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do i know its wrong:

Children's and Adults' Use of Unconventional Grammar in Text Messaging

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Abstract

There is concern that the violations of conventional grammar (both accidental and deliberate) often seen in text messages (e.g., *hi ☺ how is ya?!!*) could lead to difficulty in learning or remembering formal grammatical conventions. We examined whether the grammatical violations made by 244 British children, adolescents and young adults in their text messages was related to poorer performance on tasks of grammatical knowledge, including translating grammatically unconventional text messages into standard English. We found that variance in the production of grammatical violations in naturalistic messages was inconsistently predicted by grammatical task performance. Specifically, primary school children who made poorer grammar-based spelling choices were more likely to make more grammatical violations in their everyday messages, and university students who failed to correct more grammatical errors in a given set of messages were also more likely to make such errors in their own messages. There were no significant relationships for secondary school students. We conclude that using unconventional grammar when texting is not a consistent sign of poor grammatical abilities, although there may be links between some aspects of grammatical skill and grammatical violations in text messages.

Keywords: *text messaging, mobile phones, grammar, children, adults*

do i know its wrong: Children's and adults' use of unconventional grammar in text-messaging

Communication by text-message plays an ever-increasing role in contemporary life, with 9.6 trillion text-messages expected to be sent in 2012 (Portio Research, 2012). Although teenagers and young adults are heavy users of text-messaging (Ling, 2010; Ofcom, 2011a; Nielsen, 2010), children as young as eight are also regular texters, especially in the United Kingdom (Ofcom, 2011b). Text messages are often written in a casual form, characterised by spellings called 'textisms' (Durkin, Conti-Ramsden, & Walker, 2011; Plester, Wood, & Joshi, 2009; Rosen, Chang, Erwin, Carrier, & Cheever, 2010). These include abbreviations (e.g., *tmrw* for *tomorrow*), letter/number homophones (e.g., *c u 2night* for *see you tonight*), and initialisms (e.g., *lol* for *laughing out loud*). The use of textisms was encouraged by the limitations imposed by the small screens, alphanumeric keypads, and 160-character message limit of early mobile phones. However, despite the advent of QWERTY keyboards and word-predicting software, the use of textisms is still an integral part of text-messaging for many, especially younger texters (De Jonge & Kemp, 2012; Wood et al., 2011). Using abbreviated spellings can save time, and can also identify one's membership of a social group (Green, 2003; Taylor & Harper, 2001), and maintain relationships (Ling, 2004; Ling & Yttri, 2002).

The widespread use of textisms has led parents, educators, and the media to speculate about the harm that texting could be doing to young people's conventional reading and writing skills (see Thurlow, 2006). However, a growing body of research shows that the links between children's ability to read and write textisms and their conventional literacy abilities are overwhelmingly positive (Bushnell, Kemp, & Martin, 2011; Plester et al., 2008, 2009; Wood et al., 2011). The story for teenagers and adults is less clear, with researchers finding a mix of neutral and negative relationships between textism use and literacy skills (Drouin, 2011; Drouin & Driver, 2012; De Jonge & Kemp, 2012; Grace, Kemp, Martin, & Parrila,

2013), and positive relationships when the measures included the accuracy of reading textisms (Kemp, 2010) or the quality of informal writing (Rosen et al., 2010).

Research to date has concentrated on the varied spelling of individual words in text messages. However, many text messages also transgress some of the conventions of grammar. We use the term *grammar* here in the broad sense that it is used in many classrooms, in style guides, and in general parlance, to include morphology and syntax, but also orthographic conventions about capitalisation and punctuation, since these need to reflect the syntactic structure of phrases and sentences, and the grammatical status of some words (e.g., proper nouns). Further, we use *violation* for grammatical transgressions which may represent mistakes made through lack of knowledge or care (e.g., *your funny*; *its sam*). However, we acknowledge that some violations reflect a deliberate choice, made to affirm the sender's social identity or simply to save time/effort. For example, Ling and Baron (2007) found that American college students omitted 70% of full stops and 27% of question marks in their naturalistic (sent) text messages. These violations appear attributable to the physical constraints of the phones of the time, since such omissions were much rarer in the same students' (computer-based) instant messages. Other researchers have reported on the widespread omission of punctuation, especially of apostrophes, in text-messaging (e.g., De Jonge & Kemp, 2012; Drouin & Driver, 2012; Herring & Zelenkauskaite, 2009; Plester et al., 2009).

Other grammatical transgressions are used to represent casual speech, as ungrammatical word forms (*you is the best!*) or merged verb + preposition (*you gonna come?*) (e.g., Plester et al., 2008, 2009). Spellings such as *frendz* (De Jonge & Kemp, 2012) flout grammatical rules; here, that regular plurals are spelled with a final *s*. Sentence-level grammar can also be violated by the omission of words (Bodomo, 2010), including pronouns, verbs, and function words (*I going now. Coming too?*) or verb endings (*he look good*). In a corpus analysis of

over 11,000 text-messages sent by British adults, Tagg (2009) calculated, for example, that *I* was missing on average 29% of the time before *am* and *was*, and indefinite and definite articles were omitted in 16% and 31% of cases, respectively.

