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Texting vs. txtng: Reading and Writing Text Messages, and Links with Other Linguistic Skills

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Abstract

The media buzzes with assertions that the popular use of text-message abbreviations, or textisms (such as *r* for *are*) is masking or even causing literacy problems. This study examined the use and understanding of textisms, and links with more traditional language skills, in young adults. Sixty-one Australian university students read and wrote text messages in conventional English and in textisms. Textism messages were faster to write than those in conventional English, but took nearly twice as long to read, and caused more reading errors. Contrary to media concerns, higher scores on linguistic tasks were neutrally or positively correlated with faster and more accurate reading and writing of both message types. The types of textisms produced, and those least well understood by participants, are also discussed.

Texting vs. txtng: Reading and Writing Text Messages, and Links with Other Linguistic Skills

Mobile phone ownership and the use of text messaging have both increased rapidly worldwide in the space of a decade. By 2006, thirty countries, mainly European, had already passed the 100% mobile phone penetration mark (Informa Telecoms and Media, 2006). The technology was slower to be embraced in North America but is quickly catching up. It is currently estimated that at least 71% of American teenagers and 85% of adults own a mobile phone, with half of 15- to 17-year-olds sending text messages daily (Pew Internet Survey, 2009) and 18- to 24-year-old text users sending an average of nearly 800 messages a month (Nielsen Mobile, 2009). By 2006, 97% of British 15- to 24-year-olds were phone owners, with text-messaging the most popular feature used (Ofcom, 2006). In Australia, current mobile phone penetration is estimated at 111% (Australia Telecommunications report, 2009), with 85% of owners using text messaging (Telstra, 2009). A 2006 online survey of 2500 Australians (50% aged 25 or younger) revealed that respondents spent an average of 35 minutes a day writing and reading messages, sending an average of 9 per day (James, 2007). By the time they enter university, most young Australians are very familiar with texting: during 2008, 90% of children in school grades 7-12 reported using a mobile phone to write texts, a mean of 11 a week (Australian Bureau of Statistics, 2008).

Composing and reading text messages is thus a popular activity, but it developed within the confines of a small screen, a 160-character message limit, and an alphanumeric keyboard with three letters to each number key. The multipress entry method requires multiple key presses for some letters (Taylor & Vincent, 2005). For example, the key for the number 3 is also the key for the letters *d, e, f*. To display *d*, the key must be pressed once, for *e*, twice, and for *f*, three times. This somewhat laborious method of entering characters led to the adoption of many of the

abbreviations and acronyms that had already been developed in online written computer-mediated communication (Werry, 1996), such as *r u* for *are you*, *IMHO* for *in my humble/honest opinion*, as well as further conventions devised to deal with the limits on length, such as the reduced use of spaces (Taylor & Vincent, 2005). Such abbreviations will be referred to here as *textisms*, and messages composed using textisms will be said to be written in *textese*.

Technological advances have led to the automatic concatenation of messages, so that those longer than 160 characters can appear to users to be sent and read as a single message. Further, several types of predictive texting software are now popular. These use frequency statistics to predict the most likely next letter, or the identity of the whole word being typed (Taylor & Vincent, 2005). Predictive texting thus reduces the number of key presses required for a message, and the need to use abbreviations, especially if whole words are stored in the phone's dictionary. However, the adoption of these advances does not seem to have heralded the demise of textisms. It appears that there are both practical and psychological reasons for their continued use. In producing whole words, predictive texting leads to longer messages which must be sent in two concatenated parts (Taylor & Vincent, 2005), with cost per message being a concern for teenage texters (Ling, 2004). Anecdotal reports from younger and poorer spellers suggest that predictive texting is less useful, and even frustrating, if one does not know exactly how to spell a word. The fact that the ultimate goal of writing a text message often has nothing to do with efficiency also helps to explain the continued popularity of textisms. The informal nature of these abbreviations, and the use of textisms specific to smaller or larger social groups, produces a feeling of intimacy even between geographically distant correspondents (Ling, 2004; Thurlow, 2003), and may help to signal inclusion in a social group, especially for adolescents (Green, 2003, Taylor & Harper, 2001). Creating and deciphering new textisms can represent flexible and

playful use of language (Crystal, 2008). Finally, although text messages are used to make practical arrangements about one-third of the time, they are even more important for building and maintaining social relationships (Ling & Yttri, 2002; Thurlow, 2003), especially for women (Reid & Reid, 2005). Teenage and young adult women are much more likely to send text-messages, to write longer, more complex messages, and to use textisms, than their male peers (Ling, 2004; 2007; Rosen, Chang, Erwin, Carrier, & Cheever, in press).

The abbreviations used in text-messages can take a number of forms, which researchers have categorized in various ways, including letter/number homophones (*2moro, r*), word shortenings (*tues*), contractions in which internal letters are omitted (*txt*), nonconventional, often sound-based spellings (*skool*), clippings (*goin, hav*), initialisms (*ttfn*: *ta ta for now*), accent stylizations (*wiv, dunno*), and symbols (*@, :-o*) (Plester, Wood, & Bell, 2008; Plester, Wood, & Joshi, 2009, adapted from Thurlow, 2003). Such abbreviations have caused great concern for the future of written language, expressed in media reports worldwide. Thurlow (2006) found that five years of English-language newspaper headlines painted an "overwhelmingly pessimistic" picture of the effects of such discourse on young people's language. Other writers have instead emphasized the positive and creative effect that texting can have in motivating writers to engage in written communication (Crystal, 2008; O'Connor, 2005).

The number of empirical studies on the links, if any, between text-messaging, textisms, and traditional literacy skills is growing, but is still very small. Plester and colleagues have conducted the most detailed studies, with school-age children. Plester et al. (2008) examined the relationships between texting and literacy skills in British 10- to 12-year-olds, who were asked to translate a sentence from standard English into textese, and vice versa. There was a significant positive correlation between the proportion of textisms produced and both verbal reasoning and

spelling ability, regardless of the number of texts children typically sent per day. Better spelling was also significantly related to greater use of phonology-based textisms: letter/number homophones (*r*, *2*), phonologically reduced spellings (*nite*, *wot*), and accent stylisations (*wiv*, *gonna*). In a later study, Plester et al. (2009) asked 88 children of 10 to 12 years to compose text messages in response to various scenarios. Greater use of textisms in these more naturalistic messages correlated significantly with reading ability, phonological awareness, and vocabulary. Further, textism use accounted for a small but significant amount of variance in reading ability after controls for age, short-term memory, vocabulary, phonological awareness, and years of phone ownership.

These studies have all been conducted with children, whose written and metalinguistic skills are still developing. It is not clear whether relationships between texting and more traditional literacy skills also hold in young adults, whose skills are already largely in place by the time they begin texting. Media warnings about textese have focused on young adults as well as children, especially since across the world, text-messaging has been taken up most enthusiastically by teenagers and young adults (see Thurlow & Poff, 2009, for a review). As with children, only a handful of empirical studies have to date examined the use of texting in young adults, and its links with literacy skills.

