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Using technology to support reading development:
Current practice and new opportunities

by

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<u>ABSTRACT</u>

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Integrating computer technology into schools has been a key government agenda (Wellington, 2005). Individual computer programs have been introduced to support students across the curriculum, including with the development of literacy skills. This paper explores how computer technology can be used in supporting the development of word reading, with particular emphasis on how technology can be employed in novel and innovative ways; namely through the use of mobile phone text-messaging. Firstly, reading research is considered, with a focus on the role of phonological awareness and implications for reading interventions. Current uses of technology at home and at school are explored, before specific computer-based literacy interventions are discussed and evaluated. Finally, the possibility of integrating text-messaging into an intervention is proposed. Correlational evidence suggests a positive relationship between use of textisms (abbreviated words in text messages) and literacy (Neville, 2003). However, the causal nature of this relationship has not yet been tested experimentally. Consequently, this review is followed by a study that aimed to provide further insights into the relationship between textism use and literacy skills. Sixteen 9-10-year-old children, inexperienced with mobile phones, undertook pre-measures in textism use, phonological awareness, reading and spelling. Children were matched for reading and allocated to either a control or an experimental group. Both groups received a 30 minute texting intervention once a week for six weeks. The control group simply spent each session texting, whereas the experimental group completed activities translating and composing textisms. Following the intervention, children in the experimental group used more spontaneous textisms (in an elicited text) compared with controls. However, no significant differences between the groups were found in any of the literacy measures following the intervention. Implications for future research are discussed.

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Declaration of Authorship

I, JAMIE ELIZABETH LUCY COE, declare that the thesis entitled "Using technology to support reading development: Current practice and new opportunities"and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research.

I confirm that:

· this work was done wholly or mainly while in candidature for a research degree at this University;
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Abbreviations

%	percent
α	Cronbach's alpha
ARROW	Aural-Read-Respond-Oral-Write
BASII	British Ability Scales 2nd Edition
CAI	Computer-assisted instruction
F	test statistic for ANOVA
ICT	Information Communication Technology
M	mean
Mdn	median
n	sample size
NRP	National Reading Panel
NVQ	National Vocational Qualification
OfCom	Office of Communications
p	probability, significance of a test statistic
PASW	Predictive Analytic Software
PhAB	Phonological Assessment Battery
r	Pearson's correlation coefficient – effect size
RITA	Reader's Interactive Teaching Assistant
SD	standard deviation
SMS	Short Messaging Service
t	test statistic for the t-test
T1	Time 1 (pre-intervention)
T2	Time 2 (post-intervention)
U	test statistic for Mann Whitney U test
UK	United Kingdom
US	United States
WERP	Waterford Early Reading Programme
Ws	test statistic for the Wilcoxon signed-rank test
z	Standardised test statistic

Chapter 1: Literature Review

Using technology to support reading development:

Current practice and new opportunities

1.1. Introduction

Children today have greater access to electronic media than any previous generation (Council on Communications and Media, 2011). In the history of technological innovation, the speed at which children gain access to online and networked media is also unprecedented (Livingstone, Haddon, Gorzig, & Olafsson, 2011). The introduction of new media technology has brought great promise for social and educational benefits, alongside significant concerns about exposure to inappropriate and harmful content (Wartella & Jennings, 2000). Integrating computer technology into schools has been a key government agenda in recent years (Wellington, 2005) and technology is already being implemented to support students across the curriculum, including as a way of developing literacy.

This review aims to explore the use of computer technology in supporting the development of word reading, with particular emphasis on how technology can be employed in novel and innovative ways. Firstly, the key components of word reading are described, to provide a clear description of the evidence-base from which reading interventions develop. Additionally, the process of learning to read is examined, with particular focus on the role of phonological awareness (an awareness of the sound structure of words; Goswami & Bryant, 1990), in reading acquisition. Broad implications of reading research for reading interventions are considered.

Secondly, this review considers how children and young people currently use technology at home and in school; in particular, how computer technology is integrated into teaching and learning. Thirdly, this review explores how computer technology is already being used to teach and support reading skills. Research that investigates the efficacy of individual computer programs is examined and the overall effectiveness of computer-based approaches in this area is considered. Finally, the possibility of using mobile phone text-messaging to support reading skills is explored. Evidence is presented of a positive relationship between text-messaging and literacy skills and the possible reasons for these positive relationships are discussed. The possibility of a text-messaging intervention to support phonological awareness is proposed.

