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A Longitudinal Study of Children's Text Messaging and Literacy Development

Abstract

Recent studies have shown evidence of positive concurrent relationships between children's use of text message abbreviations ('textisms') and performance on standardised assessments of reading and spelling. This study aimed to determine the direction of this association. One hundred and nineteen children aged between 8 and 12 years-old were assessed on measures of general ability, reading, spelling, rapid phonological retrieval (RAN) and phonological awareness at the beginning and end of an academic year. The children were also asked to provide a sample of the text messages that they sent over a two-day period. These messages were analysed to determine the extent to which textisms were used. It was found that textism use at the beginning of the academic year was able to predict unique variance in spelling performance at the end of the academic year after controlling for age, verbal IQ, phonological awareness and spelling ability at the beginning of the year. When the analysis was reversed, reading and spelling ability were unable to predict unique variance in textism usage. These data suggest that there is some evidence of a causal contribution of textism usage to spelling performance in children aged 8 to 12 years. However, when the measure of rapid phonological retrieval (rapid picture naming) was controlled in the analysis the relationship between textism use and spelling ability just failed to reach statistical significance, suggesting that phonological access skills may mediate some of the relationship between textism use and spelling performance.

Keywords: reading, spelling, texting, phonological awareness, technology

The Relationship between Children's Use of Text Message Abbreviations and Literacy Development: A Longitudinal Study

Text messaging and the use of mobile phones is part of the everyday lives of young people. The Mobile Life Report (LSE, 2008) found that 94% of young people in the UK own a mobile phone (80% in the US). Ofcom's (2008) Media Literacy Report identified that between the ages of 9-15, the percentage of mobile phone users leaps from 52% to 95%. Children are now using mobile phones at earlier ages than before (Ofcom 2008), and Ofcom also report that 79% of 8-11 year olds own or have use of a mobile phone compared to 93% of 12-15 year olds.

Fifty percent of young people in the UK currently send an average of more than six text messages a day, and 52% of UK children and 32% of US children prefer to text their friends than call them (LSE, 2008). Children and young people's use of mobile phones for text messaging has, however, often come under fire in the media (e.g. Humphreys, 2007; Sutherland, 2002). In a critical review of 101 media articles released between 2000 and 2005, Thurlow (2006) examined media views of young people's language practices with new technology such as mobile phones. He identified the themes that emerged from the analysis and found an "overwhelmingly pessimistic picture" (p677) "feeding popular, social anxieties about the impact of new media" (p676).

As part of this ongoing popular narrative about the detrimental impact that mobile phones are having on young people's language development, text message abbreviations or 'textisms' are often represented in the media as misspellings. Even where children are observed to use textisms knowingly, the fear is that that these 'misspellings' cross over into children's school work and replace their knowledge of conventional forms (Woronoff, 2007). Such concerns at first glance appear to have some merit: Katz and Frost (2001) found that

exposure to misspelled words (phonologically-appropriate alternative spellings) appeared to interfere with undergraduate students' representation of the correct spellings, and they were more likely to judge misspelled words as correctly spelled when re-exposed to them. In contrast, Dixon and Kaminska (2007) found no measurable effect of the presentation of incorrect spellings on children's later spelling accuracy. Their explanation for this rests on the idea that children's lexical representations and processes are not yet fully developed and consequently exposure to words via reading does not appear to transfer easily into their written representations of words in memory. For adults, reading and spelling are more fully integrated processes, and so minimal exposure to a misspelling via reading will transfer more readily to the individual's representation of print forms. These results suggest that whilst exposure to textisms may undermine knowledge of correct spellings in adult samples of skilled readers, it is unlikely to affect formal spelling ability in children.

The suggestion that children's spelling abilities are robust to textism exposure requires direct empirical examination. Recently, Plester, Wood and Bell (2008) examined the effect of knowledge of text abbreviations on the literacy attainment of 11 and 12-year-olds. All the children were asked to complete a 'translation' exercise, which required them to translate messages from standard English into a text message and from text message language into standard English. When the children's use of text abbreviations in this exercise was considered, a positive association between textism use and performance on a verbal reasoning measure was found. Plester et al. (2008) conducted a second study involving 10-11 year old children, which looked more specifically at the relationship between textism use and spelling performance. This revealed a significant positive relationship between spelling scores on a standardised task and the ratio of textisms to real words that were used when converting sentences into text messages. Regression analysis showed that the use of the two most phonetically-based forms of textism alone (i.e. phonologically-based simplifications, such as

'nite' and youth codes in which the children wrote exactly as they spoke, as in 'wanna' and 'hafta') could account for 32.9% of variance in spelling ability.