Two studies with American undergraduates, prompted by such negative media attention, have tested the hypothesis that experience with text-messaging and/or textisms would impair students' ability to spell conventionally. Massengill Shaw, Carlson, and Waxman (2007) tested 86 students, who reported using text-messaging for an average of 2 years, and sending an average of 7 texts a day. The number of messages sent per day did not correlate significantly with either perceived or actual spelling ability. Drouin and Davis (2009) asked 80

undergraduates to translate sentences from conventional English to textese, and vice versa. Those who reported using textisms in their usual text messages did not differ significantly from those who did not, in terms of word recognition, reading fluency, spelling, speed or accuracy of translation, nor their conventionally correct spelling of the common abbreviations *2* and *ur*. Both of these studies thus suggest that greater reported use of text-messaging and of textisms is not associated with poorer literacy skills, at least in American undergraduates, who may not have been texting for as long as their European, Australasian, or Asian peers.

Some suggestion of negative effects of textisms on writing come from an on-line US study by Rosen et al. (in press) of 718 adults aged 18 to 25 years, who sent an average of 26 text messages a day. Respondents estimated their use of textisms in four linguistic categories (acronyms, shortenings, *i* for *I*, and omitted apostrophes), and provided formal and informal writing samples. Textisms intruded only occasionally, 2-3 times each in only 20% of respondents' writing samples, and consisted almost exclusively of *i* for *I* or omitted apostrophes; the latter feature certainly not unique to text messaging. Overall, sending more texts was associated with better informal writing. However, respondents with no or some college education who reported using more textisms (shortenings) showed worse formal writing than those who used fewer textisms. The authors suggest that the regular use of more textisms might carry over into formal writing, although these effects appear small, and limited to those who have not completed a college degree.

The use of textisms is clearly widespread, and as discussed above, textisms can make text-messages shorter, cheaper, more creative, and more imbued with social meaning. However, little research has focused on measuring their efficiency, for the sender, or the reader. Neville (2003) asked 45 British girls, aged 11 to 16 years, to read and write text-messages (using the multipress

method) in conventional English and "as they would to a friend" (presumably using some textese). Participants were significantly faster at composing messages in textese than in conventional English, presumably because of the reduced number of key-presses required. However, they took nearly twice as long to read messages written in textese than in conventional English, regardless of how often they typically sent text messages. It seems that for these children, the use of textisms might save time for the writer, but leads to extra time and confusion for the reader. It is unclear whether the same pattern of results would be seen in young adults, whose literacy skills are better developed, and whose experience with text messaging is greater. Like Plester et al. (2008, 2009), Neville (2003) also observed a positive relationship between literacy skill – here, spelling – and the use of textisms, as well as with the speed of reading and writing both conventional and textese messages. However, the participants' broad age range (11 to 16 years) could obscure more specific patterns, and the results suggest that the relationship with spelling did diminish with age.

The present study was designed to replicate and extend Neville's experiment with a group of Australian university students. Participants composed and read text messages in conventional English and in textese, and completed standardized tests of reading and spelling. Although predictive texting is now common, the multipress method of text entry was used for the writing conditions, for several reasons. Pilot questioning revealed that students used a variety of predictive text methods, some of which predicted the next letter, and some the next word (by displaying a changing list of potential words either letter-by-letter, or only after all letters were entered). Students had added different numbers of words and abbreviations into their phones' dictionaries, and so were differentially accustomed to spelling out certain words and having others come up as suggestions. Most importantly, using the predictive mode would have largely

eliminated the possibility of students entering abbreviations, since these would not be part of a non-customized predictive text dictionary.

Participants' morphological and phonological awareness were also assessed. Morphological awareness has not previously been studied in relation to textism use, but it might facilitate the greater use or understanding of many textisms. For example, it might make it easier to see that words with a common morpheme could be abbreviated similarly (e.g., *-ing* as *N* in *studyN, lookN*; or *one* as *1* in *any1, some1*), or that a word's morphemes could each be represented with a letter (e.g., *gf* for *girlfriend, we* for *weekend*). Phonological awareness has repeatedly been associated with reading ability (e.g., Adams, 1990; Goswami & Bryant, 1990), and more recently, with textism use (Plester et al., 2009). This link has not yet been studied in adults. Testing constraints prevented standardized individual spoken tasks of phonological awareness from being included in the present study, but an experimental task was designed to test participants' ability to identify the sounds in written words, while ignoring their spelling where necessary. Such ability might make it easier to create or to understand textisms which represent similarities of sound despite differences in spelling (e.g., *w8, l8* for *wait, late*), or which represent sound instead of conventional spelling (e.g., *wot, frenz* for *what, friends*).

Finally, this study was designed to explore the textisms produced and understood by these participants. There are thousands of lists of textisms available on-line, as well as many published paper glossaries, but as Thurlow (2006) points out, the mere existence of such dictionaries does not reliably indicate the extent to which individual textisms are used. Further, where several alternative abbreviations exist for a particular word, it is not clear how often each alternative is used. The current study will also provide preliminary information on which words or types of words are most abbreviated (and with what consistency) and best understood.

On the basis of Neville's (2003) results with children, it is predicted that these adults will be faster to type, but slower to read, messages in textese than in conventional English, although the extent of the reading difference may be less because of adults' greater texting experience. Previous research with undergraduates has not revealed significant associations between literacy skills and the frequency of sending text messages (Drouin & Davis, 2009; Massengill Shaw et al., 2007). However, it is not clear if this is because no such relationships exist, or because links with literacy are more likely to be observed with the actual use of textisms, as in Plester et al.'s (2008, 2009) research with children. It is hypothesized here that the ability to produce and decipher textisms is related at least in part to linguistic skills, and therefore that any correlations between such skills and texting performance observed in the current study will be positive.

Method

Participants

Participants were 61 Australian university students (50 female) in a second-/third-year psychology course. Their mean age was 22.2 years (SD 5.7 years), and all had English as a first language. All participants owned a mobile phone and wrote text messages at least every week.

Materials

Text messages. In an initial session, participants were given 5 minutes to write down as many textisms (and their conventional English translations) as they could. Seventy textisms produced by at least 2 participants each were selected as the basis for creating four messages to be used in the study. Each message contained several of the textisms listed by nearly all participants: *u*, *r*, *c*, *2*, and *4*. Each message also contained textisms matched as far as possible for structure. For example, each message contained a word commonly produced with an initial numeral *2* or *4*, as

in *2moro*, *4get*, (*tomorrow forget*), a word sometimes produced with a final *8*, as in *l8*, *w8* (*late, wait*), several high-frequency words that were commonly contracted, as in *hppn*, *ppl* (*happen, people*), and 3-word phrases that had been written as initialisms, as in *brt*, *omw* (*be right there, on my way*).

Extra words were added to ensure that the sentences made sense, and to match sentences as closely as possible on length, for both conventional English and textese. When written in conventional English, the messages consisted of 43-45 words each, spelled with 230-236 characters (including spaces). When written in as many textisms as possible (average 30.8 per sentence, or 70%), they consisted of 39-43 words each, and 153-158 characters. An example phrase from a message is *Please forgive me if I don't get back in time to help celebrate your birthday* / *Plz 4giv me if i dnt get bak in time 2 hlp u celebr8 ur bday*. Because these messages were too long to send as a single message when written in conventional English, they were created and tested in two parts, but the scores for each pair were combined for analysis.

