnaire and essay analyses were combined into multiple regression analyses, in which we tested whether CMC variables from the surveys and/or demographic variables (education, age, gender) significantly predicted the writing skills variables from the essays (section 3.3.4). All statistical analyses were conducted with IBM SPSS Statistics.

3.3.1 Reliability Analysis

A first step in analysing the data was to reduce the scores on the forty-three questionnaire items to composite scores for eleven CMC variables. The questionnaire was subjected to reliability analyses. Reverse-phrased items were reverse-scored before running the analyses. For three of the variables, there was high consistency among item scores: Cronbach's $a = .74$, $a = .85$, and $a = .76$, as shown in Table 2. The corrected item-total correlations were above .3 for all items of these variables, and the alphas did not improve if items were deleted. Mean scores were computed for these variables. Yet for seven variables, the alphas were lower than the commonly accepted .7, some corrected item-total correlations were below .3, and some alphas improved when deleting items. This can be attributed to the number of scales and the inconsistency of scores among different social media within a single variable. Analysing those questions separately rather than together within umbrella variables was deemed unfeasible, given the unduly high number of predictor variables this would yield for the regression analyses. To keep the variability within the data visible,[52] we computed sum scores for variables with $\alpha < .7$.

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[52] It has to be noted, though, that statistically means and sum scores perform identically.

Table 2. Reliability analysis results for the questionnaires.

CMC variable	No. of questions	α	Score
Variety of CMC use	7	.35	sum
Frequency of CMC use: average amount of time spent per day	6	.53	sum
Frequency of CMC use: number of messages sent per day	4	.53	sum
Exposure to CMC: number of messages received per day	3	.21	sum
First experience with CMC: age of first acquiring mobile phone or using CMC software	5	**.74**	mean
Intensity of CMC use: size of social network via CMC	4	.65	sum
Use of textisms in CMC	5	**.85**	mean
Understanding of textisms in CMC	1	– [i]	
Mobile phone ownership	3	.54	sum
Mobile phone dependency	3	.53	sum
Use of predictive or corrective software in CMC	2	**.76**	mean

Note: alpha scores > .7 appear in bold.

[i] Since this variable was measured using only one question, no *a* was computed.

3.3.2 Analysis of Writing Quality

As explained above, text quality is a multifaceted notion that should ideally be analysed in context. Still, we need to objectively determine the quality of our participants' writing products in isolation here. Considering the valid objections that could be raised to a one-dimensional analysis, we adopted a multidimensional approach to text quality for this study: following Spooren (2009), the texts were analysed with quantitative linguistic measures at different levels. Our analysis was facilitated by T-Scan, software that can analyse Dutch texts (Pander Maat et al., 2014; Pander Maat, Kraf, & Dekker, 2016), into which the essays were entered after they had been typed out and formatted as required by the tool. T-Scan was selected because it is state-of-the-art, frequently updated, and can be accessed freely. We came across no other software that was able to provide information on Dutch texts on such diverse levels and to analyse texts for so many features. The T-Scan output contained 411 variables for each text. Out of this large set, a selection was made of 27 variables that were deemed relevant for school writing. Some T-Scan variables measure more or less the same concept; in that case, we picked one as a representative for such a group of variables to avoid multicollinearity: for instance, for TTR_wrd (type-token ratio for words) and TTR_lem (type-token ratio for lemmas), we only selected the former. These 27 were divided into six categories – measures of length, structure, diversity & density, verbs, nouns, and other parts of speech. The following list of variables features their original T-Scan names (underlined) plus their definition:

Length measures:
1) <u>Zin_per_doc</u>: number of sentences per essay
2) <u>Word_per_doc</u>: number of words per essay
3) <u>Wrd_per_zin</u>: number of words per sentence (average)
4) <u>Let_per_wrd</u>: number of letters per word (average)

Structural measures:
5) <u>Bijzin_per_zin</u>: number of subordinate clauses (finite + infinitival) per sentence
6) <u>D_level</u>: D-level [developmental level]
7) <u>AL_gem</u>: average of all dependency lengths per sentence
8) <u>AL_max</u>: maximal dependency length per sentence

Diversity & density measures:
9) <u>TTR_wrd</u>: type-token ratio (for words)
10) <u>MTLD_wrd</u>: measure of textual lexical diversity (for words)
11) <u>Inhwrd_d</u>: density of content words [lexical density]

Verbal measures:
12) <u>Pv_Frog_d</u>: density of finite verbs
13) <u>Ww_mod_d</u>: density of modal verbs
14) <u>Huww_tijd_d</u>: density of auxiliary verbs of time
15) <u>Koppelww_d</u>: density of copula verbs
16) <u>Imp_ellips_d</u>: density of imperatives and elliptical constructions
17) <u>Lijdv_d</u>: density of passive forms

Nominal measures:
18) <u>Nw_d</u>: density of nouns
19) <u>Pers_vnw_d</u>: density of personal and possessive pronouns
20) <u>Nom_d</u>: density of nominalisations
21) <u>Spec_d</u>: density of proper nouns, names and special words

Other parts of speech measures:
22) <u>Bijw_bep_d</u>: density of adverbials
23) <u>Vg_d</u>: density of conjunctions
24) <u>Lidw_d</u>: density of articles
25) <u>Tuss_d</u>: density of interjections
26) <u>Interp_d</u>: density of punctuation
27) <u>Afk_d</u>: density of abbreviations

All measures of 'density' computed the average number per 1,000 words. The **length measures** took into account the length of the text (number of sentences, 1, and words, 2), of sentences (no of words, 3), and of words (no of letters, 4). These features have been identified to be effective in determining the level of a text (Hacquebord & Lenting-Haan, 2012). The **structural measures** gauged the extent to which complex constructions were used in the text, such as subordination (5), which is a common indicator of complexity (Shaw & Liu, 1998). D-level (6), which stands for 'development level', is a measure of sentence structures based on a classification and rank order of sentence types in eight increasingly complex developmental levels (Rosenberg & Abbeduto, 1987; Covington, 2006). Two more structural measures include dependency length (AL, '*afhankelijkheidslengte*', 7-8), i.e.

the distance between a head (of a sentence or phrase) and its dependent, such as a finite verb and the corresponding subject. The greater this distance, the more complex it becomes to process a sentence (Gibson, 2000). The **diversity & density measures** assessed the variation in word choice and the proportion of content words (vs. function words) in a text. The type-token ratio (TTR, 9) is a classic measure, calculated by dividing the number of types (different words) by the number of tokens (total number of words). The measure of textual lexical diversity (MTLD, 10) is the average length of sequential word strings in a text that maintain a TTR above a specified threshold, so it is insensitive to text length (McCarthy & Jarvis, 2010). Lexical density (11) was operationalized as the number of content words, i.e. nouns, verbs, adjectives, and adverbs, per 1,000 words (e.g. Johansson 2008). The **verbal measures** counted the density of different kinds of verbs – finite verbs (12), modal verbs (13), auxiliary verbs of time (14), copula verbs (15), imperatives and elliptical constructions (16), and passive forms (17). Passive verb constructions are commonly considered to be more complex than active constructions (Chomsky, 1965; Gazdar et al., 1985). The **nominal measures**, similarly, counted the density of various kinds of nouns – all nouns (18), personal and possessive pronouns (19), nominalisations (20), and proper nouns, names and special words (21). The use of nominalisations is generally seen as making a text more formal or impersonal (Shaw & Liu 1998), whereas personal pronouns and proper nouns make a text less distant to the reader. The final set were **measures of other parts of speech**, besides verbal and nominal ones, namely adverbials (22), conjunctions (23), articles, (24), interjections (25), punctuation (26), and abbreviations (27).

3.3.3 Identifying writing variables

To analyse the essays for their writing quality, a principal component analysis (PCA, i.e. exploratory factor analysis) was conducted on the twenty-seven writing variables selected from the T-Scan analysis. An orthogonal rotation method (varimax with Kaiser normalization) was used, because this attempts to maximize the spread of loadings for a variable across all factors, which helps in interpreting the results. As a result, the factors identified are uncorrelated. None of the variables correlate highly: the highest correlation coefficient was $r = .81$ (for AL_gem and AL_max), so overall multicollinearity was not a problem. Missing values were replaced with the mean, in order not to lose participants in the analysis (if excluding cases listwise) and not to obtain a matrix that is not positive definite (in case of pairwise deletion of missing values). The Keyser-Meyer-Olkin measure verified the sampling adequacy for the analysis: KMO = .661, well above the acceptable limit of .5 (Field, 2009). Bartlett's test of sphericity, $\chi^2 (351) = 4616.149$, $p < .001$, indicated that correlations between items were sufficiently large for PCA. The proportion of residuals with an absolute value greater than 0.05 was 46%, which is below the conventional limit of 50%. An initial analysis was run to obtain eigenvalues for each component in the data. Since this study involved a large sample size, it was possible to use a scree plot with eigenvalues over 1 for deciding how many components to extract. The scree plot showed an inflexion that would justify retaining four components.

Table 3 shows the factor loadings after rotation. The items that cluster on the same components suggest that component 1 represents lexical richness (> .40 indicates high richness, < -.40 = low richness), component 2 syntactic complexity (> .40 = high complexity, < -.40 = low complexity), component 3 writing productivity (> .40 = high productivity, < -.40 = low productivity), and component 4 formality (> .40 = high formality, < -.40 = low formality). The total variance explained by the four factors is 44.75%. The resulting factor scores were saved as Anderson-Rubin variables, so they did not correlate.

Table 3. Summary of PCA results for the essay analysis.
Rotated Component Matrix

Writing variable	Rotated factor loadings			
	1	2	3	4
Nw_d	**.796**	-.146	-.044	-.092
Let_per_wrd	**.794**	-.155	-.199	.021
Pers_vnw_d	**-.772**	.048	.018	.055
Pv_Frog_d	**-.650**	-.075	-.151	-.108
Nom_d	**.641**	.004	-.072	-.125
Lidw_d	**.626**	.018	.188	-.092
MTLD_wrd	**.521**	-.085	-.159	.238
Inhwrd_d	**.444**	-.258	-.083	.181
Lijdv_d	.390	-.166	-.145	.012
Ww_mod_d	-.342	.001	-.214	.224
Bijzin_per_zin	-.167	**.808**	-.031	.088
AL_max	.043	**.791**	.132	**.418**
D_level	-.211	**.786**	-.062	.010
Interp_d	.037	**-.628**	.032	.082
AL_gem	.027	**.614**	.149	**.559**
Vg_d	-.389	**.482**	-.049	-.325
Tuss_d	-.111	-.155	.074	-.036
Afk_d	.039	-.121	-.057	.042
Word_per_doc	.080	.040	**.882**	.119
TTR_wrd	.328	-.168	**-.775**	-.011
Zin_per_doc	.077	**-.549**	**.716**	.038
Bijw_bep_d	-.338	.022	.081	**.671**
Wrd_per_zin	-.067	-.080	.267	**.467**
Imp_ellips_d	-.075	-.052	-.151	**-.446**
Spec_d	.167	-.071	.044	-.375
Koppelww_d	-.100	.044	.051	-.351
Huww_tijd_d	.066	.011	-.086	.283
Eigenvalues	4.349	3.442	2.264	2.025
% of variance	16.109	12.749	8.387	7.501

Note: factor loadings > .40 or < -.40 appear in bold and grey.

High scores for lexical richness, syntactic complexity, writing productivity, and formality may suggest that school writings of the genre of expository discussion are of greater quality: diverse and informationally dense vocabulary, sophisticated sentence structures, a long text, and a formal tone of voice are generally believed to raise the level of an essay.

3.3.4 Exploring the Research Questions

Separate linear multiple regressions were conducted for each dependent variable. The dependent/outcome variables were the A-R factor scores resulting from the PCA of the essays, i.e. the four writing skills variables: lexical richness, syntactic complexity, writing productivity, and formality. The independent/predictor variables were the eleven CMC variables (centred)[53] from the questionnaires, as well as three demographic variables (age group, educational level, gender). None of the predictors correlated strongly (i.e. all $r < .9$). Since we had no assumptions about which was the best predictor, the predictors could not be entered in any hierarchical order, so they were all entered in one block with the forced entry method.[54]

The regression analysis was conducted several times: not just for all students, but also for the age groups (adolescents, young adults), educational levels (lower, higher), and separate educations (*vmbo*, *vwo*, *mbo*, *uni*). Numerous attempts were made to include interactions between the CMC variables and the demographic variables in the regressions. Yet because there were no fewer than eleven CMC variables which could all interact with the three demographic variables, this caused much multicollinearity, which goes against an important assumption of regression. Put differently, the research design was too complex to add interactions. Doing separate regressions was thus the only way to determine the effects of the predictor variables within the different age groups, educational levels, and educations.

4. Results

Table 4 shows participants' means and standard deviations on the essay writing task:

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[53] The predictor variables were centred to compute interactions between the CMC and demographic variables (see next paragraph). Note that centring (subtracting the mean) in a regression model does not have the same effect as standardizing (converting it to a Z score). In centring a variable, the values and intercept change, so that the mean has a value of 0, but not the scale nor the regression coefficient: one unit is still one unit. Seeing that interactions were not included in the final regressions, the uncentred variables could have been used just the same.

[54] To check our results with those of different entry methods, the regression analyses for all participants were also run with a stepwise method. This yielded largely the same results.

Table 4. Descriptive statistics.

Predictor variables	**Outcome variables**			
	Lexical richness: $\bar{x}$ (SD)	Syntactic complexity: $\bar{x}$ (SD)	Writing productivity: $\bar{x}$ (SD)	Formality: $\bar{x}$ (SD)
Educational level:				
Lower (N = 152)	0.07 (0.94)	-0.08 (0.98)	-0.28 (0.99)	-0.12 (1.03)
Higher (N = 186)	0.10 (1.08)	0.04 (1.01)	0.17 (0.94)	0.11 (0.99)
Age group:				
Adolescents (N = 189)	-0.37 (0.87)	0.06 (1.05)	0.01 (0.98)	-0.07 (1.06)
Young adults (N = 149)	0.66 (0.89)	-0.12 (0.93)	-0.08 (1.00)	0.09 (0.96)
Gender:				
Male (N = 176)	0.17 (0.99)	0.05 (0.96)	-0.09 (1.03)	-0.20 (1.10)
Female (N = 162)	-0.01 (1.04)	-0.09 (1.03)	0.03 (0.93)	0.22 (0.87)
Total (N = 338)	0.08 (1.02)	-0.02 (1.00)	-0.03 (0.99)	0.00 (1.02)

The findings for the linear multiple regressions are presented below per dependent variable, i.e. lexical richness, syntactic complexity, writing productivity, and formality. The results for all students are shown in Tables 5, 7, 9, and 11, with the significant independent variables in bold and grey; for the separate regressions that were run per specific age group, educational level, and education, only the *significant* results are shown in Tables 6, 8, 10, and 12, with the *new* significant independent variables (that were not significant predictors for all students) in grey.

4.1 Lexical Richness

As can be seen in Tables 5 and 6, educational level positively predicted lexical richness for all students (β = .21***) and for the young adults separately (β = .34***): the essays of higher educated youths were lexically richer. Likewise, age group was a significant positive predictor of lexical richness for all students (β = .60***), as well as for both the lower (β = .55***) and higher educated youths (β = .61***): essays of older participants were also lexically richer. 'Variety of CMC use' was a significant positive predictor for just the lower educated participants (β = .19*): use of a greater variety of social media caused more lexical richness for participants from vmbo and mbo.

The CMC variable 'mobile phone dependency' was a significant negative predictor of lexical richness, both for all students (β = -.12*) and for the adolescents separately (β = -.21*): youths who were more dependent on their mobile phones wrote less lexically rich essays.

Table 5. Linear multiple regression of lexical richness.

Independent variables	Dependent variable: lexical richness			
	B	$SE\ B$	β	p
Educational level	**0.42**	**0.10**	**.21**	***
Age group	**1.23**	**0.13**	**.60**	***
Gender	-0.17	0.10	-.08	
Variety of CMC use	0.04	0.05	.04	
Frequency of CMC use: time spent per day	0.00	0.02	.00	
Frequency of CMC use: messages sent per day	-0.05	0.03	-.11	
Exposure to CMC	0.02	0.02	.07	
First experience with CMC	-0.03	0.03	-.05	
Intensity of CMC use	0.00	0.00	.03	
Use of textisms in CMC	0.01	0.06	.01	
Understanding of textisms in CMC	-0.03	0.06	-.02	
Mobile phone ownership	0.05	0.08	.04	
Mobile phone dependency	**-0.08**	**0.04**	**-.12**	*
Use of predictive or corrective software in CMC	-0.15	0.12	-.06	
R^2	.58			
$ANOVA$	$F\ (14, 323) = 11.53\ (p < .001)$			

Note: *p < .05, **p < .01, ***p < .001.

Table 6. Linear multiple regression of lexical richness, per participant group

Student group	Significant independent variables	Dependent variable: lexical richness			
		B	$SE\ B$	β	p
Adolescents	**Mobile phone dependency**	**-0.12**	**0.05**	**-.21**	*
Young adults	**Educational level**	**0.62**	**0.16**	**.34**	***
Lower educated	**Age group**	**1.08**	**0.16**	**.55**	***
	Variety of CMC use	**0.14**	**0.07**	**.19**	*
Higher educated	**Age group**	**1.46**	**0.21**	**.61**	***

No significant predictor variables for separate analyses of vmbo, vwo, mbo, and uni.

4.2 Syntactic Complexity

Tables 7 and 8 show that 'first experience with CMC' was a significant negative predictor of syntactic complexity, for all students (β = -.14*), but also for the adolescent (β = -.16*), higher educated (β = -.23*), vwo (β = -.19*), and uni participants (β = -.19*): the older they were when they first started using CMC, the lower their syntactic complexity – so in fact, an earlier first experience with CMC was positively related to syntactic complexity. 'Understanding of textisms in CMC' (β = .19*) and 'variety of CMC use' (β = .45*) were positive predictors of syntactic complexity, with only the lower educated and vmbo groups respectively: a greater understanding of textisms caused a higher syntactic complexity for lower educated participants, while use of a greater variety of social media caused a higher syntactic complexity for vmbo participants.

Gender was a significant negative predictor of syntactic complexity for all students (β = -.14*) plus for vwo (β = -.23*) and uni participants (β = -.23*). This is an artefact of the coding: male youths were coded as 0 and females as 1, so male participants wrote essays of significantly higher syntactic complexity. 'Exposure to CMC' also negatively predicted syntactic complexity, but only for the lower educated (β = -.29**): youths with a lower education who received more social media messages on a daily basis produced syntactically less complex essays.

Table 7. Linear multiple regression of syntactic complexity.

Independent variables	B	SE B	β	p
	Dependent variable: syntactic complexity			
Educational level	0.07	0.12	.04	
Age group	0.03	0.15	.02	
Gender	**-0.27**	**0.12**	**-.14**	*
Variety of CMC use	0.03	0.06	.03	
Frequency of CMC use: time spent per day	0.00	0.03	-.01	
Frequency of CMC use: messages sent per day	0.05	0.04	.12	
Exposure to CMC	-0.01	0.02	-.04	
First experience with CMC	**-0.08**	**0.04**	**-.14**	*
Intensity of CMC use	0.00	0.00	.04	
Use of textisms in CMC	0.02	0.07	.02	
Understanding of textisms in CMC	0.08	0.07	.07	
Mobile phone ownership	0.06	0.09	.05	
Mobile phone dependency	-0.03	0.05	-.05	
Use of predictive or corrective software in CMC	-0.07	0.14	-.03	
R^2	.24			
ANOVA	$F(14, 323) = 1.37\ (p = .164)$			

Note: *p < .05, **p < .01, ***p < .001.

Table 8. Linear multiple regression of syntactic complexity, per participant group.

Student group	Significant independent variables	B	SE B	β	p
	Dependent variable: syntactic complexity				
Adolescents	**First experience with CMC**	**-0.12**	**0.06**	**-.16**	*
Lower educated	**Exposure to CMC**	**-0.11**	**0.04**	**-.29**	**
	Understanding of textisms in CMC	**0.21**	**0.10**	**.19**	*
Higher educated	**First experience with CMC**	**-0.13**	**0.06**	**-.23**	*
Vmbo	**Variety of CMC use**	**0.37**	**0.18**	**.45**	*
Vwo	**Gender**	**-0.48**	**0.21**	**-.23**	*
	First experience with CMC	**-0.14**	**0.07**	**-.19**	*
Uni	**Gender**	**-0.48**	**0.21**	**-.23**	*
	First experience with CMC	**-0.14**	**0.07**	**-.19**	*

No significant predictor variables for separate analyses of young adults and mbo.

4.3 Writing Productivity

It is shown in Tables 9 and 10 that educational level positively predicted writing productivity for all students (β = .25***), and for the adolescents (β = .25**) and young adults (β = .22*) separately: those with a higher educational level were significantly more productive, i.e. produced significantly longer essays. 'Use of textisms in CMC' also positively predicted writing productivity, but only for vwo (β = .22*), mbo (β = .23*), and uni (β = .22*) participants: youths with vwo, mbo, and uni educations who used more textisms in their CMC messages wrote longer essays. In addition, 'intensity of CMC use' was a significant positive predictor only for mbo students (β = .26*): youths with an mbo education who had a larger social network via CMC wrote longer essays.

Table 9. Linear multiple regression of writing productivity.

Independent variables	Dependent variable: writing productivity			
	B	$SE\ B$	β	p
Educational level	**0.50**	**0.12**	**.25**	*******
Age group	0.03	0.15	.01	
Gender	0.03	0.12	.01	
Variety of CMC use	-0.02	0.06	-.03	
Frequency of CMC use: time spent per day	0.04	0.03	.11	
Frequency of CMC use: messages sent per day	0.00	0.04	.00	
Exposure to CMC	-0.02	0.02	-.05	
First experience with CMC	0.02	0.04	.03	
Intensity of CMC use	0.00	0.00	-.01	
Use of textisms in CMC	0.07	0.07	.06	
Understanding of textisms in CMC	-0.03	0.07	-.03	
Mobile phone ownership	-0.07	0.09	-.05	
Mobile phone dependency	-0.02	0.04	-.02	
Use of predictive or corrective software in CMC	0.22	0.13	.09	
R^2	.27			
$ANOVA$	F (14, 323) = 1.88 (p < .05)			

Note: *p < .05, **p < .01, ***p < .001.

Table 10. Linear multiple regression of writing productivity, per participant group.

Student group	Significant independent variables	Dependent variable: writing productivity			
		B	$SE\ B$	β	p
Adolescents	**Educational level**	**0.53**	**0.16**	**.25**	******
Young adults	**Educational level**	**0.45**	**0.18**	**.22**	*****
Vwo	**Use of textisms in CMC**	**0.23**	**0.11**	**.22**	*****
Mbo	**Intensity of CMC use**	**0.00**	**0.00**	**.26**	*****
	Use of textisms in CMC	**0.26**	**0.13**	**.23**	*****
Uni	**Use of textisms in CMC**	**0.23**	**0.11**	**.22**	*****

No significant predictor variables for separate analyses of lower educated, higher educated, and vmbo.

4.4 Formality

Tables 11 and 12 reveal that educational level was a positive predictor of formality, for all students (β = .13*) and for the adolescents (β = .15*): higher educated participants wrote more formal essays. Gender also positively predicted formality, for all students (β = .21***) plus for the adolescent (β = .18*), young adult (β = .22*), lower educated (β = .18*), higher educated (β = .24**), vwo (β = .23*), and uni participants (β = .23*), which means that female participants wrote more formal essays.

'Exposure to CMC' was a negative predictor of formality, not just for all students (β = -.17*), but also for the adolescents (β = -.21*), higher educated participants (β = -.25*), as well as those from vwo (β = -.23*) and uni (β = -.23*).

Table 11. Linear multiple regression of formality.

Independent variables	Dependent variable: formality			
	B	*SE B*	*β*	*p*
Educational level	**0.26**	**0.12**	**.13**	*****
Age group	0.22	0.15	.11	
Gender	**0.42**	**0.12**	**.21**	******
Variety of CMC use	0.09	0.06	.11	
Frequency of CMC use: time spent per day	0.01	0.03	.05	
Frequency of CMC use: messages sent per day	-0.02	0.04	-.04	
Exposure to CMC	**-0.05**	**0.02**	**-.17**	*****
First experience with CMC	-0.01	0.04	-.02	
Intensity of CMC use	0.00	0.00	.05	
Use of textisms in CMC	0.02	0.07	.01	
Understanding of textisms in CMC	-0.01	0.07	-.01	
Mobile phone ownership	0.13	0.09	.09	
Mobile phone dependency	-0.06	0.04	-.09	
Use of predictive or corrective software in CMC	0.13	0.14	.05	
R²	.33			
ANOVA	F (14, 323) = 2.84 (p < .001)			

Note: *p < .05, **p < .01, ***p < .001.

Table 12. Linear multiple regression of formality, per participant group.

Student group	Significant independent variables	Dependent variable: formality			
		B	*SE B*	*β*	*p*
Adolescents	**Educational level**	**0.34**	**0.17**	**.15**	*
	Gender	**0.38**	**0.17**	**.18**	*
	Exposure to CMC	**-0.05**	**0.02**	**-.21**	*
Young adults	**Gender**	**0.41**	**0.19**	**.22**	*
Lower educated	**Gender**	**0.37**	**0.19**	**.18**	*
Higher educated	**Gender**	**0.48**	**0.16**	**.24**	**
	Exposure to CMC	**-0.06**	**0.02**	**-.25**	*
Vwo	**Gender**	**0.48**	**0.20**	**.23**	*
	Exposure to CMC	**-0.05**	**0.03**	**-.23**	*
Uni	**Gender**	**0.48**	**0.20**	**.23**	*
	Exposure to CMC	**-0.05**	**0.03**	**-.23**	*

Note: *p < .05, **p < .01, ***p < .001.
No predictor variables were significant for separate analyses of vmbo and mbo groups.

Table 13 presents an overview of the findings of this study.

Table 13. Overview of positive or negative predictors of outcome.

Predictor variables	Outcome variables			
	Lexical richness	Syntactic complexity	Writing productivity	Formality
Demographic variables:				
Educational level	+		+	+
Age group	+			
Gender		−		+
CMC variables:				
Variety	+ (lower educated)	+ (vmbo)		
Exposure		− (lower educated)		−
First experience		+		
Intensity			+ (mbo)	
Use of textisms			+ (vwo, mbo, uni)	
Understanding of textisms		+ (lower educated)		
Mobile phone dependency	−			

Note: + = positive predictor, − = negative predictor.
No significant predictors: frequency of CMC use, mobile phone ownership, use of predictive/corrective software

5. Discussion

5.1 Relationship between CMC Use and School Writings

The first research question of this study was whether a relationship between Dutch youths' CMC use and their schools writing skills can be found. We refrained from formulating a hypothesis because of the mixed results of previous studies. Our findings suggest that CMC use and school writings are definitely related, because seven of the eleven CMC variables of the surveys were significant predictors of the text quality of the essays.

5.1.1 Positive Predictors of Writing Quality

First, let's turn to the five CMC variables that were significant positive predictors of the writing variables. 'Variety of CMC use' positively predicted lexical richness for lower educated youths, and syntactic complexity for vmbo participants: lower educated youths using more different kinds of CMC wrote lexically richer essays, and vmbo participants with greater variety in social media use wrote syntactically more complex essays. This suggests that youths' lexical richness and syntactic complexity might improve by using more different kinds of CMC, although the correlational nature of this study prevents us from making claims about causality.

'First experience with CMC' predicted syntactic complexity: youths who first acquired a mobile phone or started using CMC software at a younger age wrote syntactically more complex essays. 'Understanding of textisms in CMC' positively predicted syntactic complexity, but only for lower educated youths: those who said to have less difficulty in understanding textisms wrote syntactically more complex essays. Accordingly, syntactic complexity might also increase by using CMC from a younger age and by understanding more textisms. Alternatively, these relationships might go in the other direction: for example, perhaps youths who produce school writings of higher syntactic complexity can understand textisms more easily.

Furthermore, 'use of textisms in CMC' was a positive predictor of writing productivity for vwo, mbo, and university participants: when they reported using more textisms in their messages, they produced longer essays. Finally, writing productivity was positively predicted by 'intensity of CMC use', for mbo participants only: those who reported having a larger social network for communication via CMC wrote longer essays. These correlations could be taken to indicate that writing productivity is boosted by having a greater online social network as well as by using more textisms in CMC. Yet the direction of this relationship is unknown, so rather than writing productivity benefiting from use of textisms and a great social media network, the relationship might be vice versa (youths who produce longer essays tend to use more textisms and have a greater social media network) or even bidirectional, or some other underling (cognitive) variable may be at play.

5.1.2 Negative Predictors of Writing Quality

Two CMC variables were significant negative predictors of writing skills. 'Mobile phone dependency' negatively predicted lexical richness: youths who admitted being

more dependent on their mobile phones produced lexically poorer essays. In other words, heavy dependence on mobiles is related to a poorer lexis: phone dependency might cause youths' lexis to become poorer, or – though this seems implausible – youths with a smaller lexicon have a greater tendency to become dependent on their mobiles, or both could reflect a third variable, e.g. parental stimulation of mobile phone use versus of reading books.

In addition, 'exposure to CMC' negatively predicted syntactic complexity – albeit only for lower educated youths, as well as formality: youths who received more messages per day produced essays that were less formal and, for lower educated youths, also syntactically less complex. Syntactic complexity and formality may thus decrease from being exposed to a greater quantity of CMC messages (which are likely to contain much non-standard grammar and spelling) or, vice versa, youths who write essays of lower syntactic complexity and formality tend to somehow be more exposed to CMC.

In sum, although we should remain cautious in speculating about the direction of these relationships, youths' writings might benefit from using CMC in various ways – from using different kinds of social media, from starting to use it at a younger age, from communicating via CMC with a large social network, and from using and understanding textisms. Yet if they heavily rely on their mobile phones or receive many CMC messages on a daily basis, this may affect the quality of their school writings.

5.2 Demographic Variables

Our second research question focused on whether age group, educational level, or gender affect the relationship between Dutch youths' CMC use and their writing skills. We hypothesized that any relationship with CMC use would be more salient with participants with a lower education or of a younger age, who may run a higher risk of revealing interference of informal written CMC on their formal school writing.

These demographic variables were significant main effects in several regression analyses. Educational level was, unsurprisingly, a positive predictor of writing skills, specifically lexical richness, writing productivity, and formality: higher educated youths overall wrote lexically richer, longer, and more formal essays. Age group positively predicted lexical richness, where young adults produced lexically richer essays. Gender predicted syntactic complexity and formality: while male participants' essays were syntactically more complex, female participants' essays were more formal.

The overview in Table 13 shows that if CMC variables were significant predictors, this was either for (practically) all participants, or just for the lower educated youths (vmbo and/or mbo). The results partly support our hypothesis on educational level and age group: lower educated youths are indeed more susceptible to interference between the registers they use, i.e. informal Dutch as used in CMC and more formal Standard Dutch as should be used at school.

6. Conclusion

This article presented results of a correlational study into the relationship between Dutch youths' social media use and their school writing. We aimed to find out if interference, comparable to that attested in bilinguals' language production, of youths' CMC language can be found in their school writings. To answer that question, we asked a large number of youths from different educational levels and age groups about their social media habits and experiences, via extensive surveys. These participants' school writing products (essays) were analysed by means of an automatic text analysis tool, T-Scan, which yielded a plethora of measures, some of which we combined to assess the quality of the essays on multiple levels, namely lexical richness, syntactic complexity, writing productivity, and formality. Regression analyses were conducted to find out to what extent CMC use, as measured in the surveys, predicted the text quality of the school writings. Educational level, age group, and gender were included as additional predictor variables, since any possible interference was expected to be greatest with high risk groups, that is, lower educated youths and adolescents.

We found ample evidence of relationships between CMC use and school writings: seven of the eleven CMC variables turned out to be significant predictors of the quality of participants' essays. The CMC variables even more often positively than negatively predicted the text quality. Social media thus are not merely negatively associated with school writing skills. This is in line with Verheijen's (2013) tentatively positive conclusion in her review of prior texting/IMing and literacy research, and with Van Dijk et al.'s (2016) recent finding that textese was positively related to Dutch children's grammar performance. Our correlational study does not allow conclusions about the causality of the relationships; still, results suggest that *passive* engagement with CMC, by heavy reliance on one's mobile phone and consumption of social media messages, might hinder youths' writing skills, whereas *active* and *creative* production of language via CMC – via various media, from an earlier age, with many people, and including textisms – might, in fact, help in developing writing skills.

Moreover, we found more significant relationships for certain demographic groups: our results indicate that especially lower educated youths are at risk of their formal writings being harmed by passively relying on their mobile phones and by consuming many social media messages with input deviating from the standard language. But at the same time, the presence of more significant positive associations for lower educated participants makes them also the ones whose writing skills might benefit most from social media by actively producing language via CMC. These results confirm the moderating effect of educational level already identified by Rosen et al. (2010). As compared to higher educated youths, who have proven to be more "easy switchers" (Dowdall, 2006:153), lower educated youths have more difficulty in effectively switching between these registers. Alternatively, it might be the case that lower educated youths care less about keeping their registers separate: this would be a case of what Baron (2002, 2008) calls 'linguistic whatever-ism' – a laissez-faire attitude towards consistency or 'correctness' in writing. Perhaps the real change in youth language use nowadays is not the inevitable interference of CMC language with

especially lower educated youths' school writings, but their indifference to the standard language norms, which is likely to be reinforced by their inconsistent and 'incorrect' writing in social media.

7. Implications

The present research may help to allay fears among parents and teachers about the consequences of written CMC on literacy skills. As long as youths are able to separate, and, crucially, understand the importance of separating, the written registers of informal, contemporary CMC and more formal, normative Standard Dutch, social media use need not damage their school writing. The present study has shown that it may even help develop their writing skills. Ultimately, Dutch language education should not discourage youths to use CMC language, but should teach them to effectively switch between formal and informal registers. This is especially relevant for those with a lower education, who have proven to be more susceptible to interference. Deviations from the standard language in formal texts are still seen as a reflection of people's (supposedly lower) education, sophistication, and even social class; they are socially unacceptable in many professional contexts. Non-standard language use can diminish one's credibility and may even lead to personal attacks. If interference of social media texts with school writing – the precursor of written communication produced in a workplace environment – can be prevented, this will be beneficial for youths: 'correct' use of Standard Dutch can prevent stigmatisation of their language as well as of themselves, and can even increase their chances in the labour market. Youths should thus be encouraged to actively and creatively produce writing via social media, but this 'whatever generation' (Baron, 2008) should also be imbued with the necessity of mastering the standard language norms and applying them whenever and wherever necessary.

8. Limitations and Future Directions

The limitations of this research provide opportunities for future research. In the present study, the questionnaires with which we measured CMC use were administered via paper and pencil, because it was practically more feasible. Administering online questionnaires would require technical support in the form of laptops or tablets for all participants. For young adults in tertiary education, this would not have been an issue, since they generally bring their own laptops to class with them anyways; for adolescents in secondary education, on the other hand, this proved to be more problematic, as they did not all own a laptop and computer rooms were not always available in all schools during testing hours. An alternative would have been to only test adolescents in so-called 'iPad schools', where all pupils have tablets at their disposal. However, such youths may not be representative of adolescents in general, given that their use of computer technology is stimulated by the school which may affect their use of CMC outside of school. Nevertheless, online surveys would have had the benefit of preventing participants from being able to leave questions unanswered, so they should be considered for future studies.

A second limitation is that a correlational study with surveys, although it allows us to research associations between various aspects of CMC use (e.g. frequency, intensity, variety, and manner of using CMC) and school writings from different perspectives, does not allow us to draw any conclusions about the direction of relationships that were found. Future research could further explore the causality of associations between CMC and literacy by conducting an intervention study or a longitudinal study. An experiment could, for instance, test the writing skills of a group of CMC-primed youths as compared to a control group. Such experimental manipulation, as carried out in a follow-up study by Verheijen and Spooren (submitted), could yield additional insights into the nature of the relation between social media and writing.

Finally, the present study has investigated the quality of youths' school writings for several important writing factors (lexical richness, syntactic complexity, writing productivity, formality), but the orthography of the essays has been left unstudied. Although this study has proven that CMC is predominantly positively related to writing skills, the orthographic minutiae of school writings might still be negatively affected. This was suggested, for example, by a mother who talks about her daughter's school writing in an online forum discussing the roots of 'bad language use' on internet fora:

> Speed in typing, typing sloppily, laziness. I see my daughter of 12 working on a paper for school. Nowhere capital letters, no punctuation, no diaereses or accents. Especially in French. But her spelling is good. I tell her that she has to get accustomed to immediately inserting those diaereses and punctuation when typing. But that is too 'difficult' and 'too much work'. As a consequence, she is busy for hours adding all of those things to her paper. (Pollewop, 2011).[55]

The absence of correct punctuation marks in CMC has been observed more often: "I also noted that often no form of punctuation whatsoever is used on social media. So I don't understand that the writers themselves can still make sense of it" (Boy J, 2014). Future studies could involve a more fine-grained analysis of the details of orthography, namely punctuation, capitalisation, and diacritics, to give a truly balanced picture of the impact of informal CMC on formal writing.