Following on from this work Plester, Wood and Joshi (2009) examined the relationship between children's knowledge of text abbreviations and reading performance in a study that also took into account the potential contribution of individual differences in the children's vocabulary and short term memory. It was anticipated that the positive relationships that had been found between textism use and literacy performance might be explained by the children's phonological awareness - a skill that is linked to successful literacy outcomes in children (Oakhill & Beard, 1999; Stanovich, 2000). That is, it would seem that many of children's preferred textisms are phonetic in nature (e.g. *2nite, anuva,* see Plester et al. 2008) and so it seems likely that good phonological skills would be necessary for textism use; children first have to analyse a spoken word into its constituent phonemes before various (ortho)graphic representations for those sounds can be selected. A sample of children aged 10-12 years were assessed and asked to write text messages appropriate to a scenario that they were asked to imagine themselves in. As expected, phonological awareness skills (as measured by a spoonerisms test and phoneme elision) were found to mediate much of the relationship between textism use and reading ability. However, use of textisms could still account for a significant amount of variance in word reading ability after controlling for individual differences in age, memory, vocabulary, nonword reading and phonological awareness.

Studies of adult samples similarly show that young people who use textisms when writing with new technology do not show signs of problematic literacy skills. Drouin and Davis (2009) compared university students who engaged in text speak across a range of different technological devices to those who did not use it. They found no evidence of differences between the two groups in terms of their literacy performance and no significant

associations between frequency of use of text speak forms (based on a text translation exercise) and performance on standardised measures of literacy.

Rationale

The studies previously conducted to date are open to criticism on a number of counts. Firstly, the studies have relied on contrived experimental data, which may not reflect the actual texting behaviour of the individuals studied. A further criticism is that the data collected in these studies were concurrent. As a consequence, the associations observed cannot indicate the direction of association, which would clarify whether there is any evidence of a causal contribution of textism use to literacy skills and literacy development.

This study was therefore designed to explore the nature and direction of any associations found between children's actual use of textisms in their spontaneous text messaging and performance on measures of reading and spelling after controlling for the effects of verbal IQ, phonological processing and autoregressors. Measures were taken twice, once at the beginning of the academic year, and one again at the end of the academic school year. In line with previous research which has showed positive associations between literacy measures and textism use, it was anticipated that we would find significant positive associations between textism use at the beginning of the academic year and growth in literacy attainment over the year. It has been previously hypothesised that the reason why there is the observed relationship between textism use and literacy measures is because the association is mediated by the common skill of phonological awareness (Plester et al., 2009), and that general verbal ability has also been linked to textism use (Plester et al., 2008). As a result, measures of verbal IQ and the phonological measures were controlled in the analysis to see if these factors do, in fact, explain any relationships observed.

The direction of the analysis was also reversed to consider the extent to which literacy skills at the beginning of the year could account for change in the use of textisms over the

year. It seemed likely, if Plester et al.'s (2008; 2009) hypothesis about the central role of phonological processing in textism use is correct, then use of textisms should also be explained by competency in written language skills at the beginning of the year: i.e. children who are better readers and spellers (who have better phonological skills) will be more able to use textisms. In other words, we anticipate finding evidence of reciprocal contributions to growth between textism use and literacy outcomes.

Method

Participants

One hundred and nineteen children aged between 8 and 12 years (49 males and 70 females) were recruited from primary and secondary schools in the West Midlands, UK. The mean age of the overall sample was 10 years and 4 months (*SD*=12.63 months). All the children in the study either owned their own phone or had easy, regular access to someone else's. In terms of the distribution of participants by school year / grade, there were 22 participants in *Year 4*, 31 in *Year 5*, 42 in *Year 6* and 24 in *Year 7*. On average, the children who owned a phone were aged 8.1 years when they received their first mobile phone, with six participants receiving theirs at just five-years-old.