1.2 Reading

1.2.1 Skilled word reading

Skilled word reading can be characterised as the ability to read words accurately and quickly (Byrne, 2005; Ehri, 2005a). Being a skilled word reader involves the integration of multiple abilities, strategies and knowledge (Cain, 2010). Because of the

complexity of the interactive processes involved, it is helpful to conceptualise this phenomenon as encompassing two key components; word reading and reading comprehension (Cain, 2010). Evidence from empirical research suggests that these two components, although correlated, can be differentiated (de Jong & van der Leij, 2002; Oakhill, Cain & Bryant, 2003). Word reading is the focus of this review as a full discussion of the literature related to both of these components is beyond the scope of this paper.

The main challenge in word reading is learning to decode printed symbols (Cain, 2010). Although writing systems differ, a focus on words or sub-word units (e.g. components that make up the written word) is common to all writing systems (Cain, 2010). English is an alphabetic language. Single symbols (letters or letter combinations; graphemes) represent the spoken sounds (phonemes) of the language (Adam, 1990). In alphabetic writing systems, there are a limited number of graphemes to encode the phonemes (Rayner, Pollatsek, Ashby & Clifton Jr, 2012). English is also a non-transparent writing system because there is not a consistent relationship between graphemes and phonemes (Adams, 1990; Coltheart, 1978). Furthermore, English is a morphophonemic system; where letters can indicate meaning as well as phonology, for example, inflections such as adding an 's' for plurals (Marsh, Friedman, Welch & Desberg, 1981). This adds an additional challenge for beginner readers learning English (Rayner et al., 2012).

Reading and visual word recognition represents the focus of a large body of research in the field of cognitive psychology (Lupker, 2005). A range of methodologies have been implemented to investigate reading; including research into eye movements during reading (Rayner 1998; 2009), computational modelling, (such as The Dual-Route Cascaded Model; Coltheart, Rastle, Perry, Ziegler, & Langdon , 2001 and The "Triangle" framework; Seidenberg & McClelland, 1989) and neuropsychological assessments of patients with acquired brain injuries (Fiez & Petersen, 1998).

Researchers have hypothesised about the processes by which skilled readers identify words. One key theoretical issue, which has been debated for many years, is the role of phonology in visual word recognition (Frost, 1998). This issue will be described in detail, as it is a key topic in the field of skilled word reading.

Phonological activation may precede word identification, or alternatively words may be identified through direct access via lexical representations (Van Orden, 1987). Dual-process theories of skilled word reading suggest that we process print to speech via two routes- the lexical route and the non-lexical route (Coltheart, 2005)-

encompassing both these possible ways of reading. Within this framework reading through the lexical route involves accessing a representation of the word in a mental lexicon (Coltheart & Rastle, 1994; Coltheart, 2005); a mental dictionary which has entries for all of the words that a reader knows (Lupker, 2005) and contains information about the spellings and pronunciation of words (Coltheart, 2005). Once the representation has been accessed at the spelling level, the phonological lexicon is accessed so that the word can be pronounced (Coltheart, 2005). Non-words cannot be read via this lexical route. In the non-lexical route the mental lexicon is not referenced, instead rules about the relationships between spelling (orthography) and sound (phonology) are used (Coltheart & Rastle, 1994). The non-lexical procedure is suggested to apply grapheme-phoneme correspondence rules to convert letters to phonemes, so that readers can accurately read regular words and non-words (Coltheart, 2005).

Even with dual-process explanations of both routes, questions remain around the speed of activation of the two routes (Van Orden, 1987). Various competing hypotheses have been postulated in an attempt to explain the timing of these processes. For example, the bypass hypothesis has been presented, which suggests that readers begin by always using phonological information in their processing of words, but that this process is eventually bypassed as direct associations develop (Van Orden, Pennington & Stone, 1990). However, some theorists argue that empirical evidence does not support this hypothesis and instead contend that phonological activation occurs in all instances of word identification (Perfetti, Bell & Delaney, 1988; Van Orden, 1987; Van Orden, Johnston & Hale, 1988; Van Orden et al., 1990). Nonetheless the debate continues, as decisive evidence to explain this process has eluded researchers (Van Orden & Kloos, 2005).

1.2.2. Summary of skilled word reading

Despite conflicting accounts of the exact nature and timing of the role of phonology in word identification, there is broad agreement that phonological activation is important in skilled word reading. All theories of skilled word reading attempt to elucidate our understanding of the complex processes involved in visual word recognition. This understanding is important because it means that we better understand the goal of reading instruction (Rayner et al., 2012). Understanding the systems by which skilled word readers process words also provides a framework for the exploration of reading development (Cain, 2010).