Text-messaging questionnaire. A one-page questionnaire was developed to ask participants how long they had owned a mobile phone, how frequently they sent and received text messages, their use of predictive texting, and their use and understanding of text-message abbreviations.

Spelling and reading tasks. The spelling and reading subtests of the Wide Range Achievement Test- IV (WRAT, Wilkinson & Robertson, 2006) were used to measure participants' ability to spell to dictation, and to read, single words of increasing difficulty.

Morphological awareness. This experimental task tested participants' awareness of the morphological structure of words. The items were 12 triplets of words (preceded by two practice items). For each item there were two morphologically complex words containing a base word with an inflectional or derivational ending (e.g., *-s, -ing, -est, -ly*), and one morphologically

simple word which had the same final letters of the other two words. Examples are *bathing*, *gobbling*, ***sibling*** and *meanest, **honest**, smartest* (odd one out shown in bold). Similar odd-one-out tasks have been used in testing children's judgements of morphological structure (Besse, 2008; Bryant, Devine, Ledward, & Nunes, 1997). Correct identification could be made by focusing on (a) whether the first part of each word constituted a stand-alone unit of meaning (e.g., *mean* in *meanest*), or simply part of the word (e.g., *hon* in *honest*), and/or (b) whether the ending constituted a grammatical unit of meaning that can be attached to various words (e.g., *est* in *meanest*), or simply part of the word (e.g., *est* in *honest*).

Phonological awareness This experimental task was designed to test the ability to identify the sounds, rather than just the letters, in written words. Three sentences were created, each consisting of 6-7 words and 18-21 phonemes (e.g., *"Is the station close?" she asked*). The same phoneme was sometimes represented with different graphemes (e.g., /ʃ/ as *ti* in *station* and *sh* in *she*), and the same grapheme with different phonemes (e.g., *s* as /z/ in *is* but /s/ in *asked*).

Procedure

Tasks were administered at the students' university, in two sessions, in late 2008. As described above, several weeks before the main study, participants were given five minutes to write down as many textisms as they could. In the main group session, participants were administered the WRAT spelling subtest, and after general instructions, completed (at their own pace) the text-messaging questionnaire and the tasks of morphological and phonological awareness. One week later, participants were individually given the WRAT reading subtest, and the text messaging tasks.

Text messaging tasks. Participants read and wrote one message in textese and one in conventional English, in counterbalanced order, using a Nokia 3105 phone. Each message was

systematically rotated through the four presentation conditions. As described above, messages were presented in two parts but combined for analysis. For the reading tasks, participants were asked to read aloud two messages that had been typed into a mobile phone. They were informed whether the message would be written in conventional English spelling or in textese, and that if they didn't understand an abbreviation, they should guess or say *I don't know*. Participants were shown how to scroll through to the end of the message, and informed that their reading would be timed. Any errors were recorded. For the writing tasks, participants were informed that predictive messaging was turned off, and that they be using the multipress method to enter messages. All students knew about this method, but were allowed to familiarize themselves with typing on the phone first, and were shown the punctuation mark/symbols menu. Participants were then asked to type in two messages to dictation. In one, they were asked to spell in conventional English, with no abbreviations. In the other, they were asked to write using text-messaging abbreviations such as *u* for *you* and *2* for *to*. The experimenter told participants that their typing would be timed, but that she would dictate at an appropriate pace for them. After each message was completed, all textisms used were recorded, as well as any errors in the conventional English condition.

Morphological awareness task. Participants were given two practice items (e.g., *banker, blender, beaver*) and for each, asked to guess which was the odd word out. The correct answers were then provided, but without information about why. Individuals worked at their own pace through the 12 test items. They could consider all items before deciding on a strategy to determine the odd one out each time, or could correct previous answers if they saw fit.

Phonological awareness task. Participants were reminded that in English, the same sounds can sometimes be represented with various letters, and the same letter/s can sometimes represent

several sounds. For this task, they would need to think about the sounds, not the letters of words. The experimenter wrote an example sentence on the board, and showed how students should circle each separate phoneme they could identify in the sentence, and number each new phoneme. For example, *that cat* has 6 separate phonemes, only 4 of which are new.

Results

Questionnaire responses revealed that participants had owned a mobile phone for an average of 6.02 years (*SD* = 1.91). They reported sending an average of 7.31 texts a day (*SD* = 5.84), and receiving 7.15 a day (*SD* = 5.88). Most (*n* = 47) now used predictive texting; 21 had never used anything but predictive texting, and the other 26 had started off using multipress but switched to predictive in recent years (*M* = 2.8 years ago, *SD* = 1.9). Of the 47 predictive texters, 34 reported using the predictive method 99 or 100% of the time. The others reported using predictive texting 95 or 90% of the time (*n* = 4 each), or 80, 70, 50, 10, and 8% of the time (*n* = 1 each). All used the multipress method for the remaining words. Fourteen participants normally used multipress exclusively.

Most participants (*n* = 46) indicated that when writing text messages, they used textisms "for some words, such as *u* for *you*", but only 2 tried to use textisms for "most words", and 13 avoided them completely. When reading text messages, 44 participants indicated that they "understood obvious abbreviations, but sometimes struggled with more obscure ones", 14 that they found it "easy to understand the sender's abbreviations", and 3 that they "found it difficult to understand abbreviations". Grouping participants by their reported use or understanding of textisms did not reveal any significant inter-group differences on any of the texting or literacy measures, and so this grouping was not included in any analyses.

Speed, accuracy, and use of textisms in reading and writing messages. It was first necessary to rule out the possibility that some participants would be faster at writing text messages than others simply because they were more practised with the multipress method. The multipress-only group did type the messages relatively fast (mean across the two message types = 208.9 seconds, *SD* = 65.6) compared to the group who had switched from multipress to predictive (*M* = 236.9 seconds, *SD* = 64.3) and the predictive-only group (*M* = 247.8 seconds, *SD* = 88.1), but these differences were not significant, $F < 1$. Thus, participants were instead grouped in terms of practice with text-messaging in general. Each participant's reported number of messages sent per day was very similar to the number reported received per day. The sample was thus divided at the median into infrequent texters (those who sent/received ≤ 5 text messages a day, $n = 32$), and frequent texters (those who sent/received > 5 text messages a day, $n = 28$). Only one participant did not fit the same group for sending (5/day) and receiving (3/day), and was placed in the infrequent texter group because her overall mean exposure was 4 messages/day. Table 1 shows the mean scores of the two groups, and overall, for reading and writing the experimental text messages. For both infrequent and frequent texters, writing messages in conventional English took considerably longer than in textese. It should be noted that every textism produced had fewer characters than the word being represented. Both groups used textisms extensively when asked to do so, and nearly always refrained when asked to write in conventional English. In contrast, reading messages in textese took nearly twice as long as in conventional English, for both texting groups, and resulted in an elevated number of reading errors.

