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Texting Behavior and Language Skills in Children and Adults

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The prevalence of text messaging continues to increase in countries across the world (Baron, 2010; Lenhart, Ling, Campbell, & Purcell, 2010; Lexander, 2011; Ofcom, 2012), and a growing body of research is focusing on this form of digital communication and its links with more conventional language skills. This chapter provides an overview of the current research on the use of text messaging and its relation to specific academic abilities, including spelling, reading, phonology, grammar, and general literacy skills. The chapter discusses adult and child cohorts separately because of the striking differences that have been found between the two groups (with further division between child and adolescent samples where necessary), and some sugges- tions are provided as to why these differences might exist.

What is Textese?

"Textese" is a term used to describe the abbreviated or slang format that many people use while texting (e.g., De Jonge & Kemp, 2012; Drouin, 2011; Thurlow, 2003). Words written in this way have been referred to as "textisms" (Durkin, Conti- Ramsden, & Walker, 2011; Plester, Wood, & Joshi, 2009; Thurlow, 2003). In order to examine textisms in a comprehensive way, a variety of coding schemes have been employed (e.g., Cingel & Sundar, 2012; Powell & Dixon, 2011). A particularly popular scheme is one developed by Thurlow (2003, based on Shortis, 2001), which has been adopted, with some variations, in numerous studies (e.g., Drouin, 2011; Grace, Kemp, Martin, & Parrila, 2012; Plester et al., 2009). A summary of Thurlow's original coding scheme is shown in Table 13.1.

Textese became popular early on to save on time and space when writing text messages (Taylor & Vincent, 2005). This was at a time when texting was still relatively new and expensive, often incurring costs per message. Nowadays people tend to sub- scribe to monthly packages where texting is unlimited, and to own phones with QWERTY keyboards, rather than the original alphanumeric layout. These changes mean that cost and time are no longer as big an issue as they once were. Nevertheless, both children and adults continue to use textisms in their messages (e.g., Drouin & Driver, 2012; Grace et al., 2012; Wood, Kemp, Waldron, & Hart, 2014). One important reason is that textisms can show belonging to a social group (Green, 2003; Thurlow, 2003) and can help to maintain social relationships (Ling, 2004; Ling & Yttri, 2002).

Thus, the use of textisms remains an important aspect of communicating by text message. However, this new form of writing has brought with it strong concerns from the popular media, as well as from some educators, that the use of textisms will damage conventional standards of reading and writing, especially in young people (see Thurlow, 2006, for a review). There appear to be two main types of concern. The first is that textisms will start to intrude into formal writing because people will fail to recognize the situations in which textisms are inappropriate. The second, more serious concern is that people's conventional orthographic representations will begin to be overwritten by their textese versions (see Grace, Kemp, Martin, & Parrila, 2013).

Other authors have noted the potential positive influence that textism use could have on writing, especially for children (e.g., Crystal, 2008). Many textisms use unconventional orthography but keep phonological representations intact (e.g., rite for right), and thus regular exposure to textese could provide writers with practice with phonics. This could, in turn, help to improve reading abilities in children (e.g., Bradley & Bryant, 1983; Hulslander, Olson, Willcutt, & Wadsworth, 2010), who are still developing their knowledge of phonology and orthography. Adults, who have already established their phonological and orthographic skills, may not benefit from any additional phonological practice.

Table 13.1. Thurlow's (2003) coding scheme

Type of 'textism'	Explanation	Example
Shortenings	Removing word endings	*bro, mon*
Contractions	Removing letters from the middle of words, usually vowels	*ltr, msg*
'G' clippings	Removing the 'g' from word endings	*borin, tryin*
Other clippings	Removing other letters from word endings	*hav, wil*
Initialisms	Using the first letter from every word in a phrase, to make a short version	*lol, brb*
Acronyms	Follows the same rules as initialisms, but are considered to be official abbreviations	*BBC,UK*
Letter number homophones	Using the sound of a letter or number to spell part or all of a word	*l8r, 2moro, c, u*
Non-conventional spellings	Spelling phonetically	*fone, luv*
Misspellings/Typos	Misspelling words non phonetically	*comming, rember*
Accent stylisation	Writing the way you talk	*innit, gonna*

Texting is often seen by children as a fun and playful activity (e.g., Plester et al., 2009), which can encourage children to learn in a way in which they feel comfortable, in contrast to school-based writing, where correctness is important and mistakes are criticized (Crystal, 2008). The enjoyment that children seem to gain from texting can also increase the time that they spend reading and writing text messages, and thus lead to an overall increase in exposure to print (Wood, Meachem, et al., 2011). It should be noted that studies of children's textism use (e.g., Plester, Wood, & Bell, 2008; Plester et al., 2009) suggest that a relatively small range of popular textisms are used extensively (e.g., c for see, u for you, 2 for

to). The more creative textisms often discussed in the popular press (e.g., initialisms such as brb for be right back and number-based homophones such as 42n8ly for fortunately, used by Powell & Dixon, 2011) are not used so widely. Thus, texting may provide less opportunity for language "play" and learning than sometimes suggested.

In methodological terms, the researchers who have studied the use of texting and textisms have used a variety of task types. These include self-report (participants estimate the use of textisms in the messages they send), translation studies (participants are given sentences to rewrite as they would in a text message), scenario studies (participants compose a text message in response to a scenario), and naturalistic studies (textism use is obtained directly from messages recorded from the participants' phones). The studies detailed in this chapter have also considered both the frequency of messages sent and the density of textisms used in those messages. However, estimating the number of messages sent or received per day does not reflect exposure to textisms as clearly as estimating the proportion of textisms in those messages, and thus textism density is the most meaningful measure to consider in terms of its links to literacy skill.