Wechsler Abbreviated Scales of Intelligence (Wechsler 1999).

Verbal IQ was measured using the *vocabulary* and *similarities* subtests of the *Wechsler Abbreviated Scales of Intelligence* (Wechsler 1999). The vocabulary subtest involved the researcher asking the participant what words meant with the participant describing the meaning of the words read to them (maximum raw score possible for oldest children in sample = 72). The similarities subtest involved the participant stating the similarities between two items that were read to them (maximum raw score possible for oldest children in sample = 48). The two tests were administered according to standardised instructions and standardised scores (i.e. *M*=100, *SD* = 15) were calculated for each child.

The internal reliability (alpha) for these subtests with the present sample were .877 and .809, respectively.

Literacy Assessments

The word reading and spelling subtests of the *British Ability Scales II* (Elliot, Smith and McCulloch 1996) were used to assess the reading and spelling skills of the children. The maximum raw score possible on the word reading subtest was 90, and the maximum possible raw score on the spelling subset was 75. Raw scores were converted to BAS ability scores prior to analysis. These measures were found to have internal reliabilities of .963 and .957 respectively. To assess children's phonological awareness the spoonerisms subtest from the *Phonological Assessment Battery* (PhAB; Frederickson, Frith and Reason 1997) was used. This is a test of phonemic awareness and requires the children to isolate and manipulate phonemes in spoken words. The assessment comprised two parts, with three practice items and ten test items each. The first part required the children to create new words by changing of their first sound (phoneme), for example changing cat with the use of the sound /f/ to fat. The second part required the creation of "real" spoonerisms. This was achieved by swapping the onsets of two words, for example "lazy dog" changes to "daisy log". A maximum score of 30 was possible on this task. The internal reliability for this measure with the present sample was .868.

The rapid picture naming (RAN) subtest from the PhAB was also administered in order to provide a measure of phonological retrieval, to compare to the contribution of phonological awareness. That is, phonological awareness as measured by the spoonerism subtask requires explicit awareness of individual phonemes and the ability to consciously manipulate them. This is one skill that we see utilized during textism construction. However, another aspect of phonological processing that appears to be required when using textisms is rapid retrieval of phonological information. Moreover, rapid naming is a skill

which has been demonstrated to be strongly related to literacy outcomes, although the exact nature of that relationship is still under debate (e.g. Bowers & Ishaek, 2003; Georgiou, Parrila, & Kirby, 2009; Torgesen, Wagner, Rashotte, Burgess & Hecht, 1997; Wile & Borowsky, 2004). We used a rapid picture naming test to assess rapid phonological retrieval in a general way (i.e. in a way not connected to orthographic representation) as there was likely to be too much overlapping variance between rapid letter naming performance and scores on any phonological awareness measure (large amounts of shared variance have been observed before; see Torgesen et al. 1997 for example).

The rapid picture naming subtest from the PhAB requires children to name, as quickly as possible, the items in a 5 (rows) by 10 (columns) grid. The items are a random sequence of five simple objects. The time that the children take to name all the items in the grid is measured in seconds, and then a second grid is administered shortly afterwards and the two durations taken to complete the grids are added together to give a total response time. The faster the children can name the items, the better their performance is judged to be, and so performance on this measure should be inversely related to literacy performance.

Texting Measure

All the children were asked to provide the text messages that they sent over a specified weekend. These were copied out exactly as they were written and the number of textisms and the total number of words used in the messages were noted. The number of textisms used were divided by the total number of words used, to provide a textism usage ratio, in which 0 indicated that no textisms were used in the messages and a maximum score of 1 indicated that someone was writing messages that were entirely composed of textisms.

Textisms were classified using the system used previously by Plester et al. (2009). This comprised 11 categories of textism, which included missing apostrophes, but did not include missing capitalisation. A twelfth category of error that was noted was genuine

misspellings, but these were not included in the textism ratio calculations as they were judged to be genuine failures to spell a word correctly, rather than a deliberate misspelling. Misspellings were therefore defined as spelling errors that did not fall into any of the other 11 categories of textism.