1.2.3. Learning to read

Although researchers have some understanding of the characteristics of skilled word reading, the process of learning to read is much less well understood (Castles & Nation, 2008). Learning theories of reading development need to accurately describe how learners become skilled word readers, such that they can read words accurately and quickly (Byrne, 2005; Ehri, 2005a). Theories of reading development must also describe the necessary underlying skills of reading acquisition and how and when they develop (Goswami & Bryant, 1990).

Reading development theories need to account for different ways of reading (Goswami & Bryant, 1990). Ehri and McCormick (1998) described four key ways of reading words; through decoding, analogy, prediction and by sight. Decoding is the process of identifying the sounds in words and blending them to read words. Reading by analogy requires the reader to access the spelling patterns of known words to help them to decipher unknown words. Predictive reading requires the reader to use initial sounds or context cues to read words. Finally, sight word readers use their memory of words that they have read before to read the words again (Ehri & McCormick, 1998). Sight word reading is suggested to be automatic to allow attention to be focused on meaning (Ehri, 2005a).

Theories of reading development typically describe a succession of qualitatively distinct phases through which learners progress (Ehri, 2005a). Three theories of early reading acquisition will be described and compared in this review, namely; Marsh et al.'s, (1981) Cognitive-developmental theory of reading acquisition; Frith's (1985) Three-phase theory of reading acquisition; and Ehri's Phases of Sight word reading (Ehri, 1995; Ehri & McCormick, 1998; also see Ehri, 2005a; 2005b).

1.2.3.1 Theories of reading development

The Cognitive-developmental theory of reading acquisition proposed by Marsh and colleagues (1981) includes four stages of development; Stage 1- linguistic guessing, Stage 2- discrimination net guessing, Stage 3- sequential decoding and Stage 4- hierarchical decoding. Frith (1985) adapted Marsh et al.'s (1981) model to create a Three-phase theory of reading acquisition. Frith's (1985) phases are labelled; logographic, alphabetic and orthographic to reflect the type of skills and strategies utilised in each phase. Finally one of the most recent and influential phase theories of sight word reading was developed by Ehri (1995; Ehri & McCormick, 1998). This theory has four distinct phases, labelled to reflect the type of alphabetic knowledge the

reader has at each phase; the pre-alphabetic phase, the partial alphabetic phase, the full alphabetic phase and the consolidated alphabetic phase. All of these theories describe the progression from pre-reading, to early reading, to decoding and finally to fluent reading (Ehri, 2005a). Despite differences in terminology use, there is considerable agreement between theories about the distinguishing features of the phases of reading development (Ehri, 2005a). To explore these distinguishing features, Ehri's (1995: Ehri & McCormick, 1998) model will be described in detail with reference to the other two theories.

During the pre-alphabetic phase, readers have a limited knowledge of letters and do not understand that letters map onto sounds in spoken words (Ehri & McCormick, 1998). Word reading is aided by visual or contextual cues (Ehri, 2005a) and children are generally non-readers because most words do not have significant visual features (Ehri, 2005b). The pre-alphabetic phase in Ehri's model corresponds directly with the logographic phase suggested by Frith (1985) and the linguistic guessing stage of Marsh et al. (1981). In all of these models, it is presumed that readers initially use graphic information and contextual clues (either syntactic or semantic) to help them with early reading.

In Ehri's model the pre-alphabetic phase is followed by the partial alphabetic phase, characterised by a rudimentary and developing knowledge of letters (Ehri & McCormick, 1998). Readers at this phase are not able to decode and are likely to mix up words that share some of the same letters (Ehri, 2005a). During this phase, readers are thought to be starting to develop connections between letters and sounds (Ehri & McCormick, 1998). Marsh and colleagues' (1981) discrimination net guessing stage is similar to the beginning of the partial alphabetic phase proposed by Ehri (Rayner et al., 2012). In the discrimination net stage, readers have started to pay attention to the printed stimulus of words, but graphemic cues are only used in as far as they discriminate one printed word from another (Marsh et al., 1981).

In the full alphabetic phase, readers are able to use known associations between letters and sounds (Ehri & McCormick, 1998) and are now able to decode unknown words (Ehri, 2005a). Words spelled similarly are no longer confused with each other (Ehri, 2005b) because complex knowledge of grapheme-phoneme correspondences is acquired (Ehri, 2005a). Together the partial alphabetic and the full alphabetic phases are consistent with Frith's (1985) conceptualization of the alphabetic phase. The full alphabetic phase in Ehri's model is also equivalent to the sequential decoding and hierarchical decoding stages of Marsh et al.'s (1981) Cognitive-developmental theory

(Rayner et al., 2012).