Reading Ability

As noted above, many textisms rely on phonological decoding, which in turn is robustly related to reading skill (e.g., Melby-Lervåg, Lyster, & Hulme, 2012). Individuals who are strong in the component skills of reading might therefore be expected to be good at creating and deciphering textisms. Alternatively, as suggested in the popular press, frequent exposure to unconventional spellings in text messages could interfere with one's memory for standard spellings, and thus with one's general reading scores. As can be seen from Table 13.2, a variety of aspects of reading ability have been investigated in terms of their link with a range of measures of texting behavior.

Child Cohorts

Plester et al. (2009) examined the textism density of messages elicited from 10- to 12-year-old British children. Controlling for age, short-term memory, phonological awareness, vocabulary, and years of phone ownership, there was still a significant positive relationship between textism density and word reading. Coe and Oakhill (2011), in their sample of British 10- to 11-year-olds, found that although the better and the poorer readers in the sample engaged in the same frequency of texting, the better readers used more textisms than the poorer readers. Johnson (2012) reported a positive correlation in a small study looking at Canadian children's scores on two reading measures and their ability to define five textisms (four of which were initial- isms). Kemp and Bushnell (2011), in contrast, found no significant association between 10- to 12-year-old Australian children's reading scores and their use of textisms in a message dictation task. The fact that children had to type these messages onto a phone provided by the experimenter, while being timed, may make these results hard to compare with those from the other untimed, pen-and-paper tasks.

De Jonge and Kemp (2012) reported negative correlations between textism use and literacy skills (reading, non-word reading, spelling, and morphological awareness) in a sample of 13- to 15-year-olds. Some of these participants may have already entered the peak time of texting seen during the older teenage years and the early 20s (described by Lenhart et al., 2010) so that their texting behavior no longer mirrored that of their younger counterparts. This suggests that results from participants in their teenage years should not be analyzed together with those of younger children.

Adult Cohorts

As seen in Table 13.2, adult samples show a much more mixed set of findings in terms of the relationships seen between texting behavior and literacy skills. Drouin (2011) found a positive relationship between self-reported texting frequency and reading fluency in adults. However, such self-report measures are not necessarily accurate, and as noted above, the frequency of sending text messages does not represent the frequency of use of textisms. In translation tasks, there have been few clear links between textism use and literacy. Drouin and Davis (2009) saw no significant associations between undergraduates' use of textisms in a translation task and their scores on tasks of read- ing fluency and word recognition. They also found no significant difference in either type of reading skill between the group of students who reported that they used textisms in their messages and the group who reported that they did not.

Further neutral evidence comes from Kemp (2010), who found that textism density in translated messages had no significant correlations with real-word reading scores. Grace et al. (2013) saw inconsistent results for the naturalistic textism use of similar cohorts of Canadian and Australian undergraduates. For Canadian students, texting density had no association with non-word reading, but for Australian students, texting density was negatively associated with non-word reading, but not significantly associated with real-word reading. These differences between even very similar cultures, with the same language, suggest that results from different countries must be compared with caution.

Both De Jonge and Kemp (2012), using a translation task, and Drouin and Driver (2012), looking at naturalistic text messages, found negative correlations between adults' textism densities and reading scores, although Drouin and Driver found no correlation between textism use and reading fluency. Drouin and Driver point out the need to consider specific types of textisms produced. These authors distinguish between textisms which reflect the "lazy" omission of characters (such as capital letters and punctuation marks) and textisms which are more creative (such as phonetic respellings and abbreviations). Drouin and Driver did not in fact find overall patterns of textisms of omission being associated with poorer literacy skills and more creative textisms being associated with better literacy skills. However, they did find some individual associations in this direction. For example, among adults who never used predictive text entry, word reading scores were negatively related to omitted apostrophes, and reading fluency scores were positively related to the use of letter/number homophone textisms. This result may help to explain some of the conflicting results between adult studies. Data collected from different samples may have included different proportions of various textism types, which would also vary with the technology of

the time of the research. Current mobile phones are more likely to correct errors of punctuation and capitalization than previous models, which might lead to different recorded patterns of textism use at different times.

Overall, then, it seems that the relationship between texting density and various measures of reading skill are generally positive for children, but more often neutral or even negative for older teenagers and adults. We suggest that one reason for these differences is because these children and adults began to use textisms at different stages in terms of learning to read, and thus at different stages of developing their phonological awareness. Children are still acquiring phonological skills and are therefore more likely to benefit from phonological practice through texting. In contrast, the adults in these studies had already developed their phonological knowledge and thus were not likely to benefit from practice with phonology. This could explain the neutral results in the adult category. More specific investigation of different textism types will be necessary to understand the negative links seen with some types of literacy in adults, but it may be that adults who are poorer readers also find it more difficult to create or decipher new, non-phonological textisms.