Texters also use unconventional devices to punctuate their messages. Sentences may end with multiple exclamation or question marks (*cute or what??!!)*, or be separated by ellipses (*hi...just seeing how u r... hope ur ok*). Different types of textism might be seen between different cultures and samples, or with changing technology and fashions. For example, texters may use multiple punctuation marks quite rarely (in only 0.7% of messages analysed by Thurlow & Brown, 2003) or more often (an average of 1.2 examples per message, Herring & Zelenkauskaite, 2009).

Like other forms of computer-medicated communication, text-messages sometimes include symbols (e.g., to represent kisses and hugs, *xx, xox*) and emoticons (e.g., ☺, *:-P*). These add pragmatic meaning (Dresner & Herring, 2010) or social and emotional intent (Provine, Spencer, & Mandell, 2007; Tossell et al., 2012). Thurlow and Brown (2003) found that nearly 6% of undergraduates' text-messages contained kisses, but only 0.5% contained emoticons, and Ling and Baron (2007) reported only one emoticon per 1,000 words of texting. More recent analyses have shown emoticons to occur in 4.2% of adults' sent messages (Tossell et al., 2012), and to make up 2% of all textisms (Grace, Kemp, Martin, & Parrila, 2012). Plester et al. (2009) found that just 33 of 88 child participants used symbols (a mean of 4.3 times each across ten messages), and Plester et al. (2008) found that children used symbols 1% of the time. Emoticons, symbols, and initialisms are also sometimes used in place of standard punctuation marks (e.g., *yeah* ☺ *can't wait*), and usually occur at phrase breaks (Provine et al., 2007).

In sum, it is likely that at least some grammatical "errors" are deliberate, to save time, or to express social identity, emotion or casual speech. However, extensive exposure to such

violations could lead to a failure to consolidate, or recall, some conventions of written English. This is not an unreasonable concern: there is evidence, for example, that exposure to misspelled words leads college students to make significantly more errors when they are then asked to spell these words, either immediately or after a one-week delay, regardless of overall spelling ability (Dixon & Kaminska, 1997). However, a later study by the same authors showed that the spelling of ten-year-old children suffered no detrimental effect after exposure to misspelled words (Dixon & Kaminska, 2007), possibly because of children's less well-specified lexical representations, which make them less vulnerable to single exposures to misspellings. Exposure to textese-style misspellings may have a different effect again: Powell and Dixon (2011) showed that adults presented with these kinds of misspellings (e.g., *LMNt* for *element*) actually spelled the original words correctly more often than adults presented with conventional misspellings (e.g., *elament*). However, the visually distinct nature of the types of textisms used in this study may have meant that they did not interfere with the orthographic representations of the original words in the way that orthographically similar conventional misspellings did. In everyday text messages, grammatical conventions may be violated in more or less visually distinct ways (e.g., *duz u wanna go ☺?!* is more visually different from conventional writing than *does he wanna go?*). Further, children's (and perhaps adults') representations of a range of grammatical conventions are likely to be specified at varying levels of detail (e.g., some people may have no real idea of when *its* requires an apostrophe, whereas others may know, but not always bother to use it correctly in texting). It is therefore important to assess the extent to which the violation of grammatical conventions in text-messaging is associated with more conventional grammatical ability.

Few previous studies have compared the use or understanding of textisms with performance on grammar-based tasks. For example, people's awareness of words' morphological structure can be measured by asking them to pick the odd-word-out of triplets

such as *catching*, *talking*, *darling* (*darling* is odd because its *-ing* ending is not a grammatical morpheme). Scores on this task correlated positively with adults' ability to decipher textisms (Kemp, 2010), but negatively with teenagers' and adults' use of textisms when translating messages from standard English (De Jonge & Kemp, 2012). Cingel and Sundar (2012) gave a grammatical task (including recognition of correct verb agreement, punctuation, capitalisation, and spelling), to 10- to 14-year-olds. Scores on this task did not correlate significantly with punctuation and capitalisation errors in text-messages, but they correlated negatively with word-level textisms (abbreviations, initialisms, letter omissions, and homophones). However, the results should be interpreted with caution, as the children scored their own textisms, and those with poorer grammatical skills may not have reliably recognised their own grammar-based errors.

To understand the links between text-messaging and grammar, then, further assessment is necessary. The Test of Receptive Grammar-II (TROG-II; Bishop, 2003) is a well-used test of the understanding of spoken grammar. However, it does not extend to written language. Although written English is basically alphabetic, some aspects of its spelling are determined by grammatical rules (Nunes, Bryant, & Bindman, 1997). For example, some inflectional endings are spelled in a consistent way despite their differing pronunciations (e.g., *smil**ed***, *laugh**ed***, and *hoot**ed***). Children often begin spelling such words as they sound (e.g., *laf**t*** for *laughed*), and take some years to learn the grammatical endings (Nunes et al., 1997). Children might also take time to learn that common pronunciations such as *hafta* and *wanna* are spelled *have to* and *want to*, and even adults frequently confuse grammatical forms such as *your* and *you're* (Kemp, 2009). Thus, children and adults who text-message frequently may forget or ignore the conventional spellings of a variety of word- and sentence-level grammatical forms.