Procedure

Ethical approval for the study was obtained from the University Ethics Committee. Parental consent was obtained in writing, and those children who owned or who had regular access to a mobile phone were approached to take part. The children who agreed were asked to complete a background questionnaire which provided details of their phone use and ownership. They were also asked to provide a sample of their text messages. Once the text message data were returned, each participant was then tested individually over the autumn term in short periods of approximately 20 minutes until all assessments had been completed.

The children were then re-contacted at the end of the academic year in the Summer term. The literacy assessments were re-administered at this point, and the children were once again asked to provide a sample of their text messages.

Results

51.4% of the children in the study reported using their phones mainly for texting, compared to 18.7% for making calls. They reported mainly texting their friends with their phone (56.3%) rather than parents (18.5%) or other family (16.0%). Only 9.2% reported using predictive text all the time, with most children never using it (54.6%). In order to provide a sense of how the children's use of textisms differed over time across the four age groups, summary statistics were generated and are presented in Table 1. These data suggest that textism usage peaks in Year 6 (the end of primary school), and show a good range of use in all four age groups, although the lowest levels are observed in the youngest children. Overall, the median textism ratio at the beginning of the academic year was .33 and it was .40

at the year end. These levels of textism use are in line with those of previous studies in the area that used pen and paper based textism production tasks (e.g. Plester et al. 2008, 2009). However, in Year 4 and Year 7 we observe a decline in children's use of textisms over the academic year. With respect to the Year 7 children, this may reflect comments made by some children in this age group that textism use was considered to be an immature form of text language. It may also reflect the influence of the children's secondary education on their attitudes to textism use. However, the decline over the year within the younger age group is harder to explain. It may be that these younger children were attempting to spell as well as they could, and therefore increasingly used their text messages to practice spelling accurately (perhaps at the request of their teacher or parents). In the case of both year groups, further investigation into the reasons behind such dips over the course of an academic year, if replicated elsewhere, is needed.

Table 1 about here.

The children's performance on each of the measures at Time 1 and Time 2 are shown in Table 2. It can be seen that the children improved on all literacy measures over the course of the academic year, with the children reading and spelling at the level of a child aged 11;3 at Time 1 (their mean age was 10;4 at Time 1). This had progressed to 12;3 and 11;9 by the end of the academic year. Their mean spoonerism and rapid naming scores were also appropriate for their age.

The associations between the various literacy measures and textism use were considered next. Because there were a number of zero values in the two textism ratio variables (i.e. those children who did not use any text abbreviations in their messages), these cases were excluded as necessary prior to statistical analysis (21 children at Time 1 and 7 children at Time 2). It should be noted that these children did not differ substantially from the remaining sample on the other measures taken; the only significant difference found was

that the children who scored zero on textism use at pre-test had significantly lower reading scores at Time 1 those who did not, $t(117)= -2.146$, $p=.034$. Given the absence of any significant differences on any other measures, it was decided that exclusion of these cases from the parametric analyses was preferable to transformation of the variables.

Pearson correlation coefficients were calculated to demonstrate the strength of zero order correlations between textism use and the various literacy measures at pre and post-test, and these are shown in Table 3. Textism use at the beginning of the year was significantly related to spelling ability at the beginning and the end of the year, and was also significantly related to reading ability at the beginning and end of the academic year. Spoonerism scores at Time 2 were significantly related to textism use at the beginning of the year. Rapid picture naming performance at the beginning of the year was significantly related to all measures taken at both Time 1 and Time 2. A similar pattern of associations is observed between the literacy measures and textism use at the end of the academic year.

Table 3 about here.

To see whether textism use could predict growth in literacy scores over the course of the academic year, a conservative regression model was applied to the data in which autogressors were entered (e.g. reading ability at Time 1 was entered at Step 1 when predicting reading ability at Time 2) alongside control variables of age, verbal IQ and phonological awareness. Age was included as a control variable because of the wide age range of the children included in this study. These analyses revealed that although textism use could not predict reading ability after the autoregressor had been entered R^2 *Change* = .006, $p=.237$, it was however able to predict significant unique variance in spelling ability, R^2 *Change*= .015, $p=.046$ (see Table 4).

Table 4 about here

This regression analysis was repeated, but this time, instead of controlling for the contribution of segmental phonological awareness (as assessed by performance on the spoonerisms task) we controlled for rapid phonological retrieval and production, as assessed by the rapid picture naming task. This time the amount of unique variance accounted for by textism used was reduced and just failed to reach statistical significance (R^2 *change* = .012, p=.073).