Acknowledgements

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[55] Again, the quotes in this section are translations from Dutch.

Appendix A. Survey variables and question types

1) <u>Variety of CMC use</u>: asking the participant… whether they text message, chat (on mobile phone or computer), use a social networking site, microblog platform, or internet forum.
   → 7 yes-no questions; *No = 0, Yes = 1.*

2) <u>Frequency of CMC use: average amount of time spent per day</u>: … how much time (in minutes) they spend on average per day text messaging, chatting (on mobile phone or computer), using a social networking site, microblog platform, or internet forum.
   → 6 open-ended questions; *0 min, None = 0; >0-20 min, Low = 1; 21-60 min, Moderate = 2; 61-120 min, High = 3; 141-600 min, Very high = 4.*

3) <u>Frequency of CMC use: number of messages sent per day</u>: … how many messages (text messages, posts on social networking sites, microblogs) they send on average per day; how often they have multiple chats at the same time.
   → 4 Likert scale questions; *None = 0, 1 or 2 = 1, 3 up to and incl 5 = 2, 6 up to and incl 9 = 3, More than 10 = 4; Never = 0, Seldom = 1, Sometimes = 2, Often = 3, Usually = 4.*

4) <u>Exposure to CMC: number of messages received per day</u>: … how many messages (text messages, posts on social networking sites, microblogs) they receive on average per day.
   → 3 Likert scale questions; *None = 0, 1 or 2 = 1, 3 up to and incl 5 = 2, 6 up to and incl 9 = 3, More than 10 = 4.*

5) <u>First experience with CMC: age of first acquiring mobile phone or using CMC software</u>: … at what age (in years) they first got a mobile phone or started text messaging, chatting, created an account on a social networking site, or on a microblog platform.
   → 5 open-ended questions.

6) <u>Intensity of CMC use: size of social network via CMC</u>: … with how many friends or relatives they frequently exchange text messages or chat; how many friends or followers they have on social networking sites or microblog platforms.
   → 4 open-ended questions.

7) <u>Use of textisms in CMC</u>: … how often they use textisms during text messaging, chatting, on social networking sites, or microblog platforms; whether they like to devise new ways to spell words.
   → 5 Likert scale questions; *Never = 0, Seldom = 1, Sometimes = 2, Often = 3, Usually = 4; No, not at all = 0, No, not really = 1, No opinion = 2, Yes, a little = 3, Yes = 4.*

8) Understanding of textisms in CMC: … how often they understand textisms other send to them.
    → 1 Likert scale question; *Never = 0, Seldom = 1, Sometimes = 2, Often = 3, Usually = 4*.

9) Mobile phone ownership: … whether they own a mobile phone; whether they own a smartphone; what kind of mobile phone they own.
    → 2 yes-no questions + 1 ordinal-polytomous question; *No = 0, Yes = 1; Alphanumeric = 1, QWERTY = 2, Touchscreen = 3*.

10) Mobile phone dependency: … how often they take their mobile phone with them; whether they usually take their mobile phone to school; how important it is for them to keep their mobile phone charged.
    → 2 Likert scale questions + 1 yes-no question; *Never = 0, Seldom = 1, Sometimes = 2, Often = 3, Always = 4; No = 0, Yes = 1; Not important at all = 0, Not important = 1, Moderately important = 2, Important = 3, Very important = 4*.

11) Use of predictive or corrective software in CMC: … whether they use a predictive dictionary or autocorrect when text messaging or chatting on their mobile phone.
    → 2 yes-no questions; *No = 0, Yes = 1*.

Chapter 10. The Impact of WhatsApp on Dutch Youths' School Writing Skills

(submitted)

with Wilbert Spooren

Abstract

Today's youths are continuously engaged with social media. The informal language they use in computer-mediated communication (CMC) often deviates from spelling and grammar rules of the standard language. Therefore, parents and teachers fear that social media might harm youths' literacy skills. This paper examines whether such worries are justifiable. An experimental study was conducted with 500 Dutch youths (408 of whose data were ultimately used) of different educational levels and age groups, to find out if social media affect their productive or receptive school writing skills. We measured whether chatting via WhatsApp directly impacts the writing quality of Dutch youths' narratives or their ability to detect and correct 'spelling errors' (deviations from Standard Dutch) in grammaticality judgement tasks. The use of WhatsApp turned out to have no short-term effects on participants' performances on either of the writing tasks. Thus, the present study gives no cause for great concern about any impact of WhatsApp on youths' school writing.

Key words: computer-mediated communication (CMC); social media; WhatsApp; chats; writing; literacy

1. Introduction[56]

It is a widely held belief that social media may have destructive effects on youths' literacy skills. We conducted empirical research to examine whether such beliefs are reasonable or misguided. This paper reports on an experimental study aimed at finding out whether there is indeed a causal connection between social media use – in particular the popular WhatsApp – and the writings produced by Dutch youngsters in an educational context. Such a large-scale experimental study to empirically establish the impact of social media use on literacy skills (of adolescents and young adults, in secondary and tertiary education) has never before been carried out in the Netherlands. Can we find evidence for the supposedly damaging effects of social media on school writing?

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[56] This paper is a greatly extended and revised version of a short conference paper by the authors: Verheijen, L., & W. Spooren (2017). The impact of WhatsApp on Dutch youths' school writing. In E.W. Stemle & C.R. Wigham (Eds.), *Proceedings of the 5th Conference on CMC and Social Media Corpora for the Humanities* (pp. 6–10). Bolzano: Eurac Research. https://cmc-corpora2017.eurac.edu/proceedings/cmccorpora17-proceedings.pdf.

Youths are nowadays constantly using computer-mediated communication (CMC) via social media platforms such as WhatsApp, Facebook chat, Snapchat, and Twitter. Examples (1)–(3) present chat messages by Dutch youths (with the English translation below):

(1)   **OMG!** Had je mijn mijn verhaal gezien
       Hahahahhaahhaaha kwam ik pas vanochtend achter
       k kan me **nie** eens herinneren **da** ik die gemaakt heb
       Miss in **mn** slaap **ofzo hagahagagaa**
       ('OMG! Did you see my my story
       Hahahahhaahhaaha only found out this morning
       i cant even remember making dat
       Mayb in me sleep or somethin hagahagagaa')

(2)   Beetje te vroeg ik val echt in slaap maar alvast **happy birthdayyyyyy tooooooooo youuuuuuuuuuuu!** 🐬🐬🐰🐰🎋🎋♥♥🎊🎊 **loveyouuuuuu xxxxxxxxxx**
       ('Bit too early I'm really falling asleep but anyway…')

(3)   **Liefie♥** gaat ie weer met jou? Wat het je😬😳 bel me **weneer** je online bent😒✅ **ly♥♥♥♥** zie je morgen☺ BEL ME ☺ **chatt👅😳**
       ('Luv♥ you doin okay again? What hare you😬😳 call me whn you are online😒✅ ly♥♥♥♥ see you tomorrow☺ CALL ME ☺ honeyy👅😳')

All the words in bold obviously deviate from the Dutch standard language norms on spelling. They contain non-standard abbreviations, letter repetitions, phonetic respellings, and other textisms. In addition, these examples feature visual, lexical, orthographic, and grammatical deviations from Standard Dutch, in the form of emoji, English borrowings, omission of punctuation, omission and overuse of capitalisation, ellipsis of different parts of speech, and sentence fragments. Since such deviations are characteristic of 'CMC language' (see Verheijen, 2017 for a definition), they have caused worries that youths' informal typed communication via new media may negatively interfere with their writing in more formal settings. Such worries exist among teachers (Ross, 2007) and, in the Netherlands, especially among parents (Spooren, 2009). These fears have existed for decades now (Mphahlele & Mashamaite, 2005; Thurlow, 2006): [57] every new medium engenders similar critique. Yet there are also scholars who point out that youth literacy may benefit from social media use, via creative and playful language use, greater exposure to written texts, more engagement in writing, and greater metalinguistic awareness (Crystal, 2008; Wood, Kemp, & Plester, 2013). The impact of written CMC on literacy and language are still the subject of much discussion. For instance, the scores on an ongoing online

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[57] Or, for that matter, for centuries. See Deutscher (2005) for a historical note on the concerns about language deterioration.

debate about the question "Is texting killing language?" are close: at the time of writing, 47% of respondents have said yes, 53% have said no (Debate.org, n.d.). Recent press reports disclosed that Dutch youths are getting mobile phones at increasingly younger ages. In the last few years, their average age of first acquiring a mobile phone has dropped from thirteen to eleven, and some children are now even receiving mobile phones at the age of four (RTL Nieuws, 2017). Such reports, in which parents also admit being worried about the effects of new media, are likely to provoke renewed discussion about the relation between texting and youth literacy. The present study aims to contribute to this debate, while at the same time we hope to surpass "polarized, dichotomous arguments often presented in the research literature as well as media reports" (Zebroff, 2017:3); specifically, we investigate the impact of WhatsApp on Dutch youths' school writing.

From a descriptive linguistic perspective, the register of informal written CMC is objectively in no way inferior to that of the formal standard language; nevertheless, many people still regard it as 'substandard', 'improper', or 'incorrect'. For example, Van Vrijaldenhoven (2016) speaks about 'crappy' language use by Dutch youths on social media and Banerji (2015) claimed that "[t]exting and Whatsapp have really screwed our language." Along those same lines, Wil (2017) writes the following about the English language:

> [T]ext messaging is completely devastating the English language. […] [S]choolchildren in the 1960s and 1970s were far more literate than children of today. … [T]he average schoolchild [now] struggles more with spelling, grammar and essay-writing: essential skills which before now were considered key to a good grasp of the English language. Text messaging is alienating English speakers from their native tongue and confusing non-natives who wish to learn the language. It promotes mis-spelling [sic]. English is a beautiful tongue with a rich literary history which does not deserve to be overshadowed by phrases like 'c u l8r' and 'megalolz'.

What matters here, crucially, are societal expectations on standard language use: even though informality is an integral part of new media and digital communication, traditional notions on use of the standard language remain very much alive in this digital age. Standard Dutch enjoys what is called overt prestige (Labov, 1966): many people openly criticize orthographic or grammatical deviations from traditional language norms, no matter how cool CMC language is among youths, i.e. irrespective of the covert prestige of this digitally written language variant. As noted by Sebba (2007), orthography is often equated with 'writing correctly' – even the term itself comes from the Greek '*orthographia*', meaning 'correct writing': spelling, like literacy, is situated within social practices, in which deviations from the written norms are seen by many as an illegitimate or marginal practice, so as "unlicensed variation" (Sebba, 2007:30). Since society still expects us to produce 'correct' standard language in many situations, youths need to show mastery of multiple registers, formal and informal, online and offline, as well as an ability to switch effortlessly between these

registers. Therefore, this study examines whether Dutch youths are indeed able to switch from CMC language to Standard Dutch without interference.

2. Theoretical Background

2.1 Interference in Writing

Switching between registers can be likened to code-switching between languages: while bilinguals alternate between two spoken or written linguistic codes (languages, language varieties, dialects) (Milroy & Muysken, 1995), youths move back and forth between two written registers. Code-switching by bilinguals often occurs within the context of a single conversation (Auer, 2013), but can also occur between different social contexts or conversational settings, whereas that by CMC-using youths occurs between different writing contexts. Hence, youngsters should be adept in skilfully shifting between their online, informal register and offline, formal register and in using these in appropriate settings. A school setting requires the standard language, while social media allow use of CMC language or 'textese'. This view of today's youths as 'bilinguals' is supported by the following quote:

> [T]he best way to think of text messaging is not as a degradation of [our standard language], and certainly not as an improvement of it, but rather as a separate language entirely. Good students today are effectively bilingual: they turn on the Textese when conversing with their friends, then turn it off when it's time to write a paper. (Anon., 2015, https://farhap12.wordpress.com)

The acquisition of two registers thus bears comparison with the acquisition of two languages, i.e. second language learning. These registers may be in constant competition, and simultaneously active, when youths write – parallel to bilinguals, whose two languages are constantly being activated when writing or speaking (Hermans, Bongaerts, De Bot, & Schreuder, 1998). While using one register, the other register may occasionally not be completely suppressed, and, consequently, linguistic features of that deactivated register may cause interference (Richards, 1972), a negative form of linguistic transfer or interlingual influence (Milroy & Muysken, 1995). Lems, Miller, and Soro (2017) define interference as "obstacles to second-language literacy based on first-language features" (38). However, it can also entail obstacles in one's first language based on features of one's second (or third, etc.) language: transfer can occur in either direction, from L1 to L2 and vice versa (Cook, 2003; Gass & Selinker, 2008) – in fact, any post-L1 language can be a source for transfer (Jarvis & Pavlenko, 2008). In the context of social media, Standard Dutch forms the basis for CMC language, but the latter register can also interfere with the former, even though CMC language was acquired at a later stage. Although transfer can occur in language comprehension and perception (Ringbom, 1992; Jarvis & Pavlenko, 2008), interference between languages more saliently occurs with language production, so speech or writing (Vildomec, 1963). School writings obviously involve a productive literacy skill, which makes them a likely candidate for orthographic,

lexical, or syntactic interference of the register of CMC language. The aim of this study is to determine if Dutch adolescents and young adults can effectively switch between registers or show signs of interference of communication via WhatsApp in their school writings.

2.2 Effects of CMC on Traditional Literacy

The relationship between CMC and literacy has been investigated in numerous previous studies. Verheijen (2013) and Zebroff (2017) present reviews of the literature and both conclude that findings on this topic are inconclusive. This is the case for research into the relationship between literacy, on the one hand, and, on the other hand, both texting practices and use of CMC language. These varied results can to a great extent be attributed to differences in previous studies regarding three aspects: (a) the way in which they operationalized literacy, (b) the way in which they measured use of CMC or CMC language, and (c) the participants that took part in the studies. This lack of consistency in both methodology and populations makes it very difficult to compare prior studies.

Demographic factors such as age, education, and gender may be important factors in the relationship between CMC and literacy skills. For example, for age, Wood, Kemp, and Waldron (2014) found different results for children, adolescents, and young adults in the effects of texting on grammar skills. The possible role of education in the relationship between writing and textisms was confirmed by Rosen et al. (2010), who found negative associations with formal letter writing and positive associations with informal writing exercises, but these associations varied by education level. Research has noted differences regarding age, gender, and (to a lesser extent) education in CMC use and language use within written CMC. Adolescents have overall been found to use more CMC language than older users (Hilte, Vandekerckhove, & Daelemans, 2016, 2017; Schwartz et al., 2013; Verheijen, 2017). Females have been reported to use CMC more frequently and to incorporate more textisms and expressive markers (Baron, 2004; Rosen et al., 2010; Varnhagen et al., 2010; Grace & Kemp, 2015; Hilte, Vandekerckhove, & Daelemans, 2016). Youths with some college experience have reported using more textisms than those with a college degree and no college education (Rosen et al., 2010), while youths with more theoretical educational tracks have been found to use fewer non-standard features in CMC (Hilte, Vandekerckhove, & Daelemans, 2017). Such age-, gender-, and education-related differences in social media use may affect associations with literacy.

Prior studies in this area are, furthermore, limited in some ways. Most previous research studied the impact of only one medium, namely text messaging, on literacy; whether findings of these studies are generalizable to other social media is unclear. Secondly, as pointed out by Verheijen (2013), nearly all previous research involved correlational analyses, except for an intervention study (Wood et al., 2011a) and a couple of non-experimental longitudinal studies (Wood et al., 2011b; Wood, Kemp, & Waldron, 2014). The majority of studies are of a correlational nature and do not warrant conclusions about the causality of associations between CMC and literacy skills. The present study, however, transcends this limitation by including

experimental intervention, which allows us to investigate the direction of any relationship.

2.3 Quality of School Writings

Since the dawn of the digital age, traditional literacy has become supplemented with other kinds of new literacies, such as digital literacy, media literacy, and information literacy: it takes more than mere reading and writing skills to survive in this world of digital and multimodal technologies (Koltay, 2011; Mills, 2015). Nevertheless, traditional literacy skills are still crucial for achieving success in education, business, and life (e.g. Smit, Hazelzet, & Bohnenn, 2006; Powell, 2009; Twickler et al., 2009; Christoffels, Baay, Bijlsma, & Levels, 2016), and national exams in many countries, including the Netherlands, remain focused on these skills: youths need to show competence in understanding and producing written texts. The texts they produce at school are evaluated in terms of both content and form, and should be of a certain quality in order for them to be successful in education. This 'quality' is often holistically and somewhat subjectively determined by an expert, the teacher. Yet large-scale scientific studies, such as the present one, require an objective analysis of text quality. In determining how to operationalize writing quality, it should be noted that this quality hinges upon the context of writing. Relevant factors include the text genre, the writer's goals, and the intended readers' needs (Spooren, 2009; Louis, 2012). Jacobs (2008b) therefore rightly points out that "[w]hat is good essay writing for a high school [] class is not good writing for IM [instant messaging]" (205). Good writing should "meet […] the purposes of the author and fulfil [...] the requirements of the audience as defined by the social and cultural expectations of the community in which the writing is used" (ibid.). Writings via chat programs such as WhatsApp have very different demands: they are generally quick, spontaneous, and informal. School writings, on the other hand, are more formal and structured and should adhere to standard language conventions.

2.4 Indices of Text Difficulty and Quality

The concept of text quality is closely connected with that of text difficulty. Traditional formulas for objectively analysing the difficulty level of texts include the Flesch formula (Flesch, 1948) and Dale-Chall formulae (Chall & Dale, 1995). These readability indices are based on a restricted number of superficial linguistic features measuring lexical and/or syntactic complexity. Still, they have been proven to have good predictive validity, yet their construct validity – the degree to which they actually measure what they claim to measure – has been argued to be limited. More recent studies have suggested that analysis of text difficulty with digital tools, e.g. using natural language processing (NLP), is more accurate than these traditional models, since such tools can analyse texts for a much broader variety of linguistic features (Schwarm & Ostendorf, 2005; Heilman, Collins-Thompson, Callan, & Eskenazi, 2006; Pitler & Nenkova, 2008; Petersen & Ostendorf, 2009; Crossley et al., 2007, 2008). Their formulas include and combine measures of linguistic features related to syntax (e.g. grammatical constructions, embedding, number of noun and

verb phrases), lexis (e.g. word frequency), semantics, and discourse, as well as text cohesion, comprehension, and processing. Among the broadest of tools for automated textual assessment is the Coh-Metrix, which can analyze English texts for over 200 language and readability measures (McNamara, Graesser, McCarthy, & Zhiqiang, 2014). These tools often outperform traditional formulas in assessing text difficulty.

Other models, designed to objectively measure text quality, take into account yet other factors. Well-known is Renkema's (2000) CCC model, which measures the correspondence, consistency, and correctness of a text, i.e. whether the objectives of the author correspond with the wants of readers, whether style and lay-out are consistent throughout the text, and whether the text correctly adheres to spelling, grammar, and genre norms. Another model used to measure text quality of school writings, as affected by social media use, was designed by Spooren (2009), who included measures of both the writing product (lexical, grammatical, cohesion/coherence features) and the writing process (typing fluency, number of backspaces) and used software to compute some of these features. In view of these previous studies, the current study makes use of sophisticated computer software (T-Scan, see 3.3.2) that analyses Dutch texts for a wide range of linguistic features in order to establish their quality.

Our research into the impact of CMC on literacy aims to be a valuable addition to prior research, which does not provide any conclusive answers (Verheijen, 2013; Verheijen, Spooren, & Van Kemenade, submitted). The goal of this study is to determine whether Dutch youngsters' frequent use of social media affects their writing in an educational context. The medium we focused on is the chat program WhatsApp, a currently very popular medium in the Netherlands. We conducted an experiment to find out whether engaging in synchronous written CMC via WhatsApp directly impacts youths' productive or receptive school writing skills, as measured via story writing and grammaticality judgement tasks[58]. This approach was taken since we are interested in participants' aptitude for switching between registers, so their ability to use the register of Standard Dutch, as expected at school, after being exposed to the register of informal CMC. If effects of social media use on school writing (as measured by the experimental groups' performance on the writing tasks) already appear after being primed by WhatsApp for a brief stretch of time, it can be assumed that youths' continuous use of social media in real life will cause continuous priming and, as a consequence, a long-lasting impact on their school writing skills. Vice versa, if there are any long-term effects of social media use on school writing skills, there should at the very least also be short-term effects. Our first research question is thus as follows:

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[58] Rather than an experimental study, an obvious methodology for trying to answer our research question is a longitudinal study comparing social media users to non-users of social media. However, such an approach is practically impossible, since all Dutch youths in secondary and tertiary education now use social media to a greater or lesser extent, so finding a control group for participants of these ages would be impossible.

> RQ1. Does Dutch youths' use of CMC (specifically, WhatsApp) directly affect their school writing skills?

Based on a pilot study (Riemens, 2016) which employed a methodology comparable to that used in this study, we hypothesize, regarding our first research question, that WhatsApp use has a direct impact on Dutch youths' school writings. Riemens found that participant groups who were primed with WhatsApp significantly differed from control groups in two writing tasks: the former used more orthographic deviations from Standard Dutch in their texts, and they had more difficulty in spotting deviations in pre-constructed sentences which deliberately contained such 'errors'. We expect the present study to support these results.

Furthermore, we aim to establish whether the three demographic variables of age, education, and gender have an effect on youths' school writing skills: as mentioned above, previous research suggests that these factors may moderate any impact of CMC on writing skills. The analysis will, therefore, include four independent variables: not only experimental condition (exposure vs. non-exposure to WhatsApp), but also educational level (lower vs. higher), age group (adolescents vs. young adults), and gender (boys vs. girls). This leads to our second research question:

> RQ2. If any direct effects of Dutch youths' CMC use on their school writing skills are found, do age group, educational level, and/or gender moderate these effects? If so, how?

As for the second research question, we hypothesize that if a direct impact of CMC use on school writing skills can be found, a greater impact will be displayed by youths of a younger age group or with a lower educational level. Younger writers have, after all, been confronted with social media and chat programs from childhood, when their literacy skills had not yet fully developed and were still fluid, which increases the chances of interference occurring between different written registers. In contrast to the writing culture common in higher educational levels, lower educated youths are more used to practical education and much less to writing formal texts and switching between genres and registers; therefore, it is conceivable that any literacy problems arising from the use of written CMC are more likely to occur in such groups. Prior research also suggests that youths of a lower educational track have more trouble distinguishing informal online writing from more formal offline writing repertoires (Vandekerckhove & Sandra, 2016). In Dowdall's (2006) terms, such youths may experience more "dissonance" between writing as a leisure activity, as in CMC, versus for school (162). It may thus be more difficult for lower educated or younger participants to smoothly switch between different registers, i.e. the register of informal written CMC and of school texts, and to keep these separate.

3. Methodology

We conducted an experiment with participants of different educations and ages. Each class was split up at random: half of the participants were primed with CMC; the other half coloured. They all wrote stories and completed grammaticality judgement tasks, to test their productive and receptive school writing skills.

3.1 Participants

Participants were 500 youths from numerous secondary and tertiary educational institutions, from different educational levels and age groups, all in Nijmegen and surroundings. For the final analyses, we excluded one group of participants, so we used data of 408 of the 500 youths.[59] The data collection period lasted from October to December 2016. Testing took place in an educational setting. Most participants were tested in class; only a small number of participants in higher tertiary education voluntarily took part outside of class. The latter were reimbursed for their participation with gift certificates of € 5. University students belonged to different faculties and academic disciplines, including communication and information sciences, biology, and literary and cultural studies. The adolescents ($N = 300$, data used of $N = 208$) were around 14 years old (for $N = 208$: $\bar{x}$ age = 14.1 yrs, range 13-16; 107 male, 101 female), all in the third grade. The young adults ($N = 200$) were around 20 years old ($\bar{x}$ age = 20.4 yrs, range 18-27; 72 male, 128 female). Youths of these age groups were selected since adolescents and young adults are heavy users of social media, so for them the impact on literacy skills can be feared to be greatest. Table 1 shows an overview of the participants included in the analyses.

Table 1. Overview of participants (excl. 92 from 'havo', see footnote 59).

| | | **Educational level** | | |
		lower	higher	Total
Age group	adolescents (secondary education)	101 'vmbo'	107 'vwo' (58 'atheneum', 49 'gymnasium')	208
	young adults (tertiary education)	102 'mbo'	98 uni	200
	Total	203	205	408

Note: '*vmbo*': 'voorbereidend middelbaar beroepsondersijs', lower secondary professional education; '*mbo*': 'middelbaar beroepsondersijs', intermediate vocational education; '*vwo*': 'voorbereidend wetenschappelijk onderwijs', pre-university education; '*atheneum*': ± grammar school; '*gymnasium*': ± grammar school with classics.

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[59] 92 participants of the intermediate secondary educational level, i.e. with education *havo*, were part of the data collection. Yet because it turned out not to be feasible to collect data from their young adult counterpart (intermediate tertiary educational) and we had no clear theoretical expectations about this intermediate level, this group was eventually omitted from the analyses rather than having an empty cell in the research design.

Afterwards, underage participants were given a document with more information about the study and our contact details, to take home to their parents or guardians, and were thanked for their participation. In case participants were interested, and time permitting, we eventually explained the point of the study (if that was not clear yet) and elaborated on the overall research goals of the first author's PhD project.

3.2 Data Collection

The data collection procedure involved two phases. First, the priming phase (section 3.2.1), in which each class was randomly divided into two groups. Experimental groups were primed with WhatsApp (3.2.1.1), while control groups carried out a control task (3.2.1.2). Then, all participants' school writing skills were measured (section 3.2.2): their productive skills via stories (3.2.2.1) and their receptive skills via grammaticality judgement tasks (3.2.2.2).

3.2.1 Priming Phase

3.2.1.1 Experimental Groups: WhatsApp

During the first phase of the data collection, experimental groups were primed with CMC via social media. They were instructed to chat via WhatsApp on their own smartphones for fifteen minutes. This medium was selected for several reasons. First of all, practically all Dutch youths use WhatsApp nowadays: it is now the largest social media platform in the Netherlands (Van der Veer, Boekee, Hoekstra, & Peters, 2018) and over 90 per cent of all Dutch smartphone owners has installed WhatsApp (Van der Zwaag, 2017). As a consequence, participants were familiar with the medium and, conveniently, already had the app installed on their phones. Secondly, WhatsApp involves near-synchronous CMC, so it is a writing genre in which communication practically takes place in real time and which usually resembles informal spoken conversation (as opposed to writing tweets or Facebook posts), in stark contrast with the school writing that was tested. In addition, despite the possibilities of including audio and visuals (images, videos, emoji) in WhatsApp chats, textual content is still a crucial part of this medium. This contrasts sharply with two other social media that are currently popular among Dutch youths, namely Instagram and Snapchat (Oosterveer, 2017; Van der Veer et al., 2018), which are much more focused on sending and receiving visuals rather than text. One more practical reason for choosing this medium is that WhatsApp chats can be easily exported via the mobile app by sending them via email, as opposed to, for example, chats in Facebook Messenger.

All students had been instructed beforehand by their teachers to bring their mobile phones to class – although, of course, only half of them were allowed to use these during the data collection. To increase the efficiency of the testing procedure, WhatsApp groups had been formed in advance by the teacher. He/She was asked to ensure a roughly equal division of boys and girls in the experimental versus control groups, as well as to take friendships among classmates into consideration, so as to minimize the awkwardness of the somewhat forced in-class WhatsApp chats.

The chats took place in small groups of three or four students rather than in dialogues, since the former can be supposed to entail fewer breaks in the conversation if one of the interlocutors were to fall silent, and thus to more exposure to CMC. They could chat about whatever they preferred; no obligatory conversation topics were provided, in order to generate as naturalistic chat conversations as possible, like messages they would actually send to friends and peers outside of class. They were asked to chat via WhatsApp as they would in daily life. Participants were only requested to send their chats to the researchers *after* the testing phase, so that their texts resembled those written in private, non-experimental conditions as much as possible. It was suggested they could app about their weekend, holiday, hobbies, sports, food, etc.: these topics were proposed as inspiration for their WhatsApp chats. They were asked to app individually and in silence, so no oral conversations or voice messages were allowed – only typing. Additionally, they were discouraged from sending pictures, again to maximize their use of and exposure to written CMC language within the fifteen-minute timespan.[60]

3.2.1.2 Control Groups: Colouring

While half of the participants chatted via WhatsApp, the control groups performed a control task, namely colouring mandalas. This task was chosen because first of all, it is not related to CMC and does not involve language, whether standard or non-standard. Moreover, it is practicable (and, we hoped, enjoyable) for all youths involved in the study, irrespective of their education or age. The activity of drawing or colouring mandalas has also been claimed to be calming, relaxing, even therapeutic (Jung, 1972; Kovacs-Donaghy, 2013; Borman, 2016), which was very practical for keeping the participants focused and quiet, while not distracting the participants in the experimental groups. What is more, a pilot study already showed that this procedure was effective in measuring the direct impact of CMC use on writing skills: it successfully revealed differences with respect to produced orthography and perceived language correctness (Riemens, 2016). Alternative control tasks were tested in other pilot studies, such as doing sums, solving sudokus (number-placement puzzles), or underlining certain letters in a text fragment, but these turned out to be less effective or unsuitable for participants of all age groups and educational levels.

The mandalas were printed on A4-format. The designs used are shown in Figure 1. These were randomly distributed among the control group participants, but if they uttered a specific preference for another design, they were allowed to swap with classmates. Participants were provided with coloured pencils and sharpeners. They were urged to take the task seriously and perform it individually and in silence. More importantly, they were instructed not to use their mobile phones during the colouring phase or afterwards, in case they had finished the mandala (but this was very rare – only five participants managed to completely finish the mandala within fifteen minutes!). Despite some initial hesitations among some (especially older,

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[60] The use of emoji was, of course, allowed, since these are an essential part of youths' WhatsApp chats.

higher educated, or male) participants, most of them afterwards expressed their enjoyment in executing this task.
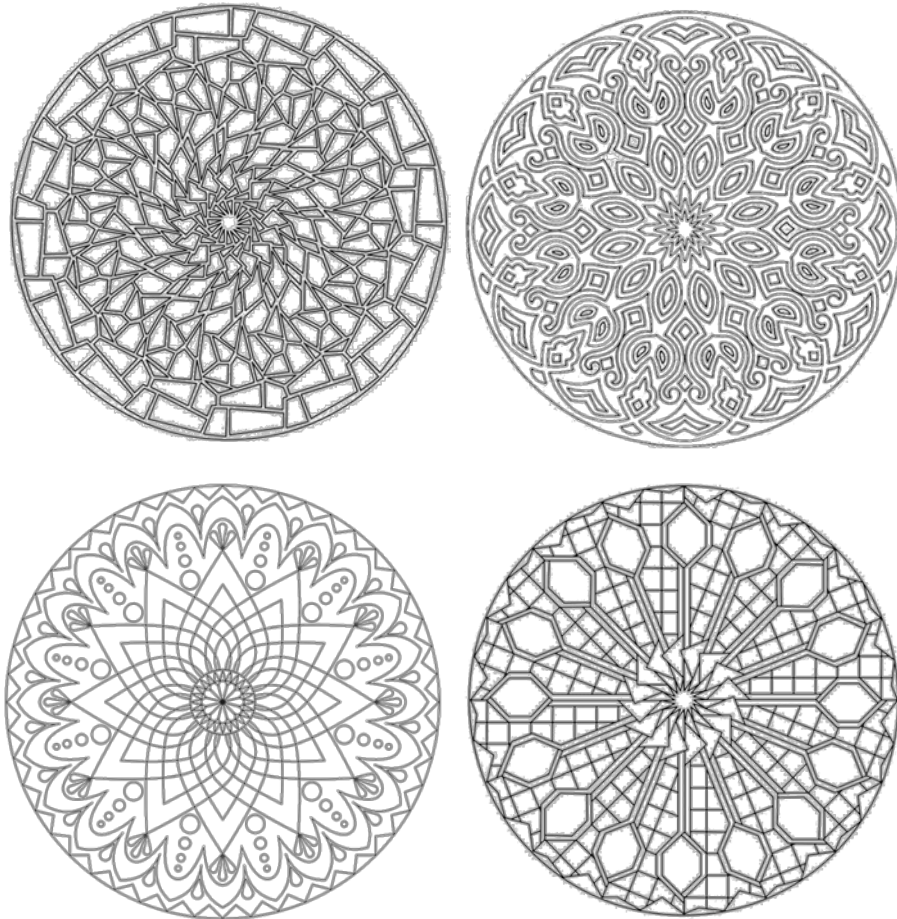
Figure 1. Mandalas used for control task.

3.2.2 Testing Phase

3.2.2.1 Productive Writing Skills: Stories

The testing phase involved measuring productive and receptive writing skills. To test their productive skills, all participants wrote a story. The writing genre that was analysed was thus that of narrative storytelling. This genre is typical for writing at school. Another possible genre central in the Dutch curriculum is that of expository discussion, which was used during a previous study when participants were asked to produce essays (Verheijen, Spooren, & Van Kemenade, submitted). However, some

youths then turned out to be more concerned about their argumentation in the essays than about producing large amounts of text, so this genre was dispreferred for the present study.

The stories had to start with the following pre-determined sentence: "I was alone in a dark room. My hand groped for the light switch, but suddenly…" (translated from Dutch). This sentence was provided so that participants had a starting point for their stories, to give them ideas and inspiration. Again, the importance of individual and quiet completion of the task was emphasized. No participants were allowed to use mobile phones during this task, since that might affect the writing process, yet participants in the experimental groups were allowed to use WhatsApp if they had finished writing their story, until the commencement of the next assignment.

Because participants were tested at multiple schools, with varying availability of digital tools, not all classes had easy access to computers and laptops. Therefore, we had all participants write hand-written stories for the sake of consistency. An added advantage of not having students type their stories was that they had no access to spelling or grammar checkers. The texts were typed out afterwards – exactly as they were written, including all deviating spelling, grammar, punctuation, capitalisation, etc. – so that they could be analysed by computer software.

3.2.2.2 Receptive Writing Skills: Grammaticality Judgement Tasks

After writing their stories, participants completed grammaticality judgement tasks (GJTs), to test their receptive grammar and spelling skills. These consisted of twenty sentences, as shown in Table 2 overleaf, in which they had to judge whether sentences had been written in 'correct' Dutch or not: they had to spot and correct 'language errors'. These were orthographic deviations typical of CMC: various types of textisms (phonetic respelling, reduplication of letter, shortening, single letter homophone, initialism); missing capitalisation, diacritics, and punctuation; spelling 'errors' that are heavily frowned upon by Dutch language prescriptivists (*is/eens, d/t, jou/jouw*); emoticons; omissions; English borrowings; and extra spacing. Five sentences contained no orthographic deviations, so participants could spot and correct a maximum of fifteen 'errors'. Once again, the task has to be executed individually, in silence, and without a mobile phone.

3.3 Data Analysis

The data analysis consisted of four phases. The grammaticality judgement tasks were processed by computing two scores (section 3.3.1). The writing quality of the stories was determined with analyses with T-Scan software (section 3.3.2) and, subsequently, a principal component analysis (section 3.3.3). Finally, regression analyses were conducted to test whether condition and/or demographic variables (educational level, age group, and gender) were significant predictors of the GJT scores or the writing quality of the stories (section 3.3.4).

Table 2. GJT sentences.

No.	Sentence	(In)correct	Error type
1	Vanavond gaan zij naar de bioscoop.	correct	
2	<u>Heej</u>, de melk is alweer op.	incorrect	textism: phonetic respelling
3	Je weet wel wat ik bedoel <u>;)</u>	incorrect	emoticon
4	Ga jij ook naar het feestje van <u>emma</u>?	incorrect	missing capitalisation
5	Mam heeft jouw sleutels gevonden.	correct	
6	Die oude man was <u>zn</u> paraplu vergeten	incorrect	missing diacritic
7	Geef mij <u>is</u> de zak chips!	incorrect	spelling 'error': *is/eens*
8	Ik weet <u>totaaal</u> niet waar je het over hebt	incorrect	textism: reduplication of letter
9	Ben er over vijf minuten.	incorrect	omission
10	De hond moet sowieso mee op vakantie.	correct	
11	Ik <u>vindt</u> het een goed idee.	incorrect	spelling 'error': *d/t*
12	Het afscheid na de date voelde echt <u>awkward</u>.	incorrect	English borrowing
13	De groeten! We gaan <u>na</u> huis.	incorrect	textism: shortening
14	Hun nieuwe wiskundeleraar is best oké.	correct	
15	De <u>trein botsing</u> zorgde voor veel vertraging.	incorrect	extra spacing
16	Wat een vies weer, <u>t</u> regent al de hele dag.	incorrect	textism: single letter homophone
17	Maar vertel eens, hoe was <u>jou</u> weekend?	incorrect	spelling 'error': *jou/jouw*
18	Ik heb het huiswerk <u>btw</u> niet af…	incorrect	English textism: initialism
19	Hoe laat begint de film ook alweer, denk je?	correct	
20	Gelukkig is deze les bijna voorbij	incorrect	missing punctuation

3.3.1 GJT Scores

For the grammaticality judgement tasks, two scores were computed for each participant. First, the choice score: whether they correctly identified the sentence as containing an 'error' or not (max. 20 points). Second, the correction score: whether they correctly managed to correct it (max. 15).