Table 13.2 Overview of Reading Results

Cohort	Textism Measure	Task Type	Reading Variable	Direction	Authors
Child	Textism Density	Scenario	Real-word reading	Positive	Plester et al (2009)
	Textism Density	Naturalistic	Real-Word Reading	Positive	Coe and Oakhill (2011)
	Correct Identification	Translation	Reading fluency	Positive	Johnson (2012)
	Correct Identification*	Translation	Comprehension	Positive	Johnson (2012)
	Textism Density	Translation	Non-word reading	Negative	De Jonge and Kemp (2012)
	Texting Frequency	Self-Report	Reading fluency	Positive	Drouin (2011)
Adult	Textism Proficiency**	Translation	Real-word Reading	Neutral	Drouin and Davis(2009)
	Textism Density	Tanslation	Read-word reading	Neutral	Kemp (2010)
	Textism Density	Naturalistic	Australian Real-word reading	Neutral	Grace, et al (in press)
	Textism Density	Naturalistic	Canadian Non-word reading	Neutral	Grace, et al (in press)
	Textism Density	Naturalistic	Australian Non-word reading	Negative	Grace, et al (in press)
	Textism Density	Translation	Non-word reading	Negative	De Jonge and Kemp (2012)
	Textism Density	Naturalistic	Reading fluency	Neutral	Drouin and Driver (2012)
	Textism Density	Naturalistic	Real-word Reading	Negative	Drouin and Driver (2012)

*correct identification is when participants are asked to identify what certain textisms mean in formal English

** textism proficiency is the ability of an Individual to turn a formal English sentence into one with a textisms

Spelling Ability

To an even greater extent than reading, spelling has been portrayed in the media as an academic skill that is vulnerable to the (perceived) excessive exposure to textisms (see Crystal, 2008, and Thurlow, 2006, for reviews). Numerous studies have examined the potential links between texting behavior and spelling, as summarized in Table 13.3.

Child Cohorts

Almost all of the child studies presented in Table 13.3 show a positive correlation between textism density and spelling ability. Plester et al. (2008) asked British children aged 11 to 12 years to translate Standard English sentences into text messages. Those children who used more textisms performed better on tasks of spelling ability. Similarly, Bushnell, Kemp, and Martin (2011) found that among 10- to 12-year-old Australian children who were asked to rewrite 30 individual words "as they would in a text message," those who created more textism-like spellings performed better on a standardized spelling test. Kemp and Bushnell (2011) saw no significant links between children's spelling scores and textisms use, but as noted above, the nature of the task (a timed message translation task on the experimenter-provided phone) may have made it difficult to compare with others.

De Jonge and Kemp (2012) reported a negative relationship between textism use in a translation task and spelling score. However, as suggested earlier, this is likely to be due to the 13- to 15-year-old participants being older than the child participants in the other studies, and showing more adult-like texting behavior (Lenhart et al., 2010) and links with literacy.

Table 13.3   Overview of Spelling Results

Cohort	Textism Measure	Task type	Variable	Direction of effect	Authors
Child	Textism density	Translation	Spelling	Negative	De Jonge and Kemp (2012)
	Textism density	Translation	Spelling	Positive	Plester, Wood and Bell (2008)
	Textism density	Translation	Spelling	Positive	Bushnell, Kemp and Martin (2011)
	Textism density	Naturalistic	Spelling Development *	Positive	Wood, Meacham, Bowyer, Jackson, Tarczynski-Bowles and Plester (2011)
	Intervention	Randomised control trial	Spelling Development *	Positive	Wood, Jackson, Hart, Plester & Wilde (2011)
Adult	Texting frequency	Self-Report	Spelling	Neutral	Massengill Shaw, Carlson & Waxman (2007)
	Texting frequency	Self-Report	Spelling	Positive	Drouin (2011)
	Textism Density	Translation	Spelling	Negative	De Jonge and Kemp (2012)
	Textism Density	Naturalistic	Spelling	Negative	Drouin and Driver (2012)
	Textism exposure	Experimental	Spelling	Positive	Powell and Dixon (2011)
	Textism Proficiency	Translation	Spelling	Neutral	Drouin and Davis (2009)
	Textism density	Translation	Spelling	Neutral	Kemp (2010)
	Textism density	Naturalistic	Spelling in Canadians	Negative	Grace et al (In press)
	Textism density	Naturalistic	Spelling in Australians	Neutral	Grace et al (In press)

*Spelling development is the change in spelling between two time points. Spelling otherwise refers to a measure at one time point only

Cross-sectional studies like these do not explain whether practice with textisms encourages better spelling, whether better spelling makes it easier to use textisms, or whether some more general skill underlies both. Longitudinal data, however, can help to determine the direction of causality. Wood, Meachem, et al. (2011) used a longitudinal design with British children between 8 and 12 years of age to examine if texting could increase spelling ability. Spelling ability at the end of the academic year was predicted by textism use at the start of the year, even after controlling for initial verbal IQ, phonological awareness, and spelling ability. However, this relation- ship was unidirectional, in that improved spelling ability did not significantly influence textism use. Wood, Jackson, Hart, Plester, and Wilde (2011) conducted a randomized intervention control trial to investigate the potential effect on spelling abilities of providing phone access to children who had never had a mobile phone before. For a 10-week period, children aged 9 and 10 years were given access to mobile phones during weekends and a one-week school break. The spelling skills of this group did not improve significantly more than those of a control group over the testing period. However, the use of textisms by children in the phone group accounted for a significant amount of variance in their post-test spelling scores, even after controlling for IQ and pre-test spelling scores. These children's access to the phones was restricted because of the school's ethical concerns, and further changes may have been seen if children were exposed to text messaging throughout the 10-week period, as they would under truly naturalistic circumstances. This is a question for future research.