As noted earlier, children are sending and receiving text messages at increasingly younger ages, using increasingly sophisticated technology. The first aim of the present study was to collect updated data on the phone use and messaging behaviour of children, teenagers, and young adults in the UK. The second aim was to investigate the nature and extent of the grammatical violations seen in naturalistic text messages. The third aim was to examine whether participants could correct, in a given set of messages, the very types of grammatical errors that are frequently seen in text messages.

If making frequent grammatical errors when texting reflects a poor grasp of the grammatical conventions of written English, we would expect that scores on tasks of grammatical skill (here, the TROG-II and the grammatical spelling choice task), in addition to the ability to correct grammatical errors in a set of text messages, would predict the proportion of grammatical violations seen in people's everyday text messages. An alternative view is that for many texters, the violation of grammatical conventions in naturalistic text messages represents deliberate time-saving or social expression. In this case, we would expect that there would be only limited predictive value in examining people's performance on tasks of grammatical skill and grammatical correction. We set out to examine these two possible relationships in children, teenagers, and young adults.

Method

Participants

Participants came from several schools and one university in the West Midlands of England, and were tested during 2011. The primary school group comprised 89 children (42 boys) aged 8-10 years (*M* age 9;11 years, *SD* 7 months). The secondary school group comprised 84 children (52 boys) aged 11-15 years (*M* age 12;11 years, *SD* 15 months). There were 70 university students (19 men) aged 18-30 years (*M* age 20;6 years, *SD* 3 years). (The greater proportion of females in the adult sample reflects the usual gender imbalance in

university Psychology classes.) Children (and their parents) agreed to participate after their schools had been invited to take part in the study, and adults participated in exchange for course credit. All participants regularly wrote text messages, and all of the children, and all but six of the adults, had English as their first language. We found that the patterns of grammatical violations made by those six adults did not differ significantly from their peers, and so we included all participants' scores in our analyses.

Materials

Questionnaire. Participants answered a series of questions that included how long they had owned a mobile phone, their current phone's keyboard type and use of predictive text, the frequency with which they sent text messages, and reasons for and preferences about writing text messages.

Naturalistic text messages.

Message collection. Participants were asked to write down, verbatim from their phones, all the messages that they had sent within a recent two-day period (excluding any messages that they were not comfortable to have documented). Previous experience has shown that participants can complete this task well when the importance of accurate transcription is emphasised, but in addition, the researchers or teaching staff checked the accuracy of the transcripts. These messages were coded for a range of grammatical violations, combined into four main categories: missing punctuation, missing capitals, word/grammar errors, and unconventional punctuation, as listed in Table 1.

Proportion of grammatical violations. The proportion of each type of grammatical violation was calculated in terms of the number of violations per message, divided by the number of words per message.

Text messages for translation.

Message creation. A set of 12 text messages was developed, based closely on messages collected during a pilot study with similar participants to those in the current study (e.g., *Im going at 6.00 sarahs not coming tho*). Participants were asked to rewrite the messages (on paper) into conventional written English; for example, to *I'm going at 6.00. Sarah's not coming, though.* Each message ranged in length from 4 to 13 words (mean 7.4) and, in line with the patterns shown in the pilot collection study, each message contained a range of grammatical violations, specifically, 0 to 2 punctuation marks or emoticons/kisses used as punctuation (mean 0.9), as well as 2 to 7 violations of conventional written English grammar (mean 4.3). These violations were of the same categories as listed in Table 1. A small number of non-grammar-based textisms were also included to keep the messages looking realistic (e.g., *ya* for *you*), but were not counted in the corrections.

Proportion of grammatical violations. The mean proportion of grammatical textisms to words for these constructed messages was .53. This proportion is rather higher than the overall mean that would be found in a typical sample of messages, but at the level of the individual message, each was modelled on the higher-textism-density messages that we had observed in collecting pilot data. Using messages with relatively high proportions of textisms kept the number of messages that the participants had to rewrite within reasonable limits, especially for the younger participants.

Grammatical skill tasks.

Test of Receptive Grammar II (TROG-II; Bishop, 2003). The TROG-II is a standardised assessment of children's and adults' understanding of spoken grammar. For each item, participants were required to choose one of four pictures that corresponded to a sentence read out by the researcher (e.g., *The book that is blue is on the pencil*).

Grammatical Spelling Choice Task (based on Mitchell, Kemp, & Bryant, 2011, and see Wood, Kemp, Waldron, & Hart, 2014). This task tested participants' ability to choose the

grammatically appropriate one of two alternative pseudoword spellings. For each item, the appropriate spelling was cued by the grammatical structure of the sentence. For example, in the sentence "Can you *joff* your computer? I *joffed* / *joft* mine", both *joffed* and *joft* are phonologically and orthographically plausible for the target pseudoword. However, the inclusion of the base form *joff* is the cue that the past-tense *joffed* is the grammatically appropriate spelling[1].