3.3.2 Analysis of Writing Quality

As stated in our theoretical discussion above, the notion of writing quality is complex and context-dependent. Given the set-up of the present study, the only way to analyse the stories we collected was afterwards, solely on the basis of the product. Although this approach might not be ideal, the quality of our participants' texts had to be established in isolation. Nevertheless, it was practically feasible to analyse the texts at multiple levels (following Spooren, 2009), so given the limitations of a one-dimensional analysis, we conducted a multidimensional analysis of text quality. The stories were automatically analysed with quantitative linguistic measures using T-Scan, software for conducting complexity analyses of Dutch texts (Pander Maat et al., 2014). We selected T-Scan because it is current, up-to-date, and continuously improved, as well as available free of charge. To our knowledge, there was no other software that could analyse Dutch texts on so many levels (word, sentence, and text) and such a broad range of features. All texts were formatted to make them suitable for analysis with T-scan, according to the T-scan guidelines (Pander Maat, Kraf, & Dekker, 2016). T-Scan provided us with a staggering 411 variables, out of which a selection of 27 relevant variables was made, following a previous study (Verheijen, Spooren, & Van Kemenade, submitted). These were divided into six categories, namely length measures, structural measures, diversity & density measures, verbal measures, nominal measures, and other parts of speech measures. The selection of these variables crucially depended on their combined meaningfulness for analysing school writings (see Verheijen, Spooren, & Van Kemenade, submitted). In selecting the variables, we also took into consideration that the same notion is often measured by several T-Scan variables, e.g. Lijdv_d ('density' of passive forms, i.e. number of passives per 1000 words) and Lijdv_dz (number of passives per clause). To avoid multicollinearity in the subsequent statistical analysis, we selected only one representative for such a set of variables. The variables we chose are listed below with their original T-Scan names (underlined) plus their definition. NB: all 'density' measures count the average frequency of a feature per 1,000 words.

Length measures:
1) <u>Zin_per_doc</u>: number of sentences per essay
2) <u>Word_per_doc</u>: number of words per essay
3) <u>Wrd_per_zin</u>: number of words per sentence (average)
4) <u>Let_per_wrd</u>: number of letters per word (average)

Structural measures:
5) <u>Bijzin_per_zin</u>: number of subordinate clauses (finite + infinitival) per sentence
6) <u>D_level</u>: D-level [developmental level]
7) <u>AL_gem</u>: average of all dependency lengths per sentence
8) <u>AL_max</u>: maximal dependency length per sentence

Diversity & density measures:
9) <u>TTR_wrd</u>: type-token ratio (for words)
10) <u>MTLD_wrd</u>: measure of textual lexical diversity (for words)
11) <u>Inhwrd_d</u>: density of content words [lexical density]

Verbal measures:

12) <u>Pv_Frog_d</u>: density of finite verbs
13) <u>Ww_mod_d</u>: density of modal verbs
14) <u>Huww_tijd_d</u>: density of auxiliary verbs of time
15) <u>Koppelww_d</u>: density of copula verbs
16) <u>Imp_ellips_d</u>: density of imperatives and elliptical constructions
17) <u>Lijdv_d</u>: density of passive forms

Nominal measures:

18) <u>Nw_d</u>: density of nouns
19) <u>Pers_vnw_d</u>: density of personal and possessive pronouns
20) <u>Nom_d</u>: density of nominalisations
21) <u>Spec_d</u>: density of proper nouns, names and special words

Other parts of speech measures:

22) <u>Bijw_bep_d</u>: density of adverbials
23) <u>Vg_d</u>: density of conjunctions
24) <u>Lidw_d</u>: density of articles
25) <u>Tuss_d</u>: density of interjections
26) <u>Interp_d</u>: density of punctuation
27) <u>Afk_d</u>: density of abbreviations

3.3.3 Identifying Writing Variables

The twenty-seven variables selected from the T-Scan analysis of the stories were still too many to put into a regression analysis, so we used exploratory factor analysis (with the extraction method of principal component analysis, PCA) to further reduce these to a set of writing components indicative of the quality of the stories.

An orthogonal rotation method was chosen, namely varimax with Kaiser normalization: this method, which does not allow correlations between factors, facilitated the interpretation of results, since it maximizes the spread of loadings for a variable across all factors. There was no multicollinearity, because none of the correlation coefficients were $r \geq .84$. Missing values were replaced with the mean, because listwise deletion would result in a loss of participants in the analysis, and pairwise deletion would lead to a non-positive definite matrix. The Keyser-Meyer-Olkin measure was well above .5 ($KMO = .644$), which verified the sampling adequacy for the analysis. Bartlett's test of sphericity showed that correlations between items were sufficiently large for PCA: χ^2 (351) = 6267.569, $p < .001$. The proportion of residuals with an absolute value greater than 0.05 was 50%. An initial analysis yielded eigenvalues for each component in the data. The large sample size of this study allowed us to use a scree plot with eigenvalues over 1 for deciding how many components to extract. The inflexion of the scree plot was not quite clear: it justified retaining three up to five components. We tried the PCA with all these options, and finally decided to retain three components, since the items that clustered on these were practically identical to those identified in a previous study (Verheijen, Spooren, & Van Kemenade, submitted): this is a solid confirmation of the appropriateness of these writing variables in analysing student texts for their writing quality.

Table 3 shows the results of the PCA after rotation. The items that cluster on the same components suggest that component 1 represents syntactic complexity (> .40 = high complexity, < -.40 = low complexity), component 2 lexical richness (> .40 = high richness, < -.40 = low richness), and component 3 writing productivity (> .40 = high productivity, < -.40 = low productivity). The total variance explained by the three factors is 38.08%. The resulting factor scores were saved as Anderson-Rubin variables.

Table 3. Summary of PCA results for the essay analysis.

Rotated Component Matrix

Writing variable	Rotated factor loadings		
	1	2	3
AL_max	**.868**	.141	.106
D_level	**.818**	-.193	.016
Bijzin_per_zin	**.792**	-.089	.077
AL_gem	**.764**	.221	.232
Wrd_per_zin	**.720**	.004	-.087
Interp_d	**-.718**	-.077	.065
Vg_d	**.556**	-.287	.072
Tuss_d	-.240	-.117	.186
Bijw_bep_d	.221	-.004	.107
Spec_d	-.147	.016	-.057
Pv_Frog_d	-.167	**-.762**	-.037
Nw_d	-.059	**.698**	-.166
Pers_vnw_d	-.102	**-.680**	.066
Let_per_wrd	-.002	**.624**	-.153
Inhwrd_d	-.045	**.554**	.054
Lidw_d	-.047	**.520**	-.232
MTLD_wrd	-.060	**.450**	.004
Nom_d	-.034	**.423**	.028
Koppelww_d	-.127	-.189	.020
Ww_mod_d	.057	-.145	.136
Imp_ellips_d	.039	-.099	.066
Word_per_doc	.023	.004	**.917**
TTR_wrd	-.141	.281	**-.800**
Zin_per_doc	**-.529**	-.038	**.782**
Huww_tijd_d	-.078	-.043	-.378
Lijdv_d	-.038	.028	-.139
Afk_d	-.095	.053	-.095
Eigenvalues	4.496	3.246	2.539
% of variance	16.652	12.021	9.405

Note: factor loadings > .40 or < -.40 appear in bold and grey.

High values for syntactic complexity, lexical richness, and writing productivity may suggest that school writings of the genre of narrative storytelling have a higher text quality: the production of sentence structures that are complex, of vocabulary that is varied and informationally dense, and of a greater volume of text are suggestive of more literary stories and are usually valued by teachers in educational settings.

3.3.4 Testing the Hypotheses

The next step of the statistical analysis was linear multiple regression. The outcome variables were the three A-R factor scores (of syntactic complexity, lexical richness, and writing productivity) resulting from the principal component analysis of the stories and the two GJT scores. The predictor variables were condition (colouring versus WhatsApp), the three demographic variables educational level, age group, and gender, plus all interactions between condition and the demographic variables. There were no strong correlations (r > .9) between the predictors. They were entered with the forced entry method in four blocks.[61],[62] The first block of the regression only contained the main effects. The interactions were entered in subsequent blocks, first two-way (block 2), then three-way (block 3), and finally the four-way interaction (block 4).

4. Results

The means and standard deviations of participants' performances on the story writing task and grammaticality judgement task (GJT) are shown in Table 4:

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[61] Several regression analyses were conducted: for all students, but also for the separate age groups (adolescents, young adults), educational levels (lower, higher), and educations (*vmbo*, *vwo*, *mbo*, *uni*), to see if condition was a significant predictor variable for specific participant groups. However, since this did not turn out to be the case, only the results for all students are reported here.

[62] As there is a hierarchy within the random variables (students are embedded within different schools), for each of the dependent variables multilevel regression analyses were carried out, with schools as a random factor and condition, educational level, age group, and gender as predictors. In all cases, the analyses led to very similar results as the regression analyses reported in the paper. For the sake of simplicity, we decided to report only the traditional regression analyses.

Table 4. Descriptive statistics.

Predictor variables	Outcome variables				
	Stories			GJTs	
	Syntactic complexity: $\bar{x}$ (SD)	Lexical richness: $\bar{x}$ (SD)	Writing productivity: $\bar{x}$ (SD)	Choice score: $\bar{x}$ (SD)	Correct-ion score: $\bar{x}$ (SD)
Condition:					
Colouring (N = 207)	-0.02 (1.00)	0.06 (1.04)	0.00 (1.09)	14.44 (3.16)	13.82 (1.03)
WhatsApp (N = 201)	0.07 (1.05)	0.09 (0.96)	0.03 (0.99)	14.71 (3.04)	13.74 (0.99)
Educational level:					
Lower (N = 203)	0.19 (1.06)	-0.03 (0.93)	-0.17 (1.04)	12.68 (2.87)	13.53 (0.99)
Higher (N = 205)	-0.13 (0.96)	0.18 (1.06)	0.20 (1.00)	16.44 (2.00)	14.03 (0.96)
Age group:					
Adolescents (N = 208)	0.01 (1.14)	-0.24 (0.92)	0.00 (1.08)	14.10 (3.09)	13.75 (1.01)
Young adults (N = 200)	0.05 (0.88)	0.40 (0.98)	0.03 (1.00)	15.06 (3.04)	13.81 (1.01)
Gender:					
Male (N = 179)	0.16 (1.16)	0.09 (1.00)	-0.14 (1.11)	14.25 (3.14)	13.60 (1.02)
Female (N = 229)	-0.08 (0.89)	0.06 (1.00)	0.14 (0.97)	14.82 (3.06)	13.92 (0.98)
Total (N = 408)	0.03 (1.02)	0.07 (1.00)	0.01 (1.04)	14.57 (3.10)	13.78 (1.01)

Tables 5, 6, 7, 8, and 9 below show the results of the linear multiple regressions, per dependent variable, i.e. syntactic complexity, lexical richness, writing productivity, GJT choice score, and GJT correction score. The significant predictor variables are in bold and grey. Figures 2 up to 8 present box plots of the outcome variables for the significant predictor variables and significant interactions.

4.1 Syntactic Complexity

One writing component was syntactic complexity. As shown in Table 5 and Figure 2, educational level was a significant negative predictor (β = -.16**): higher educated youths wrote syntactically less complex stories. Gender was a significant negative predictor (β = -.12*), which is an artefact of the coding: male participants (coded as 0) wrote syntactically more complex stories than female participants (coded as 1).

Table 5. Linear multiple regression of syntactic complexity.

Independent variables	Dependent variable: syntactic complexity			
	B	SE B	β	p
Condition	0.09	0.10	.04	
Educational level	**-0.32**	**0.10**	**-.16**	**
Age group	0.06	0.10	.03	
Gender	**-0.24**	**0.10**	**-.12**	*
R^2	.04			
ANOVA	F (4, 403) = 4.24 ($p < .01$)			

Note: *$p < .05$, **$p < .01$.
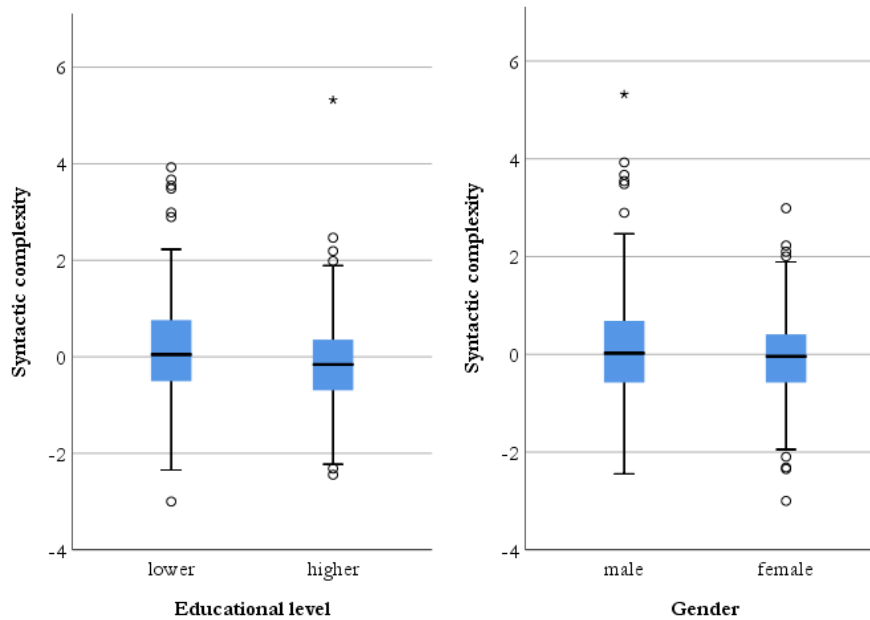
Figure 2. Simple boxplots of syntactic complexity for the significant predictors.

4.2 Lexical Richness

The second writing component was lexical richness. Table 6 and Figure 3 reveal that lexical richness was positively predicted by educational level ($\beta = .16$*) and age group ($\beta = .32$***): the stories of higher educated and of older participants were lexically richer. In addition, there was a significant interaction between gender and experimental condition ($\beta = -.22$**).

Table 6. Linear multiple regression of lexical richness.

Independent variables	B	SE B	β	p
	Dependent variable: lexical richness			
Condition	0.32	0.19	.16	
Educational level	**0.31**	**0.13**	**.16**	*****
Age group	**0.64**	**0.13**	**.32**	*******
Gender	0.11	0.13	.06	
Educational level × Condition	-0.14	0.19	-.06	
Age group × Condition	0.08	0.19	.03	
Gender × Condition	**-0.50**	**0.19**	**-.22**	******
R^2	.13			
ANOVA	$F(7, 400) = 8.90$ ($p < .001$)			

Note: **p* < .05, ***p* < .01, ****p* < .001.
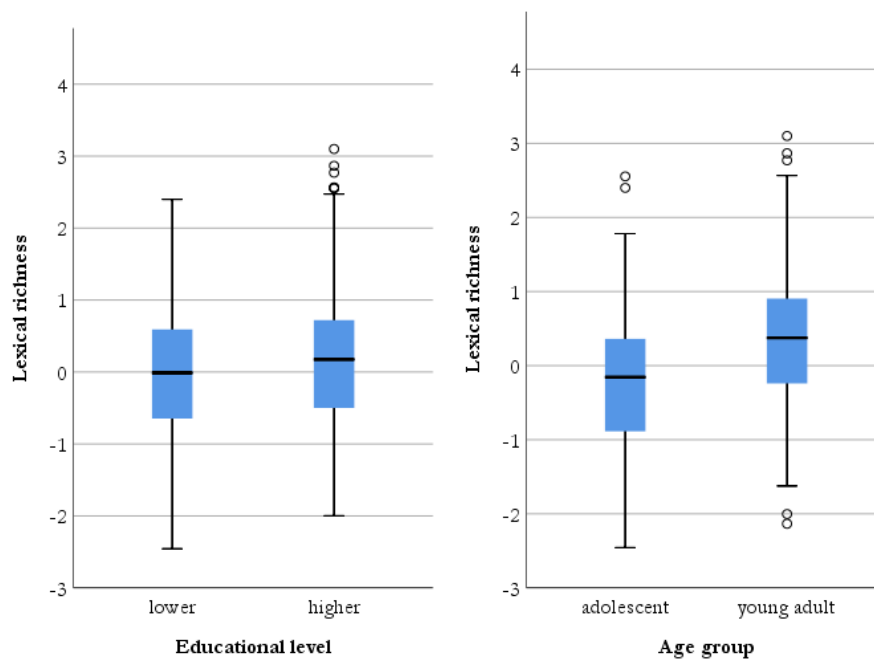
Figure 3. Simple boxplots of lexical richness for the significant predictors.
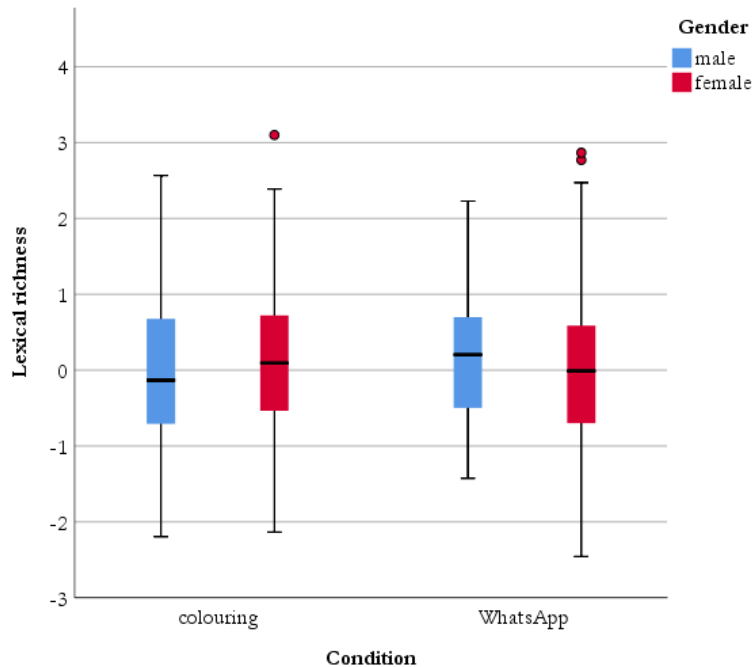
Figure 4. Clustered boxplot of lexical richness for the significant interaction.

This interaction was further explored with a simple moderation analysis using PROCESS (Hayes 2013), which estimated the conditional effect of condition (colouring vs. WhatsApp) on lexical richness at the two values of the moderator gender. The interaction is visualised in Figure 4. For the male participants, there was a significant positive relationship between condition and lexical richness, $b = 0.285$, 95% CI [0.002, 0.568], $t = 1.98$, $p < .05$, so the preceding use of WhatsApp positively affected the lexical richness of boys' stories. When the gender was female, there was a non-significant negative relationship between condition and lexical richness, $b = -0.203$, 95% CI [-0.447, 0.042], $t = -1.63$, $p = .104$. In other words, the relationship between condition and lexical richness actually only emerged for boys.

4.3 Writing Productivity

The third component is writing productivity. As can be seen in Table 7 and Figure 5, writing productivity was positively predicted by educational level ($\beta = .18^{***}$): youths with a higher educational level produced significantly longer stories. Gender was a significant positive predictor of writing productivity too ($\beta = .13^{**}$): female participants wrote longer stories than male participants.

Table 7. Linear multiple regression of writing productivity.

Independent variables	Dependent variable: writing productivity			
	B	$SE\ B$	β	p
Condition	0.03	0.10	.01	
Educational level	**0.37**	**0.10**	**.18**	*******
Age group	-0.01	0.10	.00	
Gender	**0.27**	**0.10**	**.13**	******
R^2	.05			
ANOVA	$F\ (4,\ 403) = 5.19\ (p < .001)$			

Note: **p < .01, ***p < .001.
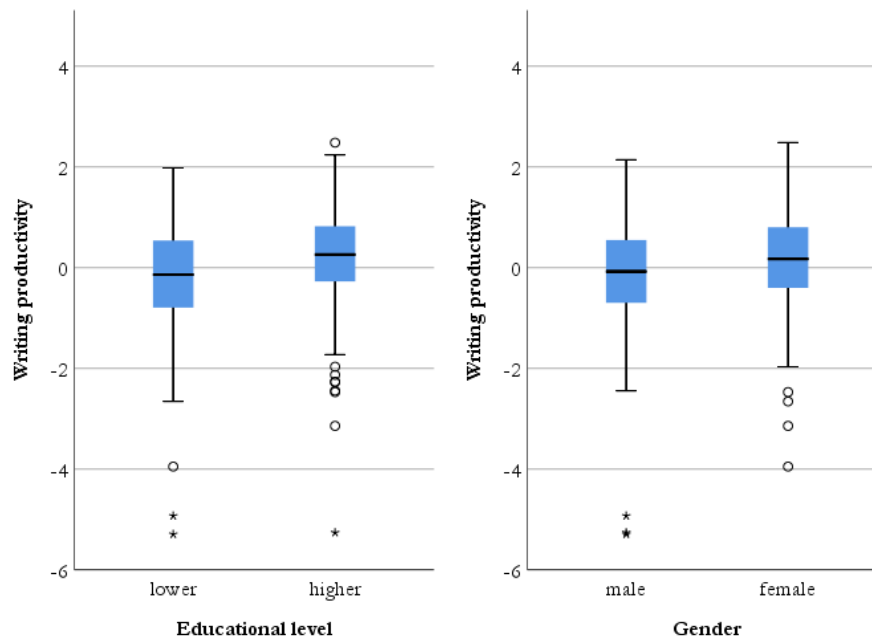
Figure 5. Simple boxplots of writing productivity for the significant predictors.

4.4 GJT Choice Score

For the grammaticality judgement tasks, Table 8 and Figure 6 show that educational level (β = .61***) and age group (β = .16***) were significant positive predictors of the choice score, so higher educated and older youths were more successful in spotting 'language errors' in the twenty sentences with which they were presented.

Table 8. Linear multiple regression of GJT choice score.

Independent variables	Dependent variable: GJT choice score			
	B	$SE\ B$	β	p
Condition	0.21	0.24	.03	
Educational level	**3.77**	**0.24**	**.61**	*******
Age group	**0.99**	**0.24**	**.16**	*******
Gender	0.35	0.24	.06	
R^2	.40			
$ANOVA$	$F\ (4, 403) = 67.21\ (p < .001)$			

Note: ***$p < .001$.
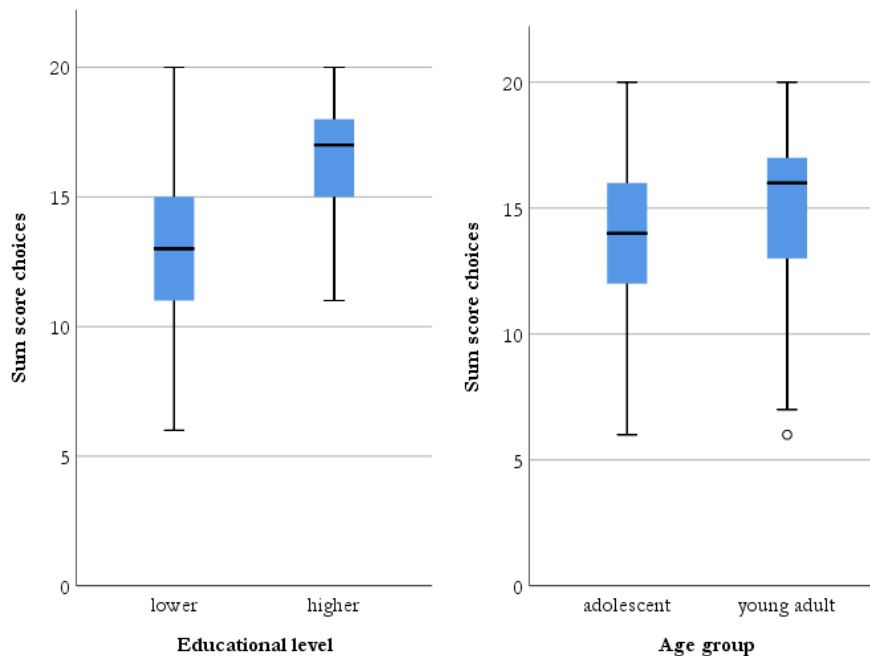
Figure 6. Simple boxplots of GJT choice score for the significant predictors.

4.5 GJT Correction Score

The correction score, presented in Table 9 and Figure 7, was significantly positively predicted by educational level (β = .20**) and gender (β = .25***): both higher educated and female participants were more successful in correcting 'language errors'. The interaction between gender and experimental condition was also significant (β = -.20*).

Table 9. Linear multiple regression of GJT correction score.

Independent variables	Dependent variable: GJT correction score			
	B	$SE\ B$	β	p
Condition	-0.09	0.19	-.05	
Educational level	**0.39**	**0.13**	**.20**	**
Age group	-0.11	0.14	-.06	
Gender	**0.51**	**0.14**	**.25**	***
Educational level × Condition	0.22	0.19	.10	
Age group × Condition	0.31	0.19	.13	
Gender × Condition	**-0.44**	**0.20**	**-.20**	*
R^2	.11			
$ANOVA$	$F\ (7,\ 400) = 6.71\ (p < .001)$			

Note: *$p < .05$, **$p < .01$, ***$p < .001$.
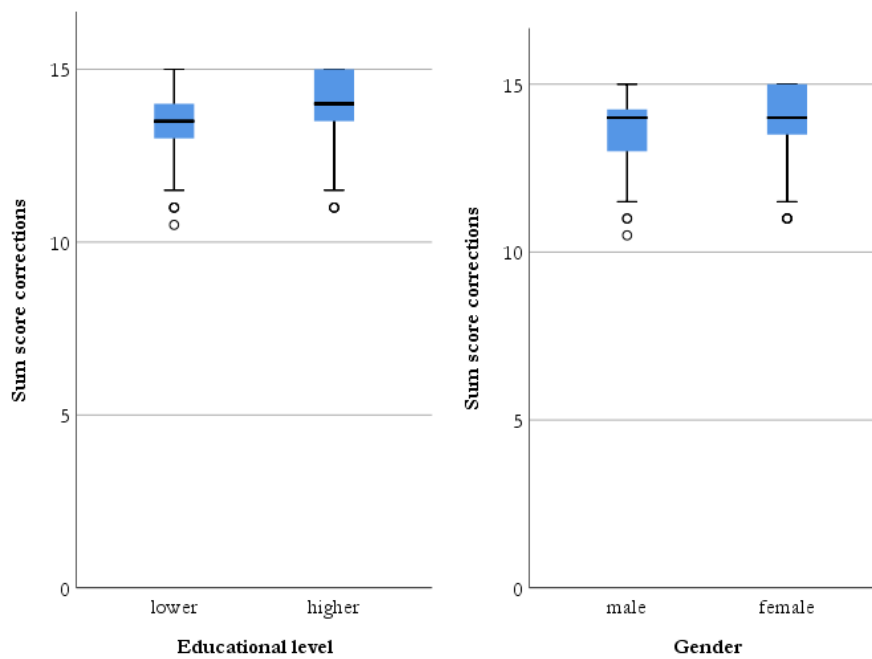
Figure 7. Simple boxplots of GJT correction score for the significant predictors.
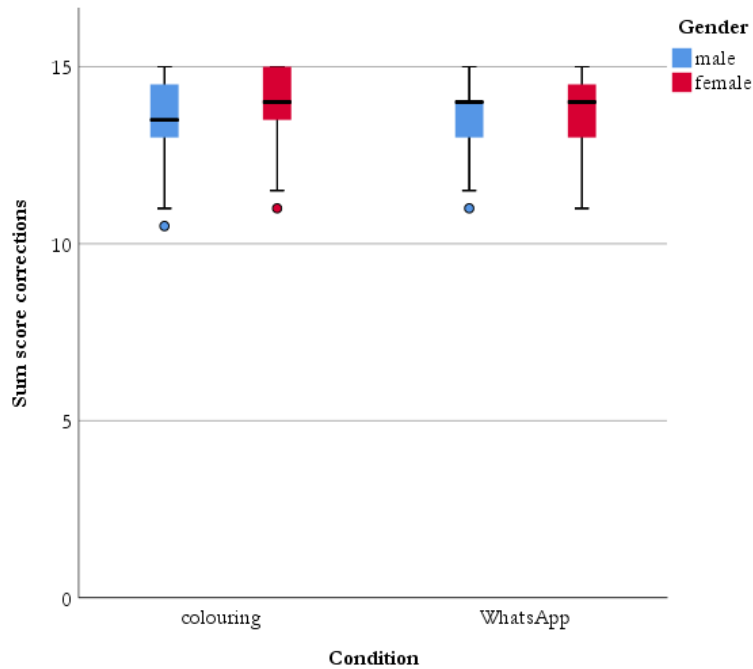
Figure 8. Clustered boxplot of GJT correction score for the significant interaction.

Again, the interaction was scrutinised with a simple moderation analysis. This estimated the conditional effect of condition on the GJT correction score at the two values of gender. For girls, WhatsApp had a small negative effect on their correction score: when the gender was female, there was a significant negative relationship between condition and correction score, b = -0.247, 95% CI [-0.489, -0.004], t = -2.00, p < .05, so using WhatsAp immediately before completing the writing tasks negatively affected girls' ability to correct orthographic deviations in GJTs, as compared to colouring beforehand. When the gender was male, there was a non-significant positive relationship between condition and correction score, b = 0.143, 95% CI [-0.160, 0.445], t = 0.93, p = .354. The relationship between condition and correction score thus only really emerged for girls, but, as can be seen in Figure 8, was rather minute.

An overview of the results of all the linear multiple regressions is presented in Table 10:

Table 10. Overview of positive or negative predictors of outcome.

Predictor variables	Syntactic complexity	Stories Lexical richness	Writing productivity	GJTs Choice score	Correction score
Main variables:					
Condition					
Educational level	−	+	+	+	+
Age group		+		+	
Gender	−		+		+
Interactions:[i]					
EL × C					
AG × C					
G × C [ii]		−			−
EL × AG × C					
EL × G × C					
AG × G × C					
EL × AG × G × C					

Note: + refers to a positive predictor, − refers to a negative predictor.
[i] EL = educational level, C = Condition, AG = age group, G = gender.
[ii] The minuses in this row reflect the negative values for *B* and *β* for these significant interactions in Tables 6 and 9.

5. Discussion

5.1 Impact of CMC Use on School Writings

The first research question of the present study addressed whether Dutch youths' CMC use directly affects their school writing skills. Based on a pilot study (Riemens, 2016), we hypothesized that such a direct impact would indeed be found. However, our findings did not reveal any direct impact of WhatsApp use on participants' school writings: condition (WhatsApp versus colouring) did not significantly predict any of the writing variables, neither for the productive task (story writing) nor for the receptive writing task (grammaticality judgement task). Our first hypothesis was, therefore, not supported.

Two objections may be raised here. One might doubt whether our measuring instruments were sensitive enough to detect differences in writing quality. However, the effectiveness of our testing methods is confirmed by finding main effects for three demographic variables (see below): this shows that analysing the stories for their text quality with the measures selected from T-Scan, as well as the GJT that was created, are successful ways of detecting differences in youths' writing skills. Despite the sensitivity of the measuring instruments, we did not find any impact of WhatsApp use on Dutch youths' writing skills.

One might also argue that our experimental manipulation, the priming phase with fifteen minutes of WhatsApp use, was not strong enough to generate any effects on participants' performances on the writing tasks. Yet the experimental manipulation was pretested in a pilot study, in which this admittedly short period of priming yielded significant results. Moreover, we found two small but significant two-way interactions between condition and the third demographic variable under analysis, gender: condition was positively related to lexical richness for male participants, and negatively related to correction score for female participants.

5.2 Demographic Variables

The second research question asked if the demographic variables of age group, educational level, or gender moderate a possible effect of WhatsApp on youths' writing skills. We hypothesized that if a direct impact of CMC use on school writing skills could be found, it would be greater for participants of particular levels of two of these demographic variables: that youths with a lower education or of a younger age would exhibit a greater effect of WhatsApp on their performance on the writing tasks.

Let us first examine the significant main effects of these demographic variables. Age group was a positive predictor, as could be expected, for two writing variables, namely lexical richness and GJT choice score, with young adults producing lexically richer stories and being more proficient in spotting 'language errors'. Educational level predicted all outcome variables, positively for lexical richness, writing productivity, GJT choice score, and GJT correction score; negatively for syntactic complexity. So higher educated youths wrote lexically richer and longer stories and achieved better results in identifying and correcting orthographic deviations in GJTs, while they also wrote syntactically less complex stories. This final finding seems quite surprising, but in retrospect, it rather fits the genre of narrative storytelling and the prompt that was formulated. Remember that the story had to start with the following sentence: "I was alone in a dark room. My hand groped for the light switch, but suddenly…" This opening sentence creates suspense and anticipation, and would be the perfect start for a thriller. It has frequently been suggested that suspense is more effectively maintained and tension more effectively heightened by succinctness, rather than long, flowy sentences, which are more appropriate for literary writing (Luke, 2011; East, 2013; Rivera, 2015). The higher educated youths thus showed more mastery of the genre of thrillers. Finally, gender predicted syntactic complexity (again, negatively), writing productivity (positively), and GJT correction score (positively): female participants wrote syntactically less complex, but longer stories and were more adept in correcting 'errors' in the GJTs.

As shown in the overview in Table 10, no interactions between educational level or age group and condition (WhatsApp versus colouring) were found. The findings of this study thus give no support for our second hypothesis: they do not provide evidence for any impact of social media use on Dutch youths' school writing moderated by education or age.

6. Conclusion

This paper reports on the first exploratory experimental study into the impact of WhatsApp on school writing. Central to this research was to empirically determine if interference of Dutch youths' CMC use with school writing tasks could be found, similar to the way a bilingual's L1 can interfere with their L2 or vice versa. This question was researched by measuring whether the use of and exposure to written CMC had a direct impact on the quality of participants' school writing products (stories) and/or on their ability to detect and correct 'language errors' in grammaticality judgement tasks. The stories were analysed with T-Scan, computer software for automatic assessment of Dutch texts on numerous levels, which allowed us to determine their syntactic complexity, lexical richness, and writing productivity. Many youths from different educational levels and age groups participated. To determine whether condition (experimental group: WhatsApp, versus control group: colouring mandalas) had an impact on performances on the productive or receptive writing tasks, regression analyses were conducted. Additional predictor variables included in the analyses were age group, educational level, and gender, because we hypothesized that interference would occur most with youths with a lower education or of a younger age.

No direct impact of WhatsApp use on participants' performances on either of the writing tasks was found: condition did not make a significant contribution to the explanatory power of the regression model in any of the analyses. The present study thus gives no indication of any interference of WhatsApp with Dutch youths' productive or receptive writing skills. This goes against Baron's (2008) glum view that today's youth – the 'whatever generation' – has become indifferent to norms of written discourse. It is more in line with her earlier suggestion that "[t]he writing style commonly used in IMing, texting, and other forms of computer-mediated communication need not spell the end of normative language" (Baron, 2005:29), as long as youths know when to heed standard language norms and are aware of the importance of using context-appropriate language. No interactions between WhatsApp and age group or educational level were found, so our study does not support findings by Wood et al. (2014) on age or Rosen et al. (2010) on education as moderating factors. Only two minor interactions were found between WhatsApp and gender, which suggest that there might be a small impact of WhatsApp moderated by gender: CMC might slightly improve boys' lexical richness and slightly impair girls' ability to correct orthographic deviations.

All in all, the present study gives no cause for concern about the impact of written CMC via WhatsApp on youths' school writings. In light of a previous study with predominantly positive findings on the relationship between social media use and school writing (Verheijen, Spooren, & Van Kemenade, submitted), it might be time to replace grave concerns in favour of moderate optimism about youngsters' use of social media. Our study reveals that the fears documented by Spooren (2009) among Dutch parents appear to be ungrounded, so perhaps parents and teachers should be pleased that young people are enjoying themselves while playfully communicating via social media. They should actually be encouraged for having fun

with writing and reading. As long as youths receive proper education on how to employ different registers and are taught about the conventions of writing formal texts in compliance with the grammatical and orthographic norms of Standard Dutch, which they will need later in life as adults in further education or in their professional careers, there is no need to worry about CMC but rather cause to celebrate youths' active and creative written language use.