Adult Cohorts

The findings with adult cohorts are once again less clear than with child cohorts. Massengill Shaw, Carlson, and Waxman (2007) and Drouin (2011) found positive associations with spelling and self-reported texting frequency. However, as mentioned earlier, it is more important to consider the proportion of textisms used. Drouin and Davis (2009) found no significant differences between individuals who reported they were textism users or non-users, on spelling skill or textism fluency (ability and speed in translating from Standard English to textese and vice versa). Within the group who did report using textisms, there was no significant correlation between textism fluency in the experimental tasks and spelling scores.

Studies that have used more direct measures than self-report, however, have seen no evidence of positive relationships with spelling. In a study with Australian undergraduates, Kemp (2010) found no significant correlations between spelling scores and the use of textisms in a translation task. In contrast, negative correla- tions between spelling scores and textism density were observed in both Standard English messages translated into text messages by another group of Australian undergraduates (De Jonge & Kemp, 2012) and in the naturalistic messages of U.S. undergraduates (Drouin & Driver, 2012). Drouin and Driver also looked at cor- relations between spelling scores and individual textism types. Although the overall pattern was negative, they saw a positive correlation between spelling scores and the use of accent stylization, but only in those who always used the predictive text entry function. This finding serves as a reminder that both textism type and phone technology should be considered when making generalized conclusions from correlational data.

Grace et al. (2013) found that spelling scores were not significantly related to the textisms used in the naturalistic messages of Australian students, but that they were negatively related for Canadian students. As noted earlier, this difference could be due to cultural differences in the uptake of mobile technology, and/or to differences in types of textisms favored in different countries, which might interact differently with spelling skill.

The importance of considering different categories of textism is emphasized by the results of an experimental study by Powell and Dixon (2011). These authors examined the effect of exposure to 30 different words spelled in different ways, on the pre- and post-test spelling of those words by 94 undergraduates. Participants saw the words spelled either correctly (e.g., tonight), misspelled phonologically (e.g., tonite), or as a textism (primarily letter/number homophones, e.g., 2nite). Participants' pre- to post-test spelling of the target words was significantly better after exposure to both correct spellings and textisms, but significantly worse after exposure to misspellings. These findings suggest that greater exposure to letter/number homophones might facilitate spelling abilities. Although both the misspellings and the textisms present in this study were heavily based on phonology, the misspellings were orthographically more similar to the real words, and may thus have created more interference with stored orthographic representations (Katz & Frost, 2001).

The research reviewed here thus suggests that certain types of textisms (e.g., non- conventional spellings) may negatively affect adults' spelling, whereas other types (e.g., letter/number homophones) may affect it more positively. The use of various categories of textism seems to vary between samples, and might help to explain the mixed set of correlations seen in adult research. Somewhere in the teenage years it appears that children start to behave more like adults in terms of texting, as negative relationships start to appear between spelling and textism density. In child cohorts, however, there appears to be a positive link between textism use and spelling, regard- less of textism category. We suggest that exposure to textisms can help children to reflect on and reinforce their own phonological representations of words. Children are also less affected by exposure to incorrect orthography than adults (Dixon & Kaminska, 2007; Katz & Frost, 2001), which could help to explain some of the negative relationships seen in adult samples.

Phonology

Phonological awareness is the ability to recognize and manipulate sounds that map on to letters and words, a skill that underpins reading and spelling ability (e.g., Furnes & Samuelsson, 2011). As has been noted, the phonological nature of many textisms means that phonological awareness could play an important role in the ability to create and decipher textisms (Plester et al., 2009). Table 13.4 summarizes the studies which have investigated links between texting behavior and awareness of phonology.

Plester et al. (2009) and Wood, Meachem, et al. (2011) controlled for children's phonology (measured by tasks of Spoonerisms and rapid automatized naming – RAN) and found that textism use still made a unique contribution to word reading and spelling. This contribution fell just short of statistical significance when RAN was controlled for (Plester et al., 2009), which suggests that phonology mediates the relationship between texting and spelling.

Table 13.4   Overview of Phonology Results

Cohort	Textism Measure	Task type	Variable	Direction of Effect	Authors
Child - Dyslexic	Textism Density	Naturalistic	Phonological awareness	Neutral	Veater, Plester & Wood (2011)
Child	Textism Density	Scenario	Phonological awareness	Positive	Plester et al. (2009)
	Textism Density	Naturalistic	Phonological awareness	Positive	Wood et al (2011)
Adults	Textism Density	Translation	Phonological awareness	Neutral	Kemp (2010)
	Textism Density	Naturalistic	Phonological awareness	Neutral	Grace et al (in Press)

The links between textism use and phonological skill have also been examined in children with dyslexia. Veater, Plester, and Wood (2011) found no significant differences in texting density between children who were typical readers and 10- to 13-year-old children who were dyslexic readers. However, the dyslexic children tended to use fewer phonology-based textisms than their peers, probably because children with dyslexia often have problems with phonological decoding (e.g., Gooch, Snowling, & Hulme, 2010). If they use and experiment with phonological textisms less often than their typically developing peers, then children with dyslexia are likely to gain even less practice with phonology, which could lead to further differences between the groups.

Kemp (2010) assessed sensitivity to phonological structure by asking Australian undergraduates to identify the sounds (rather than the letters) in a sentence. Scores on this task did not correlate significantly with textism density use in a translation task. Grace et al. (2013) gave Australian undergraduates a Spoonerisms task of phonological manipulation, but also found no significant association with naturalistic textism use. It may be that adults' phonological awareness is sufficiently developed that they receive no added benefit from practicing phonology through exposure to textisms. Future researchers could consider how the use of phonological textisms by dyslexic adults links with language skills. Further, it will be important to study the use and understanding of phonological and other types of textisms by children and adults who are deaf, and thus have limited, or no, phonological awareness.