There were 64 pseudowords, representing eight types of grammatical status, for each of which there exists a spelling rule. Sixteen were presented as plural nouns (which require a final *s*, e.g., *thocks*) or singular nouns (which require a non-*s* spelling, e.g., *thox*). Sixteen were presented as third-person singular present verbs (*s* spelling) or verb infinitives (non-*s* spelling). Sixteen were presented as regular past-tense verbs (which require a final *ed*, e.g., *joffed*) or as nonverbs (which require a non-*ed* spelling, e.g., *joft*). The final 16 pseudowords were presented as agentives (which require a final *ist*, e.g., *maibist*) or superlatives (which require a final *est*, e.g., *maibest*).

Participants saw 64 printed sentences. In each, one form of a pseudoword (e.g., plural noun) was represented by three dots (so as not to bias spelling), and a printed choice of two spellings was given for a different form of the pseudoword (e.g., singular noun). The researcher read each sentence aloud, including the missing and target form of the pseudoword. Participants circled the target pseudoword spelling they thought was the more appropriate. An example printed sentence is *I have two ..., but Mary has only one thox / thocks*, with the researcher pronouncing the missing plural form as "thoxes". Participants received one point for each correctly identified word.

Procedure

[1] There are some exceptions in which the present-tense form of a verb, unchanged in pronunciation in its past-tense form, can be spelled with an *-ed* or non-*ed* ending (e.g., *spell* → *spelled* or *spelt*). Nevertheless, the overwhelming majority of verbs, whose base portion is pronounced the same in the present and past tense, take the regular *-ed* ending, and even 8- and 9-year-old children know this pattern (Bryant, Nunes, & Snaith, 2000).

Participants were seen in two to three sessions in a quiet classroom. The TROG-II was administered in an individual session, and the grammatical spelling choice task was administered in one or two group sessions of 5-20 students. The children also completed the questionnaire and translation task in groups, with researchers assisting as necessary, while the adults completed these tasks in their own time. Participants wrote down their naturalistic messages in their own time (since most children were not allowed to have phones at school).

For both the naturalistic and the translated text messages, the proportion of grammatical violations made (for the naturalistic messages) or left uncorrected (for the translated messages) was calculated by dividing the number of grammatical violations made/left by each participant by the total number of words in the messages. The violations were calculated in terms of the four categories listed earlier, in Table 1. Some participants introduced new errors during the translation task (e.g., by omitting some of the capitals or punctuation provided), and these errors were included in the count. The proportion of correct choices was calculated for the grammatical spelling choice task, and standard scores were calculated for the TROG-II.

Results

Questionnaire

Participants' self-reported use of mobile phones and texting is summarised in Table 2. As expected, primary school students had used a mobile phone for the shortest amount of time. However, it is clear that children are starting to use mobile phones at progressively younger ages, with mean age of first phone use decreasing from the 15-year-olds' mean of 10.1 years (*SD* 1.5 years) to the 8-year-olds' mean of 6.3 years (*SD* 1.8 years). QWERTY keyboards were more common for older participants, and alphanumeric keypads for younger participants, possibly because the young adults had the financial resources to buy more

expensive and modern phones, and/or younger children received cheaper or pre-owned phones from older family members.

The questionnaire data (Table 2) also show that most participants perceived it as important to keep their phone charged, and most secondary and university students reported carrying their phone every day (even if this went against school rules). The number of messages sent daily increased with age group. In all age groups, the majority of participants reported that they wrote text messages when they were bored, and that they preferred to text their friends than ring them, although this preference increased with age. Many participants (especially the adults) rated that writing text messages took up the same amount, or more time, than a list of daily activities: reading for leisure, doing school/university work, using a computer, watching television, and playing video games. The only activities more popular than texting were playing computer games and watching television, and only for the younger children.

We next report the measures that give a more specific picture of the text messages that the participants had written. Table 3 shows these descriptive statistics, as well as the *F*-values resulting from univariate analyses of variance (ANOVAs) comparing age groups on each factor. To allow comparisons with previous research, Table 3 also shows the number of 'traditional', non-grammar-violating textisms, calculated as a proportion of the number of words texted (e.g., De Jonge & Kemp, 2012; Plester et al., 2008, 2009). Tukey post-hoc tests confirmed that adults sent more, and longer, messages, than the two school groups ($p < .001$), whose texting behaviour did not differ significantly. However, there was a significant spike in the use of nongrammatical text abbreviations during secondary school, compared to during primary school ($p < .001$) and university ($p < .05$).

Grammatical skill tasks

Table 3 also shows participants' scores on the standardised and experimental tasks of grammar. The reliability of the TROG-II with the current sample was excellent (Cronbach's alpha .92), and the reliability of the grammatical spelling choice task was good (Cronbach's alpha .88). All three age groups performed within the normal age range on the TROG-II, and their standard scores did not differ significantly from each other. On the grammatical spelling choice task, scores increased significantly across the three age groups ($p < .01$).