A series of repeated-measures analyses of variance (ANOVAs) were conducted on these differences, with message type (conventional, textese) as the repeated measure and group (infrequent, frequent texters) as the between-subjects factor. In terms of writing time, it was

confirmed that textese was faster to type than conventional English, F (1, 57) = 38.50, $p < .001$, and that frequent texters were faster than infrequent texters, F (1, 57) = 8.74, $p = .005$. The number of textisms produced was significantly greater in the textese than the conventional messages, F (1, 57) = 789.75, $p < .001$. In terms of reading time, it was confirmed that conventional English was quicker to read than textese, F (1, 58) = 166.32, $p < .001$, and that frequent texters were quicker than infrequent texters, F (1, 58) = 4.44, $p = .04$. There was no significant interaction in any of these analyses. The number of errors made during reading was significantly greater for messages in textese than in conventional English, F (1, 58) = 91.24, $p < .001$, and significantly greater in infrequent than in frequent texters, F (1, 58) = 7.61, $p = .008$. An interaction between message type and group, F (1, 58) = 4.98, $p = .03$, stemmed from both groups making a very low number of errors when reading conventional messages, but the infrequent texters making significantly more errors than the frequent texters on textese messages, $p < .05$. These results suggest that while familiarity with text-messaging helps individuals to decipher textisms and makes them faster at reading and writing messages on a mobile phone, it does not make them differentially faster with textese than with conventional English.

Literacy scores and links with texting task scores. The scores on the standardized and experimental literacy tasks, for infrequent and infrequent texters, and overall are presented in Table 2. The two experimental tasks were found to have reasonable to good internal reliability; Cronbach's alpha = .80 for the morphological awareness task and .87 for the phonological awareness task. The differences between the two texting groups appear to be small, and indeed, a series of one-way analyses of variance (ANOVAs) revealed that they differed significantly only in the number of textisms they could think of in 5 minutes, with more produced by the frequent

than the infrequent texters, F (1, 54) = 6.36, p = .015. Thus, there were no obvious differences in literacy skills between individuals who regularly wrote many or few text messages.

Correlations were then calculated between the text messaging task scores (time and number of textisms/errors) and the literacy task scores. Partial correlations were calculated, controlling for practice (number of text messages sent per day). (Inter-correlations between literacy scores and also between text messaging scores were high, but they are not theoretically interesting here, and are not reported.) Faster times to compose messages correlated significantly with WRAT spelling score, for both textese (r = .354, p = .018) and conventional messages (r = .397, p = .008), and with WRAT reading score, for textese (r = .327, p = .03) and a trend for conventional messages (r = .292, p = .055). Fewer errors in reading messages also correlated significantly with WRAT reading score, for both textese (r = .317, p = .036) and conventional messages (r = .336, p = .026). Better phonological awareness was significantly associated with fewer errors in reading conventional text messages (r = .410, p = .006) and better morphological awareness with fewer errors in reading textese messages (r = .322, p = .033). Finally, the ability to list more textisms was significantly correlated with quicker reading of text messages in textese (r = .314, p = .033) and more intrusions of textisms when composing text messages in conventional English (r = .367, p = .014), although these intrusions were few (see Table 1). Even after controlling for daily exposure to text messages, then, individuals with better literacy skills were more efficient at composing and deciphering text messages than their peers.

Textisms produced in text writing tasks. The mean proportion of textisms to words used in text-messages has been reported in previous research (e.g., Plester et al., 2008, 2009) and here was calculated to be .53 (SD = .13) for the frequent texters and .47 (SD = .15) for the infrequent texters, a non-significant difference. Table 3 shows 23 of the most often abbreviated 163 word

types included in the experimental messages, in descending order of propensity to be abbreviated when written in textese. They range from words which were always written as textisms and never in full (e.g., *are, message, tonight*) to words which were written as textisms at least 90% of the time (e.g., *be, mate, come*). The remaining words, abbreviated 3 to 89% of the time, are shown in the appendix. Only 10 already brief words were never abbreviated: *here, ask, his, may, hi, if, in, is, me,* and *or*. Table 3 lists a consistency score for each word, which uses the weighted sums of the squares of the different textisms used for each word, to express consistency score as a percentage. For example, the word *are* was represented with *r* all 42 times it was written, and so its consistency score is 100%. The word *forever* was written 11 times as *4eva*, twice as *4ever*, and once as *foreva*, and has a consistency score of 64%.

As Table 3 shows, one-syllable words which clearly lend themselves to being expressed as a letter or number (letter/number homophones, such as *r, 4*, for *are*, *for*) were written in that way on average nearly 95% of the time. Further analysis showed that the use of numbers to represent word sounds was more common when the number represented a whole syllable/morpheme, as in *4eva* (mean 83%) than when it was part of a syllable/morpheme, as in *m8* (mean 63%). The morphological endings *-ing* and *-s* were both given a textism substitute in 28% of cases: *-ing* as *in/g*/*N* (e.g., *bein, studyg, seeN*) and *-s* as *-x*/*-z* (e.g., *pix* for *pictures*, *parz* for *parents*).

One striking feature of many of the textisms in Table 3 is their variability across writers. Of the 87 word types abbreviated by 2 or more people, only 17 were abbreviated in a consistent way, and of these, 6 were the common one-syllable letter/number homophones *r, 4, u, c, b, 2*. The remaining 70 words were abbreviated from 2 to 11 different ways, which suggests that textism glossaries, which usually list one textism per word, do not reflect the variety of textisms seen in the real world.

There were not enough textisms of each category in the present study to be able to analyse category use in terms of other skills. However, one broad categorization that could be made was to score subsets of textisms as *phonological* or *orthographic* abbreviations. In each of the four messages, there were several words (mean 6 per message) which some participants abbreviated in a way that emphasized their sound, such as *no, plz*, and *wot*, for *know*, *please*, and *what*, and others in a way that emphasized their spelling, such as *knw*, *pls*, and *wat*. The spelling for each of these words (if abbreviated) was categorized as phonological or orthographic for each participant. On average, infrequent texters made equal numbers of both types of abbreviations (*M* 50%, *SD* 26.1). Frequent texters, in contrast, produced 72% phonological and 28% orthographic abbreviations (*SD* 27.2), a significantly different ratio from the infrequent texters, $F(1, 53) = 9.14$, $p = .004$. The more practised one is with texting, then, the more likely one's abbreviations are to emphasize sound than spelling. Participants' use of another common textism category, number homophones (e.g., *r* for *are*, *l8* for *late*), was also counted. The infrequent texters used number homophones for 79% of the relevant words (*SD* = 24), slightly less than the frequent texters' 83% use (*SD* = 22), but this difference was not significant, $F < 1$.

Textisms understood in reading tasks. In reading the textese messages, only 8 participants made no errors at all. Another 8, 16, 13, and 11 participants made 1, 2, 3 and 4 errors, respectively, and the remaining 5 participants for whom data were available made between 5 and 9 errors. (As a comparison, in reading the conventional message, 48 participants made no errors, and 13 made 1 or 2 errors.) Of the 163 word tokens (118 types) included in the four textese messages (of which each participant read aloud one), 114 tokens were interpreted correctly in every case. However, there were also 20 tokens (16 textisms, 4 full words) that were omitted,

misread, or not understood by 1 participant, and 29 tokens (28 textisms) by 2 or more. Table 4 shows the textisms that were not known or were misunderstood by 2 or more participants.