Grammatical Ability

Grammar concerns the system and structure of a language, and includes the systems of syntax (the order in which words and phrases are arranged) and morphology (the structure of meaning) (Templeton, 2012). Morphemes, the smallest units of meaning in a language, include suffixes such as -ed and -s, prefixes such as un- and pre-, as well as whole words such as cow, which can stand on their own or join others to form compounds such as cowboy. Morphological awareness underpins the creation of grammatical words (e.g., Nunes, Bryant, & Bindman, 1997) and sentences in conventional writing. It may also be important for reading and writing textisms, which often involve shortening individual morphemes within whole words. For example, the suffix -ing is often abbreviated to N or in, so that coming could be written as comin or comN. Whole-word morphemes can also be preserved by abbreviating them to their initials, so that girlfriend becomes gf (Kemp, 2010). Some studies have considered the relationship of texting behavior to skills in morphology, or more broadly, in grammar, as shown in Table 13.5.

Kemp (2010) asked Australian university students to complete a task of morphological awareness in which they had to pick out the odd word from triplets such as honest, meanest, smartest. Honest is the odd word out because it consists of a single morpheme, whereas meanest and smartest are both made up of two morphemes: the base word plus the ending -est. Kemp found no significant relationship between participants' scores on this task and their use of textisms in a translation task. De Jonge and Kemp (2012) gave the same task to Australian high school and university students and found that scores correlated negatively with their use of textisms in a translation task, but only when texting frequency was taken into account. The skills needed to actively distinguish mono- versus

multi-morphemic words might be more complex than the skills needed to find shorter ways to write the morphemes within multi-morphemic words such as coming and girlfriend. Thus, it is perhaps not surprising that consistently significant relationships have not been found between scores on this morphological awareness task and textism use overall.

Potential links between textism use and grammatical abilities have also been assessed at a more general level. There are various ways in which text messages can transgress the grammatical conventions of written English. One concerns punctuation, which in text messages is often omitted, or replaced by another marker, such as x (for a kiss) in place of a conventional full stop. Text messages may also include spellings of word combinations which mimic casual spoken language (e.g., wanna for want to or woulda for would have). Adults may forget, or children may fail to learn, the correct versions of these spellings in formal English, especially with cases such as woulda, sometimes incorrectly written in full as would of (for would have). Finally, textism versions are common for individual words whose spelling is usually determined by grammar, such as to, too, and two (often all written as 2) or past-tense verbs such as missed, whose final -ed signals their grammatical status (but which could easily be rewritten phonetically as mist). Thus, excessive exposure to textism versions of such grammatical words could lead to ignoring or forgetting the appropriate spelling.

Some researchers have examined the grammatical issue of the punctuation used in text messages. For instance, Rosen, Chang, Erwin, Carrier, and Cheever (2010) asked adults about their use of lower case i for pronominal I and missing apostrophes in their text messages, and Drouin and Driver (2012) and De Jonge and Kemp (2012) examined omitted apostrophes and capitalization in naturalistic and translated messages, respectively. Only Drouin and Driver compared these categories directly to literacy skills, and they found that only omitted apostrophes were negatively related to word reading (but not to other literacy measures). With the advent of more sophisticated technology, it is important to distinguish whether participants' phones were correcting such grammatical errors, as it is otherwise difficult to draw meaningful conclusions about these aspects of grammatical correctness in text messages.

Table 13.5   Overview of Grammar Results

Cohort	Textism Measure	Task type	Variable	Direction	Authors
Adults	Textism Density*	Translation	Morphological Awareness	Negative	De Jonge and Kemp (2012)
	Frequency*	Self-Report	Punctuation	Negative	Rosen et al (2010)
	Textism Density	Naturalistic	Punctuation	Negative	Drouin and Driver (2012)
	Textism Density	Translation	Punctuation	Negative	De Jonge and Kemp (2012)
	Textism Density	Naturalistic	Stable Grammar	Neutral	Wood, Kemp and Waldron (in press)
	Textism Density	Naturalistic	Unstable Grammar	Neutral	Wood, Kemp and Waldron (in press)
Secondary	Textism Density	Naturalistic	Stable Grammar	Neutral	Wood, Kemp and Waldron (in press)
	Textism Density	Naturalistic	Unstable Grammar	Negative	Wood, Kemp and Waldron (in press)
Child	Textism Density	Self-Report	Grammar	Negative	Cingel and Sundar (2012)
	Textism Density	Naturalistic	Stable Grammar	Neutral	Wood, Kemp and Waldron (in press)
	Textism Density	Naturalistic	Unstable Grammar	Neutral	Wood, Kemp and Waldron (in press)

*Density relates to the amount of textisms sent

**Frequency relates to the amount of text messages sent

Cingel and Sundar (2012) took a broader view of grammatical skill in their study of 10- to 14-year-olds' texting. These authors asked participants to identify the textisms in three of their own recently sent messages. This method is more reliable than a self-report study asking children to estimate their own textism use, but there is still much room for error. The authors found negative relationships between self-scored textism use and scores on these grammatical tasks. This suggests that those who used more textisms performed more poorly on grammatical tasks. However, the children with the poorer grammatical skills may also have found it harder to reliably identify and classify the textisms that they had used in their own messages. Thus, these results are interesting, but should be interpreted with caution.