Table 5 about here

One of the questions that we were interested in was whether the relationship between textism use and literacy performance was bidirectional. To assess this we entered textism use at the end of the academic year as the dependent variable, and considered whether either reading or spelling scores at the beginning of the academic year could predict textism use at the end of the school year, after controlling for textism use at Time 1, age, verbal IQ and phonological awareness (see Table 6). It was found that neither reading nor spelling ability was able to predict growth in textism use, suggesting a unidirectional relationship.

Table 6 about here.

Discussion

The results of this study show that children's textism use in their spontaneous text messages was positively related to reading and spelling skills both concurrently and longitudinally. With respect to the question of growth in these skills, the results show that textism use can account for changes in spelling scores over time independently of age, verbal IQ and phonological awareness, but not independently of age, verbal IQ and rapid naming ability. This finding goes further than that of past studies which drew on concurrent data only, and relied on children's responses to pen-and-paper based texting exercises. This study suggests that textism use may contribute causally, albeit to a modest extent (1.5%), to changes in spelling attainment over the course of a school year, but that some of that

contribution at least is explained by phonological retrieval and production abilities. In contrast, there was no evidence that reading or spelling ability could predict unique variance in textism use. This suggests that the it is not the case that being good at reading or spelling is more likely to make you better at using textisms. Instead it would seem that textism use may be making its own contribution to explaining literacy attainment.

The implications of this finding signal that, rather than being a potentially problematic influence on young people's written language skills (e.g. Sutherland, 2002; Woronoff, 2007), use of text message abbreviations may enhance spelling skills. Moreover, it may enhance spelling development not just through the mechanism of phonological awareness as Plester et al. (2008;2009) have argued, but also because of more general phonological processing abilities, amongst other skills. Some of the modest contribution indicated by the data in this study could be accounted for by the motivational effects of textism use – children appear to enjoy creating these new spellings, and this may help the children to practice phonological skills and consolidate their understanding of phoneme-grapheme correspondences. Mobile phones have the potential to enable children to engage in online literacy practices in a way that is more readily available and portable than internet messaging (IM) texting via a computer interface is. This can provide a consistency and continuity of engagement on a device which is attractive to children.

Another possibility is that the technology itself affords educational opportunities for young people to learn about spellings. For example, the functionality of mobile phones varies considerably, and some features may offer informal spelling tuition inadvertently (e.g. predictive text, the nature and layout of the phone's 'keyboard' interface, availability of the internet, etc). In this study very few children used predictive text consistently (just 9.2%) and further research is needed to examine systematically whether predictive text or the other features are contributing to this technology's potential to 'teach' spelling informally.

A further mechanism by which texting could contribute to children's literacy development might be metalinguistic knowledge. That is, it is possible that children who are frequent users of textisms are also children who have the pragmatic or metalinguistic awareness to recognise when and how to use them to best effect, especially when viewed in the context of developing and maintaining relationships with peers (e.g. see Lewis & Fabos, 2005). Metalinguistic understanding of language is challenging to capture in simple assessments because of the complexity of this skill, but it is an interpretation worthy of further empirical exploration.

This study has been valuable in revealing the nature of the relationship between text abbreviation use and reading and spelling development over time. However, some important limitations to the study remain. Specifically, the sample obtained was not sufficient to enable individual regression analyses of the relationships between textism use and reading / spelling within each age group in the study. It is possible, and perhaps even likely, that children's textism use will be qualitatively different at different stages of their literacy development, and therefore the relationships between textism use and reading and spelling could be different at each point. Larger scale analyses are therefore required in future studies. Another limitation of the present study was the somewhat restricted selection of phonological measures used here. The spoonerisms task was selected as a demanding measure of phoneme awareness, but it would be of interest to see whether and how textism use relates to a wider range of phonological awareness assessments.

In conclusion, this study provides support for the belief that textism use may have a positive effect on standard spelling ability in a school-age population and it fails to find evidence for the detrimental effects which are often portrayed in UK media accounts. Text messaging has become a part of the lives of young people. As Marsh (2004) highlights, children become familiar with the world of electronic print from a very young age. Children

use text messaging to socialise with their friends, build relationships, convey information and they make it their own. We argue that children should not be criticised for adopting what is in fact a sophisticated, albeit alternative, way of using language. As Crystal (2008, p175) observes texting appears to be “the latest manifestation of the human ability to be linguistically creative and to adapt language to suit the demands of diverse settings. In texting we are seeing... language in evolution”.