7. Limitations

Of course, the present study has some limitations. The use of autocorrect or word predictors during the WhatsApp priming was not mentioned (so they were silently allowed), because checking all participants' mobiles for whether they had enabled or disabled such predictive dictionaries would be time-consuming; moreover, regulating this would be less naturalistic, since in real life youths can also decide for themselves whether or not to use such software. Yet since we did not ask participants about their use of such tools and have not yet systematically analysed their WhatsApp chats, so we do not know to what extent they actually used CMC language. Still, exploratory observation of their chats suggests that they communicated informally as they would in their private daily chats.

Another critical note is that we cannot know for sure that we actually measured the impact of WhatsApp use on the experimental groups' performance the writing tasks, rather than the impact of colouring mandalas on the control groups' performance on those tasks. Both interpretations of our findings remain possible. This could have been prevented by having the control groups do nothing at all instead of assigning them to a control task, but this alternative was deemed infeasible for several reasons. Not only might such a boring fifteen minutes cause youths in the control groups to find some other activity to keep them occupied (which would be hard to control for), thereby possibly distracting the experimental groups, but it might also cause them to lose interest in the study, to not complete the subsequent writing tasks seriously, or even to drop out of the study entirely. What is more, the control task was not chosen at random, but was the result of piloting and evaluating numerous tasks. Plus, since no main effect of condition was found anyways, this absence need not be attributed to one of the two conditions.

8. Suggestions for Further Research

We did not find evidence for our hypothesis that particularly writers of a younger age group or lower educational level could experience interference of social media in their school writings. Further research could explore other ways to test for such interference. Perhaps effects of social media crop up in minor orthographic details of school writings, such as non-standard punctuation, capitalisation, spacing, or diacritics, because in several of our pilot studies, these were consistently the items on which CMC use had the greatest impact. The frequent omission of punctuation and capitalisation (sentence-initial or with proper names) in school writings was also noted by Vandekerckhove and Sandra (2016). The stories written for the present

experiment could thus be analysed for the occurrence of non-standard orthographic details, calculating the relative frequency of such features to the total number of words used per story.

Another possibility is that participants in the present study were already too 'old' for a major direct impact of CMC use on school writing tasks: perhaps such an impact could be found for youths of a younger age group. This is suggested by Riemens' (2016) finding that immediately preceding WhatsApp use affected first-graders in secondary school more in their ability to spot orthographic/grammatical 'errors' in GJTs than third-graders. It would be interesting to replicate the present study with younger participants, such as primary school-aged children, around the age of 10. One might hypothesize that their registers are more fluid than those of our youngest participant group, namely adolescents of around 14 years. Such fluidity could lead to more interference of CMC use on school writing skills.

In addition, the WhatsApp chats produced by participants in the experimental groups during the priming phase were nearly all collected afterwards, of course with their consent (sent to the first author via email), but were not analysed. If properly formatted and annotated, these CMC data could be a valuable corpus for further analysis. Such formatting and annotation is currently implemented for other WhatsApp data, collected during the first author's PhD project, in the ACAD project (Automatic Coherence Analysis of Dutch; Komen & Hoek, forthcoming). We could study the nature of these WhatsApp interactions, e.g. for individual variation in the use of textisms, to find out to what extent these chats actually differ from Standard Dutch in terms of orthography and grammar, and whether the amount of deviations affected the direct impact of CMC use on the writing tasks.

Acknowledgements

Chapter 11. Conclusion

The continuing growth of computer-mediated communication (CMC) and social media has gone hand in hand with folk-linguistic concerns of disturbingly deviant language use in youths' informal digital writing, and with alarming accounts of the possible damaging impact thereof on language and literacy. This doctoral research has explored the impact of Dutch youths' written CMC on their traditional literacy skills as applied in an educational setting, to find out if such concerns are justified at all, or perhaps only for youths of younger ages or lower educational levels. Part 1 of this thesis has presented the theoretical background on CMC and literacy, part 2 has presented four studies on the language in Dutch youths' written CMC (one on data collection, three on data analysis), and part 3 has presented three studies exploring the relations between Dutch youths' written CMC and school writing. The main findings of this thesis are summarized in the next section.

Overview of Findings

Part 1: Theoretical Background on CMC and Literacy

Chapter 2 problematized the concept of literacy. It made clear how the traditional notion of literacy, namely reading and writing print-based texts, no longer suffices in this age in which digital communication plays such an important role. New media have, for decades, had a profound impact on the way literacy has been conceptualised. Many scholars, educators, and policy makers have called for a reconceptualization of literacy, for broadening the concept, and many new literacies have been coined to meet these calls, such as computer literacy, digital literacy, (new) media literacy, and multiliteracies. Literacy has even evolved into an all-purpose word, generally expressing 'competence', which has occasioned a plethora of literacies. Various definitions have been provided for each new literacy – focusing on receptive or productive skills, providing impressionistic accounts or listing specific competences; these express a diversity in approaches. Ultimately, old and new literacies should co-exist in a complementary relationship, but the question remains whether youths, even though they are digital natives, are able to acquire and effectively switch between traditional literacy, i.e. conventional writing and reading, and digital literacies, which are useful for CMC.

Chapter 3 discussed prior research into relations between written CMC and literacy. Two contrasting views were presented: some feel that CMC has a detrimental impact on traditional literacy skills, whereas others believe it may be beneficial. This chapter showed that neither previous attitudinal studies, presenting the perceptions of parties involved (youths, parents, and/or teachers) through qualitative or quantitative surveys, nor observational studies, presenting empirical evidence through mostly correlational studies, give a clear picture about the effects of CMC on literacy. This can be attributed to substantial differences between those previous studies in their methodologies and participants. Literacy was operationalized in various ways and CMC use was measured in various ways; the greatest difference between participants

was their age group. Many studies which included multiple measures of CMC or of different literacy skills even had conflicting findings: both positive and negative relations were found within a single study. Still, most attitudinal studies reported negative perceptions, held by teachers and young adults in particular, whereas observational studies reported more evidence of a positive relationship than of a negative relationship, especially when the participants were children.

However, previous research is limited in several ways. It focused mostly on SMS, rather than WhatsApp, which is now all the rage among (Dutch) youths (and adults). Only few studies were conducted in the Netherlands; instead, most participants were English-speaking. Thirdly, conclusions on the directionality of relations could barely be drawn, since almost all analyses were cross-sectional; therefore, we do not know if there is a causal connection. Thus, based research to date no final conclusion can be dwawn on the relationship between CMC and youths' literacy.

Part 2: Language Use in Dutch Youths' Written CMC

Chapter 4 reported on the compilation of a corpus of authentic social media messages, specifically chats from the mobile chat application WhatsApp and posts from the social networking site Facebook. Dutch youths were hesitant to voluntarily donate their privately written CMC to the researchers. Even with the added incentive of a prize raffle, a great deal of media coverage promoting the data collection was required in order to convince youths throughout the country to share their data. This chapter also showed that collecting contributors' metadata, obtaining their informed written consent as well as that of their parents/caretakers in case of underage contributors, and gaining ethical approval of an ethics assessment committee are of great importance in the data collection. The websites and application we created for collecting social media messages and for scraping Facebook posts from users' timelines can serve as a model for other researchers aiming to collect a social media corpus.

Chapter 5 reported the findings of a pilot corpus study into the written CMC of Dutch youths between the ages of 12 and 23. It focused on a salient orthographic aspect of CMC language, namely the use of 'textisms', here defined as unconventional spellings. Manual analysis of a new media corpus of nearly 400,000 words revealed not only that Dutch youths' online messages indeed generally greatly differ orthographically from Standard Dutch, but also, and more importantly, that the extent to which youths use textisms and particular textism types depends on both the medium or 'CMC mode' (MSN, SMS, Twitter, WhatsApp) and individual user characteristics such as age group. MSN chats contained the most textisms, followed by WhatsApp, then SMS, and tweets the least. Adolescents (12–17 years old) used many more textisms than young adults (18–23), in all four media, but especially in instant messages (MSN, WhatsApp) and text messages (SMS). Youths of different age groups were found to prefer different textism types – adolescents' CMC included many phonetic respellings, making the register more speechlike and informal, while

young adults used many standard language abbreviations, apparently to communicate more concisely and more quickly.

Chapter 6 presented further findings of my corpus studies into Dutch youths' written CMC, using the same corpus as in chapter 5, but analysing the orthography in much more detail. This study showed that the orthographic deviations from Standard Dutch in youths' CMC are not random, pointless 'errors': rather, this register is governed by implicit orthographic principles. Youths were found to use textisms of specific forms (with letters, diacritics, punctuation, spacing or capitalisation), with specific edit operations (omission, substitution, and addition), and for specific functions – what I call the 'SUPER-functions' of textisms. They can make orthography more Speechlike, Understandable, Playful, Expressive, and Reduced. Dutch youths most frequently omitted letters to apparently achieve orthographic brevity and velocity, so to reduce the keystroke effort. Moreover, a finding from the previous chapter was confirmed, namely that adolescents and young adults preferred different textism types, and that the use of textism types also depended on the medium of communication. Textisms were used much more by adolescents than young adults, and occurred much more in MSN chats and WhatsApp messages than in SMS and particularly tweets. These findings were tentatively attributed to youths' differing perceptions on the significance of adhering to the standard language orthography, as well as the unique combinations of characteristics and constraints of different new media, including possible message size limits, synchronicity of communication, visibility, level of interactivity, and technology.

Chapter 7 presented the final part of my corpus research into Dutch youths' written CMC – their 'social media slang'. It focused not just on textisms, but on more linguistic features, including additional orthographic features as well as features of other writing dimensions: besides orthography (textisms, 'misspellings', typos), also typography (emoticons, symbols), syntax (omissions), and lexis (English borrowings, interjections). Youths' written CMC was revealed to contain all these features, thereby distinguishing the register from Standard Dutch. In addition, the results again revealed that Dutch youths' written CMC is linguistically diverse: age group crucially determined youths' language use in computer-mediated messages, and medium even more so due to an interplay of characteristics of each medium. This study thus showed that CMC language is not a homogeneous register, but encompasses various 'subregisters'.

Part 3: Relations between Dutch Youths' Written CMC and School Writing

Chapter 8 compared Dutch adolescents' and young adults' written CMC – again analysing the four media MSN, SMS, Twitter, and WhatsApp – to their school writings. Linguistic analyses with the text analysis software 'T-Scan' indicated that Dutch youths indeed employ different registers, because their CMC and school writings differed significantly on several lexical and syntactic measures. In comparison to the school writings, more ellipses were used in the written CMC. It was also syntactically less complex: CMC contained shorter sentences and fewer

subordinate clauses per sentence, and had a lower 'D-level' (developmental level, indicative of syntactic complexity) and lower average dependency length per sentence (the distance between the head of a sentence or phrase and its dependent, higher means syntactically more complex). Lexically, the written CMC was more diverse (it contained more different words or differently spelled words), more different (which means it contained more 'special' words, i.e. character strings that the software could not recognize as words, including textisms, 'misspellings', and typos), and more dense (more content words and fewer function words). These findings showed that Dutch youths clearly employ different registers in the writing contexts of informal CMC and school.

Chapter 9 reported on a correlational survey study with 400 Dutch youths – we eventually used the data of 338 of them – to explore relationships between their self-reported CMC use, as measured via questionnaires, and their school writing products, by having them write essays in class. The T-Scan software was again used to linguistically analyse the school writings and to assess their text quality: this time, we combined several measures provided by T-Scan into four factors – lexical richness, syntactic complexity, writing productivity, and formality. We found multiple associations between, on the one hand, the extent to which or the way in which participants said to use CMC and, on the other hand, their performance on the productive school writing task. Of these associations, more were positive than negative. Results revealed that passive engagement with CMC, by heavy reliance on one's mobile phone and consumption of others' social media messages, was negatively related to the quality of school writings, whereas active and creative language production in CMC – via various media, from an early age, with many people, and including textisms – was positively related to school writing performance. Educational level turned out to be a relevant demographic factor in the relations between CMC use and literacy, with the most negative and the most positive significant correlations for lower educated youths (in lower secondary, professional education (*vmbo*) or lower tertiary education (*mbo*)). In comparison to higher educated youths (in higher secondary, pre-university education (*vwo*) or higher tertiary education (university)), their school writings may thus be more at risk of being affected, but may linguistically also benefit more from social media. However, the correlational nature of this study prevents us from drawing conclusions about the causality of the relationships.

Chapter 10, finally, was designed to explore the causality of relations between CMC use and school writing performance. An experimental study, in which 500 Dutch youths participated (the data of 408 of them were used), was conducted to investigate if WhatsApp use interferes with their school writing skills. The participants were randomly divided into two conditions. Half of the participants were primed with CMC by chatting via WhatsApp for fifteen minutes immediately prior to performing a productive and a receptive writing task, viz. writing a story and completing a grammaticality judgement task in class. The other half conducted a non-verbal control task – colouring mandalas – before performing the two school writing tasks.

The stories were analysed with the T-Scan software, as in chapter 9; their quality was assessed in terms of the factors of lexical richness, syntactic complexity, and writing productivity (the factor of formality turned out to play no role in stories, as opposed to in essays). No short-term effects of the directly preceding WhatsApp use were found on participants' performance on either of the tasks: neither on the quality of their school writing products, nor on their ability to detect and correct 'language errors' (deviations from Standard Dutch) in a grammaticality judgement task. This study thus showed no direct impact of use of and exposure to written CMC, not even for youths with a lower educational level or of a younger age group. Only two minor interactions between condition (WhatsApp vs. colouring) and gender suggest that WhatsApp use might slightly improve the lexical richness of boys' stories and slightly impair girls' ability to correct deviations from Standard Dutch.

Implications

Theoretical Implications

This thesis suggests that contrary to critical media reports, and despite Dutch youths' considerable use of social media and a diverse range of textism types therein, the majority of adolescents and young adults can apply the appropriate language variant in an educational context. This is in line with findings pertaining to Australian students by Grace, Kemp, Martin, and Parrila (2015), who did not find textisms crossing the boundaries of informal CMC: instead, students avoided using textisms in exams. Prior studies into CMC and writing skills gave inconclusive results, as shown by overviews of Verheijen (2013), Wood, Kemp, and Plester (2013), Zebroff (2017), and chapter 3 of this thesis. This doctoral research adds conflicting, but cautiously positive findings to this body of previous literature. My corpus studies into language use in Dutch youths' written CMC show that although their social media messages greatly deviate from Standard Dutch, especially in terms of orthography, these deviations are tailored to the medium and in general appear to be motivated (although perhaps partly unconscious) language choices, guided by orthographic principles – to make the text more speechlike, understandable, playful, expressive, or reduced, and possibly to help form a social identity or to adhere to implicit social in-groups norms among adolescent peers.

The results of the empirical studies into relations between Dutch youths' written CMC and school writing indicate that, for the school levels and age groups we studied, there is no need to worry about any detrimental impact of social media on higher-level linguistic aspects of the text quality of their school writing. No direct impact of WhatsApp use on the lexical density, syntactic complexity, or writing productivity of stories was found in the experimental study reported in this thesis – not even for the supposed 'high-risk' groups of adolescents and lower educated youths. This is consistent with the results of Dürscheid, Wagner, and Brommer (2010), who compared Swiss students' informal digital writings to their school writings and found little to no transfer of online writing features. It also supports Tagg's (2015) claim that "young people are generally able to use digitalese in online communications to their friends and standard spelling in school essays" (n.p.). No

evidence of a direct impact of CMC use on youths' performance on school writing tasks was found. Therefore, the hypothesis that they experience so-called interference (Lems, Miller, & Soro, 2017) of their informal CMC register on their formal school register was not supported; rather, adolescents and young adults show an ability to effectively shift between registers.

This raises important questions: can switching between two registers be compared to switching between two languages at all, as suggested by Van Dijk et al. (2016) too? Are today's CMC-immersed youths indeed similar to early bilinguals? Despite the obvious similarities between registers and languages, the two are also distinctly dissimilar. While register differences between CMC language and Standard Dutch are most apparent in orthography, and largely depend on issues of formality and normativity (informal, casual, 'sloppy' writing that is condoned or even preferred in CMC, versus formal writing according to the standard language rules that is expected at school), languages differ much more fundamentally on the levels of syntax, lexis, and morphology.[63] As a consequence, code-switching between languages may require a much greater cognitive effort, thereby occasioning more interference. It is feasible that no such cognitive overload occurs when switching between registers, thus not causing any negative (reverse) transfer, which was indeed not found in chapter 10. Even lower educated youths revealed no such interference, perhaps because the educational context in which the research was conducted is a linguistically 'focused' context (Odlin, 1989), in which adolescents and young adults of all educational levels pay special attention to their written language.

What is more, the correlational study (chapter 9) showed that youths who use CMC in an active and linguistically creative way, as opposed to those who passively consume others' CMC messages, produce essays of better quality, i.e. more lexically rich, syntactically complex, or productive. The positive relations suggest that producing social media messages may train youths' writing skills, while the negative relations suggest that exposure to other people's textese with much non-standard language input may make such non-standardness dominant in their own school writings – especially if they are minimally exposed to standard language input via other channels. However, this study could not prove the causality of these relations, so another underlying variable might be involved (see Limitations). Still, more correlations, positive as well as negative, between habits and experiences of using CMC and the quality of school writings were present for lower educated youths, in accordance with findings by Rosen et al. (2010) and Vandekerckhove and Sandra (2016). This may be because they are not required to write as much (in Standard Dutch) at school in comparison to higher educated students, making them less used to switching between registers. The differences in associations between youths of different educational levels suggest that, even though no direct impact was found in the experimental study, youths with a lower education are more susceptible to one of their registers affecting the other.

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[63] Yet what is codified as a 'language' is socially and politically determined (depending on issues of national identity and politics) , and some languages are, of course, much more similar than others.

Despite the tentatively hopeful findings of this thesis, it would be wise to focus educational efforts on instilling the current 'whatever generation' (Baron, 2008) with an awareness of why traditional literacy and adherence to standard language norms still matter – especially in their later professional lives (Maes, 2016) – even in this digital day and age, in which various new literacies such as 'digital literacy', '(new) media literacy' and 'visual literacy' are becoming more and more important. As Walsh (2008) stresses, new conventions of digital production have become very relevant, but traditional writing conventions such as text structure, sentences, grammar, spelling, and punctuation are still important.

In digital writings, "[t]he normative claim of standardized orthography is challenged" (Androutsopoulos, 2014:30), which is fine within the informal CMC context: it only becomes problematic when youths transpose their challenging of the standard language to more formal contexts. An awareness of the importance of keeping textese and written Standard Dutch separate may help today's 'digital natives' (Prensky, 2001; Bennett, Maton, & Kervin, 2008) to restrict the interference of social media on their school writings. Youths intuitively understand and create non-standard spellings in CMC without any formal instruction or dictionaries, simply by their immersion into CMC, but their knowledge of standard language conventions does require formal instruction. As such, the orthographic and grammatical rules necessary for writing 'correct Dutch' need to be extensively taught at school – especially to lower educated youths, for whom more associations between written CMC use and school writing performance were found – in order to prevent any possible knowledge gap of written Standard Dutch from allowing textese to ultimately take over in more formal contexts, which are considered inappropriate for such informal online language use. Without losing sight of such educational opportunities for helping youths switch between registers, we should let them enjoy social media, because their active, creative language use in written CMC may even allow them to develop their writing skills and it keeps our Dutch language alive and kicking.

Practical Implications

A first practical implication of the present research concerns the data collection of authentic social media messages. Our collection method can be an example of how such CMC texts and metadata can be collected in today's "textually mediated social world" (Barton & Lee, 2013) – as it is by now, witness Dorantes et al.'s (2018) sociolinguistic corpus of Spanish college students' WhatsApp chats. Future researchers should take into consideration that youths need quite some convincing to donate their private messages to science, with the possible additional incentive of a prize to be raffled off among contributors. Indeed, when Crystal (2011) noted that "[p]eople are notoriously reluctant to allow their private e-communications to be accessed by passing linguists" (13), this was no overstatement.

The research presented here has been conducted at the interface of language, social media, and education. The findings of this thesis can be put to practical use at schools for a variety of purposes. As Bernicot et al. (2014) proposed, texting can be "an ally for learning at school" as opposed to an antagonist; it can be an "academic

learning aid" (571–2). It provides opportunities for creating teaching materials for the language classroom. Pointing out the richness of orthographic variation in CMC could be a tool for youths to reflect upon language. It could be helpful, for example, in explaining the concept of language change, or, more accurately, sociolinguistic change due to mediatisation (Androutsopoulos, 2014). This thesis has shown that textisms often serve useful functions, which can teach students about how language can evolve to keep fulfilling people's communicative needs in a world with many new media and continuous technological innovations. Integrating textese into the educational curriculum as an illustration of language change could enable teachers to go beyond language teaching that is exclusively functionally oriented, towards more reflective teaching (Bennis, 2015:215). These findings can also be employed to support writing instruction (Sweeny, 2010), to instruct youths about language variation and audience design in writing (Tagg, 2015). Pointing out to students, with real-life CMC examples, that they actually are already accustomed to adapt their use of language, and orthography in particular, to different new media may help them to learn to adapt their writing to suit particular text genres and audiences in more formal contexts as well. Crystal (2011) suggests that "[a] fruitful exercise is the 'translation' of text-messages into a more formal kind of standard language, and vice versa, in order to develop the student's sense of the appropriateness of styles of language in particular situations" (6): such assignments can teach youths about register differences.

More generally, these results could be used to make youths aware that their informal CMC language and the standard language are different varieties of Dutch – registers which society expects them to keep separate and use in appropriate settings. This view is expressed as follows in a language blog (Anon., 2015): "the important thing to remember for education is teaching children how to employ different ways of communication. Writing an essay and writing a text [message] are different things; children can learn both," as long as sufficient attention is paid to these register differences. Differentiating between registers remains important, especially considering the ever larger role of digital media in youths' (and adults') lives. The school writings of youths who "write like they text" or chat can be improved, as Turner (2009) and French (2018) suggest, by helping them "flip the switch," i.e. transitioning between informal CMC language and formal standard language. Contrastive analysis with examples of how new media writings deviate from standard language norms can help raise register awareness; Turner (2009), Bennis (2012), and French (2018) provide several practical suggestions for classroom activities with textese. These could be incorporated into language teaching in primary and secondary education, in order to prevent interference from CMC with youths' performance on school writing tasks or with other formal writing genres. This is especially relevant for teachers of lower educated youths, who were shown in the correlational study to have more difficulty in keeping their registers separated.

Limitations

Language use in Dutch youths' written CMC. A limitation of the present thesis is that the social media corpus, reported on in chapter 4, that was analysed – containing nearly 400,000 tokens – was of modest scale in comparison to other similar corpora, such as the 'What's up, Switzerland?' corpus from 2014 (Stark et al., 2015a) and the DiDi corpus from 2013 (Frey, Stemle, Glazniek, 2014; Frey, Glazniek, Stemle, 2015), with about 5 million and 650,000 tokens respectively. For the present thesis, the corpus was more than large enough, because all data were analysed manually in the corpus studies. The advantage of manual linguistic analysis is that all textisms could be identified and classified, no matter their orthographic form, which may be difficult with an automatic script. Yet automatic analysis, besides being able to handle a larger corpus, would be much less time-consuming and perhaps more reliable or consistent.

Considering the data analysis, one drawback is that the data of the four media that were compared span a time period of six years. The MSN chats, text messages, and tweets were collected by researchers of the SoNaR corpus between 2009 and 2011, while we collected the WhatsApp chats in 2015. These different collection periods cast some doubt on the validity of the comparison, since linguistic differences between WhatsApp chats and messages from the other three media may partly arise from changes through time in Dutch online youth language, which is very changeable (Van Wijk & Den Ouden, 2006). Nevertheless, the SoNaR social media messages were analysed because they were a wealth of data in need of analysis, and the WhatsApp data were added because this CMC mode is currently extremely popular in the Netherlands – and, of course, collecting WhatsApp data from 2011 in 2015 would be quite problematic.

Relations between Dutch youths' written CMC and school writing. The analysis of Dutch youths' CMC and school writings in chapter 8 on several lexical and syntactic measures was limited in that the CMC and school data were not written by the same youths, which makes the comparison not entirely valid. On top of that, the social media messages were collected over a time span of six years, as stated above, which also compromises the validity of the comparison.

Limitations of the correlational and experimental study, presented in chapters 9 and 10, may explain why associations between reported CMC use and performance on a school writing task were found in the former study, but no direct impact of CMC use on school writing tasks in the latter study. The most apparent drawback of the correlational survey study (chapter 9) is that the associations that were found do not tell us anything about the causality, i.e. the direction of relations between various aspects of CMC use (e.g. frequency, intensity, variety, and manner of use) and school writings. There might be an underlying factor at play which explains the associations, such as cognitive skills. To try and determine the causation, the experiment was conducted, but that yielded no significant impact of CMC use. Alternatively, future correlational studies could administer additional cognitive tests, to control for such variables.

A possible limitation of the experimental study (chapter 10), which might explain the absence of an impact of WhatsApp use on the school writings, is that the priming phase was rather short, viz. only fifteen minutes, to find any direct effects of WhatsApp. Still, such a direct effect of condition was found in a pilot study that used the same priming and was of the same duration, so fifteen minutes *were* long enough in the pilot study. Yet the participants in that pilot study were younger adolescents; it might be the case that effects with somewhat older adolescents and young adults are only found after a longer time of WhatsApp use.

Furthermore, if a significant effect of condition on participants' writing skills were found in the experiment – which was not the case – we would be unable to pinpoint whether that was indeed the effect of CMC use or instead of the control task, colouring mandalas. A completely neutral control group would not have executed any task beforehand, to prevent a possible impact of any control task, but this was deemed impractical. Doing nothing for fifteen minutes would be incredibly boring for the participants in the control groups, which might cause them to distract the participants in the experimental groups, who were in the same room for each class that was tested. Splitting up the control and experimental groups into separate rooms was neither a possibility, since the only room available in the secondary and most tertiary institutions was the room in which each class was scheduled to be taught; moreover, there was only one experimenter (me), who would, in case of spatial separation of control and experimental groups, have been unable to keep an eye on all participants. Another drawback of having control groups do nothing during the priming phase – instead of the colouring task – is that this may very well could have caused them not to take the experiment seriously, to lose interest, perhaps even to refuse completing the tasks. The colouring task was chosen after careful piloting with various control tasks, because, as opposed to other control tasks, it met the following criteria: it did not involve CMC or language, was performable for participants of all ages and educational levels, kept participants calm, and produced significant results in the pilot study.

Suggestions for Further Research

Language use in Dutch youths' written CMC. There is great potential for sociolinguistic future studies in the area of CMC, since social media and the language used therein keep developing. A first and obvious suggestion for further research regarding the corpus analyses is to analyse more recent CMC data, seeing that the online messages analysed in the studies reported in this thesis were collected between 2009 and 2011 (SoNaR texts) and in 2015 (WhatsApp texts). The data that have been left unanalysed, namely the Facebook posts that we collected in 2015–2016, can be used in future research, because this social networking site is still very relevant: it is the second most popular social medium in the Netherlands (Van der Veer, Boekee, Hoekstra, & Peters, 2018). In addition, since the new media via which youths communicate online swiftly substitute each other, it is necessary to examine other new media in order to keep linguistic research into youths' written CMC up-to-date. By now, SMS has already become an 'old new medium' (Dürscheid & Frick, 2014).

Future studies could focus on CMC language on visual media sharing platforms, similar to Marrón Fernández de Velasco's (2015) study of *YouTube* comments. Other currently popular genres are *Snapchat* and *Instagram* (Van der Veer et al., 2018). Including these in further studies would require the development of data collection methods for gathering textual data from both media, which would be especially tricky for Snapchat, since chats in this medium are automatically deleted after a short period of time.

Furthermore, it would be interesting to analyse the written CMC of youths of even younger ages, extending the corpus-linguistic studies to include texts by children below the age of 12, to see if their language use in CMC deviates even further from Standard Dutch than that of adolescents. However, because social media data are of a private and perhaps sensitive nature, it might be difficult to gain ethical approval for such research involving young children. Another way to go could be to compare youths' language use in CMC with that of an older generation (adults), as did Sánchez-Moya and Cruz-Moya (2015b). They found, in their small-scale corpus study, that Spanish teenagers, unsurprisingly, use more textese and emoticons in WhatsApp chats than Spanish adults. More such contrastive analyses, also with Dutch participants, could enlighten us on how 'digital immigrants' communicate in CMC as compared to digital natives (Prensky, 2001).

Besides including additional media or age groups, future corpus studies into written CMC could include other independent sociolinguistic variables, such as users' gender or educational background, because previous research suggests that boys and girls, as well as youths with a lower and higher education, differ in their online language use (Varnhagen et al., 2009; Hilte et al., 2016/2017; Chalak, 2018). Gender, moreover, was found to affect the relation between texting frequency and writing in one previous study (Wardyga, 2012), in which a (negative) relation was only found for female participants. These demographic variables could not be included in the present study, because information about gender and education was merely known for the contributors of the WhatsApp chats, not for the SoNaR data. The variable of gender could add a new and exciting dimension to sociolinguistic variationist research into gender differences in communication. Women have often been asserted to be at the forefront of language change, to use more innovative language than men, especially when it comes to conscious change in the direction of prestige forms (Holmes & Meyerhoff, 2003; Coates, 2015). Research into boys' and girls' language use in written CMC could reveal whether such claims of women initiating and furthering language change can be supported by current online data. Because textese enjoys much covert prestige among youths, as stated in chapter 7, one would expect girls to use more linguistic deviations in their written CMC than boys, as Hilte et al. (2016) found for Flemish teenagers.

The language analyses of computer-mediated messages could involve not only more/younger age groups and more/different media, but also other variables – medium, personal, or situational. The language use in written CMC is likely to depend on characteristics besides those included in the corpus studies presented here, such as the possible use of predictive or corrective dictionaries, the technology used with WhatsApp or Facebook chat (mobile app on smartphone vs. web app on computer),

the goal or topic of the conversation (playful vs. serious), users' relationship with the recipient of their message (social vs. professional relations, viz. friends or family vs. colleagues; acquaintances vs. strangers) and their demographic profile (peers vs. older) (Drouin & Davis, 2009; Sánchez-Moya & Cruz-Moya, 2015b; Kemp & Clayton, 2017). Such additional variables would help us gain an even greater insight into language variation in youths' CMC.

Moreover, the use of textisms in CMC might decrease in the coming years because of changes in technology use: the rise of predictive software makes it easier to type out the full standard form of words than to use unconventional spellings or abbreviations (Grace & Kemp, 2015). Linguistic variation in CMC may thus become a less relevant study area, whereas the visual aspects of CMC will become more relevant. The focus of corpus studies into CMC may need to shift from wholly linguistic analyses to multimedia analyses, since in many popular CMC modes nowadays, such as *Snapchat* and *Instagram*, there is a greater focus on visual language than on written text. Indeed, we need multimodal, instead of monomodal, social media corpora: in view of today's possibilities for incorporating visual besides verbal content into CMC, further research should pay greater attention to multimodality, since these different modes interact in meaning-making (Barton & Lee, 2013; Jewitt, 2015). Such multimodality is also crucial in WhatsApp and Facebook messages (Sánchez-Moya & Cruz-Moya, 2015a; Georgalou, 2017). Multimodal analyses should not only focus on photos and videos, but also on GIFs and emoji, which are used more and more, to complement or to replace text (Danesi, 2017; Dürscheid & Siever, 2017).

If future studies include automatic rather than manual data analysis, a much larger corpus could be analysed. What might help in gathering an even larger social media corpus is a greater budget for raffling off prizes and generating publicity for the data collection, since this may motivate youths to donate their private social media messages. Large economic incentives and lottery incentives with prizes of substantial value have been shown to boost response rates on student surveys (Collins, Ellickson, Hays, & McCaffrey, 2000; Laguilles, Williams, & Saunders, 2011), so this may also work for donating social media messages.

Another fruitful avenue for further research is to complement corpus studies with self-reports about language use in CMC – more specifically, to quantitatively survey and qualitatively interview youths, possibly in focus groups, to find out more about their own ideas about why they use (certain kinds of) textisms. Such data triangulation could unearth, among other things, whether youths' self-assessment concurs with the results of the functional classification of textisms in the corpus study presented in chapter 6: do youths indeed feel that they mostly use textisms with omitted letters in order to compose shorter and quicker messages?

Relations between Dutch youths' written CMC and school writing. Future survey studies should consider administering online questionnaires rather than paper-and-pencil questionnaires, because web surveys can prevent participants from not answering certain questions and the data are already digitally available without having to be manually entered into a computer. Since not all educational institutions

have laptops or tablets available for all students, a mobile questionnaire that can be filled in on students' smartphones would be ideal.

Although the reliability of self-report surveys has been convincingly defended in previous studies (Spector, 1994), an alternative for further research would be to measure youths' actual CMC use, making use of state-of-the-art technological functionalities of smartphones. Many smartphones nowadays track the amount of time that an individual has spent using specific social media applications, including CMC apps such as WhatsApp and Snapchat, in the last 24 hours or the last couple of days. Future studies could make use of this functionality to more accurately measure participants' frequency of CMC use.

Further empirical research could also consider different ways of measuring the text quality of school writings, viz. essays and stories. In the correlational and experimental studies reported in this thesis, school texts were analysed on a number of higher-level features, namely their lexical richness, syntactic complexity, writing productivity, and formality. An impact of youths' written CMC on their school writing may be different for simple surface features of the texts, such as orthographic and grammatical deviations: different associations may be found in a correlational study, and the direct impact of WhatsApp use that was absent from our experimental study may crop up if school writings are simply analysed on 'spelling errors'. Spelling is pre-eminently a product of language norms, and therefore not considered as the 'essence' of language by many linguistics (Vandekerckhove & Sandra, 2016:206). Nevertheless, adherence to Standard Dutch spelling is deemed important in both educational and professional contexts, so it actually is relevant to research.

In fact, such a follow-up study has already been carried out in a bachelor thesis (Van der Laan, 2018). Van der Laan again analysed the essays produced in our survey study, as well as the stories of the CMC-primed youths versus those of the control group produced in our experimental study. She focused on orthographic deviations. We distinguished between three kinds, namely textisms, non-standard orthographic details (punctuation, capitalisation, spacing, diacritics), and 'misspellings' (the same restricted selection of spelling deviations strongly disapproved of by language prescriptivists, as used in chapter 7 of this thesis, supplemented with one form, *na/naar*). The relative frequencies of these features to the total number of words used per story and essay were calculated. Van der Laan, perhaps surprisingly, found fewer 'misspellings' in the school writings of (a) youths who were primed with WhatsApp immediately before writing a story in the experimental study, than youths who performed the control task of colouring mandalas, especially for adolescents, as well as (b) youths who reported owning smartphones in the questionnaires in the correlational survey study, than youths who owned old-fashioned mobile phones or none at all. She also found that the essays of youths who reported usually using predictive and corrective dictionaries in CMC contained more textisms than those of youths who did not. Dutch youths' WhatsApp use and smartphone ownership were thus related to their orthographic performance in school writings in a positive way, in terms of fewer 'misspellings', but the use of auto-correction and auto-completion were related in a negative way, evident from more textisms. This suggests that there is no need to worry about the impact of social media or mobile phones on youths'

orthography, as long as youths keep formulating their own words and sentences, instead of passively relying on word predictors and correctors.

Further research is necessary to determine the causality of the relationship between CMC and traditional literacy. Such research should, if practically possible, prime participants somewhat longer than in the experiment reported in chapter 10. Admittedly, fifteen minutes is only a brief period of time. Perhaps no direct impact of WhatsApp use immediately before performing school writing tasks was found because the priming phase was only of short duration. Nonetheless, equally long priming did significantly hinder participants' ability to detect 'language errors' in grammaticality judgement tasks and significantly increased participants' use of textese in stories, in a pilot study with younger participants (Riemens, 2016). The same priming also yielded significantly fewer spelling errors in a follow-up study of the experimental study presented here, with the same data but with an operationalization of text quality focused on orthographic surface features (Van der Laan, 2018).

Different experimental tasks, rather than chatting via WhatsApp, could be used in future studies. For instance, participants in the experimental group could translate sentences from Standard Dutch into textese, a method that was used to measure participants' textism use in several previous studies (Plester, Wood, & Bell, 2008; Drouin & Davis, 2009; De Jonge & Kemp, 2012; Ouellette & Michaud, 2016). This would be a variation on Powell and Dixon's (2011) methodology, who used exposure to textisms (and misspellings) as an experimental prime. Accordingly, the two conditions could be (a) translating sentences into textese and (b) colouring mandalas. A translation into textese task is obviously more artificial and not a naturalistic way of using CMC, but at the same time it would intensify the use of textisms and might, therefore, be a more effective prime than the one used in the experimental study reported in chapter 10.