As shown in the table, 6 of the 10 least understood textisms were initialisms. Another 2 abbreviations well used in the text-writing task were not consistently understood by others in this text-reading task, and represent the initials of their two morphemes: *bc* (*because*), and *bf* (*boyfriend*), similarly to the way that initialisms represent the initials of their constituent words. Although all textisms used in the messages had been produced by at least 2 participants in the initial textism-listing task, initialisms seem to be the most difficult to interpret, presumably because if not known, they cannot easily be guessed. Other challenging textisms were those that involved letter homophones that were doubled, such as *BN* (*being*), or combined with some other device (see Table), such as *d* (*the*), *aQr8* (*accurate*), and *ez* (*easy*, especially opaque because *z* is pronounced *zed* in Australian English). Missing letters also presented difficulties of interpretation, as in *shl* (*shall*), and *dnt* (*don't*). Despite its popularity as a "typical" textism, *l8* (*late*), which was produced by 12 of 17 participants in the writing task, was misunderstood by 4 of 13 (different) participants in the reading task.

Discussion

This experiment looked at text-messaging efficiency in Australian undergraduates who had been mobile phone owners for an average of 6 years, and who sent and received an average of about 7 messages a day, similar to young adults in other nations where mobile phones are ubiquitous (Ling, 2004; Massengill Shaw et al., 2007). The rise of predictive messaging and concatenated messages had not stopped these students using textisms in their messages, but using as many textisms as possible was not seen as an important feature of texting.

The tasks used here confirmed our hypotheses about the use of textisms: they make text-messages faster to type, but slower to read. Just like Neville's (2003) female high school participants, these undergraduates were significantly quicker at composing text messages in textese than in conventional English, whether they were frequent (more than 5 messages a day) or infrequent (5 or fewer) texters in everyday life. There may have been some extra time involved in deciding how to abbreviate a word compared with spelling it conventionally, but this was not possible to measure here. Even so, any such delay was eclipsed by the reduced number of key-presses required to type the textisms. The frequent texters were quicker typists than the infrequent texters, but although practice helped to speed typing, it did not confer a special advantage for typing in textese. Nor did practice determine overall fluency with textese. Frequent and infrequent texters did not differ in the proportion of words they abbreviated (about half), and those who did not normally use textisms were no worse at reading them than those who did (as in Drouin & Davis, 2009). It seems that knowledge of textese has indeed spread into general communication (Thurlow, 2006), even among those without extensive practice. Nevertheless, like the young adults in previous studies (Drouin & Davis, 2007; Rosen et al., in press), these participants remained capable of limiting their use of textisms to appropriate situations. Although the intrusion of textisms into the conventional messages was greater for frequent than infrequent texters, the very low numbers for both groups (0.32 and 0.21 per 44-word message, respectively) do seem to discount media concerns about textese spreading into conventional writing.

Both frequent and infrequent texters took nearly twice as long to read messages written in textese than in conventional English, just as reported by Neville (2003) with high school girls. All but 8 of the current participants encountered at least one word that they either misinterpreted or could not understand, and most (70%) made between 2 and 4 errors on a 44-word message.

Some of the extra time taken for the textese messages can thus be attributed to participants pausing to try to work out what unfamiliar textisms meant, sometimes successfully and sometimes not. However, even when textisms appeared familiar, participants still read them more hesitantly than they read conventionally spelled words. Both texting groups made more errors when reading messages in textese than in conventional English, and infrequent texters made more errors than frequent texters on textese, but did not differ on conventional messages.

It seems that although practice with textese improves fluency in reading textese, the practice gained through a few years of composing and deciphering messages in this writing system cannot begin to match the fluency possessed by literate young adults in reading conventional English. Even a rough calculation suggests that by this stage of their academic careers, students would have spent at least an order of magnitude more time on reading conventional English (perhaps 10,000 hours: 16 hours a week for 12 years) than textese (perhaps 1000 hours: 3.5 hours a week (James, 2007) for 6 years, the mean length of phone ownership). Textisms can require a number of different strategies to decipher: they may need to be pronounced phonetically (*no* for *know*), have vowels reinstated (*tgthr* for *together*), or have some letters or numbers pronounced as their names, within a word otherwise conventionally pronounced (*studyN* for *studying*; *l8* for *late*). It is likely that the lesser amount of practice in decoding textisms (cf. conventional words) would thus have been compounded by the frequent need to switch decoding strategies, which can be time-consuming. For example, switching between equally familiar scripts costs Japanese readers processing time in both naming and semantic categorization tasks (Shafiullah & Monsell, 1999), deciding how to pronounce an ambiguous word written in shared Cyrillic/Roman letters leads to response delays in biscriptal speakers of Serbian/Croatian (Feldman & Barac-Cikoja, 1996), and even reading words presented in mixed upper and lower case takes English-speaking

adults longer than reading words in consistent case (Rho, 2002). Although switching between even familiar writing styles clearly involves processing demands, the differences observed here between the reading of conventional English and textese may begin to decrease as individuals are exposed to textese at increasingly early ages (see Plester et al., 2008). Such a decrease is suggested by evidence that greater experience with a writing system can mean better mental representations: undergraduates with differing exposure to conventional print showed large differences in the strength of their real-word orthographic and phonological representations (Chateau & Jared, 2000).

It is not surprising that message-writers use textisms: as well as saving space and hence potentially money, these results confirm that textese is quicker to write than conventional English. Why, then, do receivers of text-messages in the real world not revolt against the increased time and confusion that textisms can cause? It is probable that the textese messages read in this study were longer (mean 22 words per part-message) and had a higher proportion of textisms to words (mean .7) than everyday messages, and thus they may have provided more scope for confusion. However, the extent of the differences between the experimental messages and more natural messages is difficult to quantify. Estimates of average message length range from 7.7 words in American undergraduates (Ling & Baron, 2007) to 14 in British undergraduates (Thurlow, 2003) to 22 in British children (Wood, Plester, & Bowyer, 2008, as cited in Plester & Wood, 2009). Estimates of the average proportion of textisms to words varies similarly, although the current messages were more dense with textisms than is typical for naturalistic text messages in English (.19 in British undergraduates, Thurlow, 2003), for elicited messages (.34 in British children, Plester et al., 2009), and for dictated messages (.58 in British children, Plester et al., 2008). Also, since the current participants came from different social

groups, there may have been more unfamiliar textisms than in messages between friends (Green, 2003). The increased reading time and confusion caused by textisms in naturalistic messages thus probably occurs to a lesser extent than that shown in this empirical study. The disadvantages of having to decipher textese may be considered as a trade-off for the sense of intimacy, fun, and social connectedness that textisms bring to text-messaging (Crystal, 2008; Green, 2003; Ling, 2004; Thurlow, 2003), as well as for the licence to use textisms in one's own messages.