Naturalistic text messages: proportion of grammatical violations

Table 4 shows a breakdown of the mean proportion of the detailed categories of grammatical violation made in the naturalistic text messages, expressed as a proportion of the total words per message. All three age groups made numerous grammatical violations. On average, both primary and secondary school students produced about half as many grammatical errors as actual words in their messages, but the university students showed only about a quarter as many errors as words. Overall, the most common error was to omit sentence-level punctuation (commas, full stops, and question marks), followed by omitting words, missing sentence-initial capital letters, and replacing conventional sentence-final punctuation with emoticons, kisses, or initialisms.

The numbers are too small and the comparisons too numerous to make statistical comparisons for each. However, some contrasts are highlighted to explore the extent to which participants' grammatical violations might have been corrected automatically by their phone software. Two common errors for phones to correct are to add missing sentence-level punctuation (such as full stops), and to capitalise letters in sentence-initial position. The tendency to omit sentence-level punctuation, and to omit capital letters at the start of sentences, was much more marked in primary and secondary students than in university students. This could be due to young adults being more likely to avoid these errors themselves, or to own more sophisticated phones which corrected these errors, or a

combination of both. However, Table 4 shows a different pattern of results for two errors that are not always corrected by phone software: there are very limited differences between the three age groups on the proportions of missing apostrophes (as it is often not clear if a word is a possessive or a plural) and missing capitals for proper nouns (which may not always be stored in the phone's dictionary). Although these proportions are very small in the first place, they do suggest that the apparent grammatical advantage that adults have over children may stem at least partly from their access to superior phone technology. However, adults' greater focus on spelling grammatical forms correctly must also play a role: dividing the participants by keyboard type and by predictive text use (rather than age group) led to much smaller between-group differences.

Comparison of grammatical violations made in naturalistic messages and left uncorrected in translated messages

Table 5 shows the mean proportions of the four broad categories of grammatical violation made in the naturalistic messages, and left uncorrected in the translated messages. It appears that participants knew more about grammar than their naturalistic messages would suggest, as the number of errors remaining after correction is less than the number of errors in the sent messages, for each category. However, it is also clear the errors were not reduced to zero, even by the adults.

A repeated-measures analysis of variance (RM-ANOVA) was conducted on the data, to determine whether the grammatical violations seen in the naturalistic messages realistically represented participants' knowledge of grammar, or whether they could produce messages without grammatical errors when asked to do so (by correcting the errors in the messages given for translation). This ANOVA had two within-subjects factors, Message Type (Naturalistic, Translated) and Error Type (Missing Punctuation, Missing Capitals, Word/Grammar Errors, Unconventional Punctuation), and one between-subjects factor, Age

Group (Primary, Secondary, University). This ANOVA revealed a significant main effect of Message Type, $F(1, 240) = 177.83$, $p < .001$, partial $\eta^2 = .41$. This confirmed that there were fewer grammatical errors in the translated than the naturalistic messages. There was also a significant main effect of Error Type, $F(3, 720) = 116.58$, $p < .001$, partial $\eta^2 = .33$. Tukey post-hoc tests showed that overall, missing punctuation was significantly more common than word/grammar errors, which were significantly more common than missing capitals, which were in turn significantly more common than unconventional punctuation, ps < .01. The main effect of Age Group was also significant, $F(2, 240) = 73.72$, $p < .001$, partial $\eta^2 = .38$. Tukey post-hoc tests confirmed that adults made significantly fewer grammatical violations than the two school groups, $p < .01$, who did not differ significantly from each other.

All of the two-way interactions were significant, but these were subsumed into a three-way interaction, $F(6, 720) = 6.37$, $p < .001$, partial $\eta^2 = .05$. Again, post-hoc Tukey tests identified the significant differences between individual means (all ps < .01). In their naturalistic messages, adults made significantly fewer grammatical errors of all four types than either school group, while the secondary students showed significantly less unconventional and missing punctuation than the primary students. In their translated messages, adults made significantly fewer errors in terms of missing punctuation and word/grammar errors than either school group, and fewer missing capitals than the primary school group. The secondary and primary school groups showed no significant differences on their translated messages. Thus, older texters made fewer grammatical errors than younger texters, but these differences were much clearer in naturalistic than translated messages.

Comparing message types within age groups, all three age groups were able to correct the very type of grammatical errors that appeared in their naturalistic messages. Specifically, the post-hoc tests showed that adults made significantly fewer errors in their translated than naturalistic messages in terms of unconventional punctuation and word/grammar errors

(missing capitals and missing punctuation did not differ significantly). Further, the two school groups showed significantly fewer errors on their translated than their naturalistic messages on all four error types, except for primary students on unconventional punctuation (which they appeared to have trouble knowing how to "translate").