For establishing whether it is indeed CMC that affects school writing and not vice versa, future studies could apply more sophisticated statistical techniques, such as path analysis or structural equation modelling (SEM). These analyses make use of multiple regression to test causal relationships between variables: path models, in path and structural equation analyses, measure whether a change in the independent variable (or causal source) at the beginning of the path will result in a change in the dependent variable at the end of the path (Loehlin, 1998; Foster, Barkus, & Yavorsky, 2006). This means that path diagrams test associations with a specific direction, i.e. cause-and-effect relations. Path models are useful if multiple variables are involved, as is the case in the present issue. They can measure both direct and indirect effects of independent variables on dependent variables, and enable researchers to make causal claims (e.g. Braaksma et al., 2000; Peeters et al., 2009). However, Foster et al. (2006) qualify this, stating that path analysis "works on the assumption of causation, but this does not mean that it *confirms* causation" (100, emphasis added). Still, path analyses are more informative about causality than 'regular' multiple regression analyses, can determine the contribution made by each variable, plus any relationships between the independent variables, and account for measurement errors.

Another possibility for future research, similar to that for the corpus studies, is to extend the correlational and experimental studies by including another age group – children. This would paint a more comprehensive picture of the impact of Dutch youths' CMC on their school writings. Since youths use new media at increasingly younger ages (Van Gaalen, 2017) and are thus exposed to and make use of CMC earlier in life, it would be interesting to find out whether younger participants would yield different results, by replicating the studies with primary school-aged children, up to the age of 11. Several studies have already found different results for children than for other age groups (Bouillaud, Chanquoy, & Gombert, 2007; Kemp, Wood, & Waldron, 2014; Wood, Kemp, & Waldron, 2014; Wood et al., 2014; Waldron, Wood, & Kemp, 2016). Children may be more susceptible to any interference of CMC on school writing than adolescents and young adults, because their writing skills are in an earlier stage of development, in which their registers of textese and Standard Dutch are not yet consolidated and are still more fluid – similar to the poor spellers in Simoës-Perlant et al.'s (2018) study, who were found to be negatively impacted by CMC use and exposure to textese. Children are acquiring both language variants at an even lower age, and may even be exposed to textese prior to Standard Dutch. Indeed, a bachelor thesis conducted as a pilot study for the experimental study reported in this thesis found that first-graders were more negatively affected by WhatsApp use in their performance on an immediately following school writing task – specifically, in their ability to spot orthographic and grammatical 'errors' in grammaticality judgement tasks – than third-graders in secondary school (Riemens, 2016).

Moreover, future research could analyse whether the amount of individual linguistic variation in CMC, e.g. the frequency with which an individual uses textisms in their social media messages, directly affects the impact of CMC use on school writing tasks. This is feasible with the data of the experimental study reported on in chapter 10, since the WhatsApp chats produced by WhatsApp-primed participants in the priming phase of the experimental study were nearly all collected afterwards.

Such an analysis has, in fact, already been performed in a bachelor thesis (Van Helden, 2018). Van Helden coded the WhatsApp messages produced in the priming phase of our experiment for orthographic deviations, applying the same distinction in as Van der Laan (2018), inspired by Cingel and Sundar (2012), i.e. textisms ('word adaptations'), non-standard orthographic details ('structural adaptations'), and spelling errors, and then calculated the relative frequency of these features to the total number of words used per participant in their WhatsApp messages. She found no direct impact of any of these three categories of unconventional orthography on participants' performances on the immediately following writing tasks – not on the productive story writing task (measured for syntactic complexity, lexical richness, and writing productivity), nor on the receptive grammaticality judgement task (ability to detect and correct 'language errors'), except for two minor interactions between the frequency of structural deviations and age group. An additional study could analyse whether individual variation in orthographic deviations in the WhatsApp messages collected of the CMC-primed youths *does* affect their use of these same orthographic deviations in the essays: this could tell us if a greater use of textisms, spelling errors,

and/or non-standard orthographic details in CMC leads to a greater use of these deviations in school writings. Social media messages and school texts of the same students could thus be compared in terms of orthography.

Future studies could explore the implications of the present thesis for second language acquisition (SLA). The absence of interference in the experiment in chapter 10 suggests that code-switching between registers and languages is essentially different after all. This could be investigated further, for example involving youths in bilingual education. Bilingual primary and secondary schools are increasingly common in the Netherlands, also at lower educational levels, and they usually teach in Dutch and English (NOG, 2018). A future study with children or adolescents in bilingual education as participants could compare a WhatsApp-primed group with a group primed with English, as well as with a non-primed control group. One group could translate sentences or messages into textese, another group into English, and a third group could perform a colouring task. Such a methodology could further explore the differences in the presence of interference between two registers versus between two languages, i.e. whether youths reveal reverse transfer – about which little is known in the field of SLA – from their second language to their first language (English to Dutch) or from their second register to their first register (CMC language to Standard Dutch). Including educational level as an extra independent variable could provide insights into the efficacy with which lower and higher educated youths switch between registers.

The differences in educational level that were found in the correlational study reported in chapter 9 can also be further investigated in future research. It would be interesting to find out if the higher number of associations between CMC use and school writing quality that was found for youths with a lower educational level can be attributed to their supposedly lower cognitive skills or to some other reason. This could be explored by including standardized cognitive assessment tests, such as an IQ test, as a control variable in the research design. Furthermore, an attitudinal study among youths of different educational levels could reveal whether their attitudes differ towards the appropriateness of features of textese in non-CMC writings. Such research could clarify whether any greater interference in lower educated youths' school writings would be a matter of ability, i.e. more difficulty in keeping registers separated, or of 'whateverism' (Baron, 2008), i.e. less willingness to make sure one's language adheres to standard language norms.

There is also an urgent need for more longitudinal research, to determine if people's worries about Dutch youngsters' declining literacy skills are at all valid – irrespective of the possible cause, such as CMC. This could include a large-scale, systematic comparison of current school writings (e.g. essays) with such writings – preferably of similar length and topic, to make them as comparable as possible – of decades ago, for example of ten, twenty, thirty, forty, fifty years ago. Such research, whose need is also recognized by Dutch historical corpus linguist Van der Meulen (2018), could clarify whether today's 'e-generation's (Underwood & Farrington-Flint, 2015) spelling and writing at school are indeed more at odds with Standard Dutch than those of previous generations. For instance, De S.P.E.L.-show (2018b) claims that the average language proficiency level is declining in the Netherlands, that youths

can read and write less well than twenty years ago. Research needs to be conducted to find out if this perceived decline in literacy skills can be backed up with empirical evidence.

Afterword

I would like to finish this thesis the same way it started, namely with a personal email (anonymised), again from 2006:

(7)   **Haaj grieksvolk**,
      [NAME] heeft me haar plan van aanpak gestuurd. Dan kunnen we allemaal dezelfde datums in de PO zetten bij ons plan van aanpak, de datums van wanneer we in de les aan de PO hebben gewerkt (aangezien we het niet meer precies weten). Is wel zo handig dat we dezelfde datums hebben, anders is het nogal raar als [NAME] gaat vergelijken **:p**. Dus, dit zijn de datums waarin we in de les aan de PO gewerkt hebben: 04-09-2006, 05-09-2006, 06-09-2006, 07-09-2006, 08-09-2006.
      En dan steeds 50 min. per les.
      Nog veel succes ermee!
      xxx Liekuuuuuh.

This email to classmates in Greek class is similar to those presented in the introduction to this thesis, in that it again includes several deviations from the standard language: phonetic respellings (*Haaj*), letter reduplication (*Liekuuuuuh*), omission of capitalization (*grieksvolk*), ellipsis (of demonstrative pronoun: *[Dat] Is wel zo handig*), emoticon (*:p*), symbols (*xxx*), and extra punctuation at the ending of the email (redundant period). Yet 93 of the 98 words adhere to the standard language norms: it is just the opening and closing lines that deviate considerably – the other lines include standard spelling and orthographic details (capitalization, spacing, punctuation) and are perfectly grammatical, except for one ellipsis. The author, who was a higher educated Dutch adolescent, displays an apparent capability of effortlessly switching between Standard Dutch and informal CMC language. Considering that the findings of this thesis do not support the supposed detrimental impact of CMC on school writings, perhaps the author of example (1) was no exception in being able to shift between different written registers of Dutch.

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Appendices

Appendix A. Overview of new literacies: The literacy landscape transformed

1. Computer Literacy or Computing Literacy

One type of literacy that is relevant for computer-mediated communication—although CMC nowadays can also occur on mobile phones—is **computer literacy**. Coined as **computing literacy** as early as 1976 by Nevison (1976), it was one of the first literacy terms to be devised besides traditional literacy. Watt (1980) defines it as the "collection of skills, knowledge understanding, values, and relationships that allow a person to function comfortably as a productive citizen in a computer-oriented society" (3). Gillaspy simply defines computer literacy as "learning computer commands" (Hanley, Terpstra, Gillaspy, & McCoy, 1983:26); a very brief definition totally orientated to practical computer skills. McCoy takes a broader view of computer literacy: he sees it as "know[ing], on a conceptual level, what the programmer and computer are doing" and having "evaluation tools continuously at work as verbal information is being read or heard ... [, at work] on device-generated or modified information too" (ibid., 27). Hunter (1984) describes it as "the skills and knowledge needed by a citizen to survive and thrive in a society that is dependent on technology for handling information and solving complex problems" (45, qtd. in Oliver & Towers, 2000). Calfee (1985) vaguely defines computer literacy as the ability to "deal with machines effectively" (13). Simonson, Maurer, Montag-Torardi, and Whitaker (1987) define it as "an understanding of computer characteristics, capabilities and applications, as well as an ability to implement this knowledge in the skilful and productive use of computer applications suitable to the individual roles in society" (232, qtd. in Oliver & Towers, 2000).

Besser (1993) remarks that in the early days when computers had not yet become part of people's everyday lives, it was not clear what computer literacy exactly entailed:

> Anyone involved in discussions around development of "computer literacy" curriculum in the 1980s recognizes the ambiguity of the term. Courses in programming, word processing, and even in explanations of basic components (such as how to use a floppy disk) all were termed "computer literacy".

This lack of consensus explains why Watt's (1980), Gillaspy's (1983), McCoy's (1983), Hunter's (1984), Calfee's (1985), and Simonson et al.'s (1987) early definitions are so different. Although McMillan (1996) defines computer literacy roughly as "the ability to process information using ... the computer" (162), thus focusing on receptive skills, he stresses that it remains difficult to formulate a clear, specific, and concise definition. Bawden (2001) defines computer literacy as competence in the use of computers, but states that, indeed, "there is a spectrum of views as to quite what this 'competence' involves" (225). Warschauer (2002) sees it as one of several electronic literacies (see section 4) and defines it simply as "comfort and fluency in

keyboarding and using computers" (455) and later redefines it as "comfort and fluency in using hardware and software" (Warschauer, 2007:915), thereby shifting his focus.

Childers (2003) agrees with Besser that there have been diverse accounts of computer literacy, ranging from "the ability to program, having only a general awareness of how to use a computer, or some point in-between where the user can use most programs, but has no knowledge about the specific workings of computers or programming" (101). Besides this continuum of opinions on what constitutes computer literacy, the concept has been referred to with different terms, such as **computer competency** and **computer proficiency**.

The definition of computer literacy provided by Kershner (1998, 2003) is nearly identical to Calfee's: it is the ability to use computers effectively. Kershner adds to this that computer literacy also requires being comfortable in this computer age, which includes comfortably using computers for communication, e.g. through emailing. She specifies five essential features of computer literacy:

(i) "The ability to use the computer as a tool for problem solving";

(ii) "An understanding of what computers can and cannot do (the function of hardware and software)";

(iii) "Non-technical experience with computer software";

(iv) "Experience in using the Internet ... as an information-gathering tool";

(v) "The ability to evaluate the societal impact of computers" (396).

In contrast to what McCoy claimed twenty years earlier, Kershner states that computer literacy does not require any technical expertise of computers: she does not consider knowledge of programming or computer processes to be an integral part of it.

Pincas (2004) sees computer literacy as related to e-literacy (see section 4). She specifies three characteristics of computer literacy, namely:

(a) "the specific features of the computer, e.g. typing conventions, icons, menu bars, pop-up windows, hyperlinks,[64] etc.";

(b) "how meaning is conveyed differently on the computer, e.g. moving text, flashing text, text with sound, text appearing in response to speech, etc.";

(c) "how sound, moving image, or the special conventions in journalism and film convey their meanings, and how, again, these are different on a computer, e.g. the flowing of text around images, the juxtaposition of movie with PowerPoint slides, etc." (921).

This description makes clear that Pincas sees computer literacy as a multifaceted concept that includes diverse computer skills.

Computer literacy was reconceptualised by Selber (2004), as a multiplex (rather than unilateral) concept, consisting of three complementary **computer multiliteracies**. The first one is functional literacy, whereby computers are used as tools and students should be effective users of technology. Another computer literacy is critical literacy: Selber describes this as the use of computers as cultural

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[64] Hyperlinks are associative electronic links that enable users to jump to other websites, pages or computer files.

artifacts for the objective of informed critique, in which case students are informed questioners of technology. The third computer literacy is rhetorical literacy: students should be reflective producers of technology who can design and evaluate online texts and interfaces and use computers as hypertextual media. Hypertextual media are characterised by hypertext, i.e. non-linearly organized text on the Internet (which, rather than in one fixed sequence, can be read in different ways—there are multiple pathways to go through it); by a hypertext-based network structure with a modular design, containing modular nodes (points); and by hyperlinks. This array of computer literacies is required for people "in order to participate fully and productively in the technological dimensions of their professional and personal lives" (234). Being computer literate requires becoming adept at using all computer multiliteracies in Selber's tripartite framework.

Arguing that computer literacy is "essential in today's computer-centric World" (115), Gupta (2006) defines it in detail, as the

> ability to operate a computer system, have basic understanding of the operating system to save, copy, delete, open, print documents, format a disk, use computer applications software to perform personal or job-related tasks, use Web browsers and search engines on the Internet to retrieve needed information and communicate with others by sending and receiving email. (115)

Similar to Kershner, Gupta sates that programming skills or extensive technological know-how are not necessary for computer literacy; for him it is all about the ability to use computer technology effectively and efficiently, which does not require software writing skills.

Martin (2008) outlines three phases in conceptualisations of computer literacy, focusing on mastery, application, and reflection. In the mastery phase (up to the mid-1980s), definitions of computer literacy emphasized skills to master the computer and specialized computer knowledge; the *application* phase (mid-1980s to late-1990s) saw an emphasis on usage of the computer as a practical tool, on applications software; and definitions in the *reflective* phase (late-1990s onwards) emphasized reflective, evaluative, critical approaches to computers. Yet it has to be pointed out that it would be greatly oversimplifying matters to see Martin's three phases as distinct and separate. Rather, they overlap and "the earlier phases remain as subordinate layers" in the later phases (Martin, 2008:158): definitions proposed during the later phases tend also to include the need to master computer skills.

Lastly, in her list of multiliteracies (see section 13), Westby (2010) broadly defines computer literacy as "[t]he ability to use a computer and its software to accomplish practical tasks" (65). She does not specify what these practical tasks entail or what skills are involved.

2. Web Literacy, Internet Literacy, Network Literacy, or Cyberliteracy

Web literacy, Internet literacy, network literacy, or cyberliteracy have been classified as subtypes of computer literacy (see section 1), of information literacy, or of critical literacy.[65] These new literacies are relevant in the context of CMC because much CMC nowadays involes online messaging. The four concepts are very similar, which is why they are discussed in one section here, but they are not identical. The terms 'World Wide Web' (commonly abbreviated to 'Web' or 'W3') and 'Internet' are often used interchangeably, but in fact they are not synonymous: the World Wide Web is a portion of the Internet, albeit a large portion. The Web is "the full collection of all the computers linked to the Internet which hold documents that are mutually accessible through the use of a standard protocol" (Crystal, 2006:13); it is an information-sharing model through which one can access information via the Internet, whereas the Internet is a massive networking infrastructure connecting millions of computers together globally. McClure (1994) introduced the term **network literacy** and provides the following definition: it is "the ability to identify, access and use electronic information from the network" (115). The network he refers to is the Internet, which was then a new communication technology. McClure sees network literacy as including two major components: knowledge and skills. He posited it as necessary to be productive and effective in the 'networked society' which was then emerging.

Devlin (1997) also writes about network literacy. According to Devlin, this includes the knowledge of when to use the Internet as an information source and the ability to use effective search strategies. The term is also used in a handful of recent studies (Ngulube, Shezi, & Leach, 2009; Welsh & Wright, 2010;[66] Ezeani, 2011; Lai, 2011), but appears to have declined due to the rise of other terms such as web literacy, Internet literacy, and cyberliteracy, which express a similar concept.

As Sorapure, Inglesby, and Yachtisin (1998) write, **web literacy** involves the "ability to manage the diverse and largely unfiltered content of the Web" (409), so of finding relevant information online and assessing its quality and value; they thus focus on receptive literacy. This goes together with "attentiveness to the information conveyed in a site's nontextual features" (ibid.), which includes audiovisual features (still or moving images, graphics, animations, video, audio), interactive features, and hyperlinks. Sorapure et al. consider web literacy to include the ability to handle text in multimedia, interactive, and hypertextual formats.

Web literacy is defined by Darrow (1999) as "the ability to access, search, utilize, communicate, and create information on the World Wide Web" (35). He thus mentions receptive (*access*, *search*, and *utilize*) as well as productive skills (*communicate* and *create*). He identifies several stages in becoming web literate; the final stage is that of the web master.

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[65] Or, alternatively, information literacy or critical literacy can be conceived as parts of Internet literacy (McClure, 1994; Livingstone, 2008).

[66] Welsh and Wright distinguish two types of network literacy: on the one hand, searching the Internet / the World Wide Web (i.e. Internet literacy, web literacy, cyberliteracy) and, on the other hand, database searching.

Derived from 'cyberspace', i.e. virtual places on the Internet interconnected though technology, Gurak (2001) uses the term **cyberliteracy**: the ability to navigate the Internet with awareness, a kind of 'Internet consciousness'. Cyberliteracy includes several skills:

(i) "to sort fact from fiction";

(ii) "to detect extremism from reasonable debate";

(iii) "to identify gender bias, commercialism, imitation, parody, and other aspects of written language that are problematic in online communication" (blurb).

Gurak mostly discusses critical, evaluative reading skills, which makes her definition of cyberliteracy one that focuses on receptive literacy.

Karchmer (2001) states that "the ability to communicate through animated graphics, video, digitized pronunciations, hyperlinks, and other information resources necessitates the development of new literacy skills," namely of **Internet literacy** (442). This incorporates the ability "to use Internet technologies to quickly gather and evaluate information, use that information to solve problems, and then quickly communicate their solutions to others" (442,445): this is both receptive and productive literacy. Karchmer suggests that web-based texts differ from print-based texts in various features: the former "are interactive and malleable," "incorporate audiovisual aids," "are easily connected to related texts," and "produce alternative [non-linear] text structures" as compared to the traditional linear organisation of print-based texts (448). For Karchmer, Internet literacy includes the ability to handle these characteristic features of websites.

Web literacy, according to Sutherland-Smith (2002), is "finding, scanning, digesting, and storing Internet information" (663). It includes being competent and comfortable with the Web. Sutherland-Smith focuses on the reading skills involved in web literacy, so on receptive literacy. These include skills to access and analyse information, as well as processing procedures to store or move text. Sutherland-Smith suggests that, in comparison with traditional literacy, web literacy requires extended reading skills to evaluate nontextual features such as images, graphics, and multimedia and more associative logic to handle hypertext. She identifies several characteristics of web-based text, which are similar to those listed by Karchmer: it "permits nonlinear strategies of thinking," "allows nonhierarchical strategies," "offers nonsequential strategies," "requires visual literacy skills to understand multimedia components," "is interactive, with the reader able to add, change, or move text," and "enables a blurring of the relationship between reader and writer" (664–5). Being web literate includes the ability to deal with these characteristics of the Web.

Writing about web literacy, Salpeter (2003) does not present a definition, but mentions several relevant skills – all receptive: the ability to search for desired information online, using and interpreting online information, and understanding the issue of online authorship.

Kuiper, Volman, and Terwel (2008) identify three groups of web literacy skills: web searching, web reading, and web evaluating skills. *Searching skills* are required to find desired information on the Web. They include, for instance, the ability to use appropriate search terms. *Reading skills* consist of both traditional (technical and

comprehensive reading) and new skills that are required because of the information overload of the Web and the use of hypertext (which can be read in a non-linear path chosen by the reader) and multimodal text (which are composed using a combination of modes, e.g. written (text), visual (images, graphics), and audio (sounds)). They include scanning and close reading techniques and the ability to "identify the meaning of non-textual elements" (¶5). *Evaluating skills* are required because of the openness and accessibility of the Web. They include the ability to critically assess the usefulness, reliability and authority, and one's own understanding of information on websites. These three categories of web literacy skills are all receptive.

A both receptive and productive view of cyberliteracy is taken by Stiller and LeBlanc (2006). To their mind, it includes the ability to "critically consume Internet content" (receptive) and to "use a variety of media on the Internet to express [one's] own viewpoints" (productive) (6). They also mention several issues that are essential for cyberliteracy: these include topicality; authorship; expressivity; diversity; accessibility; interactivity; multimedia; social and ethical issues such as intellectual property, libel, 'netiquette' (informal rules and social conventions on the Internet), and media ownership; privacy issues; and dangers. Cyberliteracy, according to Stiller and LeBlanc, requires being aware of and knowledgeable about such concepts. It is necessary in order to fully participate in 'cybersociety'.

Gregson (2008) also writes about cyberliteracy. She stresses that it is more than simply "knowing how to use a computer and surf the Internet" (8). Rather, it entails the abilities to evaluate the reliability and accuracy of online information (a receptive literacy skill), and to use and attribute such online information in one's own writing (a productive skill).

A brief definition of Internet literacy is provided by Livingstone (2008): "the ability to access, understand, critique, and create information and communication content online" (110), which, again, acknowledges the relevance of both receptive and productive Internet skills.

Finally, Leung and Lee (2012) define Internet literacy succinctly as the ability to critically evaluate and sort out information on the Internet. This focus on the processing of information indicates a receptive view of Internet literacy. They conceptualise it as a multidimensional model, which includes seven subliteracies or abilities (those specified by Shapiro & Hughes (1996) for their definition of information literacy), most of which focus on understanding:

(a) tool literacy: "the ability to understand and use practical and conceptual information technology tools in respective professional life";

(b) resource literacy: "the ability to understand the form, location, access methods, and formats of information resources";

(c) social-structural literacy: "the understanding of how information is socially situated and produced";

(d) research literacy: "the ability to understand and use relevant information technology tools for research";

(e) publishing literacy: "the ability to format and publish research and ideas in textual and multimedia formats";

(f) emerging technology literacy: "the awareness and the ability to adapt to, understand, evaluate, and make use of emerging information technology";
(g) critical literacy: "the ability to critically evaluate the strengths and weaknesses, capabilities and limits, of information technologies" (405).
Each component describes a skill that Leung and Lee find necessary for Internet literacy.

3. Digital Literacy

Because CMC makes use of digital tools, **digital literacy** is evidently relevant here. Indeed, Lankshear and Knobel (2008) mention text messages, social networking sites, online forums, and blogs as examples of genres that require digital literacy. Gilster (1997) provides two definitions of digital literacy: firstly, he says it is "the ability to access networked computer resources and use them" and secondly, he defines it as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (1). Both definitions focus on one digital tool, the computer, because it was one of the few digital technologies in people's everyday lives in 1997. Gilster's first definition, furthermore, focuses on computer networks, i.e. the Internet, which started to spread among the globe at the time. He sees digital literacy as including four core competencies:
(i) content evaluation: making informed judgements about information presented online by thinking critically;
(ii) hypertextual navigation: reading and understanding dynamic, non-sequential information;
(iii) Internet searching: developing online search skills;
(iv) knowledge assembly: building a "reliable information horde" from various sources (3).
Gilster thus considers digital literacy as much more than mastering technical skills with digital tools; he stresses the central role of critical thinking.
        Eshet-Alkalai (2004) defines digital literacy as a "survival skill in the digital era" (102) for functioning effectively in digital environments. He distinguishes five subtypes:
(a) photo-visual literacy: understanding visual representations, e.g. "'reading' instructions from graphical displays in user interfaces";
(b) reproduction literacy: creatively reusing existing materials, e.g. "using digital reproduction to create new, meaningful materials from existing ones";
(c) branching literacy: understanding hypermedia, e.g. "constructing knowledge from a nonlinear, hypertextual navigation";
(d) information literacy: being sceptic, e.g. "evaluating the quality and validity of information";
(e) socio-emotional literacy: behaving sensibly in cyberspace, e.g. "hav[ing] a mature and realistic understanding of the 'rules' that prevail in the cyberspace" (93).
Eshet-Alkalai thus considers digital literacy as including not just the technical skills necessary for operating digital devices or for using software, but also various cognitive, sociological, and emotional skills.

Jones and Flannigan (2005) also use digital literacy as an umbrella term, covering four subtypes of literacy:
(i) photo-visual literacy: "the ability to 'read' instructions from graphic interfaces";
(ii) reproduction literacy: the ability "to use the computer's digital reproduction capability ('copy & paste') in order to form genuine-creative products";
(iii) lateral literacy: "the flexibility of thinking that enables learners to construct knowledge from hypertextual, non-linear navigation through knowledge domains";
(iv) information literacy: "the ability to critically evaluate and assess the quality of digital information" (6).
These types are similar to those of Eshet-Alkalai (2004), but slightly differ in that Jones and Flannigan exclude socio-emotional literacy and speak about lateral literacy rather than branching literacy, although these two terms describe the same concept.

Jones-Kavalier and Flannigan (2006) feel that literacy is nowadays all about "connecting the digital dots"—dots that are multidimensional and constantly changing, of different sizes and colours, and linked to other dots (9). It is the ability to "understand[] the multiple media that make up our high-tech reality and develop[] the skills to use them effectively" (8). They divide twenty-first century literacy into digital literacy and visual literacy (see section 10). Digital literacy, which is important for today's 'digitally savvy' youth, is defined as the "ability to perform tasks effectively in a digital environment" (ibid.). This includes "the ability to read and interpret media (text, sound, images), to reproduce data and images through digital manipulation, and to evaluate and apply new knowledge gained from digital environments" (ibid.)—both receptive (*read, interpret, evaluate*) and productive (*reproduce, apply*) skills. It also includes a critical component, namely "the ability to make educated judgments about what we find online" (ibid.).

Digital literacy is described by Buckingham (2006) as the skills necessary for handling and understanding digital media. He states that digital literacy includes the basics of knowing "how to use a computer and a keyboard" and "how to do online searches" (which, in turn, includes knowing "how to use browsers, hyperlinks and search engines" etc.), but that it encompasses much more than that (267). Besides retrieving information, digital literacy also involves the ability "to evaluate and use information critically" (ibid.). Buckingham thus sees digital literacy as including not just functional or instrumental skills, but also a cognitive component and critical thinking.

Jacobs (2006) writes of instant messaging as one of more **digital literacies**, in the plural. She thereby describes the use of a particular CMC mode as a specific digital literacy practice. According to Jacobs, the skills required for IMing are collecting, assembling, and distributing information. IMing also involves the ability to work collaboratively and interactively. Jacobs sees these skills as essential in today's "fast capitalist, information-based" society (191).

Merchant (2007) stresses the importance of digital literacy, which he defines as "the study of written or symbolic representation that is mediated by new technology" (121). It concerns mostly "the production and consumption of the verbal and symbolic aspect of screen-based texts"—simply put, with reading (receptive) and writing (productive) digital, and often multimodal, texts. This is an

extension of the traditional literacy skills of reading and writing from print texts to digital texts. Merchant says that part of digital literacy is a critical digital literacy, but he does not explain this further.

Bawden (2008) sees digital literacy as an umbrella concept. From his perspective, the underpinnings of digital literacy are traditional literacy and computer literacy (see section 1) or ICT literacy (section 5); these are the basics necessary to acquire digital literacy. Also required for digital literacy is background knowledge about the world of information and the nature of information resources. As the central competencies of digital literacy, Bawden lists media literacy (section 6) and information literacy, as well as several receptive and productive skills: the ability to read and understand digital and non-digital formats, the ability to create and communicate digital information, the ability to evaluate information, and knowledge assembly. Moreover, he sees digital literacy as including attitudes and perspectives: moral or social literacy (in this case, an understanding of correct and sensible behaviour in digital environments) and the skill of independent learning. An interesting and somewhat unexpected element of Bawden's description of digital literacy is that of reading and understanding *non-digital* formats: hereby, he stresses that digital technologies should complement rather than replace traditional formats. Bawden thus has a very broad conception of digital literacy.

According to Hartley, McWilliam, Burgess, and Banks (2008), digital literacy includes "access and understanding of professionally produced digital content" (equated by them with media literacy, see section 6), but also "its creation and publication by non-professional users and consumers" (59). There are elements of reception (*access, understanding*) and production (*creation, publication*) in this description. Hartley et al. discuss three examples of digital literacies: telling digital stories with short videos, using photo-sharing platforms such as *Flickr*, and playing online games. They regard the use of such multimedia as part of digital literacy.

Martin (2008) presents quite an elaborate definition of digital literacy: in his words, it is "the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process" (167). This definition includes a broad range of receptive and productive elements. Martin distinguishes two levels of digital literacy: digital usage and digital transformation. 'Digital usage' is about the application of digital competence in professional or disciplinary contexts, while 'digital transformation' involves critical reflection and understanding of the transformative (human and social) impact of digital actions. Martin notes that a requirement for digital literacy is 'digital competence', which involves the mastery of skills, concepts, approaches, and attitudes; yet he does not see this as a part, but rather as a precursor to digital literacy. In Martin's view, digital literacy also includes an awareness of and resistance to "the digital threats to identity" and the ability of using digital tools "to secure and support one's own identity" (174), which are important in this 'dangerous' digital world.

Tomita (2009) notes that traditional literacy is insufficient nowadays and that digital literacy has become crucial for youngsters to be successful in life:

> In a rapidly changing world students will need to understand and master the use of 21st century technology tools to effectively communicate and collaborate together. Students need to be effective communicators not only from a formal standpoint, but also an informal one as well. ... literacy is not limited to only typographic literacies, but includes digital literacies as well. Both require different skills, each specific to its intended audience. Beyond mastering traditional writing skills, students will also need to understand and master tools like Twitter and IM. (189–90)

So besides conventional reading and writing, youngsters have to be able to communicate through CMC, which "require[s] a different set of skills, language and thinking" (187): it requires digital literacy.

Similar to how Jacobs (2006) and Hartley et al. (2008) describe IMing, digital storytelling, online gaming, and using photo-sharing platforms as digital literacies, Buck (2012) sees the use of social networking sites as a digital literacy practice. He points out that "managing information on these [social networking] services and navigating their complicated settings requires sophisticated literacy skills" (35), but does not further specify these skills.

Lankshear and Knobel (2008) do not write of digital literacy but rather of digital literacies: they take an expansive view of the concept and emphasize its plurality, because there is great diversity and complexity of digital literacy accounts, as clearly emerges from this section. Rather than presenting a definition of their own, they note that "the most immediately obvious facts about accounts of digital literacy are that there are many of them and that there are significantly different *kinds* of concepts on offer" (2, emphasis in original): there is "a veritable legion" of conceptions of digital literacy (4).

Finally, Aleixo, Nunes, and Isaias (2012) see digital literacies as an umbrella term covering computer literacy (see section 1), information literacy, multimedia literacy (section 8), and computer-mediated communication literacy (section 11). They define digital literacies as a set of cognitive competences and ICT competences (technological skills) that people need "in order to use digital technologies, communication media, social networking tools, and networked information" (223). These are required to participate in our information- and knowledge-based society, since not being digitally literate may lead to 'digital exclusion'.

4. Electronic Literacy, E-Literacy, or eLiteracy

Since CMC occurs via electronic devices, another relevant concept is that of electronic literacy or e-literacy. Reinking (1994) defines **electronic literacy** simply as "electronic reading and writing" (¶3). This differs from print-based literacy because electronic texts differ from print texts in that readers can interact with electronic

texts and their reading can be guided. In addition, electronic texts may have different structures and employ new 'symbolic elements' such as animations, moving visuals, sound effects, and videos. Electronic literacy includes the ability to deal with the non-linear, non-sequential text structures (e.g. with hyperlinks) of electronic texts, by strategies for reading and writing such texts. It also includes the ability to effectively use new symbolic elements in reading and writing electronic texts. Reinking thus mentions both receptive and productive skills in his definition of electronic literacy.

Rather than defining electronic literacy, Winkelmann (1995) lists a variety of terms that can describe it, including *nonhierarchical*, *hypertextual*, *non-linear*, *anti-linear*, *malleable*, *manipulable*, *multivocalic*, *de-centerable*, *re-centerable*, *dynamic*, *democratized*, *anarchic*, *transformative*, *fragmentary*, and *reticulate* (433). She states that these characteristics make the process of creating a text even more complex and that the malleability and 'multivocality' associated with electronic literacy blur the boundaries between writers and readers of a text.

Selfe and Hawisher (2002) define electronic literacy as "the practices involved in reading, writing, and exchanging information in online environments," together with the social, cultural, political, and educational values associated with such practices (232). This is a broad definition, stressing that literacy does not exist in a vacuum but is related to important values. Selfe and Hawisher treat electronic literacy as synonymous with digital literacy (see section 3) and technological literacy, but different from computer literacy (section 1), which they consider simply to be the skills required to use computers.

Identical to Aleixo et al.'s (2012) conceptualisation of digital literacies, Warschauer (2002) uses **electronic literacies** as an umbrella term for computer literacy (see section 1), information literacy, multimedia literacy (section 8), and computer-mediated communication literacy (section 11).

Alternatively, Martin (2003) writes about **eLiteracy**, which he defines as "the awarenesses, skills, understandings, and reflective-evaluative approaches that are necessary for an individual to operate comfortably in information-rich and ICT-supported environments" (18). This description focuses on reception rather than production. Martin elaborates that eLiteracy consists of five elements:
(a) "awareness of the ICT [information and communication technology] and information environment";
(b) "confidence in using generic ICT and information tools;
(c) "evaluation of information-handling operations and products";
(d) "reflection on one's own eLiteracy development";
(e) "adaptability and willingness to meet eLiteracy challenges" (ibid.).
The same, rather vague, definition is used by Martin and Ashworth (2004).

Spelled **e-literacy**, Pincas (2004) classifies this as one of two subtypes of computer literacy (see section 1). The first is 'operational computer literacy': skills in computer commands and processes. The second is 'cognitive computer literacy' or e-literacy. She defines it as "an intellectual grasp of how to exploit what the computer (including the WWW) offers" (921), which includes, among other things, finding, recording, and sharing information and interacting with others. She considers it to also involve information literacy and ethical literacy (about intellectual copyright, data

protection, netiquette, etc.). Pincas thus uses e-literacy as a term which comprises multiple new literacies required to survive in this 'e-society'.

E-literacy, in the words of Joint (2005a), entails the "ability to interpret, navigate and shape the landscape of virtual democracy" or 'e-democracy' (81): it involves more than "mastering it in a passive, mechanistic sense," namely also "knowing how to infuse it with the values that we think it should have" (82). Joint hereby takes a broad and rather political view on e-literacy. He claims that e-literacy has an important role to play in attaining 'digital citizenship'. Joint (2005b) adds that e-literacy requires knowledge of both the potential and the limitations of 'e-world' skills.

Macleod (2005) describes electronic literacy as the skills and practices that are necessary to make effective use of ICTs. She sees it as encompassing not only "the operational aspects of using a computer" such as word processing, handling computer files, and searching the Internet, but also "the development of higher order skills situated within a cultural context" (Electronic Literacy section, ¶3). We can deduce from this that Macleod's description contains elements of ICT literacy (see section 5), computer literacy (section 1), and Internet literacy (section 2).

Beeson (2006) sees e-literacy as the ability to judge the relevance of information on the World Wide Web, as well as to express judgements on this. He identifies four important skills for e-literacy:
(i) to reflect critically on one's search for information;
(ii) to critically evaluate sources and authors;
(iii) to substantiate the relevance of information through practical argumentation;
(iv) to articulate and explain in writing one's selection of sources.
In short, Beeson sees e-literacy as information literacy in an age of electronic information.

The constantly changing nature of electronic literacy is emphasized by Godwin-Jones (2006): as the Internet evolves, online reading and writing keep evolving. New electronic literacy skills he identifies are blogging, community tagging (adding tags to texts, photographs, or other content posted online, which summarize their essence in key words), and shared bookmarking (adding bookmarks to online documents). He also emphasizes the social dimension of electronic literacy, which is present because writing and reading on the Internet are often collaborative activities.

Morris and Brading (2007) focus on what they see as an important part of e-literacy: the ability to effectively use the Internet. This is exactly what others have termed 'Internet literacy' (see section 2). Yet Morris and Brading describe Internet literacy as a subtype of e-literacy.