This study also examined links between participants' usual frequency of sending/receiving text messages, their use of textisms in the experiment, and their more conventional literacy skills. As in previous studies with both children and adults, text messaging frequency was not related to differences in literacy scores (Plester et al., 2008; Massengill Shaw et al., 2007); here, on reading, spelling, or phonological and morphological awareness. However, as in previous studies with children (Neville, 2003; Plester et al., 2008, 2009), there were correlations between textism use and other linguistic abilities, even when controlling for texting experience (number of messages typically sent/received per day). Faster typing of both conventional and textese messages was correlated with better reading and spelling, and fewer errors in reading both conventional and textese messages were correlated with better reading. Higher scores on the experimental task of phonological awareness were associated with fewer errors in reading conventionally spelled messages, which fits the evidence that phonological awareness is associated with reading skill not just in children, but in young adults (e.g., Braze, Tabor, Shankweiler, & Mencl, 2007; Stringer & Stanovich, 2000). However, the number of errors was so small (mean 0.27 per 44-word message) that the correlation may not have important implications. Unexpectedly, phonological awareness scores did not correlate significantly with the ability to read or write textisms, but it may be that there were not enough phonology-based

textisms for this relationship to reach significance, or that the experimental task of phonological awareness was not sufficiently sensitive to reveal it. Finally, higher morphological awareness scores were significantly correlated with fewer errors in reading messages in textese. Better understanding of word structure may have facilitated participants' understanding of textisms which abbreviate words according to their structure, especially their morphological structure, such as *bf* or *sum1* (for *boyfriend, someone*).

Overall, these results suggest that just as in children (Plester et al., 2008, 2009), relationships between fluency with textisms and more conventional literacy skills in young adults are neutral or positive. This provides further evidence that media fears about the use of textisms masking or even causing problems with reading and spelling may be unfounded. Although the cross-sectional nature of this study precludes causal interpretations, it seems likely that young adults with stronger linguistic skills can better employ these strengths to create and decipher textisms than those with weaker linguistic skills. It is also possible that the language "play" encouraged by extensive practice with textisms (Crystal, 2008) helps to boost interest in language and thus scores on language tasks, as found with children (e.g., Plester et al., 2009), and/or that all these skills are driven by an underlying level of linguistic or general intelligence. Future longitudinal or intervention studies should further explore these questions of causality.

On-line and published glossaries of textisms are often dominated by initialisms (*lol, brb,* for *laughing out loud, be right back*), and even when other abbreviations are listed, there is often only one textism listed per word. It is not clear how frequently such textisms, or any alternatives, are used or understood. The current study was conducted with mainly female undergraduate students from a single university, and although the textisms that they produced and understood may not be representative of those in other social, cultural, or national groups, they can provide

some preliminary answers to these questions. Initialisms were used very rarely indeed, even compared to others' findings (Ling & Baron, 2007, Neville, 2003, Plester et al., 2009). Letter/number homophones were very frequent, especially to represent whole words (*r, 4, u, c, b*), and also when they represented a word syllable or morpheme (*4eva, 2nite, any1*), but much less so when they were part of a syllable or morpheme (*m8, studyN*). There was no clear most popular method of creating textisms. The words which were abbreviated at least 90% of the time varied in length and structure, with some abbreviated by omitting internal letters (*msg, bak*), or final letters, especially for longer words (*tho, thru*), and a few by also changing letters to better represent word sounds (*foreva, plz*). Most striking, though, was the variability in the abbreviations produced. Eighty percent of words abbreviated by two or more people were written in more than one way, from as few as two (e.g., *anyone*: *any1*, *NE1*) to as many as 11 (*because*: *bcause, bcos, bcoz, bcuz, bcaz, cause, cos, coz, cus, cuz, bc*). Such inconsistency has also recently been noted in a study of Instant Messaging in adolescents (Varnhagen, McFall, Pugh, Routledge, Sumida-MacDonald, & Kwong, 2009), who, for example, variously wrote *got to go* as *gotta go, got 2 go,* and *g2g*. It seems that glossaries of textisms should be seen as descriptive and possibly idiosyncratic rather than proscriptive and general: clearly they do not have the consistency or authority of contemporary conventional dictionaries.

Infrequent texters produced as many textisms in their experimental messages, and as many number homophones, as frequent texters. When producing abbreviations by deleting letters, infrequent texters were equally likely to create orthographic textisms by retaining the remaining letters and thus some of the visual features of the written words (e.g., *com, knw, wat* for *come, know, what*), as they were to create phonological textisms, by altering some of the remaining letters so that they represented the word's sounds (e.g., *cum, no, wot*). Frequent texters, in

contrast, were more likely to create phonological (72%) than orthographic (28%) textisms. Increased experience with texting may increase the tendency to make text-messages imitate speech rather than writing (Ling, 2004; Werry, 1996). Alternatively, people who enjoy using language in a more casual, speech-oriented way may be attracted to texting more frequently. As suggested by Plester et al. (2008), future research should consider the consistency with which words are abbreviated, and whether this evolves across time and individuals. Further studies could also consider whether such variability adds to the difficulty of deciphering text messages, and could also examine which types of abbreviations were most generally well understood.

Although the design of the current experiment does not allow a description of which textisms took longest to process, it provides preliminary information on participants' speed and errors when reading textese. In keeping with the finding that initialisms were not widely produced, initialisms (e.g., *brt, bbs* for *be right there, be back soon*) proved to be the most difficult to decipher, presumably because they provide less information than other textism types and are therefore more difficult to guess. Despite being well understood singly (e.g., *r, u* for *are, you*), letter homophones presented challenges of interpretation when they were combined (e.g., *BN, bz* for *being, busy*), and some contractions (e.g., *tim, shl, ttly* for *time, shall, totally*) were also often misunderstood. Textisms with combined abbreviation types were also difficult, such as *d* for *the*, which combines a letter homophone with accent stylization, *aQr8* for *accurate*, which includes both a letter and a number homophone, and *parz* for *parents*, which represents a slang abbreviation with a phonological ending. Even when textisms were correctly deciphered, they often caused obvious delays in reading, contributing to the nearly doubled time required to read messages in textese than in conventional English. Future studies could use voice-activated

recording to examine which type of textisms require greater processing time, as well as which defy interpretation most often.

The design of this study meant that participants read and wrote text messages that were probably longer, and much denser with textisms, than they would in everyday life. It also required them to type on a phone that was not their own, with the multipress entry method, when only 28% normally used this method 50-100% of the time (and predictive entry otherwise), 17% used it 5-30% of the time, and 55% normally used only predictive entry. Using relatively long, dictated messages, entered by the multipress method on an experimenter-provided phone, was necessary to ensure consistent conditions and unconstrained scope for textism use, and to allow more complete comparisons between the message types, both written and read. Previous researchers have noted the ethical and practical obstacles to obtaining naturalistic text messages (e.g., Ling, 2004; Plester, Wood, Jackson, & Wilde, 2009), but possible solutions are to ask participants to compose messages in response to given situations (e.g., Plester et al., 2008) or to persevere in asking respondents to provide examples of their most recent messages sent (Plester, Wood, Jackson, & Wilde, 2009; Ling, 2004; Ling & Baron, 2007). Further research will be necessary to examine the effects of textism use and understanding in more naturalistic messages.