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Table 1

Summary Statistics on Textism Use Across Age Groups

	Year 4	Year 5	Year 6	Year 7	Total N
Time 1					
Median	.268	.238	.439	.420	.333
Range	.74	1.0	.86	.75	1.0
Time 2					
Median	.074	.359	.492	.328	.4
Range	.60	.71	1.0	.58	1.0

Table 2

Summary statistics for literacy and psychometric measures at Time 1 and Time 2.

	Time 1			Time 2		
	Mean	SD	Age Equiv.	Mean	SD	Age Equiv.
Reading (Ability Score)	150.9	28.2	11;3	161.3	30.2	12;3
Spelling (Ability Score)	116.8	26.2	11;3	121.9	22.9	11;9
Spoonerisms (Raw Score)	22.1	6.3	12;0-12;5	22.9	6.0	12;6-12;11
Rapid Naming (Raw Score)	85.3	14.9	10;6-10;11	82.6	22.5	11;6-11;11
Verbal IQ (Standard Score)	96.6	12.9	-	-	-	-

Table 3

*Correlations between Textism Ratio and Literacy Attainment at Time 1 and Time 2 (N=68) (*p<.05, **p<.01)*

	Textism T1	Textism T2	Read T1	Read T2	Spell T1	Spell T2	PA T1	PA T2	RAN T1
Textism T2	.405**								
Read T1	.263*	.172							
Read T2	.261*	.267*	.824**						
Spell T1	.343**	.323**	.710**	.832**					
Spell T2	.302*	.247*	.771**	.860**	.865**				
PA T1	.151	.331**	.608**	.637**	.677**	.602**			
PA T2	.329**	.385**	.521**	.611**	.632**	.546**	.753**		
RAN T1	-.325**	-.274*	-.471**	-.404**	-.438**	-.464**	-.451**	-.393**	
RAN T2	-.249*	-.366**	-.457**	-.457**	-.489**	-.508**	-.436**	-.449**	.755**

Key: T1 = Time 1; T2 = Time 2; Textism = Textism Rato; Read = Reading Ability Score; Spelling = Spelling Ability Score; PA = Spoonerisms Score; RAN = Rapid Picture Naming Score.

Table 4

*Regression analysis indicating the contribution of textism use to reading (Model 1)and spelling ability (Model 2) after controlling for age, verbal IQ, phonological awareness and Time 1 autoregressors (*p<.05, **p<.001).*

	Model 1 Reading		Model 2 Spelling	
Predictor	R^2 Change	Beta	R^2 Change	Beta
Step 1	.665**		.692**	
Age		.077		.048
Verbal IQ		.119		.198*
Spoonerisms		.126		-.015
Autoregressor		.645**		.719**
Step 2	.006		.015*	
Textism Use		.082		.131*

Table 5

*Regression analysis indicating the contribution of textism use to reading (Model 1)and spelling ability (Model 2) after controlling for age, verbal IQ, rapid naming and Time 1 autoregressors (*p<.05, **p<.001).*

	Model 1 Reading		Model 2 Spelling	
Predictor	R^2 Change	Beta	R^2 Change	Beta
Step 1	.660**		.704**	
Age		.076		.043
Verbal IQ		.146*		.197*
Rapid Naming		-.079		-.122
Autoregressor		.672**		.661**
Step 2	.004		.012	
Textism Use		.064		.117

Table 6

*Regression analysis indicating the contribution of reading (Model 1) and spelling ability (Model 2) to textism use after controlling for textism use at Time 1, age, verbal IQ and phonological awareness (*p<.05, **p<.001)*

	Predictor	R^2 *Change*	*Beta*
Model 1	Step 1	338**	
	Age		-.107
	Verbal IQ		-.026
	Spoonerisms		.318*
	Time 1 Textism Ratio		.473**
Model 1	Step 2	.008	
	Reading		-.127
Model 2	Step 2	.002	
	Spelling		.071