Two dimensions of e-literacy are identified by Brandtweiner, Donat, and Kerschbaum (2010): one representing basic skills and the other advanced skills. Basic technical skills and computer literacy (see section 1) are involved in 'e-competence', the technical use of computers and the Internet. Here, the Internet is used as an administrative tool (e.g. for voting, searching for a job, and e-commerce) and the literacy skills involved are receptive. Advanced, sophisticated skills are 'media competence', which requires more cognitive abilities. Here, the Internet is used as a mass medium (for the purposes of communication, education, information, and

entertainment) and involves more interactivity and production. Brandtweiner et al.'s conceptualisation of e-competence is comparable to Pincas's (2004) operational computer literacy, while their media competence appears similar to Pincas's cognitive computer literacy.

5. ICT Literacy

CMC takes place, of course, through information and communication technologies (ICTs). Oliver and Towers (2000) provide one of the earliest definitions of **ICT literacy**: it is "the set of skills and understandings required by people to enable meaningful use of ICT appropriate to their needs" (384). Focusing on the use of ICT by students in tertiary education, Oliver and Towers specify four important skills required:

(a) computer operations: the "ability to independently operate personal computer systems";

(b) software applications: the "ability to use software for preparing and presenting work";

(c) Internet skills: the "ability to use the Internet and its various features as a communications device";

(d) WWW skills: the "ability to access and use information from the WWW" (384).

Although this definition, which includes receptive as well as productive literacy skills, was devised in the context of university students, it could easily apply to a more general population.

The International ICT Literacy Panel (2002), which was commissioned by the Educational Testing Service (ETS), regard ICT literacy as involving not only technical skills, but also cognitive skills such as general literacy, numeracy, critical thinking, and problem solving; they have a broad perspective on ICT literacy. They define ICT literacy as "using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society" (2). This definition reflects what they consider as the five essential skills for ICT literacy. A year later, the ETS (2003) slightly adapted this definition: ICT literacy is "the ability to use digital technology, communication tools, and /or networks appropriately to solve information problems in order to function in an information society," which includes firstly, "the ability to use technology as a tool to research, organize, evaluate, and communicate information" and secondly, "the possession of a fundamental understanding of the ethical / legal issues surrounding the access and use of information" (11). Their list of essential skills for ICT literacy then became as follows (in order of increasing cognitive complexity):

(i) defining: "[u]sing ICT tools to identify and appropriately represent an information need";

(ii) accessing: "[k]nowing about and knowing how to collect and/or retrieve information";

(iii) managing: "[o]rganizing information into existing classification schemes";

(iv) integrating: "[i]nterpreting, summarizing, comparing and contrasting information using similar or different forms of representation";
(v) evaluating: "[r]eflecting to make judgments about the quality, relevance, usefulness, or efficiency of information";
(vi) creating: "[g]enerating new information and knowledge by adapting, applying, designing, inventing, or representing information";
(vii) communicating: "[c]onveying information and knowledge to various individuals and/or groups" (18).
These include both receptive and productive skills. 'Defining' and 'communicating' have been added to the skills already identified in 2002. In addition to the technical and cognitive abilities that were mentioned as vital for ICT literacy in 2002, the ETS adds "social and ethical understanding" (11). All this is necessary to be literate in a "technology-driven world" (10).

ICT literacy was also defined by the Australian Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) (2005), as "the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others," with the goal of participating effectively in society (vii). They identify the following six key skills for ICT literacy:
(a) accessing information: "identifying the information needed and knowing how to find and retrieve information";
(b) managing information: "organising and storing information for retrieval and reuse";
(c) evaluating: "reflecting on the processes used to design and construct ICT solutions and about making judgements regarding the integrity, relevance and usefulness of information";
(d) developing new understandings: "creating information and knowledge by synthesising, adapting, applying, designing, inventing or authoring";
(e) communicating with others: "exchanging information by sharing knowledge and creating information products to suit the audience, the context and the medium";
(f) using ICT appropriately: "making critical, reflective and strategic ICT decisions and about using ICT responsibly by considering social, legal and ethical issues" (12–3).
MCEETYA's definitions of skills draw heavily on those by proposed ETS.

Furthermore, the Korea Education Research & Information Service (KERIS) (2011) define ICT literacy as "the ability to recognize the problem, to explore and collect necessary information, to critically analyze information based on the collected data, to manage and use information efficiently, to create new information for a purpose, and to communicate with others with information using ICT" (qtd. in Kim & Lee, 2013:84). Elements involving receptive and productive literacy skills, as well as a focus on dealing with information, are present here similar to the abovementioned definitions by ETS and MCEETYA. There thus seems to be a general consensus on what ICT literacy entails.

The Australian Curriculum, Assessment and Reporting Authority (ACARA) (2012) still uses the same definition given by MCEETYA in 2005. They explain that

"[e]ven though advances in hardware and software technologies have meant that the contexts in which ICT Literacy can be demonstrated are changing, the core capabilities ... have remained consistently relevant" (ACARA, 2012:xiii), which is why they saw no need to revise the definition.

The interesting addition of **mobile ICT literacy** was made by Gomez and Elliot (2013). Simply put, it is ICT literacy on a mobile device – which are often used for CMC. Gomez and Elliot provide the following definition of mobile ICT literacy: it is the "ability of individuals to participate, within digital environments, in transactions invoking illocutionary action" (8). Illocutionary speech acts are performative actions, such as confirming, warning, advising, asking, thanking, and requesting. This is quite different from ICT literacy as discussed above and focuses solely on productive communicative skills. Gomez and Elliot discuss mobile ICT literacy in the context of emergency response settings, in which it is particularly important to write effective mobile messages expressing the appropriate illocutionary speech act.

6. Media Literacy

Another type of literacy that applies to computer-mediated communication is media literacy, which focuses on the skills required for dealing with media. Much has been written about this. Aufderheide (1993) reports on the National Leadership Conference on Media Literacy (NLCML), where media educators met to establish a vision, framework, and definition for **media literacy**. The NLCML's landmark document presents three definitions of media literacy:
(i) "the ability of a citizen to access, analyze, and produce information for specific outcomes";
(ii) the ability to "decode, evaluate, analyze, and produce both print and electronic media";
(iii) "the ability to analyze, augment and influence active reading (i.e., viewing) of media in order to be a more effective citizen" (v, 1, 26, qtd. in Tyner, 1998:120–1).
These three definitions, although they only differ subtly, reveal that there was still some dissent among the NLCML group about media literacy. The third definition differs crucially from the other two in excluding productive literacy skills.

Some years later, McBrien (1999) described media literacy as the ability "to understand, interpret, and evaluate the media" (76), not just print media but also electronic media, including video, audio, websites, and images. It involves analytically and critically 'reading' media messages,[67] as well as comprehending them. This includes recognizing "stereotypes, biases, multiple viewpoints, advertising devices, camera techniques, and photographic manipulations" (78). McBrien distinguishes five essential skills for media literacy:

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[67] Media messages are "informational and creative contents included in texts, sounds and images carried by different forms of communication, including television, cinema, video, websites, radio, video games and virtual communities" (European Commission, 2007:3).

(a) background: learning about the historical and contemporary backgrounds of media;
(b) tools: recognizing media tools;
(c) deconstruction: recognizing the techniques used for creating media products;
(d) evaluation: evaluating media messages created by media tools;
(e) original construction: creating one's own media messages.
McBrien focuses on receptive literacy skills, but the fifth skill is all about production.

Media literacy is split up by Soetaert and Bonamie (1999) into visual literacy (see section 10) and audio literacy. They see media literacy as involving the ability to resist media messages and the ability to use different kinds of media effectively in a variety of contexts.

Bawden (2001) defines media literacy as "critical thinking in assessing information gained from the mass media" (225). These mass media include television, radio, newspapers, magazines, and the Internet. His definition of media literacy focuses on the critical evaluation of information, thereby including only receptive literacy skills.

Arguing that "a restrictive, singular view of literacy that privileges print" is out-dated and should be replaced by a multiliteracies view (see section 13) (¶4), media literacy is seen as part of multiliteracies by O'Brien (2001). He focuses on electronic media and identifies two crucial skills in their use. Firstly, 'intermediality', defined as "the ability to read and write media that depends on facility in the use of a range of symbol systems," so not just print texts, but also video and images (¶5). Secondly, 'visual arts and representation': productions in a variety of media can be viewed as public art, which shows the producers' "ability, insights, and innovation in representing and re-representing their world through media" (¶5). O'Brien feels that people who struggle with the traditional skills of reading and writing (because of e.g. problems with decoding/encoding or word recognition and comprehension) may nevertheless possess these abilities which, in his opinion, also "count[] as literacy" (¶4): media literacy may compensate for any difficulties with traditional literacy.

Silverblatt (2001) provides a comprehensive definition of media literacy. He emphasizes the following elements, some of which involve receptive and others productive literacy:

- "a critical thinking skill that allows audiences to develop independent judgments about media content";
- "an understanding of the process of mass communication";
- "an awareness of the impact of media on the individual and society";
- "the development of strategies with which to discuss and analyze media messages";
- "an awareness of media content as 'text' that provides insight into our contemporary culture and ourselves";
- "the cultivation of an enhanced enjoyment, understanding and appreciation of media content";
- "the ability to produce effective and responsible media messages" (120).

Later, Silverblatt (2008) described media literacy as the ability to "decipher information conveyed through the various channels of mass communication—print, photography, film, radio, television, and interactive media" (blurb). This differs slightly from the description in the first edition of his book (Silverblatt, 1995), which did not yet mention 'interactive media': this was added because of the changed media landscape by the rise of Web 2.0 (a term coined by O'Reilly, 2005) and social media.

Four main aspects of media literacy are identified by Buckingham (2006), namely representation, language, production, and audience. Because media represent the world in a particular way rather than objectively reflect it, media literacy includes the ability to evaluate media material, which involves issues of authority, authenticity, reliability, and bias. In terms of language, media literacy requires an awareness of how (digital) media are designed and constructed and of their verbal and visual rhetoric. The producers of media are also important: media literacy involves an awareness of who produced the material (authorship) and why and of how advertising and promotion are used. A final aspect of media literacy is an awareness of one's own role as reader or user of media and an understanding of how media target specific audiences. Buckingham emphasizes that media literacy involves both 'reading' and 'writing' the media, where reading is critical analysis and writing is production: this makes it clear that he recognizes the importance of both receptive and productive media literacy skills.

Even the European Commission (2007) presents their own definition of media literacy: it is "the ability to access the media, to understand and to critically evaluate different aspects of the media and media contents and to create communications in a variety of contexts" (3). Media literacy includes the following skills:

- "feeling comfortable with all existing media";
- "actively using media ... and better exploiting the potential of media for entertainment, access to culture, intercultural dialogue, learning and daily-life applications";
- "having a critical approach to media as regards both quality and accuracy of content";
- "using media creatively";
- "understanding the economy of media and the difference between pluralism and media ownership";
- "being aware of copyright issues" (4).

The European definition and list of skills include, again, reception and production of media.

Commissioned by the Dutch national expertise centre on curriculum development, Frankenhuis, Van der Hagen, and Smelik (2007) define media literacy as the set of knowledge, skills and attitudes which students should have to move consciously, critically, and actively in our complex and ever-changing media culture (7). They consider media literacy as including not just the ability to deal with the media, but also to produce media.

According to Considine, Horton, and Moorman (2009), media literacy is "the ability to access, analyze, evaluate, and effectively communicate in a variety of forms

including print and nonprint texts" (472), again a reception- as well as production-oriented definition. They argue that this requires paying attention to issues of text (type, genre, structure), audience (target readership), and production (authorship, production techniques, marketing and distribution).

Brandtweiner, Donat, and Kerschbaum (2010) classified media literacy or **media competence** as a subtype of e-literacy (see section 4). They specified four essential abilities:

(i) knowledge about media, usage and participation: "selecting and using the appropriate media and contents";

(ii) analysis and evaluation: "understanding and evaluating media contents";

(iii) self-reflection: "recognizing and responding to the influences of media contents";

(iv) seriousness and credibility: "identifying and evaluating the circumstances of production" (818).

These are receptive literacy skills, having to do with critical reading.

Discussing media literacy, Tyner (2010) points out that "the parameters, aims, and purpose of media literacy are still in question" (2), which means that no definitive definition can be resolved upon. Besides media literacy, the terms **critical media literacy** (similar to critical literacy), **news media literacy** (taking a journalism perspective), **media literacy 2.0** (referring to Web 2.0, in the context of video games and virtual words), and **new media literacies** (specifically, gaming literacies) are discussed in Tyner's volume, by Share (2010), Fleming (2010), Delwiche (2010), and Robison (2010) respectively. This indicates that media literacy is a versatile, productive concept.

Welsh and Wright (2010) in brief define media literacy in the digital age as the ability "to *understand*, *evaluate*, and *use* digital, multimedia information" (108, italics in original). This definition with its focus on dealing with information excludes any notion of creating or producing (multi)media.

In listing several multiliteracies (see section 13), Westby (2010) defines **media literacies** (plural) as "[l]iteracies in digital mediums and on the Internet, involving hypertext, multimedia, and electronic forms of communication" (65). This is rather unspecific.

Five crucial aspects of media literacy that are necessary to participate in today's media-filled world are recognized by De Abreu (2011): media literacy is "the ability to access, analyze, evaluate, [create,] and communicate information in a variety of forms and formats" (13). Some of these skills are receptive, others productive. De Abreu states that media literacy "teaches metacognition, creativity and intellectual curiosity" (36). Being media literate involves critical thinking—not accepting media messages at face value, but rather approaching them with a critical attitude and questioning the ideas and images they present. It involves an understanding of the creators of media messages (authorship); what creative techniques media makers use to construct them and to attract attention (format); how such messages can be interpreted differently (audience); what values and viewpoints are embedded in or omitted from particular messages (content); and why messages are sent (purpose). De Abreu sees media literacy as encompassing visual and computer literacies (see

sections 10 and 1), and including the skills to employ online technologies such as Web 2.0 tools like SNS.

Hoechsmann and Poyntz (2012) see media literacy as "a set of competencies that enable us to interpret media texts and institutions, to make media of our own, and to recognize and engage with the social and political influence of media in everyday life" (1). This definition includes elements of reception (*interpret*), production (*make*), and participation (*engage*). Hoechsmann and Poyntz add that media literacy "enables one to engage with a variety of multimodal texts ('texts' that may include visual, audio, and print text elements)" (1), so their conception of media literacy includes the notion of multimodality. They discuss two models of media literacy, 1.0 and 2.0—responses to two distinct media eras. **Media literacy 1.0** was at its highpoint in the 1980s and 1990s; it is the reaction to the era of modern communication technologies, which began in the mid-nineteenth century. It is all about old (mass) media such as photographs, newspapers, film, television, and radio, and focuses on the analysis and evaluation of media institutions, texts, and audiences. **Media literacy 2.0**, a term used earlier by Delwiche (2010), emerged in the 2000s as an enhancement, and deals with new digital media, such as computers, the Internet, and video games. Hoechsmann and Poyntz (2012) list several concepts (the 'seven Cs') that are at the core of contemporary youth media practices and thus crucial to Media Literacy 2.0: consciousness (of self, for identity formation), communication (through IMing, texting, and SNS), consumption and surveillance (regarding online advertising and online safety), convergence (of media platforms and modalities), creativity (in media arts and in engagement with technology through video games), copy-paste (in the composition of digital texts and multimodal cultural productions), and community (built in SNS). In fact, media literacy 2.0 is similar to new media literacy (see section 7).

Cooper, Lockyer, and Brown (2013), then, provide the following definition of media literacy: "the ability to decode, encode and produce media messages" (95). This definition, brief and to the point, includes receptive (*decode*) and productive (*encode*, *produce*) literacy skills.

Three elements of media literacy are distinguished by Potter (2013): personal locus, knowledge structures, and skills. Someone's personal locus are their goals and drives for information, which determine their content choice. Knowledge structures are explained by Potter as "sets of organized information in a person's memory" (16). He identifies seven skills as necessary for media literacy:
(a) analysis: "breaking down a message into meaningful elements";
(b) evaluation: "judging the value of an element";
(c) grouping: "determining which elements are alike in some way; determining how a group of elements are different from other groups of elements";
(d) induction: "inferring a pattern across a small set of elements, then generalizing the pattern to all elements in the set";
(e) deduction: "using general principles to explain particulars";
(f) synthesis: "assembling elements into a new structure";
(g) abstracting: "creating a brief, clear, and accurate description capturing the essence of a message in a smaller number of words than the message itself" (19).

Potter continues to define media literacy as "a set of perspectives that we actively use to expose ourselves to the mass media to interpret the meaning of the messages we encounter" (22–3). Our perspectives are built from our knowledge structures and in order to create these structures, we need tools (media literacy skills), raw materials (information from the media and real world), and willingness (from our personal locus). Media literacy involves many skills, both receptive and productive: it is being adept at "assessing the meaning in any kind of messages, organizing that meaning so that it is useful, and then constructing messages to convey that meaning to others" (15). Furthermore, Potter emphasizes that media literacy is a continuum (there are degrees of being media literate) and a multidimensional concept, involving not just the cognitive domain, but also emotional, aesthetic, and moral domains of understanding. He also states that media literacy includes the "ability to access and process information from any form of transmission" (14), so from all types of media, including interactive media such as online games and social media. Potter is thus quite comprehensive in his explanation of media literacy.

7. New Media Literacy

New media literacy is, obviously, highly relevant for CMC, since many CMC modes can be classified as new media. Jones and Flannigan (2005) define **new media literacy** as "the ability to apply critical thinking and viewing skills to what we see, hear and read" (6). In the same publication, they also define it as "the ability to access, analyze, evaluate and create information in a variety of media formats including print and non-print" (ibid.). These two definitions are quite different; the second is much broader and includes other skills besides critical evaluation.

The approach of Jenkins, Purushotma, Clinton, Weigel, and Robinson (2006) to new media literacies focuses on especially youths' participation with media culture. They describe **new media literacies** as "a set of cultural competencies and social skills" needed to engage and participate in this new media age (xiii). Jenkins et al. list many new literacy skills:

(i) play: "the capacity to experiment with the surroundings as a form of problem solving";

(ii) performance: "the ability to adopt alternative identities for the purpose of improvisation and discovery";

(iii) simulation: "the ability to interpret and construct dynamic models of real-world processes";

(iv) appropriation: "the ability to meaningfully sample and remix media content";

(v) multitasking: "the ability to scan the environment and shift focus onto salient details";

(vi) distributed cognition: "the ability to interact meaningfully with tools that expand mental capacities";

(vii) collective intelligence: "the ability to pool knowledge and compare notes with others toward a common goal";

(viii) judgement: "the ability to evaluate the reliability and credibility of different information sources";

(ix) transmedia navigation: "the ability to follow the flow of stories and information across multiple modalities";
(x) networking: "the ability to search for, synthesize, and disseminate information";
(xi) negotiation: "the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms" (xiv). These skills build on traditional literacy and research skills, technical skills, and critical analysis skills, but obviously go far beyond them.

Exploring the relationship between traditional and new media literacies, Plester and Wood (2009) define literacy as "the ability to decode information in various orthographic formats, including digital media, to make and take meaning from it, and to encode information into those formats to communicate ideas to others" (1109), which involves reception (*decode*) as well as production (*encode*). They argue that

> [d]eveloping literacy in this world of multiple text formats requires a wider set of skills than earlier generations required, if children are to grow to fit, and indeed contribute to, the digital world in which they will work and play as adults. ... Much of children's wider literacy experience may be in print or visible text ... and some may be multimedia literacy, with visual, spatial, and auditory components". (1108–9)

Yet Plester and Wood restrict both traditional and new media literacy to skills that involve written language, so they exclude other communicative practices.

Stornaiuolo, Hull, and Nelson (2009) state that new media literacy calls for "a familiarity with a range of communicative tools, modes, and media," but also for "a facility with distinctive semiotic practices, such as the orchestration of meaning across pictures, language(s), and other modes" (384). This literacy has become multimodal and 'multimedial' and can be defined, then, as "the ability to construct meaning from multiple modes and multiple semiotic systems [systems of meaning-making] at once" (ibid.), for example, written, visual, and audio.

New media literacies are straightforwardly seen by Williams and Zenger (2012) as reading and writing with new media, which they believe belongs to "the essential core of sophisticated literacy practices" (5). New media have changed literacy practices and conceptions in several ways. They involve collaboration and interactivity, e.g. in blogs and discussion forums, which brings up issues of dialogue in reading and issues of audience and genre in writing. New media make it easier to copy and recompose texts, which challenges ideas of authorship and the stability of texts—ideas that are also challenged by wikis, a form of new media characterized by co-authorship and open editing. New media also offer opportunities for publishing and distributing texts: writers can choose between many new media and can easily post texts online, which enables them to reach many readers, again raising issues of audience. New media, finally, make it possible to compose multimodal texts, which can combine several modes with language, such as graphics, audio, and video, and to create associative/non-linear texts; this raises questions of effective communication

and rhetoric in writing, and of comprehensibility and meaning-making in reading. Williams and Zenger thus point out several issues of literacy in the context of new media.

Van Kruistum (2013) writes about **old and new media literacy** together. She conceptualises literacy as one broad, complex, pluralistic concept that includes the use of old media and new media and in which 'family resemblances' exist between different literacy practices. The similarities (and differences) can exist in five facets— modality, spatial-temporal distance, social distance, function, and type of engagement. Van Kruistum feels that making a strict distinction between, on the one hand, traditional print-based media and print literacy and, on the other hand, new (digital) media and new media literacy would be an oversimplification.

8. Multimedia Literacy

Derived from media literacy is the concept of multimedia literacy. Multimedia refers to content that uses a combination of multiple media forms, such as text, audio, video, images, and interactivity. This is relevant here because CMC can involve multimedia. Zain and Lie (2009), for example, describe **multimedia literacy** in the context of blogging, a CMC mode which they see as a multimedia literacy event.

One of the first to consider multimedia literacy was Mayer (2000). He defines it as "knowing how to make sense out of multimedia messages created by others and how to create multimedia messages that make sense to others" (364). Mayer points out that multimedia literacy pays attention not just to verbal forms of presentation, but also to visual and auditory forms. His conceptualisation of multimedia literacy changes two important elements of traditional literacy, namely the content and the processes. Its content goes from written texts (consisting of verbal material) to multimedia messages (composed by means of a variety of formats including words, graphics, sounds, etc.). Its processes go from reading and writing to 'sense making' and 'making sense': the former is the "ability to make sense of messages" and the latter the "ability to create messages that make sense to others" (365). Mayer's definition thus explicitly distinguishes between reception (*sense making*) and production (*making sense*). Mayer feels that multimedia literacy is required, for example, for reading textbook graphs and viewing computer animations. Some years later, Mayer (2008) reformulated multimedia literacy as "being able to generate multimedia communications that others comprehend and to comprehend multimedia communications that others generate" (359), but this includes the same elements as his original definition. He stresses that multimedia formats include both words and pictures, which can be static (e.g. illustrations, photos, graphs) or dynamic (animations, video).

Multimedia literacy was classified by Warschauer (2002) as one of several electronic literacies (see section 4). In his view, multimedia literacy is "the ability to produce and interpret complex documents comprising texts, images, and sounds" (455). Some years later, he redefined it as "the ability to interpret and produce documents combining texts, sounds, graphics, and video" (Warschauer, 2007:915).

So he split up images into graphics and video: static vs. moving images. Both definitions include receptive (*interpret*) and productive (*produce*) literacy skills.

Hull (2003) presents a reconceptualisation of literacy for 'new times', which she later refers to as multi-media literacy. According to Hull, this includes "a familiarity with the full range of communicative tools, modes, and media, plus an awareness of and a sensitivity to the power and importance of representation of self and others, along with the space and support to communicate critically, aesthetically, lovingly, and agentively" (230). This description is rather socially oriented and broad and could, in fact, apply to some other new literacies.

Multimedia literacy is discussed by Hobbs (2006) in the context of other multiliteracies (see section 13), namely visual literacy (section 10), information literacy, media literacy (section 6), and critical literacy. She explains that these new literacies have several conceptual tenets in common, regarding authors and audiences, messages and meanings, and representations and reality. Because of these similarities, Hobbs suggests that these new literacies can be integrated into a multimedia literacy framework.

Finally, the definition of multimedia literacy offered by Aleixo, Nunes, and Isaias (2012) is "the use of computer-based technology to present and combine text, graphics, audio, and video with links and tools that let the user navigate, interact, create, and communicate" (223–4). This has a clear focus on productive literacy skills. Aleixo et al. classify multimedia literacy as one of a number of digital literacies (see section 3).

9. Multimodal Literacy

Multimodality is "an orchestration of multiple modes to communicate, represent, and express meanings" (Rowsell, 2013:6). In simpler terms, it is the combination of two or more modalities or modes ("unit[s] of expression and representation" (Rowsell, 2013:3)), such as written-textual, visual, audio, gestural, spatial, or tactile. CMC can involve multimodality because it can involve different modes – written text, images, audio and video; even the use of emoji, the inclusion of hypertext, and the layout of online messages can be considered forms of multimodality. Therefore, multimodal literacy is required for many CMC modes. Rowsell (2013) stresses that literacy pedagogy requires rethinking, such that it includes not just the written modality, because multiple modes of meaning-making – multimodal consumption and production – are important in this digital age.

An early discussion of multimodal literacy is that by Jewitt and Kress (2003), who point out that literacy in this world of modern communication tools includes not just print texts but also multimodal texts. These involve other representational and communicational modes besides writing, such as images, animations, and speech. They stress that literacy should no longer be thought of solely as a linguistic accomplishment, but as a much broader phenomenon: written language is only one of multiple available meaning-making resources.

Walsh (2008, 2010) discusses multimodal literacy more extensively. She states that because of developments in digital communications, the basics of literacy "may

never be the same again" (2008:101): traditional literacy with print texts no longer suffices. Multimodal literacy is defined as "meaning-making that occurs through the reading, viewing, understanding, responding to and producing and interacting with multimedia and digital texts" (2010:213). In digital technologies, reading and writing are often combined with other modalities (images, graphics, video, audio), rather than occurring in isolation. Since "the traditional ideas of texts are blurred," Walsh prefers to speak about 'hybrid texts' (2008:102). Multimodality features *convergence* of, *interactivity* between, or *transference* between different modalities, and there can be *simultaneity* and *interdependence* in the processing and production of multimodal texts, as different literacy skills are often called upon at the same time. Walsh (2010) presents an exhaustive description of multimodal literacy. Firstly, it includes the ability to deal with four types of texts: print-based, digital, spoken, and multimedia texts. Secondly, it includes five processes: reading, viewing, writing, talking, and listening. Thirdly, multimodal literacy involves the ability to use and combine different skills within these modes:

(a) reading & viewing: decoding, responding, interpreting, analysing, browsing, searching, navigating, hyperlinking;

(b) writing: planning, composing, evaluating, creating, designing, producing, transforming.

(c) talking & listening: collaborating, investigating, negotiating, enacting, interacting, connecting, networking;

These five processes of literacy can all occur in CMC.

A different perspective to multimodal literacy is applied by Alexander (2008). He sees multimodal literacy as the ability to shift modes between open and closed digital networks. The World Wide Web is an open digital network; closed digital networks are, for example, online course management systems used for educational purposes, such as Blackboard.

Literacy has also been re-examined by Yamada-Rice (2011) in the context of new multimodal technologies. Her view on multimodal literacy is one that emphasizes (our increased reliance on) the visual mode, yet she does not speak of visual literacy. Her main point is that multimodal literacy requires an understanding of modes other than just the written mode.

Bowen and Whithaus (2013) stress that being literate now requires **multimodal literacies**. They focus on productive literacy skills, namely on multimodal composition: "new forms of writing are emerging all around us ... we are in the midst of a shift that is affecting how we write, why we write, and where we write . . . or don't" (5). They argue that the development from entirely written-textual writing to multimodal writing requires especially youths to compose texts using multiple modes of communication. Bowen and Whithaus present the following definition for multimodal composing: "the conscious manipulation of the interaction among various sensory experiences—visual, textual, verbal, tactile, and aural—used in the processes of producing and reading texts" (7). This calls, among other things, for an awareness of relationships among different text tools, of interactions between different modes, and of reader and user expectations of texts in different genres.

10. Visual Literacy

Since CMC can include visual elements such as images, videos, and emoji, visual literacy is important. As Snyder (1999) asserts, there has been a "turn to the visual" which is "closely associated with the construction and production of electronically mediated texts" (14): images are becoming increasingly important in CMC and other domains of communication. This can also be gathered from the popularity of visual items such as GIFs, stickers, and emoji in CMC. Visual literacy can even be acquired via CMC by creating wikis, as Luce-Kapler (2007) points out. The term **visual literacy** was coined by Debes (1969), co-founder of the International Visual Literacy Association. He originally defined visual literacy as

> [A] group of vision-competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences. ... When developed, they enable a visually literate person to discriminate and interpret the visible actions, objects, symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication. (25–6)

Debes's definition of visual literacy draws attention to skills that are receptive (*discriminate*, *interpret*, *comprehend*) and productive (*communicate*), so it is not just about the perception of visual imagery.

Two decades later, Considine (1986) defined visual literacy as "the ability to comprehend and create images in a variety of media in order to communicate effectively" (38). This brief definition again includes both receptive (*comprehend*) and productive (*create*) elements; Considine thus notes that being visually literature requires skills of interpretation as well as production of visual messages.

In their description of web literacy (see section 2), Sorapure, Inglesby, and Yachtisin (1998) list visual literacy as one of its parts. They see visual literacy as the ability to interpret visual elements on a website, which should be done in two distinct ways: first, "as conveying information in themselves—information that may complement, complicate, or contradict the message conveyed by the text" and secondly, "as providing clues to the overall rhetorical situation of the site" (417). So, images and videos on the Web should be understood in themselves and in relation to the surrounding text. We can infer from their definition that Sorapure et al. see visual literacy as involving receptive skills, necessary for interpreting and evaluating websites – put differently, for critically reading websites.

A theoretical framework for visual literacy was presented by Branch (2000). He presented the following, rather abstract, definition of visual literacy: it is "the understanding of messages communicated through frames of space that utilize objects, images, and time, and their juxtaposition" (383). Visual literacy involves a visual grammar, whose "principles, rules, and form ... are based on communicating

perception and the ecology of symbol systems" (ibid.). He elaborates that 'communicating perception' takes place through visual cues and artistic expression and he explains this 'ecology of symbol systems' as "the totality or pattern of relations between symbols and their environment" (386). Though he mentions both the 'reading' and composing of visual messages, Branch's definition focuses on meaning-making from imagery in time and space, so on perception rather than on production.

Chauvin (2003) differentiates between media literacy (see section 6) and visual literacy and defines the latter as "the ability to access, analyze, evaluate, and communicate information in any variety of form that engages the cognitive processing of a visual image" (qtd. in Jones & Flannigan, 2005:8). This definition of visual literacy, which includes receptive as well as productive literacy skills, is very similar to definitions of media literacy, the difference being the presence of visual images.

Visual literacy has also been conceptualised as a part of textured literacy (see section 12). This is the approach Yancey (2004) takes. She describes visual literacy as the ability to incorporate graphic elements into writing, such as different formats (bold-facing, italicizing, underlining, using bullets), colour, and images. It is about integrating visual imagery with words: although combining text with images is far from a new phenomenon, the digital tools that have emerged in recent decades have made this much easier. Yancey thus approaches visual literacy from a productive perspective, involving skills that can be used to enhance writings.

Jones-Kavalier and Flannigan (2006) describe visual literacy as the ability to "communicate information in a variety of forms and appreciate the masterworks of visual communication" (9). The first part of this definition is productive; the latter receptive. Visual literacy, for them, includes "the imaginative ability to create, amend, and reproduce images, digital or not, in a mutable way" (ibid.)—again, productive literacy skills. Jones-Kavalier and Flannigan explicitly mention the relevance of digital images for visual literacy.

In their report for the Dutch national expertise centre on curriculum development, Frankenhuis, Van der Hagen, and Smelik (2007) not only define media literacy (see section 6), but also visual literacy: as the set of knowledge, skills and attitudes which students should have to move consciously, critically and actively in our complex and ever-changing visual culture (7). They perceive only one difference between media literacy and visual literacy: the latter is about visual culture rather than media culture.

Some additional brief definitions of visual literacy have been offered by Felten (2008), Westby (2010), and Cooper, Lockyer, and Brown (2013). Felten (2008) defines visual literacy as "the ability to understand, produce, and use culturally significant images, objects, and visible actions" (60). Again, this includes both receptive (*understand*) and productive elements (*produce*, *use*). It is interesting in going beyond images and including objects as well as visible actions. Moreover, Felten's use of the words 'culturally significant' reveals a normative view: apparently, not all visual imagery necessitates visual literacy. Westby's (2010) definition of visual literacy, listed by her as one of several multiliteracies (see section 13), is as follows: "[t]he ability to understand and produce visual messages" (65). This definition is to the

point and still includes reception as well as production. Cooper et al. (2013) see visual literacy as "the ability to comprehend visuals and the ability to communicate effectively through the creation of visual texts" (94). Once more, both receptive and productive literacy skills are mentioned, *comprehension* as well as *creation.*

11. Computer-Mediated Communication Literacy or CMC Literacy

Another new literacy that is unmistakably relevant for this thesis is computer-mediated communication literacy or CMC literacy, yet this concept has not been widely discussed. Warschauer (2002) classifies it as one of several electronic literacies (see section 4). He defines **computer-mediated communication literacy** as the "knowledge of the pragmatics of individual and group online interaction" (455). Five years later, Warschauer (2007) redefined it as "the mastery of the pragmatics of synchronous and asynchronous CMC" (915): this new definition emphasizes the distinction between synchronous and asynchronous CMC rather than between one-to-one (individual) and many-to-many (group) CMC. So, Warschauer shifted his focus from level of interactivity to synchronicity.

Computer-mediated communication literacy is categorized by Aleixo, Nunes, and Isaias (2012) as one of multiple digital literacies (see section 3) and described as "the ability to express oneself, interpret and interact online in order to communicate effectively" (224), which involves production (*express*, *interact*) and reception (*interpret*). Aleixo et al. give examples of several skills that are necessary for CMC literacy: the ability to use netiquette, the capability of argumentation and persuasion, as well as technological competence such as the ability to establish and manage online group communications.

11.1 Computer-Mediated Communication Competence

A concept closely related to computer-mediated communication literacy is **computer-mediated communication competence**. The first to present a basic model of CMC competence was Spitzberg (1997). Nearly a decade later, she still wrote extensive about it. CMC competence depends, according to Spitzberg (2006), on motivation, knowledge, and skills. She defines CMC motivation as "the ratio of approach to avoidance attitudes, beliefs, and values in a given CMC context" (640). CMC knowledge is "the cognitive comprehension of content and procedural processes involved in conducting appropriate and effective interaction in the computer-mediated context" (641). Competent CMC users possess four specific skills: attentiveness or 'other-orientation' (interest, concern, attention for one's communication partner), composure (displaying confidence and mastery as a CMC user), coordination or 'interaction management' (managing the number, length, relevance, etc. of CMC messages), and expressiveness (using emoticons and other paralinguistic cues to convey emotion in CMC). Spitzberg underscores the importance of media, message, and contextual factors for CMC competence; she thus sees it as a rather complex phenomenon.

CMC competence is also termed "competence in computer-assisted interpersonal and group communication," by Bubaš, Radošević, and Hutinski (2003).

They describe it as "interaction skills in computer-mediated communication environments" (54). It is "the ability to socially interact by novel technological systems," systems which include computer technology, telecommunication tools, and multimedia. Bubaš et al. thus focus on the social aspect of CMC competence and recognize its direct link with computer literacy.

In Bunz's (2003) opinion, computer-mediated communication competence builds on computer literacy (see section 1), but comprises more than just computer skills (technological know-how). It is rather the "ability to communicate effectively not despite the technological mediation, but making full use of the communicative options technology provides" (57). She stresses two important 'constructs' for CMC competence: knowledge, i.e. one's understanding of or familiarity with CMC, and efficacy, i.e. one's confidence about using or learning to use CMC technologies. Bunz (2003) (after Morreale, Spitzberg, & Barge, 2001) mentions that CMC competence also includes taking into account contextual, message, and media factors.

12. Textured Literacy

One more new literacy that is relevant for CMC is **textured literacy**. This term was coined by Yancey (2004) and defined as "the ability to comfortably use and combine print, spoken, visual, and digital processes in composing a piece of writing" (38). Textured literacy defined as such is only about productive literacy skills. It is an umbrella term that includes print literacy, visual literacy (section 10), and digital literacy (section 3), as well as oral literacy skills. Yancey argues that writers, nowadays, should "develop fluency and competence in a variety of technologies," so that they can exploit the resources that have become available through digital technologies (ibid.). These technologies can create "a more sophisticated, multilayered composing process," where writers navigate "between different tools and composing processes" (39). Yancey encourages the use of such tools in writing, for example, hyperlinking: adding hyperlinks to a digital text creates a hypertext. Hyperlinks can be used to refer to sources, to "information that is relevant ... but not appropriate to include in the body of the text" (39): hyperlinks allow us to include additional material without interrupting the coherence of a text.