Further research is providing a more detailed picture of how texting relates to grammar. Wood, Kemp, Waldron, et al. (2014) developed a coding system that identified all the textisms that violated grammatical conventions. The categories included unconventional orthographic forms (e.g., smiley faces for punctuation), capitalization and punctuation errors (e.g., im for I'm), word reduction textisms (e.g., hafta, wanna), word omission (e.g., Coming too?), the incorrect use of grammatical homonyms (e.g., there for their), and the use of ungrammatical word forms (e.g., is you going? for are you going?). These "errors" are not necessarily mistakes; some may have been written deliberately, to save time or to introduce more expression to a message.

Wood, Kemp, Waldron, et al. (2014) collected examples of naturalistic sent text messages from primary school, secondary school, and adult cohorts at the start of a one-year period. When the data collected at the start of the study were analyzed, it was found that the proportion of grammatical errors in children's sent text messages was not significantly related to their performance on two tasks of grammatical skill, although it was negatively correlated with scores on one of the tasks in adults. This relationship remained even after controlling for individual differences in IQ and spelling ability within the sample. Overall, this suggests that ungrammatical texting behavior in children and adolescents is not related to grammatical understanding; however, in young adults, some negative relationships are apparent. All of these participants are being followed up one year later, to assess the patterns of development across age groups, and to examine whether change in literacy skills over time can be accounted for differently depending on whether the textisms produced are stable (their use was similar between the two time points), or unstable (their use varied between the time points).

Thus far, these findings suggest that in adults, some of the grammatical errors made in texting may be related to poorer literacy skills, but in children and adolescents, there is no such relationship. The longitudinal data will reveal whether change over time in literacy task performance is explained by the incidence of stable or unstable textisms, and whether these patterns differ with age group. For now, we suggest that the violations of conventional grammar that are common in children's and teenagers' messages represent a phase of "play" with language. It seems that children and teenagers may move away from this phase once they have become bored with "playing" with language in this way. Alternatively, the common grammatical violations seen during this phase may reflect inconsistent linguistic self- monitoring during texting. In future, it will also be important to find ways of distinguishing textisms that represent intentional and accidental violations of conventional grammar.

General Writing

The higher-order ability of general writing skill has not been much studied in terms of its relationship to textism use. Nevertheless, it is an important aspect to consider, as it is a conglomerate of the previous skills reviewed; it relies on spelling, grammar, and the ability to reflect on one's own writing. In the one study on this question, Rosen et al. (2010) asked adults to self-report their frequency of sending text messages as well as to write a formal letter to a company and an informal piece on (un)happiness. These pieces were marked using a university graded writing scale. Participants who reported that they texted more frequently performed more poorly on the formal writing task than those who texted less frequently. The converse was true for the informal writing task. This pattern of results could be taken to suggest that frequent texting negatively influences formal writing ability. However, the most common textisms reported by the sample were the use of i in place of I and the omission of apostrophes, both of which reflect violations of conventional grammar. Thus, rather than the use of textisms themselves being related to poorer formal writing, the production of these grammatical errors in text messages and poorer scores on the formal writing task may be underlain by poorer grammatical skills in general. Participants with no college education were more likely to report using textisms than those with a college education. This suggests that educational background should be considered in mixed samples, especially when, as in this study, the marking scheme for the writing task was based on university exam criteria, with which the student participants would be more experienced. Given that textism use is related to spelling, and spelling contributes to general writing ability, future researchers could consider the links between texting and general writing skill in more detail, and extend this work to child participants as well.

Methodological Issues

Throughout the chapter we have discussed methodological limitations posed by factors such as the lack of reliability and validity from self-report measures (see also Wood, Kemp, & Plester, 2014). One specific finding illustrates the potential discrepancy between people's perceived and actual use of textisms. Grace et al. (2012) found that undergraduates who reported using textisms "none of the time" actually used an average of 13% textisms in their naturalistic messages, whereas those who reported using textisms "some" or "most of the time" used an average of 20%. This result serves as a reminder that even adults' estimates of their own textism use may not be accurate.

The way that textism use is measured can also have a significant effect on the conclusions drawn. Grace et al. (2012) compared textism densities across the three main textism collection methods: translation, elicitation, and the collection of naturalistic data. The highest textism densities were observed in translated messages, followed by scenario-based elicited messages, and the lowest in naturalistic messages. This discrepancy may be due to demand characteristics, where individuals use more textisms in experimental procedures because they want to appear more knowledgeable or fluent in this form of writing, or simply because knowing that the study is about texting makes them overestimate their textism use. Even when participants are asked to write down their messages directly from their phones, they may not do so entirely accurately. Inaccurate transcription may occur through carelessness, or more deliberately: self-presentation motives may lead to biased reporting, which may result in under- or overestimations of textism use. Individuals may also choose text messages which reflect what they want others to think about the way they text, rather than more representative messages. Future researchers should consider the method of Underwood,

Rosen, More, Ehrenreich, and Gentsch (2012), who provided participants with communication devices that automatically sent copies of all their sent messages to a secure server searchable by the researchers. However, this method would be too costly for many research groups, and now that most people have their own phones, switching to an unfamiliar research phone could in itself influence the data obtained.

Grace et al. (2012) found differences between undergraduate students at similar universities in Australia and Canada in terms of texting frequency, texting density, and uptake of new technology. This suggests that care must be taken when comparing studies across the world, even with similar participant samples who speak the same language. The use of textisms in different languages will obviously differ even more (Crystal, 2008), and although this chapter focuses on texting in English, the types of abbreviations will depend on the nature of the language of communication.