There were many more women than men in the current study, and it should again be noted that across countries and cultures, females tend to send more texts and use more textisms than their male counterparts (Ling, 2004, 2007; Plester et al., 2008; Rosen et al., in press, Thurlow, 2003). Thus, the results reported here do not give a gender-balanced view of textism use and comprehension. Further, these participants, like those in most studies of text-messaging in young adults (e.g., Drouin & Davis, 2009; Massengill Shaw et al., 2007; Thurlow, 2003) were university students, whose use and understanding of textisms, and their potential links with

literacy skills, may not be representative of those of young adults in general. It is possible that frequent exposure to textisms may have a greater influence on those with weaker reading and writing skills, although this may not necessarily be so, given the neutral or positive relationships between textism use and literacy levels observed in children (Plester et al., 2008; 2009). Nevertheless, Rosen et al. (in press) found more reported use of textisms in young adults with less than with more education, and stronger relationships between reported textism use and quality of writing samples than in those with no or some college education and those with a college degree. Future research should consider texters from different educational backgrounds for a broader understanding of text message composition and comprehension.

Research in this area is just beginning, but as texting assumes an increasingly important role in the lives of individuals worldwide, it becomes even more imperative to study its potential impact. The current study provides some of the first evidence on the efficiency of reading and writing messages in textese, and of young adults' actual (rather than reported) use of textisms and links with literacy skills. However, in pace with technological advances, both children and adults are constantly upgrading to new text entry methods and new keypad configurations, especially as the use of the QWERTY configuration (as a keypad or touch-screen) begins to supersede the alphanumeric layout. Researchers will need to keep up with such changes to continue their examination of the use of texting, of the prevalence and nature of textisms, and of their relationship to more traditional linguistic skills.

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Table 1

Means and SDs for Time and Number of Errors/Textisms in Reading and Writing Messages in Conventional English and Textese for Texting Groups

	Writing messages		Reading messages	
	Time (sec)	No. textisms	Time (sec)	No. errors
Conventional				
Infreq texters	278.69 (88.28)	0.21 (0.82)	14.25 (2.57)	0.34 (0.60)
Freq texters	221.44 (62.30)	0.32 (0.63)	13.21 (2.71)	0.18 (0.48)
Overall	252.49 (85.05)	0.26 (0.73)	13.77 (2.66)	0.27 (.55)
Textese				
Infreq texters	239.69 (74.42)	20.78 (6.42)	27.25 (8.16)	3.22 (2.31)
Freq texters	189.44 (59.60)	23.26 (5.52)	23.50 (6.61)	1.96 (1.14)
Overall	216.69 (72.04)	21.92 (6.10)	25.50 (7.65)	2.63 (1.95)

Table 2

Mean Scores and SDs on Standardized and Experimental Literacy Tasks for Texting Groups

	WRAT reading SS *n* = 58	WRAT spelling SS *n* = 58	MA proportion *n* = 54	PA proportion *n* = 54	No. textisms in 5 mins *n* = 56
Infreq texters	103.55 (11.68)	117.58 (12.56)	.73 (.27)	.76 (.18)	15.86 (4.90)
Freq texters	100.19 (7.39)	111.30 (22.39)	.77 (.20)	.74 (.13)	19.22 (5.06)
Overall	101.98 (10.45)	114.66 (17.94)	.75 (.24)	.75 (.24)	17.48 (5.22)

Note. SS = standard score, MA = morphological awareness, PA = phonological awareness.

Table 3

Words Most Often Abbreviated, by Frequency of Conventional Spelling, Consistency of Textism Spelling, and Textisms Produced

Word	% Conv spelling	% Textism consistency	N	Textisms produced (%, rounded to whole number)
are	0	100	42	r (100)
though	0	100	14	tho (100)
through	0	100	14	thru (100)
message	0	89	17	msg (94), mess (6)
forever	0	64	14	4eva (79), 4ever (14), foreva (7)
tonight	0	64	14	2nite (79), tnight (14), tnite (7)
anyone	0	51	14	any1 (57), NE1 (43)
see you soon	0	51	17	c u soon (65), cya soon (29), cys (6)
back	0	49	17	bak (65), bk (24), bac (11)
please	0	41	17	plz (59), plse (18), pls (18), pleas (5)
thanks	0	28	17	thanx (35), thnx (35), thxs (12), tnx (12), thnks (6)
tomorrow	0	12	14	2morrow (14), 2moro (14), 2mro (14), tomoz (14), 2moz (10), 2morow (7), 2morw (7), 2mz (7), 2m (7)
because	2.6	10	39	bc (18), bcoz (15), coz (15), cos (13), bcos (10), cause (10), bcuz (5), cuz (5), cus (3), bcause (3), bcaz (3)

for	3.6	93	28	4 (96)
you	4.9	91	61	u (95)
see	4.9	91	61	c (95)
no problem	5.9	89	17	no prob (94)
boyfriend	5.9	79	17	bf (88), boyfrnd (6)
forgive	5.9	4	17	4giv (47), 4give (41), fgv (6)
be	7.1	87	28	b (93)
mate	7.1	87	14	m8 (93)
come	7.1	56	14	cum (71), com (21)

Table 4

Textisms Misunderstood or Not Known by ≥2 Participants in Textese Reading Condition

Textism	Conventional English	Proportion errors	Number errors	Proportion errors	Textism type
brt	be right there	0.88	14	0.88	initialism
pu	pick up	0.86	12	0.86	initialism
bbs	be back soon	0.85	11	0.85	initialism
np	no problem	0.69	9	0.69	initialism
BN	being	0.62	8	0.62	letter homophone x 2
tim	time	0.57	8	0.57	contraction
d	the	0.53	9	0.53	letter homophone + accent stylisation
bfn	bye for now	0.50	8	0.50	initialism
aQr8	accurate	0.50	7	0.50	letter homophone + number homophone
omw	on my way	0.47	8	0.47	initialism
shl	shall	0.31	5	0.31	contraction
l8	late	0.31	4	0.31	number homophone
ttly	totally	0.25	4	0.25	contraction
bz	busy	0.23	4	0.23	letter homophone x 2
bc	because	0.28	4	0.28	contraction/initialism
parz	parents	0.23	3	0.23	slang abbreviation + phonological spelling

ez	easy	0.19	3	0.19	letter homophone x 2
i	I	0.19	3	0.19	capitalisation drop
dnt	don’t	0.15	2	0.15	contraction
bf	boyfriend	0.15	2	0.15	contraction/initialism
btw	by the way	0.14	2	0.14	initialism
an	an	0.14	2	0.14	(read as “and”)
dnr	dinner	0.14	2	0.14	contraction
ull	you’ll	0.13	2	0.13	letter homophone
xamz	exams	0.12	2	0.12	phonological spelling

Appendix

Words Abbreviated More than Once, by Frequency of Conventional Spelling, Consistency of Textism Spelling, and Textisms Produced