13. Multiliteracies

The whole of new literacies has been referred to with the umbrella term 'multiliteracies'.[68] Lewis and Fabos (2000) discuss IMing, a CMC mode, as an example of multiliteracies used by youths. The concept of **multiliteracies** was formulated by the New London Group or NLG (Cazden et al., 1996; Cope & Kalantzis, 2000), a multidisciplinary group of educators whose name derives from the town where they met – New London, USA. The NLG came up with the multiliteracies approach, where literacy is not seen as a unitary but as a multifaceted

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[68] Multiliteracies differ from 'pluriliteracies', a concept that describes literacy practices in multilingual contexts (García, Bartlett, & Kleifgen, 2007, cf. 'biliteracy', in bilingual contexts).

construct. They asserted that this broad view of literacy is required because of two major developments: first, the multiplicity of communication channels and media (technological innovations), which include CMC, and second, the increasing salience of cultural and linguistic diversity and global connectedness. This led them to the concept of multiliteracies. They point out that a central aspect of multiliteracies is the ability to analyse textual designs in diverse modalities: not just the written-textual, but also the visual, audio, gestural, spatial, and multimodal. These other modes have become important in the meaning-making process. Visual meanings include images, page layouts, and screen formats; audio meanings can be music and sound effects; gestural meanings are, for example, body language; spatial meanings concern environmental and architectural spaces; and multimodal meanings are the interconnection of the written mode with other modes. The NLG puts forward a metalanguage of multiliteracies that is based on the concept of 'design'. They see all acts of meaning-making as matters of design involving three elements: available designs (design conventions, i.e. the 'grammars' of semiotic systems such as languages, film, or photography), designing (the work performed on or with available designs, e.g. by reading, seeing, or listening), and the redesigned (the outcome of designing). The NLG's discussion of multiliteracies is quite abstract, focusing on their theory of literacy pedagogy. Luke (2000), part of the NLG, explains that CMC is one of the reasons that a multiliteracies approach is necessary, in order to "take account of multiple forms of textual, graphic, and symbolic languages, as well as the culturally diverse virtual communities of the global mediascape" (77), the media landscape.

Rather than seeing literacy as a uniform concept, Tyner (1998) says that in this digital world it is splintered into several associated multiliteracies. She sees many multiliteracies as related to ICT and points out that they "have stepped forward to define the changing, amorphous shape of communication needs for a society awash in electronic sounds, images, icons, and texts" (64). Tyner makes a distinction between 'tool literacies' and 'literacies of representation', but emphasizes that there is much cohesion between them. The former are all about technological tools and include computer literacy (see section 1), network literacy (section 2), and technology literacy. The latter build on traditional literacy and concern the use of technologies within the context of schooling, including media literacy (section 6), visual literacy (section 10), and information literacy.

Four kinds of multiliteracies are distinguished by Unsworth (2001), who defines multiliteracies as "multidimensional, multiple literacies" (9): visual literacies (see section 10), curriculum literacies, cyberliteracies (section 2), and critical literacies. Unsworth states that technological developments have facilitated the use of typographic variation and dynamic text, the growing impact of images, and the incorporation of multimodality in texts, which has made visual literacies essential. Multiple literacies can also be differentiated according to school subject area (e.g. history, geography, science, and maths), which have distinctive literacy demands and practices: these subject-specific literacies are what Unsworth calls curriculum literacies. Computer-based and networked technologies have caused a shift from page- to screen-based literacies and have brought about the rise of, among other

things, hypertext, chat rooms, and email, which have generated new kinds of literacy practices – cyberliteracies. Finally, critical literacies involve critical recognition of, reproduction of, and reflection on texts. Unsworth (2008) underscores that multiplicity is a central principle of new literacies.

Withrow (2004) also writes about the importance of multiple literacies (although he does not use the term 'multiliteracies'). He states that "[r]eading and writing are no longer the single mode of literacy" (29): viewing and computing, which are relevant for digital technologies, have also become literacy processes. Withrow defines literacy in the digital age as "the ability to analyze critically all that is read, viewed, and listened to" (45). He feels that twenty-first century literacy is about being "critical in both receptive and expressive communication modes" (30), so he focuses on both reception and production here, and being "informed and logical decision makers" (32), also involving reception.

There are four multiliteracies skills according to Kitson, Fletcher, and Kearney (2007):
(i) dealing with a variety of texts, both print-based and digital ('ICT-mediated');
(ii) locating and retrieving information, in print or digital form;
(iii) critically reading and comprehending texts;
(iv) composing and designing digital texts while considering audience and purpose.
These, again, include receptive as well as productive skills. Kitson et al. see multiliteracies as a three-dimensional concept, which includes (a) the use of multimedia texts, various information and communication technologies (ICTs), and multiple semiotic systems (written, visual, audio, spatial, gestural); (b) cultural and linguistic diversity; and (c) critical literacy. Their view of multiliteracies thus encompasses multimodal and critical literacy, plus diversity.

Web 2.0 is the focus of Alexander's (2008) account of multiliteracies. He relates multiliteracies specifically to dual digital literacies, multimodal literacy, and hypertext literacy. Alexander claims it is necessary nowadays to acquire 'dual digital literacies': one for the open digital network of Web 2.0 and one for closed digital networks. The ability to shift from open to closed networks is what he calls multimodal literacy (see section 9). Web 2.0 is defined by Alexander as "Web pages focusing on microcontent and social connections between people" with "digital content [that] can be copied, moved, altered, remixed, and linked, based on the needs, interests, and abilities of users" (151). Alexander discusses several skills that are part of being literate in Web 2.0, such as blogging, creating wikis, using SNS, social bookmarking and tagging, and hyperlinking. He refers to the ability to deal with hypertext on the Web, including hyperlinking, as 'hypertext literacy'.

That digital communication tools are changing the essence of literacy practices is also recognized by Williams (2008): "the change in communication technologies that seems to happen almost daily is both real and dramatic in the ways it is changing how young people read and write with words and images" (682). He sees literacy not as "a standalone set of skills," but as "social practices influenced by context and culture" (683). Besides the traditional literacy skills of reading and writing, he specifies several new literacy practices: "appropriation of media content,

networking, negotiation of social contexts, and working with multiple media" (685). Together, Williams refers to these as multiliteracies.

Lam (2009) approaches multiliteracies from a socio-cultural perspective: she discusses multiliteracies in the context of CMC (specifically, instant messaging) and migration. Her view on multiliteracies resembles that of the NLG. She argues that a multiliteracies perspective is necessary to explain "the multiplicity of textual practices associated with cultural and linguistic diversity and multimedia communication in a globalizing society" (393). In order to maintain relationships with different social and cultural communities, migrants have to use not only multiple languages but also multiple modes of communication, which causes them to develop diverse textual practices. These multiliteracies require the ability to read and write across multiple digital interfaces, genres, and modes in communicating with communities that each have their own conventions.

The term multiliteracies has been applied to a broad range of academic disciplines. Mills (2009) does not provide her own conceptualisation, but reflects upon others' conceptualisations and argues that "new, multimodal, digitally mediated, culturally diverse and dynamic multiliteracies" are essential to communicate effectively nowadays (111). She states that literacy scholars have "encountered multiliteracies in active and creative ways to serve their own purposes" (ibid.): the concept has been greatly extended since the NLG first came up with it, sparking off competing discourses on multiliteracies. Still, there appears to be consensus on the idea that it should include a wide range of hybrid literacies.

Taking a multiliteracies perspective, Stornaiuolo, Hull, and Nelson (2009) point out that an important aspect in redefining literacy is the issue of audience. Because digital and web-based texts can reach much larger audiences and at a much greater distance than print-based texts, writers need to be able create texts suitable for diverse audiences. Stornaiuolo et al. refer to these as 'migrant audiences': audiences that need not be in the same location and need not share our "local understandings" (383). An essential productive multiliteracies skill is thus the ability to address migrant audiences.

Cole and Pullen (2010) expand and update the multiliteracies framework established by the NLG. They emphasize that the concept of multiliteracies is continually in motion and expanding, as it depends on social-cultural factors that are constantly shifting. Cole and Pullen define it as follows: "to be literate in the digital age requires experience and opportunities to actively engage with a number of literacy modes" (120). Smolin and Lawless (2010), in the same volume, define multiliteracies as "encompass[ing] issues of visual literacy, technological or cyberliteracies, information or media literacy, and critical literacies" (176). Cole and Pullen contrast multiliteracies with 'mono-literacy', in particular reading and writing print-based texts, and claim that mono- rather than multiliteracies is still the prevailing practice in many educational contexts.

The multiliteracies that have emerged in recent decades are also discussed by Westby (2010), who states that "[l]iteracy practices are changing at an unprecedented pace" (64). Nowadays, communicating effectively requires proficiency in multiple modalities. She regards multiliteracies as "multiple literacies that involve culturally

appropriate ways of thinking and reasoning critically in all areas of life" (65). It includes comprehension and production of print texts as well as of various other modalities. Westby lists visual literacy (see section 10), computer literacy (section 1), media literacies (section 6), technology literacy, and cultural literacy. She explains that all these multiliteracies have their own functions and structures.

Cooper, Lockyer, and Brown (2013), finally, define being multiliterate as having the ability "to analyse and construct multi-modal texts" (93). Cooper et al. see multiliteracies as including technology literacy, information literacy, visual literacy (see section 10), and media literacy (section 6).

14. CMC and Other New Literacies

In Snyder's (1997) volume about taking literacy into the electronic era, Beavis (1997) writes about new literacies in describing the way in which "multimedia and digital technologies are redefining literacy" (244)—technologies which were then new include word-processing, email, hypertext, and the Internet. According to Beavis, new literacies include "the capacity to 'read' and 'write' the new technologies, and to understand what is entailed in the operation, reception and production of their texts" (ibid.). She lists five **new literacy** skills (the first four after Lemke, 1998): (i) multimedia authoring skills, (ii) multimedia critical analysis, (iii) cyberspace exploration strategies, (iv) cyberspace navigation skills, and (v) the capacity to negotiate and deconstruct visual and verbal images. These new literacy skills (some productive, others receptive) focus on multimedia, cyberspace, and the visual; thereby, in effect, combining multimedia literacy, cyberliteracy, and visual literacy.

In his exploration of how written CMC differs from traditional writing, Jacobsen (2002) recognises the transformations that literacy has undergone in the context of CMC. He argues that informal synchronous discourse in CMC asks for a reconceptualisation of the traditional norms of 'print textuality'; he refers to this as **cyberdiscursivity**. This includes elements of both literacy and orality: it obviously requires writing, but also has conversational traits. Moreover, it transforms them: CMC is virtual (since it usually occurs online), dynamic (i.e. continuous and immediate), emergent (cybertexts are constructed differently from print texts), and idiosyncratic (as regards navigation by the reader, because of the non-linearity of hypertext). Jacobsen thus places cyberdiscursivity, with its four crucial (though not always clearly distinguishable!) aspects, on the same plane as literacy and orality.

A great change in the new media age is noted by Kress (2003): a remaking of relations between representational modes (means for meaning-making, such as writing, speech, images, gestures) and media of dissemination (means for distributing messages, such as books, magazines, computers, films, video, radio). This change consists of two essential parts: a move from the book and page to the screen (new ICT) as the dominant medium of communication, as well as a move from writing to imagery as the dominant mode of communication. Yet despite his focus on visuality, Kress prefers not to use the term visual literacy; for Kress, literacy is only about "messages using letters as the means of recording that message" (23), i.e. about reading and writing. Still, he stresses that meaning-making is no longer just a matter

of language but also of multimedia design, since new media can combine multiple modes.

A medium that has attracted attention in literacy research is Facebook: several studies focus on the new literacy practices that have arisen on this social networking site. Knobel and Lankshear (2008) take a socio-cultural perspective in discussing the **digital literacy** practices of Facebook. Davies (2012) also considers literacy from a social stance. She describes Facebook as a new **social literacy** practice, because it allows us to manage social relationships in new ways: performing "displays of seeming[ly] private lives" with a strong sense of audience, but carefully considering what is kept private (28). Pérez-Sabater (2012), studying writing conventions on Facebook, states that the rapid advances in communication tools "have created new forms of literacies" (81), but does not specify what these new literacies entail. Witek and Grettano (2012) discuss **information literacy** practices on Facebook; they suggest that social media affect users' attitudes toward and behaviours with information. Information literacy on social media involves not just locating, evaluating, and using information effectively, but calls for an additional skill, a 'metaliteracy', defined as "a critical awareness of why we do what we do with information" (242), which users should acquire to prevent social media making decisions for them. Finally, Facebook is also discussed in Williams and Zenger's (2012) volume on **new media literacies** and participatory popular culture.

Appendix B. Overview of attitudinal studies
into the impact of written CMC on literacy

Survey design and medium

Year of publication	Author(s)	Survey design	Medium
2006/ 2007	Adams	qualitative	IMing
2008	Lenhart, Arafeh, Smith, & Macgill	quantitative	emailing, IMing, texting, SNS
2009	Drouin & Davis	quantitative	texting
2009	Freudenberg	quantitative	texting, IMing
2009	Spooren	quantitative	texting, IMing, SNS
2010	Mildren	quantitative	texting
2011	Dansieh	quantitative	texting
2011	Geertsema, Hyman, & Van Deventer	quantitative	texting
2011	Rankin	qualitative	texting
2012	Tayebinik & Puteh	qualitative	texting, IMing
2013	Aziz, Shamim, Faisal Aziz, & Avais	quantitative	texting
2013	Purcell, Buchanan, & Friedrich	quantitative/ qualitative	SNS, texting, microblogging, blogging
2013	Salem	qualitative	BlackBerry Messenger, WhatsApp
2013	Yousaf & Ahmed	quantitative	texting

Participants (group, nationality, number) and youths' age group

Year of publication	Author(s)	Participants' Group	Nationality	No.	Youths' age group
2006/ 2007	Adams	high school students	American	8	adolescents
2008	Lenhart, Arafeh, Smith, & Macgill	middle and high school students & parents	American	700	adolescents (12-17)
2009	Drouin & Davis	university students	American	80	young adults ($\bar{x} = 22$)
2009	Freudenberg	high school students & high school teachers	South African	88 / 7	adolescents (grades 8 & 11)
2009	Spooren	secondary school students, parents, secondary school teachers	Dutch	112 / 74 / 77	adolescents (15-17)
2010	Mildren	middle and high school students, parents, middle and high school teachers	American	123 / 112 / 50	adolescents (grades 7 & 10)
2011	Dansieh	polytechnic students, polytechnic teachers	Ghanese	400 / 30	young adults (20-30)
2011	Geertsema, Hyman, & Van Deventer	secondary school teachers	South African	22	adolescents (grades 8 & 9)
2011	Rankin	university students	American	25	young adults
2012	Tayebinik & Puteh	university students	Malaysian	40	young adults (20-23)
2013	Aziz, Shamim, Faisal Aziz, & Avais	university students, university teachers	Pakistani	50 / 15	young adults (19-25)
2013	Purcell, Buchanan, & Friedrich	middle and high school teachers	American	2,462	adolescents
2013	Salem	intermediate and secondary school students	Kuwaiti	211	adolescents
2013	Yousaf & Ahmed	university students	Pakistani	100	young adults

Attitudes

Year of publication	Author(s)	Attitudes
2006/ 2007	Adams	adolescents have mixed feelings, depends on aspect of writing. Positive impact on voice and note taking.
2008	Lenhart, Arafeh, Smith, & Macgill	majority of parents and adolescents neutral (no impact on writing quality)
2009	Drouin & Davis	half of young adults pessimistic, other half optimistic
2009	Freudenberg	majority of teachers pessimistic, more so than adolescents (majority neutral)
2009	Spooren	parents most pessimistic; teachers most optimistic; adolescents have mixed feelings, depending on aspect of writing.
2010	Mildren	majority of teachers pessimistic, majority of adolescents optimistic, parents in between (neutral)
2011	Dansieh	teachers much more pessimistic than young adults (neutral)
2011	Geertsema, Hyman, & Van Deventer	majority of teachers pessimistic
2011	Rankin	all young adults pessimistic
2012	Tayebinik & Puteh	majority of young adults pessimistic
2013	Aziz, Shamim, Faisal Aziz, & Avais	all teachers pessimistic, majority of young adults also pessimistic
2013	Purcell, Buchanan, & Friedrich	teachers have mixed feelings, depends on aspect of writing. Positive impact on collaborative writing, creativity and personal expression in writing, writing frequently and in different formats.
2013	Salem	majority of adolescents pessimistic
2013	Yousaf & Ahmed	majority of young adults pessimistic

Nature of people's concerns

Year of public- ation	Author(s)	Nature of people's concerns
2006/ 2007	Adams	writing conventions (spelling, grammar, punctuation, capitalisation); perhaps also ideas and content, organisation, sentence fluency, word choice
2008	Lenhart, Arafeh, Smith, & Macgill	spelling, punctuation, capitalisation (textisms school writing)
2009	Drouin & Davis	remembering and using standard language
2009	Freudenberg	spelling (textisms in school writing)
2009	Spooren	text quality, writing frequency, writing creativity, writing ease, spelling
2010	Mildren	writing and communication skills, spelling (textisms in school writing)
2011	Dansieh	writing skills, textisms in school writing, sentences, spelling
2011	Geertsema, Hyman, & Van Deventer	spelling, punctuation, sentence length
2011	Rankin	spelling
2012	Tayebinik & Puteh	formal writing, speaking (textisms in formal writing and informal conversations), grammar (omissions, incomplete sentences), spelling
2013	Aziz, Shamim, Faisal Aziz, & Avais	spelling, punctuation, grammar
2013	Purcell, Buchanan, & Friedrich	formal writing (textisms etc.), writing productivity (text length); spelling, grammar
2013	Salem	vocabulary, spelling, grammar
2013	Yousaf & Ahmed	spelling, writing difficulty, formal writing

Appendix C. Overview of observational studies
into the impact of written CMC on literacy

Medium

Year of publication	Author(s)	Medium
2002	Raval	texting
2003	Neville	texting
2007	Bouillaud, Chanquoy, & Gombert	texting, IMing (incl. chat rooms), forums
2007	Massengill Shaw, Carlson, & Waxman	texting
2008	Plester, Wood, & Bell	texting
2009	Drouin & Davis	texting, emailing
2009	Plester, Wood, & Joshi	texting
2009	Spooren	texting, IMing, SNS
2009	Winzker, Southwood, & Huddlestone	texting, IMing
2010	Dürscheid, Wagner, & Brommer	CMC (texting, IMing, emailing, blogging, websites)
2010	Gann, Bartoszuk, & Anderson	texting
2010	Kemp	texting
2010	Radstake	texting, IMing, SNS, emailing
2010	Rosen, Chang, Erwin, Carrier, & Cheever	texting, IMing, emailing
2010	Shafie, Azida Darus, & Osman	texting
2010	Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong	IMing
2011	Bushnell, Kemp, & Martin	texting
2011	Coe & Oakhill	texting, IMing
2011	Dixon	SNS: Facebook
2011	Drouin	texting, SNS, emailing
2011	Durkin, Conti-Ramsden, & Walker	texting
2011	Kemp & Bushnell	texting
2011	Kreiner & Davis	texting, IMing
2011	Lee	texting, IMing
2011	Plester, Lerkkanen, Linjama, Rasku-Puttonen, & Littleton	texting
2011	Powell & Dixon	texting
2011	Rankin	texting
2011	Veater, Plester, & Wood	texting
2011	Wood, Jackson, Hart, Plester, & Wilde	texting
2011	Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, & Plester	texting

2012	Cingel & Sundar	texting
2012	Johnson	texting
2012	De Jonge & Kemp	texting
2012	Wardyga	texting
2013	Aziz, Shamim, Aziz, & Avais	texting
2013	Wood (reported in Wood, Kemp, & Plester, 2013)	texting
2014	Bernicot, Goumi, Bert-Erboul, & Volckaert-Legrier	texting
2014	Drouin & Driver	texting
2014	Grace, Kemp, Martin, & Parrila	texting
2014	Kemp, Wood, & Waldron	texting
2014	Wood, Kemp, Waldron, & Hart	texting
2014	Wood, Kemp, & Waldron	texting
2015	Grace, Kemp, Martin, & Parrila	texting
2015	Rathje	texting, Facebook
2015	Sánchez-Moya & Cruz-Moya	WhatsApp
2016	Ouellette & Michaud	texting
2016	Vandekerckhove & Sandra	CMC (incl. texting, IMing, WhatsApp, Facebook)
2016	Van Dijk, Van Witteloostuijn, Vasic, Avrutin, & Blom	('texting' via) WhatsApp
2016	Waldron, Wood, & Kemp	predictive texting
2018	Simoës-Perlant, Gunnarsson-Largy, Lanchantin, & Largy	instant messaging

Operationalization of literacy and measurement of CMC use

Year of public- ation	Author(s)	Operationalization of literacy	Measurement of CMC use
2002	Raval	spelling, grammar, writing expressiveness/conciseness	CMC use vs. no CMC use
2003	Neville	spelling	proficiency with textese; use of textisms; understanding of textisms
2007	Bouillaud, Chanquoy, & Gombert	spelling	knowledge of textisms; frequency of CMC use
2007	Massengill Shaw, Carlson, & Waxman	spelling	frequency of CMC use
2008	Plester, Wood, & Bell	spelling, grammar, verbal reasoning, non-verbal reasoning, writing	frequency of CMC use; knowledge and use of textisms
2009	Drouin & Davis	reading (fluency and word recognition), spelling	knowledge and use of textisms; familiarity with textisms
2009	Plester, Wood, & Joshi	reading, spelling, non-word reading (alphabetic/orthographic decoding), phonological awareness. Also: vocabulary, short-term memory	knowledge and use of textisms
2009	Spooren	writing (incl. grammar and spelling)	intensity of CMC use
2009	Winzker, Southwood, & Huddlestone	writing, spelling	use of textisms
2010	Dürscheid, Wagner, & Brommer	writing (incl. lexis, morphosyntax, spelling, typography, textual coherence)	use of textisms
2010	Gann, Bartoszuk, & Anderson	spelling	frequency of CMC use; use of textisms
2010	Kemp	reading, spelling, morphological awareness, phonological awareness	frequency of CMC use; proficiency with textese
2010	Radstake	spelling	frequency of CMC use

2010	Rosen, Chang, Erwin, Carrier, & Cheever	writing	frequency of CMC use; frequency of simultaneous CMC use; use of textisms
2010	Shafie, Azida Darus, & Osman	writing, spelling	use of textisms
2010	Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong	spelling	use of textisms
2011	Bushnell, Kemp, & Martin	spelling	knowledge and use of textisms
2011	Coe & Oakhill	reading (orthographic decoding)	frequency of CMC / mobile phone use; knowledge and use of textisms
2011	Dixon	writing	engagement with CMC; size of CMC network
2011	Drouin	reading (fluency and accuracy), spelling	frequency of CMC use; use of textisms
2011	Durkin, Conti-Ramsden, & Walker	reading (efficiency and accuracy), spelling	frequency of CMC use; use of textisms
2011	Kemp & Bushnell	writing, reading (speed and accuracy), non-word reading, spelling	CMC use vs. no CMC use (texting experience); proficiency with textese
2011	Kreiner & Davis	spelling	frequency of CMC use; use of textisms; knowledge of ('sensitivity' to) textisms; identification of textisms
2011	Lee	language acceptability	exposure to CMC
2011	Plester, Lerkkanen, Linjama, Rasku-Puttonen, & Littleton	reading (fluency, accuracy, comprehension), non-word reading, spelling, phonological skill; vocabulary, rapid serial naming, short-term memory	use of textisms
2011	Powell & Dixon	spelling	exposure to textisms
2011	Rankin	writing, spelling	use of textisms
2011	Veater, Plester, & Wood	reading, phonological awareness (rhyme detection, non-word reading)	use of textisms

2011	Wood, Jackson, Hart, Plester, & Wilde	reading, spelling, non-word reading, phonological awareness, phonological retrieval, lexical retrieval	CMC use vs. no CMC use; use of textisms; frequency of CMC use
2011	Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, & Plester	reading, spelling, phonological awareness, phonological retrieval	use of textisms
2012	Cingel & Sundar	grammar	frequency of CMC use; use of textisms
2012	Johnson	reading (fluency, comprehension)	comprehension of textisms
2012	De Jonge & Kemp	reading, non-word reading, spelling, morphological awareness, orthographic awareness	frequency of CMC use; use of textisms; experience with CMC
2012	Wardyga	writing	frequency of CMC use
2013	Aziz, Shamim, Aziz, & Avais	spelling	use of textisms
2013	Wood (reported in Wood, Kemp, & Plester, 2013)	spelling, phonological awareness, phonological retrieval, orthographic processing	mobile phone dependency; experience with CMC; size of CMC network; understanding of textisms
2014	Bernicot, Goumi, Bert-Erboul, & Volckaert-Legrier	writing, spelling	CMC use vs. no CMC use
2014	Drouin & Driver	reading (accuracy and fluency), spelling, vocabulary	use of textisms
2014	Grace, Kemp, Martin, & Parrila	spelling, non-word reading; novel word reading, reading history, phonological processing, non-verbal reasoning	experience with CMC; frequency of CMC use; use of textisms
2014	Kemp, Wood, & Waldron	grammar, grammatical spelling	use of grammatical violations in CMC; frequency of CMC use; experience with CMC
2014	Wood, Kemp, Waldron, & Hart	grammar, orthographic processing, spelling	use of grammatical violations in CMC

2014	Wood, Kemp, & Waldron	grammar, orthographic processing, spelling	use of grammatical violations in CMC
2015	Grace, Kemp, Martin, & Parrila	spelling	use of textisms
2015	Rathje	spelling	use of textisms
2015	Sánchez-Moya & Cruz-Moya	spelling	-
2016	Ouellette & Michaud	spelling, reading, non-word reading, vocabulary	use of textisms (incl. 'misuse' of capitalisation/punctuation); fluency with textese; frequency of CMC use
2016	Vandekerckhove & Sandra	spelling	use of textisms
2016	Van Dijk, Van Witteloostuijn, Vasic, Avrutin, & Blom	grammar in spoken language, vocabulary, executive functions	frequency of CMC use; use of textisms
2016	Waldron, Wood, & Kemp	grammar, orthographic processing, spelling	use of grammatical violations in CMC; use of textisms
2018	Simoës-Perlant, Gunnarsson-Largy, Lanchantin, & Largy	spelling	exposure to CMC

Participants (age group, nationality, number)

Year of publication	Author(s)	Participants'		
		Age group	Nationality	No.
2002	Raval	children (11-12)	British	20
2003	Neville	children/adolescents (11-16)	British	45
2007	Bouillaud, Chanquoy, & Gombert	children (10-12) / adolescents (12-14) / adolescents (14-16)	French	144 (52 / 46 / 46)
2007	Massengill Shaw, Carlson, & Waxman	young adults (18-19)	American	86
2008	Plester, Wood, & Bell	children (10-12)	British	100
2009	Drouin & Davis	young adults ($\bar{x} = 22$)	American	80
2009	Plester, Wood, & Joshi	children (10-12)	British	88
2009	Spooren	adolescents (15-17)	Dutch	35
2009	Winzker, Southwood, & Huddlestone	adolescents (grades 8 & 11, range / mean unspecified)	South African	88
2010	Dürscheid, Wagner, & Brommer	adolescents (grades 9, 10, 11 + grades 1, 2, 3 of vocational schools)	Swiss	1148 CMC texts
2010	Gann, Bartoszuk, & Anderson	adults, mostly young adults (18-78, $\bar{x} = 25.5$)	American	106
2010	Kemp	young adults ($\bar{x} = 22$)	Australian	61
2010	Radstake	adolescents (12-15)	Dutch	352
2010	Rosen, Chang, Erwin, Carrier, & Cheever	young adults (18-25)	American	718
2010	Shafie, Azida Darus, & Osman	young adults (18-22)	Malaysian	264
2010	Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong	adolescents (12-17)	Canadian	40
2011	Bushnell, Kemp, & Martin	children (10-12)	Australian	227
2011	Coe & Oakhill	children (10-11)	British	41
2011	Dixon	adults, mostly young adults (mostly 18-20)	American	293
2011	Drouin	young adults ($\bar{x} = 21$)	American	152
2011	Durkin, Conti-Ramsden, & Walker	late adolescents (17)	British	94

2011	Kemp & Bushnell	children (10-12)	Australian	86
2011	Kreiner & Davis	young adults (18-29, $\bar{x}$ = 20) / young adults (18-26, $\bar{x}$ = 19)	American	104 (64 / 40)
2011	Lee	young adults (18-21)	Canadian	33
2011	Plester, Lerkkanen, Linjama, Rasku-Puttonen, & Littleton	children (9-11)	Finnish	65
2011	Powell & Dixon	young adults ($\bar{x}$ = 24)	British	94
2011	Rankin	young adults (range / mean unspecified)	American	25
2011	Veater, Plester, & Wood	children (10-13)	British	65
2011	Wood, Jackson, Hart, Plester, & Wilde	children (9-10)	British	114
2011	Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, & Plester	children (8-12)	British	119
2012	Cingel & Sundar	children/adolescents (10-14)	American	228
2012	Johnson	children (8-13)	Australian	91
2012	De Jonge & Kemp	adolescents (13-15) / young adults (18-24)	Australian	105 (52 / 53)
2012	Wardyga	young adults (18-24)	American	127
2013	Aziz, Shamim, Aziz, & Avais	young adults (19-25)	Pakistani	50
2013	Wood (reported in Wood, Kemp, & Plester, 2013)	children (8-11) / children/adolescents (11-14)	British	201 (106 / 95)
2014	Bernicot, Goumi, Bert-Erboul, & Volckaert-Legrier	children (11-12)	French	49
2014	Drouin & Driver	young adults ($\bar{x}$ = 21)	American	183
2014	Grace, Kemp, Martin, & Parrila	young adults ($\bar{x}$ = 23)	Canadian / Australian	236 (150 / 86)
2014	Kemp, Wood, & Waldron	children (8-10) / children/adolescents (11-15) / young adults (18-30, $\bar{x}$ = 21)	British	243 (89 / 84 / 70)

2014	Wood, Kemp, Waldron, & Hart	children (8-10) / children/adolescents (11-15) / young adults (18-30)	British	243 (89 / 84 / 70)
2014	Wood, Kemp, & Waldron	children (8-10) / children/adolescents (11-15) / young adults (18-30)	British	T1: 243 (89 / 84 / 70) > T2: 210 (83 / 78 / 49)
2015	Grace, Kemp, Martin, & Parrila	young adults	Australian	153
2015	Rathje	adolescents (13-15)	Danish	10
2015	Sánchez-Moya & Cruz-Moya	adolescents (13-18) / adults	Spanish	15 / 15
2016	Ouellette & Michaud	young adults ($\bar{x} = 19$)	Canadian	51
2016	Vandekerckhove & Sandra	adolescents / young adults (14-19)	Flemish	736
2016	Van Dijk, Van Witteloostuijn, Vasic, Avrutin, & Blom	children (10-13)	Dutch	55
2016	Waldron, Wood, & Kemp	children (8-10) / children/adolescents (11-15) / young adults (18-30)	British	T1: 208 (83 / 77 / 48) > T2: 190 (76 / 67 / 47)
2018	Simoës-Perlant, Gunnarsson-Largy, Lanchantin, & Largy	adolescents ($\bar{x} = 13$)	French	90

Findings

Year of public- ation	Author(s)	Findings
2002	Raval	**conflicting**: no relation between CMC use and grammar or spelling, but relation between CMC use and expressiveness (negative) or conciseness (positive)
2003	Neville	**positive**: positive relation between speed of reading and writing textese and spelling ability; positive relation between use of textisms and spelling ability; positive relation between understanding of textisms and spelling ability
2007	Bouillaud, Chanquoy, & Gombert	**conflicting**: for children, positive relation between knowledge of textisms and spelling ability; for older adolescents, negative relation between CMC use and spelling ability
2007	Massengill Shaw, Carlson, & Waxman	**no significant relations**
2008	Plester, Wood, & Bell	**conflicting**: <u>study 1</u>: negative relations between texting frequency and literacy skills; positive relation between knowledge and use of textisms and verbal reasoning ability; <u>study 2</u>: positive relations between knowledge and use of textisms and spelling and writing ability
2009	Drouin & Davis	**no significant relations**
2009	Plester, Wood, & Joshi	**positive**: positive relations between knowledge and use of textisms and reading, vocabulary, and phonological awareness
2009	Spooren	**no significant relations**
2009	Winzker, Southwood, & Huddlestone	**conflicting**: textisms present in school writings, but not many, and even fewer in writings by L2 participants
2010	Dürscheid, Wagner, & Brommer	**no significant relations**
2010	Gann, Bartoszuk, & Anderson	**no significant relations**
2010	Kemp	**positive**: positive relations between speed and accuracy of reading and writing textese and literacy skills
2010	Radstake	**no significant relations**
2010	Rosen, Chang, Erwin, Carrier, & Cheever	**conflicting**: positive relation between use of textisms and quality of informal writing; negative relation between use of textisms and quality of formal writing; negative relation between

		frequency of simultaneous IM chats and quality of formal writing
2010	Shafie, Azida Darus, & Osman	**conflicting**: textisms present in school writings, but only few, and only in writings by participants with weaker English proficiency
2010	Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong	**no significant relations**
2011	Bushnell, Kemp, & Martin	**positive**: positive relation between knowledge and use of textisms and spelling ability
2011	Coe & Oakhill	**conflicting**: negative relation between frequency of texting / mobile phone use (in minutes) and reading ability; positive relations between knowledge and use of textisms and reading ability
2011	Dixon	**no significant relations**
2011	Drouin	**conflicting**: positive relations between texting frequency and spelling and reading fluency; negative relations between use of textisms on SNS and in formal emails and reading accuracy
2011	Durkin, Conti-Ramsden, & Walker	**positive**: positive relations between use of textisms and spelling and reading ability; positive relation between reading ability and willingness to return a text message
2011	Kemp & Bushnell	**positive**: positive relation between CMC use and writing speed; positive relations between textese reading speed and accuracy and spelling, reading, and non-word reading skills; positive relations between textese writing speed and spelling and reading ability
2011	Kreiner & Davis	**positive**: positive relation between knowledge of textisms and spelling ability; positive relation between reaction time for identification of textisms and spelling ability
2011	Lee	**conflicting**: negative relation between exposure to texting and language acceptability, but is this a positive or negative impact?
2011	Plester, Lerkkanen, Linjama, Rasku-Puttonen, & Littleton	**positive**: positive relations between use of textisms and reading fluency, reading comprehension, phonological skill, short-term memory, and vocabulary
2011	Powell & Dixon	**positive** > *experiment*: positive impact of exposure to textisms on spelling
2011	Rankin	**negative**: textisms present in academic writings

2011	Veater, Plester, & Wood	**conflicting**: positive relations between use of textism and phonological awareness and reading ability, but not for dyslexic children; positive relations between different textism types and literacy skills, but barely for dyslexic children
2011	Wood, Jackson, Hart, Plester, & Wilde	**conflicting** > *intervention*: no relation between CMC use and literacy attainment, but positive relations between use of textisms and literacy development (positive predictive relation with spelling); positive relation between texting frequency and lexical retrieval
2011	Wood, Meachem, Bowyer, Jackson, Tarczynski-Bowles, & Plester	**positive** > *longitudinal*: positive relations between use of textisms and reading and spelling; positive predictive relation between use of textisms and spelling
2012	Cingel & Sundar	**negative**: negative relation between texting frequency and grammar ability; negative relation between use of textisms and grammar ability; negative predictive relation between use of certain textism types and grammar ability
2012	Johnson	**positive**: positive relations between knowledge of textisms and reading fluency and comprehension
2012	De Jonge & Kemp	**negative**: negative relations between texting frequency and use of textisms and spelling, reading, non-word reading, and morphological awareness; moderately negative relations between texting experience and reading and non-word reading
2012	Wardyga	**negative**: negative relation between texting frequency ('volume') and SAT writing score, but only for female students
2013	Aziz, Shamim, Aziz, & Avais	**no significant relations**
2013	Wood (reported in Wood, Kemp, & Plester, 2013)	**conflicting**: positive relations between mobile phone dependency and orthographic processing and phonological retrieval; negative relations between mobile phone dependency and spelling ability; for children, negative relations between mobile phone dependency and phonological awareness; for adolescents, positive relations between mobile phone dependency and phonological awareness; positive relations between experience with CMC and spelling ability and orthographic processing; for children, negative relation between size of texting network and phonological awareness; positive relation

		between understanding of textisms and orthographic processing
2014	Bernicot, Goumi, Bert-Erboul, & Volckaert-Legrier	**no significant relations** > *longitudinal / intervention*
2014	Drouin & Driver	**conflicting**: negative relations between use of textisms and reading accuracy and spelling; negative relations between some textism types and literacy skills; positive relations between other textism types and literacy skills
2014	Grace, Kemp, Martin, & Parrila	**conflicting**: <u>Canadians</u>: negative relation between use of textisms and spelling; negative relation between experience with CMC and spelling; <u>Australians</u>: negative relation between use of textisms and non-word reading; negative relation between use of textisms and phonological processing and reading history; positive relation between experience and novel word reading; negative relation between texting frequency and novel word reading; negative relations between appropriateness ratings of using textisms and non-word reading and reading history
2014	Kemp, Wood, & Waldron	**negative**: for children, negative relation between grammatical violations in texting and grammatical spelling; for young adults, negative relation between grammatical violations in texting and ability to translate texts with unconventional grammar into Standard English
2014	Wood, Kemp, Waldron, & Hart	**negative**: for young adults, negative relation between non-standard punctuation and capitalisation in texting and written grammar understanding
2014	Wood, Kemp, & Waldron	**conflicting** > *longitudinal*: both positive and negative relations; for young adults, positive predictive relation between use of 'ungrammatical' word forms and orthographic choice ability
2015	Grace, Kemp, Martin, & Parrila	**no significant relations**
2015	Rathje	**no significant relations**
2015	Sánchez-Moya & Cruz-Moya	**no significant relations** > *experiment*
2016	Ouellette & Michaud	**no significant relations**

2016	Vandekerckhove & Sandra	**negative**: few textisms present in school writings, but more in writings by participants with a lower educational level
2016	Van Dijk, Van Witteloostuijn, Vasic, Avrutin, & Blom	**positive**: positive relations between use of textisms and vocabulary, grammar, and selective attention; positive relations between use of omissions and vocabulary and grammar; positive predictive relation between use of omissions and grammar
2016	Waldron, Wood, & Kemp	**conflicting** > *longitudinal*: for children/adolescents, negative relation between predictive text use and spelling in text messages; for young adults, positive relation between predictive text use and grammar in text messages; for young adults, negative relation between predictive text use and morphological awareness
2018	Simoës-Perlant, Gunnarsson-Largy, Lanchantin, & Largy	**negative** > *longitudinal*: for poor spellers, negative relation between exposure to CMC and spelling

Samenvatting (Summary in Dutch)

De aanhoudende groei van communicatie via nieuwe en sociale media (zogenaamde 'computer-gemedieerde communicatie') gaat gepaard met niet-aflatende zorgen over verontrustend afwijkend taalgebruik in het informele digitale schrijven van jongeren, en met alarmerende berichten over de mogelijke schadelijke gevolgen daarvan voor taal en geletterdheid. Er is al decennia kritiek op zulk afwijkend taalgebruik in nieuwe en sociale media, dat onder verschillende noemers bekend staat: 'chattaal', 'MSN-taal', 'SMS-taal', 'twittertaal' en tegenwoordig 'whatsapptaal'. Dit alles noem ik 'digi-taal'. Dit promotieonderzoek heeft de invloed onderzocht van de digi-taal van Nederlandse jongeren op hun traditionele geletterdheid in een onderwijsomgeving, om te achterhalen of zulke zorgen überhaupt terecht zijn, of misschien alleen voor jongeren van een jongere leeftijdsgroep of met een lager opleidingsniveau. Het eerste deel van dit proefschrift presenteert de theoretische achtergrond over digi-taal en geletterdheid, het tweede deel presenteert vier studies over het gebruik van digi-taal in nieuwe- en socialemediaberichten van Nederlandse jongeren (één over het verzamelen van de data, drie over het analyseren van de data) en het derde deel presenteert drie studies over de verbanden tussen digi-taal en schrijven in een schoolse context. De belangrijkste bevindingen van dit proefschrift zijn hier samengevat.