We must also be cautious about generalizing and comparing studies across time, because mobile phone technology is developing rapidly. Participants in most of the earlier studies reported here had phones with alphanumeric keypads, but in more recent studies, participants have used a mix of QWERTY, alphabetic, and alphanumeric keypads. It is likely that alphanumeric keypads will soon be completely super- seeded, and the quicker and easier typing associated with QWERTY keyboards could lead to further changes in textism use.

Conclusions

Table 13.6 summarizes the results discussed in this chapter, and leads to the conclu-sion that texting behavior is related to different abilities in different age groups. In primary school children, textism use is linked consistently positively with measures of spelling, reading, and phonological awareness, while the relationship with grammar is more mixed, with no links, or a negative link, between textisms use and grammatical task performance. By secondary school there is quite a different profile, with adolescents showing largely negative relationships between textism use and performance on language tasks. Adults show a more varied set of results, with a mix of neutral and negative correlations between texting behavior and language task scores.

Overall it seems that adult, child, and even adolescent samples cannot be considered together, as the links between texting behavior and literacy skills are so different in the three groups. These differences may stem from a variety of reasons, including the fact that these cohorts have had different experiences of technology, including access to different types of phones, keyboards, and predictive text, as well having had varying numbers of years to experience all of these factors. Perhaps more importantly, at the time of these studies, adult and some adolescent participants had largely consolidated their literacy skills before owning their first mobile phone, whereas many children may have been exposed to textisms while still improving their reading and writing abilities. Children can still benefit from playing and practicing with written language, but adults may not, although it is not yet clear whether adults' use of unconventional spelling in text messages could be a cause or a result of poorer linguistic skills. At least some of the variation in adults' textisms use probably comes not from their literacy skills, but from other sources instead, including differences in phone technology, conscientiousness (rather than knowledge) about spelling, and social norms about composing messages in their particular friendship groups. In sum, it appears that the use of

textisms is not actively harming, and may even help to promote, children's language skills. For adolescents and adults, the picture is less clear, and continuing research will be necessary to draw out the reasons for some of the negative relationships seen between textism use and performance on measures of language skills.

Table 13.6   Overview of the Relationship between Texting and Literacy Abilities in Child and Adult Age Groups

Ability	Primary	Secondary	Adults
Reading	Positive	Negative	Negative
Spelling	Positive	Negative	Mixed
Grammar	Neutral	Negative	Neutral
Morphological Awareness	N/A	Negative	Negative
Phonology	Positive	N/A	N/A
Writing-Formal	N/A	N/A	Negative
Writing-Informal	N/A	N/A	Neutral

R**eferences**

Baron, N. S. (2010). Attitudes toward mobile phones: A cross-cultural comparison. In H. Greif, L. Hjorth, A. Lasen, & C. Lobet (Eds.), Cultures of participation (pp. 77–94). Frankfurt, Germany: Peter Lang.

Bradley, L., & Bryant, P. E. (1983). Categorizing sounds and learning to read: A causal connection. Nature, 30, 419–421.

Bushnell, C., Kemp, N., & Martin, F. H. (2011). Text messaging practices and links to general spelling ability: A study of Australian children. Australian Journal of Educational and Developmental Psychology, 11, 27–38.

Cingel, D., & Sundar, S. (2012). Texting, techspeak, and tweens: The relationship between text messaging and English grammar skills. New Media and Society, 1–17.

Coe, J. E. L., & Oakhill, J. V. (2011). "txtN is ez f u no h2 rd": The relation between reading ability and text-messaging behavior. Journal of Computer Assisted Learning, 27, 4–17.

Crystal, D. (2008). Txting: The gr8 db8. Oxford, UK: Oxford University Press.

De Jonge, S., & Kemp, N. (2012). Text-message abbreviations and language skills in high school and university students. Journal of Research in Reading, 35, 49–68.

Dixon, M., & Kaminska, Z. (2007). Does exposure to orthography affect children's spelling accuracy? Journal of Research in Reading, 30, 184–197.

Drouin, M. (2011). College students' text messaging, use of textese and literacy skills. Journal of Computer Assisted Learning, 27, 67–75.

Drouin, M., & Davis, C. (2009). R u txting? Is the use of text speak hurting your literacy? Journal of Literacy Research, 41, 46–67.

Drouin, M., & Driver, B. (2012). Texting, textese and literacy abilities: A naturalistic study. Journal of Research in Reading. doi: 10.1111/j.1467-9817.2012.01532.x

Durkin, K., Conti-Ramsden, G., & Walker, A. J. (2011). Txt lang: Texting, textism use and literacy abilities in adolescents with and without specific language impairment. Journal of Computer Assisted Learning, 27, 49–57.

Furnes, B., & Samuelsson, S. (2011). Phonological awareness and rapid automatized naming predicting early development in reading and spelling: Results from a cross-linguistic longitudinal study. Learning and Individual Differences, 21(1), 85–95.

Gooch, D., Snowling, M., & Hulme, C. (2010). Time perception, phonological skills and executive function in children with dyslexia and/or ADHD symptoms. Journal of Child Psychology and Psychiatry, 52, 195–203.

Grace, A., Kemp, N., Martin, F. H., & Parrila, R. (2012). Undergraduates' use of text messaging language: Effects of country and collection method. Writing Systems Research, 4, 167–184.