Predictors of naturalistic grammatical violations

As noted in the introduction, if making grammatical errors when texting reflects poor understanding of grammatical conventions, then scores on the two tasks of grammatical skill, in addition to the ability to correct grammatical errors in text messages, should predict the proportion of errors made in naturalistic messages. If, however, the presence of grammatical violations in everyday texting instead mostly represents a deliberate saving of time, or a show of linguistic fun or social identity, then the proportion of grammatical violations seen in the naturalistic messages should not be predicted by these grammatical task scores. We carried out a regression analysis for each age group, with three predictors; scores on the TROG-II, the grammatical spelling choice task, and the text message translation task of grammatical correction.

For the primary school group, the model incorporating these three predictors explained 20% of the variance in the proportion of grammatical violations in naturalistic text messages, $R^2 = .20$, $F(3, 66) = 5.33$, $p = .002$. This variance was not predicted significantly by scores on the TROG-II (ß = .12, $p = .32$) nor the translation task (ß = .15, $p = .25$), but was predicted by scores on the grammatical spelling choice task (ß = -.36, $p = .01$). Specifically, children who had poorer scores on the spelling choice task made more grammatical violations in their everyday text messages. For the secondary school group, the model predicted a non-significant 2% of the variance in grammatical violations in naturalistic messages, $R^2 = .02$, $F(3. 80) = 0.56$, $p = .64$. None of the three predictors made a significant contribution: TROG-II (ß = -.02, $p = .88$), spelling choice task (ß = .12, $p = .34$), nor translation task (ß = -.06, p =

.60). For the university group, the model predicted a non-significant 8% of the variance in the use of grammatical violations in naturalistic messages, R^2 = .08, $F(3, 85) = 2.45$, p = .07. This variance was not predicted significantly by scores on the TROG-II (ß = .09, p = .48) nor the grammatical spelling choice task (ß = -.07, p = .54), but was predicted by scores on the translation task (ß = .28, p = .02). Thus, adults who left more grammatical errors uncorrected in a given set of text messages tended to make more grammatical violations in their naturalistic text messages.

Discussion

The aims of this research were to study young people's text messaging behaviour, to examine the nature and extent of the grammatical violations they made in their text messages, and to test whether making such grammatical violations is associated with a poor understanding of grammatical conventions. In terms of the first aim, the results confirmed that at least in the UK, children are beginning to use mobile phones at progressively younger ages, with the youngest participants (age 8 years) reporting their first mobile phone use at age 6. This tendency will require further study, as it suggests that already, at least some children are beginning to learn to read and write conventionally at the same time as they may be starting to use or see textisms. This could potentially lead to more confusion about conventional writing than has been seen in studies to date, in which participants have had the chance to consolidate their literacy skills before starting to use text messaging. The current results showed that the use of text messaging increased with age, but confirmed the importance of text-messaging for all age groups, with even primary school children reporting that they preferred to text than ring friends, and spent longer on texting than many other everyday academic and leisure activities.

We briefly considered the nongrammatical textisms produced (such as *sis* for *sister*, *txt* for *text*, and *r u there?* For *are you there?*). We observed textism densities of about 28% for

the primary school students and 20% for the university students, not too dissimilar from the densities reported in recent studies of naturalistic messages (16% for 9- to 10-year-olds, Wood, Jackson, Hart, Plester, & Wilde, 2011; and for undergraduates, 28%, Drouin & Driver, 2012, and 17%, Grace et al., 2012). Our secondary school sample, in contrast, sent messages containing over 40% textisms. This greater use may stem from the secondary students making the most of the (relatively) new opportunity to carry and use their phones at all times, and thus to experiment with different ways of writing, compared to the primary students, with their more restricted phone access, and the university students, for whom the appeal of using textese may have diminished with experience and maturity. The greater use of textese by the secondary school sample may also reflect the importance of developing one's social identity during adolescence, as textisms are often used by teenagers for social as much as for linguistic reasons (Green, 2003; Ling, 2004; Ling &Yttri, 2002; Taylor & Harper, 2001).

The second aim of this study was to examine the violations of conventional grammar made in naturalistic messages. We observed a variety of such violations, in line with previous research (e.g., Ling & Baron, 2007; Plester et al., 2008, 2009; Tagg, 2009; Thurlow & Brown, 2003). Young adults, teenagers, and children all showed multiple examples of missing or unconventional punctuation, missing capitals, and errors in word-level grammar. Combined, these errors occurred at a ratio of about one for every two words for the two child groups, and one for every four words for the adults. For children, the most common error was to omit conventional punctuation (e.g., *hi how are you*), followed by omitting words (pronouns, verbs, and function words, e.g., *you want come out?*); for adults, these two types of violations were also the most common. Although we cannot be sure without asking individual writers, the omission of non-essential words seems likely to represent a deliberate transgression rather than a grammatical oversight. However, our results suggest that the

omission of conventional punctuation may stem from a mixture of carelessness and the lack of consistent use of predictive software (both of which appeared to be more common in the younger age groups).