Deel 1: Theoretische achtergrond over digi-taal en geletterdheid

Hoofdstuk 2 problematiseert het begrip 'geletterdheid'. Het maakt duidelijk hoe het traditionele begrip van geletterdheid, namelijk het lezen en schrijven van gedrukte teksten, niet meer volstaat in deze tijd waarin digitale communicatie zo'n belangrijke rol speelt. Nieuwe media hebben decennialang een diepgaande invloed gehad op de manier waarop geletterdheid is opgevat. Veel wetenschappers, onderwijzers en beleidsmakers hebben gepleit voor een nieuwe conceptualisering van geletterdheid, voor een verbreding van het concept, en veel nieuwe 'geletterdheden' zijn bedacht om aan deze oproepen tegemoet te komen, zoals computergeletterdheid, digitale geletterdheid en (nieuwe-)mediawijsheid. Geletterdheid – vooral het Engelse *literacy* – is zelfs geëvolueerd tot een universeel woord, een algemene uitdrukking voor 'bekwaamheid', waardoor een overvloed aan geletterdheden is bedacht. Van elke nieuwe geletterdheid zijn verschillende definities gegeven, die de nadruk leggen op receptieve of productieve vaardigheden en die algemene omschrijvingen geven of specifieke competenties opsommen; deze reflecteren een diversiteit aan benaderingen. Uiteindelijk zouden oude en nieuwe geletterdheden naast elkaar moeten bestaan en elkaar moeten aanvullen, maar de vraag blijft of jongeren, ook al zijn zij opgegroeid in een wereld met digitale media, in staat zijn om zowel traditionele geletterdheid, d.w.z. conventioneel lezen en schrijven, als digitale geletterdheden, nuttig voor het gebruik van sociale media, te verwerven en hier effectief tussen te switchen.

Hoofdstuk 3 behandelt eerder onderzoek naar verbanden tussen digi-taal en geletterdheid. Hierin worden twee tegengestelde visies gepresenteerd: sommigen

denken dat digi-taal een schadelijke invloed heeft op traditionele geletterdheid (lees-
en schrijfvaardigheid), terwijl anderen geloven dat dit juist nuttig kan zijn. Dit
hoofdstuk laat zien dat noch eerdere attitudestudies, die de percepties van betrokken
partijen (jongeren, ouders en/of leraren) presenteren door middel van kwantitatieve
of kwalitatieve interviews of enquêtes, noch observatiestudies, die empirisch bewijs
presenteren via vooral correlationeel onderzoek naar de verbanden tussen variabelen,
een duidelijk beeld geven van de effecten van digi-taal op geletterdheid. Dit kunnen
we toeschrijven aan aanzienlijke verschillen tussen die eerdere studies in hun
methodes en deelnemers. Geletterdheid werd op verschillende manieren
geoperationaliseerd en socialemediagebruik op verschillende manieren gemeten; het
grootste verschil tussen deelnemers was hun leeftijdsgroep. Veel studies die meerdere
maten van socialemediagebruik of van verschillende geletterdheidsvaardigheden
(lezen, schrijven, spelling, grammatica, etc.) hanteerden, hadden zelfs tegenstrijdige
bevindingen: er werden dan zowel positieve als negatieve verbanden gevonden
binnen een enkele studie. Toch rapporteerden de meeste attitudestudies negatieve
percepties, met name van leraren en jongvolwassenen, terwijl observatiestudies meer
bewijs van een positief verband dan een negatief verband rapporteerden, vooral
wanneer de deelnemers kinderen waren.

Het bestaande onderzoek is echter op meerdere vlakken beperkt. Het richtte
zich voornamelijk op SMS, in plaats van WhatsApp, dat nu gangbaar is onder
(Nederlandse) jongeren (en volwassenen). Slechts weinig onderzoek is uitgevoerd in
Nederland; in plaats daarvan kwamen de meeste deelnemers uit Engelstalige landen.
Ten derde konden conclusies over de richting van verbanden nauwelijks getrokken
worden, aangezien bijna alle analyses 'cross-sectioneel' waren, en daarom weten we
niet of er sprake is van een oorzakelijk verband. Uit het bestaande onderzoek kan
dan ook geen eindconclusie getrokken worden over het verband tussen digi-taal en
de geletterdheid van jongeren.

Deel 2: Digi-taal in nieuwe- en socialemediaberichten van Nederlandse jongeren

Hoofdstuk 4 rapporteert het samenstellen van een corpus van authentieke
socialemediaberichten, namelijk chats van de mobiele chat-applicatie WhatsApp en
posts van de socialenetwerksite Facebook. Nederlandse jongeren doneerden niet
zomaar vrijwillig hun privéberichten aan de onderzoekers. Zelfs met extra stimulans
in de vorm van het verloten van prijzen, was er veel media-aandacht ter promotie
van de dataverzameling nodig om jongeren uit het hele land ervan te overtuigen hun
data te delen. Dit hoofdstuk laat ook zien dat het verzamelen van de metadata van
bijdragers, het verkrijgen van hun geïnformeerde schriftelijke toestemming evenals
die van hun ouders/verzorgers in het geval van minderjarige bijdragers en het krijgen
van ethische goedkeuring van een ethische toetsingscommissie van groot belang zijn
bij de dataverzameling. De websites en applicatie die we gemaakt hebben voor het
verzamelen van respectievelijk socialemediaberichten en Facebook-posts van de
tijdlijn van gebruikers kunnen een voorbeeld zijn voor andere onderzoekers die een
socialemediacorpus willen verzamelen.

Hoofdstuk 5 rapporteert de bevindingen van een eerste corpusonderzoek naar de digi-taal van Nederlandse jongeren tussen 12 en 23 jaar oud. Het richtte zit op een opvallend orthografisch aspect van digi-taal, namelijk het gebruik van zogenaamde *textisms*, hier gedefinieerd als onconventionele spelling. Handmatige analyse van een nieuwe-mediacorpus van bijna 400.000 woorden onthulde niet alleen dat de online berichten van Nederlandse jongeren inderdaad doorgaans sterk orthografisch verschillen van het Standaardnederlands, maar ook, en nog belangrijker, dat de mate waarin jongeren *textisms* en bepaalde soorten *textisms* gebruiken afhangt van zowel het medium of de 'CMC modus' (MSN, SMS, Twitter, WhatsApp) als individuele gebruikerskenmerken zoals leeftijdsgroep. MSN-chats bevatten de meeste *textisms*, gevolgd door WhatsApp, vervolgens SMS en ten slotte tweets. Adolescenten (12-17 jaar oud) gebruikten veel meer textisms dan jongvolwassenen (18-23 jaar oud), in alle vier de media, maar vooral in chatgesprekken (MSN, WhatsApp) en sms'jes. Jongeren van verschillende leeftijdsgroepen bleken de voorkeur te geven aan verschillende soorten textisms – de digi-taal van adolescenten bevatte veel fonetisch gespelde woorden, waardoor het register meer op spreektaal lijkt en informeler wordt, terwijl jongvolwassenen veel afkortingen uit de standaardtaal gebruikten, schijnbaar om beknopter en sneller te communiceren.

Hoofdstuk 6 presenteert verdere bevindingen van mijn corpusonderzoek naar de digi-taal van Nederlandse jongeren. Hierbij werd hetzelfde corpus gebruikt als in hoofdstuk 5, maar werd de orthografie veel gedetailleerder geanalyseerd. Deze studie toonde aan dat de orthografische afwijkingen van het Standaardnederlands in de digi-taal van jongeren geen willekeurige, zinloze 'fouten' zijn: dit register wordt juist geleid door impliciete orthografische principes. Jongeren bleken textisms gebruiken met specifieke vormen (met letters, diakritische tekens, interpunctie, spaties en hoofdletters), met specifieke bewerkingsoperaties (weglating, vervanging en toevoeging) en voor specifieke functies – wat ik de 'SUPER-functies' van *textisms* noem. Ze kunnen de orthografie meer *Speechlike* (spreektaalachtig), *Understandable* (begrijpelijk), *Playful* (speels), *Expressive* (expressief) en *Reduced* (beknopt) maken. Nederlandse jongeren lieten vooral letters weg, ogenschijnlijk om orthografische beknoptheid en snelheid te bereiken, dus om minder toetsen te hoeven indrukken. Bovendien werd een bevinding uit het vorige hoofdstuk bevestigd, namelijk dat adolescenten en jongvolwassenen de voorkeur gaven aan verschillende soorten *textisms* en dat het gebruik van deze soorten textisms ook afhankelijk was van het medium waarmee gecommuniceerd werd. *Textisms* werden veel meer gebruikt door adolescenten dan door jongvolwassenen en kwamen veel meer voor in MSN-chats en whatsappjes dan in sms'jes en met name tweets. Deze bevindingen werden voorzichtig toegeschreven aan de verschillende percepties van jongeren over het belang van het naleven van de orthografie van de standaardtaal, evenals de unieke combinaties van kenmerken en beperkingen van verschillende nieuwe media, waaronder een mogelijke limiet op de lengte van een bericht, de gelijktijdigheid van communicatie, de zichtbaarheid, de mate van interactiviteit en technologie.

Hoofdstuk 7 presenteert het laatste deel van mijn corpusonderzoek naar de digi-taal van Nederlandse jongeren, oftewel hun 'socialemedia*slang*'. Het focuste niet alleen op *textisms*, maar op meer talige kenmerken, zoals andere orthografische kenmerken en kenmerken van andere schrijfdimensies: naast orthografie/spelling (*textisms*, 'spelfouten', typefouten) ook typografie (emoticons, symbolen), syntaxis/grammatica (weglatingen) en lexis/woordgebruik (Engelse ontleningen, tussenwerpsels). De digi-taal van jongeren bleek al deze kenmerken te bevatten, waarmee het register zich onderscheidt van het Standaardnederlands. Daarnaast lieten de resultaten opnieuw zien dat de digi-taal van Nederlandse jongeren talig divers is: leeftijdsgroep speelde een cruciale rol in het taalgebruik van jongeren in nieuwe- en socialemediaberichten, en medium was nog belangrijker vanwege een samenspel van kenmerken van elk medium. Deze studie toonde dus aan dat digi-taal niet een homogeen register is, maar allerlei 'subregisters' omvat.

Deel 3: Verbanden tussen de digi-taal van Nederlandse jongeren en hun schrijven in een schoolse context

Hoofdstuk 8 vergelijkt nieuwe- en socialemediaberichten van Nederlandse adolescenten en jongvolwassenen – wederom werden de vier media MSN, SMS, Twitter en WhatsApp geanalyseerd – met teksten die ze op school schreven. Talige analyses met de tekstanalysesoftware 'T-Scan' lieten zien dat Nederlandse jongeren inderdaad verschillende registers gebruiken, want hun nieuwe-/socialemediateksten en schoolteksten verschilden op meerdere lexicale en syntactische maten. In vergelijking met hun schoolteksten gebruikten ze meer ellipsen (weglatingen) in hun nieuwe- en socialemediaberichten. Ook waren die berichten syntactisch minder complex: ze bevatten kortere zinnen en minder bijzinnen, en hadden een lager 'D-niveau' (*D* voor *developmental*; een hoger niveau wijst op meer syntactische complexiteit) en een lagere gemiddelde afhankelijkheidslengte per zin (de afstand tussen het hoofd van een zin of woordgroep en het hiervan afhankelijke element; hoger betekent syntactisch complexer). Wat betreft woordgebruik waren de nieuwe- en socialemediaberichten diverser (ze bevatten meer verschillende woorden of verschillend gespelde woorden), verschillender (wat betekent dat ze meer 'speciale' woorden bevatten, d.w.z. tekenreeksen die de software niet kon herkennen als woorden, inclusief *textisms*, 'spelfouten' en typefouten) en compacter (meer inhoudswoorden en minder functiewoorden). Deze bevindingen toonden aan dat Nederlandse jongeren duidelijk verschillende registers gebruiken in de schrijfcontext van informele nieuwe en sociale media en die van school.

Hoofdstuk 9 rapporteert over een correlationele studie met 400 Nederlandse jongeren – we hebben uiteindelijk de data van 338 van hen gebruikt – om verbanden te onderzoeken tussen hun zelf-gerapporteerde socialemediagebruik, gemeten via enquêtes, en hun schrijfproducten geproduceerd op school, door ze opstellen te laten schrijven in de klas. De T-Scan software werd weer gebruikt om de schoolteksten talig te analyseren en om hun tekstkwaliteit te beoordelen: dit keer combineerden we verschillende maten die T-Scan aanleverde tot vier factoren – lexicale rijkheid, syntactische complexiteit, schrijfproductiviteit en formaliteit. We vonden meerdere

verbanden tussen, enerzijds, de mate waarin of de manier waarop deelnemers sociale media zeiden te gebruiken, en anderzijds, hun prestaties op de productieve schoolse schrijftaak. Van deze verbanden waren er meer positief dan negatief. Uit de resultaten bleek dat passief gebruik van sociale media, door erg afhankelijk te zijn van je mobiele telefoon of door veel socialemediaberichten van anderen te lezen, negatief verband hield met de kwaliteit van schoolteksten, terwijl actieve en creatieve taalproductie in sociale media – via verschillende media, van jongs af aan, met veel mensen en inclusief *textisms* – positief verband hield met schrijfprestaties op school. Opleidingsniveau bleek een relevante demografische factor te zijn in de verbanden tussen socialemediagebruik en geletterdheid, met de meeste negatieve en de meeste positieve significante correlaties voor lager opgeleide jongeren (vmbo'ers en mbo'ers). In vergelijking met hoger opgeleide jongeren (vwo'ers en universitaire studenten) kunnen hun schoolteksten dus een groter risico lopen om 'aangetast' te worden, maar kunnen ze talig gezien ook meer baat hebben bij sociale media. Door de correlationele aard van deze studie kunnen we echter geen conclusies trekken over de causaliteit van de verbanden.

Hoofdstuk 10, ten slotte, was ontworpen om de causaliteit van verbanden tussen socialemediagebruik en schoolse schrijfprestaties te onderzoeken. We voerden een experimentele studie uit, waaraan 500 Nederlandse jongeren deelnamen (de data van 408 van hen zijn gebruikt), om te onderzoeken of WhatsApp-gebruik hun schoolse schrijfvaardigheid belemmert. De deelnemers werden willekeurig verdeeld over twee condities. De helft van de deelnemers werd 'geprimed' met sociale media door een kwartier lang te whatsappen, direct voorafgaand aan het uitvoeren van een productieve en een receptieve schrijftaak, namelijk het schrijven van een verhaal en het voltooien van een zinsbeoordelingstaak in de klas. De andere helft vervulde een niet-verbale controletaak – het kleuren van mandala's – voordat ze de twee schoolse schrijftaken uitvoerden. De verhalen werden geanalyseerd met de T-Scan software, net als in hoofdstuk 9; hun kwaliteit werd beoordeeld op basis van de factoren lexicale rijkheid, syntactische complexiteit en schrijfproductiviteit (de factor formaliteit bleek geen rol te spelen bij verhalen, in tegenstelling tot bij opstellen). We vonden geen kortetermijneffecten van het direct voorafgaande WhatsApp-gebruik op de prestaties van deelnemers op beide taken: noch op de kwaliteit van hun schoolse schrijfproducten, noch op hoe goed ze waren in het herkennen en verbeteren van 'taalfouten' (afwijkingen van het Standaardnederlands) in een zinsbeoordelingstaak. Deze studie toonde dus geen directe invloed van gebruik van en blootstelling aan sociale media, zelfs niet voor jongeren met een lager opleidingsniveau of van een jongere leeftijdsgroep. Slechts twee kleine interacties tussen conditie (WhatsApp vs. kleuren) en geslacht suggereren dat WhatsApp-gebruik de lexicale rijkheid van verhalen van jongens enigszins zou kunnen verbeteren en de bekwaamheid van meisjes om afwijkingen van het Standaardnederlands te verbeteren iets zou kunnen verslechteren.

Implicaties

Theoretische implicaties

Dit proefschrift suggereert dat, in tegenstelling tot kritische mediaberichten, en ondanks het aanzienlijke gebruik van sociale media door de Nederlandse jeugd en een breed scala aan *textisms* daarin, de meerderheid van de adolescenten en jongvolwassenen de juiste taalvariant kan toepassen in een schoolse context. Dit sluit aan bij de bevindingen voor Australische studenten van Grace, Kemp, Martin en Parrila (2015), die niet vonden dat *textisms* de grenzen van informele sociale media overschreden: studenten vermeden juist het gebruik van *textisms* in tentamens. Eerdere onderzoeken naar digi-taal en schrijfvaardigheid gaven geen eenduidige resultaten, zoals blijkt uit overzichten van Verheijen (2013), Wood, Kemp en Plester (2013), Zebroff (2017) en hoofdstuk 3 van dit proefschrift. Dit promotieonderzoek voegt tegenstrijdige, maar voorzichtig positieve bevindingen aan deze eerdere literatuur toe. Mijn corpusonderzoek naar de digi-taal van Nederlandse jongeren laat zien dat hoewel hun socialemediaberichten sterk afwijken van het Standaardnederlands, met name wat betreft orthografie, deze afwijkingen afgestemd op het medium en over het algemeen functionele (hoewel misschien gedeeltelijk onbewuste) taalkeuzes lijken te zijn, geleid door orthografische principes – om de tekst meer spreektaalachtig, begrijpelijk, speels, expressief of beknopt te maken, en mogelijk om te helpen bij het vormen van een sociale identiteit of om zich te houden aan impliciete sociale groepsnormen van adolescente leeftijdsgenoten.

De resultaten van de empirische studies naar verbanden tussen de digi-taal van Nederlandse jongeren en hun schrijven in een schoolse context laten zien dat we ons bij de onderzochte schoolniveaus en leeftijdsgroepen geen zorgen hoeven te maken over enige nadelige gevolgen van sociale media voor talige aspecten van een hoger niveau m.b.t. de schrijfkwaliteit van hun schoolteksten. Er werd geen directe invloed van WhatsApp-gebruik gevonden op de lexicale dichtheid, syntactische complexiteit of schrijfproductiviteit van verhalen in de experimentele studie van dit proefschrift – niet eens voor de zogenaamde 'risicogroepen' van adolescenten en lager opgeleide jongeren. Dit komt overeen met de resultaten van Dürscheid, Wagner en Brommer (2010), die het informele digitale schrijven van Zwitserse studenten vergeleken met hun schrijven op school en weinig tot geen inmenging van online schrijfkenmerken vonden. Het ondersteunt ook de bewering van Tagg (2015) dat jongeren over het algemeen in staat zijn digi-taal te gebruiken in online communicatie met hun vrienden en standaardspelling in opstellen op school. We vonden geen bewijs van een directe invloed van socialemediagebruik op de prestaties van jongeren op schoolse schrijftake. Daarmee wordt de hypothese dat hun informele digi-taal-register een belemmering vormt voor ('interfereert' met) hun formele schoolregister (Lems, Miller, & Soro, 2017) niet ondersteund; integendeel, adolescenten en jongvolwassenen laten zien dat ze effectief tussen registers kunnen switchen.

Dit roept belangrijke vragen op: kan het switchen tussen twee registers überhaupt vergeleken worden met het switchen tussen twee talen, zoals Van Dijk et al. (2016) ook voorstelden? Zijn de jongeren van vandaag de dag, die leven in een wereld vol sociale media, inderdaad vergelijkbaar met vroeg-tweetalige mensen?

Ondanks de duidelijke overeenkomsten tussen registers en talen zijn de twee ook duidelijk verschillend. Hoewel registerverschillen tussen digi-taal en het Standaardnederlands het meest zichtbaar zijn in de spelling, en grotendeels afhankelijk zijn van kwesties als formaliteit en normativiteit (informeel, casual, 'slordig' schrijven dat door de vingers wordt gezien of zelfs de voorkeur heeft in sociale media, versus formeel schrijven volgens de regels van de standaardtaal dat verwacht wordt op school), verschillen talen veel fundamenteler op de niveaus van syntaxis, lexis en morfologie.[69] Het switchen tussen talen kan dus een veel grotere cognitieve inspanning vereisen, wat meer interferentie veroorzaakt. Het is mogelijk dat een dergelijke cognitieve overbelasting niet optreedt bij het switchen tussen registers, en dus geen negatieve (achterwaartse) invloed veroorzaakt, wat we inderdaad niet vonden in hoofdstuk 10. Zelfs lager opgeleide jongeren toonden zulke interferentie niet, misschien omdat de schoolse context waarin het onderzoek werd uitgevoerd een talig 'gefocuste' context is (Odlin, 1989), waarin adolescenten en jongvolwassenen van alle opleidingsniveaus extra aandacht besteden aan hun geschreven taalgebruik.

Bovendien toonde de correlationele studie (hoofdstuk 9) aan dat jongeren die sociale media op een actieve en talig creatieve manier gebruiken, in tegenstelling tot jongeren die passief de socialemediaberichten van anderen lezen, opstellen van hogere kwaliteit produceren, d.w.z. lexicaal rijker, syntactisch complexer of productiever. De positieve verbanden suggereren dat het produceren van socialemediaberichten de schrijfvaardigheid van jongeren kan trainen, terwijl de negatieve verbanden suggereren dat blootstelling aan digi-taal van anderen met veel afwijkingen van de standaardtaal zulke afwijkingen dominant kan maken in hun eigen schoolteksten – vooral als ze via andere kanalen nauwelijks zijn blootgesteld aan talige input die zich wél aan de standaardtaal houdt. Deze studie kon echter de causaliteit van deze verbanden niet bewijzen, dus er zou een andere onderliggende variabele in het spel kunnen zijn. Toch vonden we meer verbanden, zowel positieve als negatieve, tussen gewoontes en ervaringen met socialemediagebruik en de kwaliteit van schoolteksten voor lager opgeleide jongeren, in overeenstemming met bevindingen van Rosen et al. (2010) en Vandekerckhove en Sandra (2016). Dit kan het geval zijn omdat zij niet zoveel (in Standaardnederlands) hoeven schrijven op school in vergelijking met hoger opgeleide leerlingen en studenten, waardoor ze minder gewend zijn om tussen registers te switchen. De verschillen in verbanden tussen jongeren van verschillende opleidingsniveaus suggereren dat, hoewel we geen directe invloed vonden in de experimentele studie, jongeren met een lagere opleiding gevoeliger zijn voor beïnvloeding van een van hun registers op een ander register.

Ondanks de voorlopig hoopvolle bevindingen van dit proefschrift, zou het verstandig zijn om educatieve inspanningen te richten op het bewust maken van de huidige '*whatever*-generatie' (Baron, 2008) van waarom traditionele geletterdheid en naleving van de normen van de standaardtaal er nog steeds toe doen – vooral in hun

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[69] Wat vastgelegd is als een 'taal' is echter wel sociaal en politiek bepaald (afhankelijk van kwesties als nationale identiteit en politiek), en sommige talen lijken natuurlijk veel meer op elkaar dan andere.

latere professionele levens (Maes, 2016) – zelfs in dit digitale tijdperk, waarin verschillende nieuwe geletterdheden zoals 'digitale geletterdheid', '(nieuwe)mediawijsheid' en 'visuele geletterdheid' steeds belangrijker worden. Zoals Walsh (2008) benadrukt, zijn nieuwe conventies voor digitale productie zeer relevant geworden, maar zijn traditionele schrijfconventies als tekststructuur, zinnen, grammatica, spelling en interpunctie nog steeds belangrijk.

In digitale teksten wordt de normatieve claim van gestandaardiseerde spelling uitgedaagd (Androutsopoulos, 2014), wat prima is binnen de informele context van sociale media: het wordt pas problematisch als jongeren het tarten van de standaardtaal meenemen naar meer formele contexten. Bewustwording van het belang van het gescheiden houden van digi-taal en het geschreven Standaardnederlands kan de '*digital natives*' (Prensky, 2001; Bennett, Maton, & Kervin, 2008) van tegenwoordig helpen om de invloed van sociale media op hun schoolteksten te beperken. Jongeren begrijpen en creëren intuïtief onconventionele spelling in digi-taal zonder enige formele les of woordenboeken, simpelweg door hun onderdompeling in sociale media, maar hun kennis van conventies van de standaardtaal vereist wél formeel onderwijs. Daarom moeten de orthografische en grammaticale regels die nodig zijn voor het schrijven van 'correct Nederlands' uitgebreid worden aangeleerd op school – vooral aan lager opgeleide jongeren, voor wie we meer verbanden tussen socialemediagebruik en schoolse schrijfprestaties vonden – om te voorkomen dat enig gebrek aan kennis van geschreven Standaardnederlands digi-taal uiteindelijk de overhand laat nemen in meer formele contexten, die als ongepast worden beschouwd voor zulk informeel online taalgebruik. Zonder dergelijke educatieve kansen uit het oog te verliezen om jongeren te helpen switchen tussen registers, moeten we hen laten genieten van sociale media, omdat hun actieve, creatieve taalgebruik in nieuwe- en socialemediaberichten hen zelfs in staat kan stellen om hun schrijfvaardigheid te ontwikkelen en onze Nederlandse taal springlevend houdt.

Praktische implicaties

Een eerste praktische implicatie van het huidige onderzoek betreft de dataverzameling van authentieke socialemediaberichten. Onze verzamelmethode kan een voorbeeld zijn voor hoe zulke digitale teksten en metadata verzameld kunnen worden, in een wereld waarin die teksten tegenwoordig zo'n grote sociale rol spelen (Barton & Lee, 2013) – wat het inmiddels is, getuige het sociolinguïstische corpus van Dorantes et al. (2018) van WhatsApp-chats door Spaanse studenten. Toekomstige onderzoekers moeten er rekening mee houden dat jongeren ervan overtuigd moeten worden om hun privéberichten aan de wetenschap te doneren, met de mogelijke extra stimulans van een prijs die verloot wordt onder bijdragers. Sterker nog, toen Crystal (2011) opmerkte dat mensen erom bekend staan terughoudend zijn met het verlenen van toegang aan taalkundigen tot hun privé digitale communicatie, was dit geen overstatement.

Het hier gepresenteerde onderzoek is uitgevoerd op het grensvlak van taal, sociale media en onderwijs. De bevindingen van dit proefschrift kunnen op scholen praktisch worden gebruikt voor verschillende doeleinden. Zoals Bernicot et al. (2014)

voorstelden, kan digi-taal een 'vriend' zijn van leren op school in plaats van een 'vijand'; het kan een academisch hulpmiddel zijn. Het biedt mogelijkheden voor het ontwikkelen van lesmateriaal voor taalonderwijs. Als we de aandacht vestigen op de rijkheid in orthografische variatie in digi-taal, kan dit een middel zijn voor jongeren om te reflecteren op taal. Het kan bijvoorbeeld nuttig zijn bij het uitleggen van het concept van taalverandering of, beter gezegd, sociolinguïstische verandering ten gevolge van 'mediatisering' (Androutsopoulos, 2014). Dit proefschrift heeft aangetoond dat *textisms* vaak nuttige functies hebben, wat studenten kan leren over hoe taal kan ontwikkelen om te blijven voldoen aan de communicatieve behoeften van mensen in een wereld met veel nieuwe media en voortdurende technologische innovaties. Het integreren van digi-taal in het onderwijscurriculum ter illustratie van taalverandering kan leraren in staat stellen om verder te gaan dan taalonderwijs dat uitsluitend functioneel gericht is, naar meer reflectieve lessen (Bennis, 2015). Deze bevindingen kunnen ook worden gebruikt om schrijfonderwijs te ondersteunen (Sweeny, 2010), om jongeren meer te leren over taalvariatie en tekstontwerp dat rekening houdt met het leespubliek (Tagg, 2015). Door met voorbeelden uit authentieke socialemediaberichten aan studenten duidelijk te maken dat ze eigenlijk al gewend zijn om hun taalgebruik, en spelling in het bijzonder, aan te passen aan verschillende nieuwe media, kunnen ze leren om in meer formele contexten hun teksten ook aan te passen aan bepaalde tekstgenres en doelgroepen. Crystal (2011) suggereert dat het een nuttige oefening is om sms'jes of chatberichten te vertalen naar berichten in de standaardtaal, en omgekeerd, om bij studenten meer *feeling* te ontwikkelen voor de geschiktheid van taalstijlen in bepaalde situaties: zulke opdrachten kunnen jongeren leren over registerverschillen.

        In het algemeen zouden deze resultaten gebruikt kunnen worden om jongeren ervan bewust te maken dat hun informele digi-taal en de standaardtaal verschillende varianten van het Nederlands zijn – registers waarvan de samenleving van hen verwacht dat ze die gescheiden houden en in de geschikte context gebruiken. Of zoals een taalblog (anoniem, 2015) het uitdrukt: het belangrijkste om te onthouden voor onderwijs is dat we kinderen leren hoe ze verschillende communicatiestijlen kunnen inzetten. Het schrijven van een opstel en het schrijven van een sms'je zijn verschillende dingen; kinderen kunnen beide leren, zolang er maar voldoende aandacht is voor deze registerverschillen. Onderscheid maken tussen registers blijft belangrijk, vooral gezien de steeds grotere rol van digitale media in het leven van jongeren (en volwassenen). De schoolteksten van jongeren die schrijven vergelijkbaar met hoe ze chatten of appen, kunnen worden verbeterd, zoals Turner (2009) en French (2018) suggereren, door hen te helpen om te switchen, d.w.z. schakelen tussen informele digi-taal en formele standaardtaal. Een contrastieve analyse met voorbeelden van hoe nieuwe-mediateksten afwijken van de normen van de standaardtaal kan helpen om een groter bewustzijn van registers te creëren; Turner (2009), Bennis (2012) en French (2018) geven een aantal praktische suggesties voor activiteiten in de klas met digi-taal. Deze kunnen worden geïntegreerd in taallessen in het lager en voortgezet onderwijs, om te voorkomen dat de digi-taal een belemmering vormt voor de prestaties van jongeren op schoolse schrijftaken of voor

andere formele schrijfgenres. Dit is vooral relevant voor leraren van lager opgeleide jongeren, die meer moeite bleken te hebben om hun registers gescheiden te houden.

In een aanvullende studie, uitgevoerd met een bachelorstudente (Van der Laan, 2018), zijn de opstellen uit de correlationele studie en de verhalen van de whatsappende jongeren versus de kleurende jongeren uit de experimentele studie opnieuw geanalyseerd. Hierbij lag de focus op orthografische afwijkingen. We maakten een onderscheid tussen drie soorten, namelijk *textisms*, onconventionele orthografische details (interpunctie, hoofdletters, spaties, diakritische tekens) en 'spelfouten' (dezelfde beperkte selectie aan afwijkende spellingen die sterk worden afgekeurd door taalprescriptivisten, die gebruikt is in hoofdstuk 7 van dit proefschrift, aangevuld met één vorm, *na/naar*). De relatieve frequenties van deze kenmerken ten opzichte van het totaal aantal woorden per verhaal en opstel werden berekend. Misschien tot veler verbazing vonden we minder 'spelfouten' in de schoolteksten van (a) jongeren die in de experimentele studie vlak voor het schrijven van een verhaal gewhatsappt hadden, dan jongeren die de controletaak van het kleuren van mandala's uitvoerden, vooral voor adolescenten, evenals (b) jongeren die in de enquêtes van de correlationele studie gemeld hadden een smartphone te bezitten, dan jongeren die een ouderwetse mobiele telefoon hadden, of helemaal geen. We ontdekten ook dat de opstellen van jongeren die in de enquêtes meldden dat ze normaal gesproken voorspellende en corrigerende woordenbroeken gebruiken op sociale media méér textisms bevatten dan die van jongeren die niet zulke woordvoorspellers of -verbeteraars zeiden te gebruiken. Het WhatsApp-gebruik en smartphonebezit van Nederlandse jongeren stonden dus in een positief verband met hun orthografische prestaties in schoolteksten, wat bleek uit minder 'spelfouten', hoewel het gebruik van automatische aanvulling en correctie juist in een negatief verband hiermee stonden, wat zich uitte in de vorm van meer *textisms*. Dit suggereert dat we ons geen zorgen hoeven maken over de invloed van sociale media of mobieltjes op de orthografie van jongeren, zolang zij maar hun eigen woorden en zinnen blijven formuleren, in plaats van passief te vertrouwen op woordvoorspellers en autocorrectie.

Curriculum Vitae

Angelique Josephine Petronella (Lieke) Verheijen was born in Sevenum, the Netherlands, on 27 July 1989. After finishing secondary school (gymnasium) at Dendron College in Horst in 2007, Lieke studied English Language and Culture at Radboud University Nijmegen, which she completed in 2011 ('propedeuse', BA, and MA cum laude). Then she followed the two-year research master's program Language and Communication at Radboud University and Tilburg University and graduated in 2013 (ReMA summa cum laude). During her studies, Lieke worked as a student assistant on several projects and did a research internship at VU University in Amsterdam. Her PhD proposal entitled *The Impact of Computer-Mediated Communication on Literacy* was granted funding by the NWO program PhDs in the Humanities in 2013. She then moved to Nijmegen to conduct her PhD project at the department of Dutch Language and Culture and the Centre for Language Studies at Radboud University. During the final year of writing her thesis, she held a position as a lecturer at Tilburg University at the department of Communication and Information Sciences, in the track Business Communication and Digital Media. In 2018, Lieke went back to Radboud University, where she is currently working full-time as an assistant professor at the department of Communication and Information Studies. She enjoys talking about her linguistic research on social media and about emoji at public events and international conferences.