Grace, A., Kemp, N., Martin, F. H., & Parrila, R. (2013). Undergraduates' text messaging language and literacy skills. Reading and Writing, 27, 855–873.

Green, N. (2003). Outwardly mobile: Young people and mobile technologies. In J. Katz (Eds.), Machines that become us: The social context of personal communication technology. New Brunswick, NJ: Transaction Publishers.

Hulslander, J., Olson, R., Willcutt, E., & Wadsworth, S. (2010). Longitudinal stability of read- ing-related skills and their prediction of reading development. Scientific Studies of Reading, 14, 111–136.

Johnson, M. (2012). Comprehension of Standard English text and digital textism during child- hood. International Journal of Language, Culture and Society, 35, 1–6.

Katz, L., & Frost, S. J. (2001). Phonology constrains the mental orthographic representation. Reading and Writing, 14, 297–332.

Kemp, N. (2010). Texting versus txting: Reading and writing text messages, and links with other linguistic skills. Writing Systems Research, 2, 53–71.

Kemp, N., & Bushnell, C. (2011). Children's text messaging: Abbreviations, input methods and links with literacy. Journal of Computer Assisted Learning, 27, 18–27.

Lenhart, A., Ling, R., Campbell, S., & Purcell, K. (2010, April 20). Teens and mobile phones. Pew Internet & American Life Project. Retrieved November 28, 2014, from http://pewinternet.org/Reports/2010/Teens-and-Mobile-Phones.aspx

Lexander, K. (2011). Texting and African language literacy. New Media and Society, 13, 427–443.

Ling, R. (2004). The mobile connection: The cell phone's impact on society. San Francisco, CA: Morgan Kaufmann.

Ling, R., & Yttri, B. (2002). Hyper-coordination via mobile phones in Norway. In J. Katz & M. Aakhus (Eds.), Perpetual contact: Mobile communication, private talk, public performance (pp. 139–169). Cambridge, UK: Cambridge University Press.

Massengill Shaw, D., Carlson, C., & Waxman, M. (2007). An exploratory investigation into the relationship between text messaging and spelling. New England Reading AssociationJournal, 43, 57–62.

Melby-Lervåg, M., Lyster, S. H., & Hulme, C. (2012). Phonological skills and their role in learning to read: A meta-analytic review. Psychological Bulletin, 138, 322–352.

Nunes, T., Bryant, P., & Bindman, M. (1997). Morphological spelling strategies: Developmental stages and processes. Developmental Psychology, 33, 637–649.

Ofcom. (2012). UK children and parents: Media use and attitudes report. Retrieved November 28, 2014, from http://stakeholders.ofcom.org.uk/binaries/research/media-literacy/oct2012/main.pdf

Plester, B., Wood, C., & Bell, V. (2008). Txt msg n school literacy: Does texting and knowledge of text abbreviations adversely affect children's literacy attainment? Literacy, 42, 137–144.

Plester, B., Wood, C., & Joshi, P. (2009). Exploring the relationship between children's knowledge of text message abbreviations and school literary outcomes. British Journal of Developmental Psychology, 27, 145–161.

Powell, D., & Dixon, M. (2011). Does SMS text messaging help or harm adults' knowledge of standard spelling? Journal of Computer Assisted Learning, 27, 58–66.

Rosen, L. D., Chang, J., Erwin, L., Carrier, M., & Cheever, N. A. (2010). The relationship between "textisms" and formal and informal writing among young adults. Communication Research, 37, 420–440.

Shortis, T. (2001). The language of ICT: Information and communication technology. London, UK: Routledge.

Taylor, A., & Vincent, J. (2005). An SMS history. In L. Hamill & A. Lasen (Eds.), Mobile world: Past, present and future (pp. 75–91). New York, NY: Springer.

Templeton, S. (2012). Teaching and learning morphology: A reflection on generative vocabulary instruction. Journal of Education, 192, 101–107.

Thurlow, C. (2003). Generation txt? The sociolinguistics of young people's text-messaging. Discourse Analysis Online. Retrieved November 28, 2014, from http://extra.shu.ac.uk/daol/articles/v1/n1/a3/thurlow2002003.html

Thurlow, C. (2006). From statistical panic to moral panic: The metadiscursive construction and popular exaggeration of new media language in the print media. Journal of Computer Mediated Communication, 11, 667–701.

Underwood, M. K., Rosen, L. H., More, D., Ehrenreich, S. E., & Gentsch, J. K. (2012). The BlackBerry Project: Capturing the content of adolescents' text messaging. Developmental Psychology, 48, 295–302.

Veater, H. M., Plester, B., & Wood, C. (2011). Use of text message abbreviations and literacy skills in children with dyslexia. Dyslexia, 65–71.

Wood, C., Jackson, E., Hart, L., Plester, B., & Wilde, L. (2011). The effect of text messaging on 9- and 10-year-old children's reading, spelling and phonological processing skills. Journal of Computer Assisted Learning, 27, 28–36.

Wood, C., Kemp, N., & Plester, B. (2014). Text messaging and literacy: The evidence. London, UK: Routledge.

Wood, C., Kemp, N., Waldron, S., & Hart, L. (2014). Grammatical understanding, literacy and text messaging in school children and undergraduate students: A concurrent analysis. Computers and Education, 70, 281–290.

Wood, C., Meachem, S., Bowyer, S., Jackson, E., Tarczynski-Bowles, M. L., & Plester, B. (2011). A longitudinal study of the relationship between children's text messaging and literacy development. British Journal of Psychology, 102, 431–442.