The final aim of this study was to determine whether participants could correct, when asked, the types of grammatical violations that they produced in their everyday text messages. We found that children, teenagers, and young adults all significantly reduced the proportion of grammatical errors they had made on all or nearly all of the four main textism categories. However, the corrections were not made uniformly, as some grammatical transgressions remained uncorrected, even for the adults, although the overall rate of errors was reduced by about half.

Related to this final aim, we asked whether the proportion of grammatical violations produced in participants' naturalistic messages could be predicted by their scores on the two tasks of grammatical skill, and their ability to correct such grammatical violations in the translation task. Regression analysis revealed that the proportion of grammatical violations in naturalistic messages was not consistently predicted by grammatical skill. The only two significant predictors were scores on the grammatical spelling task for the primary students, and scores on the message translation task for the university students. This means that children who found it harder to choose the correct grammar-based spelling for nonwords, and adults who found it harder to correct grammatical errors in others' messages, were more likely to include grammatical violations in their own text messages. Although no causal conclusions can be drawn from this cross-sectional study, it could be that children and adults who violate conventional written grammar when writing text messages might have a poorer grasp of some grammar-based spelling rules than their peers. However, this negative relationship is not a general one, as it occurred for only one of the three tasks for two of the age group.

There was no significant relationship between grammatical task score and naturalistic grammatical violations for the secondary school students. For these students, it may be that using unconventional written forms is a socially expected aspect of digital communication (Lewis & Fabos, 2005; Ling, 2010). This possibility is reflected in the secondary group's relatively high use of nongrammatical textisms. Thus, the widespread use of unconventional writing forms in the secondary school years might mean that, regardless of students' other language skills, no significant relationships exist between grammatical violations in messages and more conventional grammatical skills.

Limitations and conclusions

The present results come from self-chosen and self-transcribed messages, and thus may not perfectly reflect the pattern of grammatical transgressions present in the messages sent, despite our efforts to check the transcripts against the actual messages. Future researchers should consider having participants forward their text messages directly to a central phone number or server to assure the accuracy of the chosen messages (as done by Underwood, Rosen, More, Ehrenreich, & Gentsch, 2012). We did not have information on the nature of the relationship that our participants had with the recipients of the messages analysed here (e.g., parent, friend, boss), and nor did we have access to the messages that our participants had previously received from these recipients. These will be important factors to take into account in future work, since people might write quite different text messages to different people, depending on their relationship and the expectations or understanding that the sender and recipient have about the written language used in text messages. Further, although our child and adolescent samples were relatively gender-balanced, our adult sample, like that of many other undergraduate-based texting studies (e.g., De Jonge & Kemp, 2012; Drouin & Driver, 2012; Ling & Baron, 2007) did show a preponderance of females. Since women tend to produce more text messages, and more words per message, than men (e.g., Baron &

Campbell, 2010; Tossell et al., 2012), ways of finding more gender-balanced adult samples should be sought.

Overall, the current findings help to confirm that texters of various ages do violate the conventions of English grammar when they compose messages. However, the children and adults who make such errors do not necessarily do so simply because they do not know, or have forgotten, grammatical conventions. It seems more likely that people are also saving time and effort, or making social links. A significant proportion of the variance in the production of grammatical violations in naturalistic text messages was explained by performance on the grammatical spelling choice task for children, and on the ability to correct grammatical violations in messages for adults. This suggests that children and adults with poorer knowledge of grammatical conventions may manifest some of this difficulty in their naturalistic messaging. Writing text messages with numerous grammatical violations could lead to poorer conventional grammar. However, this explanation cannot be the whole story, as the links between grammatical scores and the incidence of naturalistic grammatical violations were not consistent across tasks or age groups. Longitudinal data are needed to confirm these speculations. For now, however, the overall conclusion seems to be that parents and educators need not be concerned that children's grammatical knowledge is being consistently or directly compromised when they make grammatical violations in their text messages.

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Table 1

Categories of Grammatical Violations in Naturalistic and Translated Messages

Category of violation, and violation types	Example
Missing punctuation	
Missing comma/full stop/question mark	*Great how about you*
Missing contractive/possessive apostrophe	*Ill find out.*
Missing capitalisation	
i for pronoun *I*	*i finally finished.*
Missing capital for proper noun	*I heard jess is coming.*
Missing capital for start of sentence	*it sounds like fun.*
Word and grammatical errors	
Missing pronoun/verb/function word	*Am going out soon; I going out soon*
Lack of verbal agreement	*I am go soon; Does you want to go?*
Verb + preposition merged	*Tryna, hafta, wanna, gonna*
Grammatical homonyms	*Their nearly here; Your hilarious*
Unconventional punctuation	
>1 question mark/exclamation mark	*Did you see her dress???*
Ellipsis for other punctuation*	*Hi…How's it going?*
Start of sentence emoticon/kiss	*:D Hi there! / xx Hello*
End of sentence emoticon/kiss/initialism	*I miss you ☺/ It's all over lol*

Note. *Ellipses were not used in the messages to be translated, but appeared in many naturalistic messages