Word	% Conv spelling	% Textism consistency	n	Text spellings (%, rounded to whole number)
I'm	10.7	81	17	im (89)
I	11.5	8	17	i (89)
it's	11.8	79	17	its (88)
could	11.8	61	17	cld (76), culd (6), cud (6)
birthday	11.8	45	17	bday (65), b'day (12), brtday (6), b'rthday (6)
different	11.8	38	17	diff (59), dif (6), diferent (6), dif'rent (6), diffnt (6), difrnt (6)
be back soon	11.8	32	17	b bak soon (53), b bac soon (12), be bk soon (6), b back soon (6)
know	12	47	25	no (64), kno (20), knw (4)
definitely	12.5	78	16	def (88)
text	12.5	78	16	txt (88)
celebrate	12.5	42	16	celebr8 (63), celbr8 (6), cbr8 (6), celebrte (6), c'bte (6)
to	12.8	78	47	2 (87)
when	14.3	76	14	wen (86)
over	14.3	74	14	ova (86)
people	14.3	64	14	ppl (79), peps (7)
until	14.3	55	14	til (71), till (14)
what	14.3	43	14	wot (57), wat (29)
pictures	14.3	39	14	pix (43), pics (43)
don't	14.9	39	47	dont (51), dnt (32), dun (2)
about	17.9	36	28	bout (50), abt (29), abot (4)
girlfriend	18.7	37	16	gf (56), grlfriend (6), grlfrnd (6), gal friend (6), g.friend (6)

easy	21.4	4	14	ez (57), ezy (14), z (7)
going	21.4	38	14	goin (5), gng (29)
someone	21.4	32	14	sum1 (43), some1 (29), som1 (7)
between	21.4	23	14	btwn (35), btween (21), btwen (7), betwn (7), bw (7)
late	23.5	56	17	l8 (71), lte (6)
with	23.5	19	17	wit (24), w (24), wif (12), wth (6), wiv (6), wid (6),
weekend	25	20	16	wkend (31), wknd (13), w/e (13), weeknd (6), wkd (6), w.end (6)
shall	28.6	35	14	shl (43), shal (29)
going to	28.6	27	14	gonna (34), goin 2 (22), gunna (7), gong 2 (7)
and	29.4	31	17	& (41), n (24), a (6)
parents	29.4	24	17	pars (29), parz (24), pez (6), parnts (6)
forget	31.2	57	16	4get (69)
next	31.2	57	16	nxt (69)
seeing	31.2	42	16	cing (56), seein (6), CN (6)
would	31.2	31	16	wld (44), wd (13), wud (6), wood (6)
together	31.2	28	16	2gether (38), 2getha (19), 2gther (6), tgthr (6)
lecture	31.2	20	16	lect (19), lec (19), lctr (13), lcture (6), lctre (6), lter (6)
from	35.7	54	14	frm (64)
have	35.7	39	14	hav (50), hve (7), hv (7)
excited	35.7	31	14	xcited (36), xited (21), xcitd (7)
studying	35.7	31	14	stdyN (36), stdying (21), studyg (7)
onwards	35.7	28	14	onwds (36), onwrds (7), onwads (7), owds (7), ow (7)
tickets	35.7	21	14	tickts (14), tikets (14), tix (14), tiks (14), tkts (7)
by the way	37.5	53	16	btw (63)
hate	37.5	4	16	h8 (50), ht (6), h8te (6)

wait	42.9	51	14	w8 (57)
busy	42.9	39	14	bz (43), bsy (14)
want	50	5	14	wnt (50)
totally	50	34	14	ttly (21), totaly (14), tot (14)
help	52.9	5	17	hlp (47)
things	52.9	38	17	thngs (29), thingz (6), thgs (6), tings (6)
being	52.9	36	17	bein (18), BN (18), bing (12)
still	56.2	46	16	stil (38), stl (6)
dinner	56.2	38	16	dinna (19), dnr (13), dina (6), din (6)
accurate	56.2	37	16	accur8 (19), acurate (19), aQr8 (6), acqR8 (6), acc (6)
the	57.7	42	14	th (21), d (21)
exams	57.7	42	14	xamz (29), xams (7), exms (7)
pick up	68.7	51	16	pik up (13), pu (13), pic up (6)
good	71.4	59	14	gd (29)
classes	78.6	64	14	clases (14), classz (7)
friends	81.2	68	16	frendz (13), frends (6)
on my way	85.7	76	14	omw (14)
like	87.5	77	116	lik (6), lke (6)
time	88.2	79	17	tme (12)

Text messages as presented to participants

Conventional Message 1 (43 words, 235 characters)

Part 1: Does anyone want to see my pictures? Because I'm totally excited about how good they are. Don't know what you'll think, though.

Part 2: Shall I come over between classes, or wait until tomorrow? I'm easy but I can be right there. Bye for now!

Textese Message 1 (39 words, 158 characters)

Part 1: does NE1 wnt 2 c my pix? bc im ttly xited abt how gd they r. dnt no wot ull think, tho.

Part 2: shl i cum ova btwn classes, or w8 til 2mro? im ez but i can brt. bfn!

Conventional Message 2 (45 words, 232 characters)

Part 1: Hi mate! When are you people going through town? Can you get the tickets for tonight? I'm busy because I have a lecture.

Part 2: Hey, I know someone is going to be studying for exams forever. I'm on my way. See you from about 8.00 onwards.

Textese Message 2 (43 words, 159 characters)

Part 1: hi m8! wen r u ppl gng thru town? can u get d tix 4 2nite? im bz coz i hav a lctr.

Part 2: hey, i no sum1 is gonna b studyN 4 xamz 4 eva. im omw. c u frm abt 8 onwds.

Conventional Message 3 (45 words, 230 characters)

Part 1: Hi, how are you? Would you like to get together next weekend? By the way, is Jo still seeing his girlfriend?

Part 2: I hate to ask, but don't forget to text me an accurate time to pick up my friends. Thanks. Definitely see you for dinner!

Text Message 3 (42 words, 157 characters)

Part 1: hi, how r u? wld u like to get tgthr nxt wknd? btw, is jo stil CN his gf?

Part 2: i h8 2 ask, but dnt 4get 2 txt me an aQr8 time to pu my frendz. thnx. def c u 4 dnr!

Conventional Message 4 (45 words, 236 characters)

Part 1: Hi. Please forgive me if I don't get back in time to help you celebrate your birthday, because I could be late.

Part 2: Things may be different with my parents and boyfriend being here. It's no problem to message you. Be back soon. See you soon!

Text Message 4 (41 words, 154 characters)

Part 1: hi. plz 4giv me if i dnt get bak in time 2 hlp u celebr8 ur bday, bc i cld b l8.

Part 2: Thngs may be diff w my parz & bf BN here. its np 2 msg u. bbs. cya soon!

Morphological awareness task items

Practice 1. catching, talking darling.	Practice 2. banker, blender, beaver.
1. agreement, element, employment	7. bathing, gobbling, sibling
2. baker, lover, cover	8. naked, hiked, baked
3. gimmicks, flummox, hammocks	9. fries, fuse, fees
4. wearing, crumbling, cunning	10. meanest, smartest, honest
5. weakly, madly, silly	11. snorted, hatred, parted
6. punishment, monument, measurement	12. timely, beastly, bully

Phonological awareness task items

Example: That cat is fat

1. Both of them bothered to come over (21 sounds overall; 14 different)
2. “Is the station close?”, she asked (20 sounds overall; 14 different)
3. Have you seen the house he bought? (18 sounds overall; 14 different)

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