Table 2

Text-Messaging Questionnaire Responses Across Age Group

	Primary	Secondary	University
Mean no. years owned phone (SD)	2.2 (1.7)	4.0 (2.5)	7.9 (2.8)
Mean age of first phone (SD)	8.4 (10.2)	8.5 (2.2)	12.6 (2.6)
Percentage of participants:			
Use qwerty keyboard?[a]	37	55	70
Use alphanumeric keyboard?*[a]	43	29	23
Always use predictive text?[a]	19	20	34
Carry phone every day?[a]	21	83	96
Phone allowed at school?[a]	12	76	-
Send 3-9 messages daily[a]	55	24	30
Send ≥10 messages daily[a]	14	48	60
Write texts when bored?[a]	66	66	86
Prefer to text than ring friends?[a]	56	71	86
(Very) important to keep phone charged?[b]	87	84	99
Spend same/more time texting than on other activities?[c]	34-62	44-68	57-81

Note. * Other students reported having a phone with letters in alphabetic order. [a] 'Yes' response to yes/no questions, [b] 'Very' or 'quite important' response on four-point scale, [c] 'Yes' or 'Same amount' response on three-point scale, for five given activities: reading for leisure, doing school/university work, using a computer, watching television, and playing video games.

Table 3

Characteristics of Naturalistic Text-Messages, and Mean Scores on the Standardised and Experimental Tasks of Grammar. Standard Deviations in Parentheses.

	Primary	Secondary	University	*F*-value[e]
Naturalistic texting:				
Total no. messages sent[a]	7.84 (5.97)	8.43 (5.85)	19.16 (9.23)	60.41**
Total no. words sent	33.37 (27.18)	33.38 (29.69)	180.84 (101.1)	154.18**
No. words/message	4.47 (2.05)	4.19 (2.66)	9.89 (4.36)	78.89**
Traditional[b] textism density	.28 (.21)	.41 (.21)	.20 (.13)	24.71**
Grammatical tasks:				
TROG-II[c]	91.16 (13.12)	91.96 (16.06)	96.59 (13.69)	3.13*
Grammatical Spelling Choice[d]	.59 (.10)	.62 (.14)	.83 (.14)	84.40**

Note. [a] Over two-day period, [b] Ratio of nongrammatical textisms to words, [c] Standard score, [d] Proportion correct, [e] *F*-values for univariate ANOVAs for age group, ** $p < .001$, * $p < .01$.

Table 4

Mean Proportions of each Category of Grammatical Violations Made In Naturalistic Messages for each Age Group. Standard Deviations in Parentheses.

Category of violation, and violation types	Primary	Secondary	University
Missing punctuation			
Missing comma/full stop/question mark	.226 (.184)	.182 (.112)	.051 (.057)
Missing contractive/possessive apostrophe	.012 (.027)	.014 (.029)	.015 (.030)
Missing capitalisation			
i for pronoun *I*	.012 (.027)	.005 (.013)	.008 (.013)
Missing capital for proper noun	.016 (.029)	.014 (.029)	.011 (.015)
Missing capital for start of sentence	.073 (.085)	.060 (.082)	.010 (.029)
Word and grammatical errors			
Missing pronoun/verb/function word	.103 (.116)	.108 (.126)	.061 (.047)
Lack of verbal agreement	.007 (.018)	.005 (.018)	.007 (.047)
Verb + preposition merged	.003 (.013)	.011 (.028)	.006 (.016)
Grammatical homonyms	.004 (.016)	.002 (.010)	.002 (.006)
Unconventional punctuation			
>1 question mark/exclamation mark	.006 (.018)	.007 (.022)	.005 (.014)
Ellipsis for other punctuation	0 (0)	.004 (.120)	.006 (.012)
Start of sentence emoticon/kiss	0 (0)	.002 (.010)	.001 (.003)
End of sentence emoticon/kiss/initialism	.026 (.110)	.071 (.093)	.037 (.037)

Table 5

Mean Proportion[a] of Grammatical Violations Made in Naturalistic and Translated Messages. Standard Deviations in Parentheses.

	Primary	Secondary	University
Naturalistic messages			
Missing punctuation	.24 (.19)	.20 (.12)	.07 (.08)
Missing capitals	.10 (.91)	.08 (.10)	.03 (.04)
Word/grammar errors	.13 (.13)	.14 (.16)	.08 (.06)
Unconventional punctuation	.04 (.11)	.10 (.12)	.07 (.05)
Total	.50 (.29)	.52 (.23)	.24 (.12)
Translated messages			
Missing punctuation	.13 (.05)	.13 (.05)	.05 (.04)
Missing capitals	.05 (.03)	.04 (.03)	.01 (.01)
Word/grammar errors	.07 (.03)	.06 (.03)	.03 (.03)
Unconventional punctuation	.04 (.02)	.04 (.02)	.01 (.02)
Total	.29 (.11)	.27 (.10)	.09 (.07)

Note. [a]Ratio of number of grammatical violations per message to number of words per message.