Finally in Ehri's model there is the consolidated alphabetic phase. This phase is characterised by the use of larger units of grapheme-phoneme relations (Ehri & McCormick, 1998), such as recognising spelling patterns (Ehri, 2005b). During this phase, sight word vocabulary continues to grow and readers are able to decode multi-syllabic words, learning implicitly about the location of syllable breaks (Ehri & McCormick, 1998). This phase is comparable to Frith's (1985) orthographic phase where letter strings are learned and used.

1.2.3.2. Summary of reading development

Theories of reading development share broad agreement about the distinguishing features of the phases of development (Ehri, 2005a). It has been argued that Ehri's contribution to this area has been to more explicitly define the alphabetic phases and to establish greater flexibility within and between the phases (i.e. children may not automatically progress through the phases exactly in sequence; Beech, 2005). Even the use of the term 'phase' has been chosen to relax the boundaries between them and suggest that mastery is not necessary for progression to later phases (Ehri, 2005a). Other developmental theories have not adopted the phase approach, such as Goswami and Bryant (1990). In their developmental theory of reading acquisition they argued that readers simply get better at using strategies that they used from the beginning, rather than progressing through discrete stages (Goswami & Bryant, 1990).

Models of reading development should be able to take account of individual differences (Bowey, 2005), as different learners will make different contributions to the process of learning to read (Byrne, 2005). It has been argued that once we know which skills are required to learn to read, then we can ensure that we teach those skills (Goswami & Bryant, 1990). One critical skill frequently referenced in theories of skilled word reading and in models of reading acquisition is phonological awareness.

1.2.4. Phonological awareness

Phonological awareness has been used as a blanket term to describe an explicit awareness and ability to reflect on the sound structure of spoken words (Goswami & Bryant, 1990; Hatcher, Hulme & Ellis, 1994). Many definitions of phonological awareness have been provided, typically embedded in well-developed theoretical frameworks (Anthony & Lonigan, 2004). However, some controversy continues around what is the best conceptualisation of phonological awareness (Anthony & Lonigan,

2004). Goswami and Bryant (1990) argue that there are at least three ways of breaking up words into their constituent sounds; by syllable, by onset (initial consonant group) and rime (vowel and any following consonants; Duncan, Seymour & Hill, 1997) or by phoneme. The term phonological awareness is often used to encompass these different ways of breaking up words (Goswami & Bryant, 1990; Rayner et al., 2012).

Phonemes are the smallest units of sound that change the meaning of a word (Goswami & Bryant, 1990). English has an alphabetic orthography that represents language at the phonological level (Wagner & Torgesen, 1987). Therefore, letters of the alphabet typically represent phonemes (Goswami & Bryant, 1990). We have to learn that printed symbols represent units of speech and that the unit of speech is the phoneme (Wagner & Torgesen, 1987). However, English is a non-transparent writing system. Therefore there is not a consistent relationship between graphemes and phonemes (Adam, 1990). Phonemic awareness is an awareness at the level of individual speech sounds (Rayner et al., 2012).

There has been much debate and disagreement over the most accurate way to define and conceptualise phonological awareness. Equally, within research in this area different descriptive terms have been used interchangeably, such as 'phonological awareness', 'phonological sensitivity' and 'phonological processing' to describe the same construct. In this review, the term 'phonological awareness' will be used to describe an awareness of the sound structure of words at a variety of levels; in line with the definition of Goswami and Bryant (1990). However, other terms used by individual researchers will be used in the context of recounting specific studies and findings. The term phonemic awareness will be used to refer purely to an awareness at the level of individual speech sounds (phonemes).

1.2.4.1 When do phonological awareness skills develop?

Phonological awareness skills are reported to develop with age. The results of one correlational study of 2-5 year olds suggested that sensitivities to larger phonological units, such as syllables, might be precursors of higher levels of phonological sensitivity or phonemic awareness (Lonigan, Burgess, Anthony & Barker, 1998). Consequently, younger children appear to be sensitive to larger units of sound, whereas older children are sensitive to both large and smaller units (Anthony & Lonigan, 2004). Other researchers support this trajectory (Bryant, Maclean, Bradley & Crossland, 1990) and it is consistent with the developmental theory postulated by Goswami and Bryant (1990).

As phonological awareness skills appear to develop at about the age that a child is taught to read (Wagner & Torgesen, 1987), there has been considerable interest in the nature of the relationship between phonological awareness and the development of reading ability. The main debate concerns whether or not phonological awareness plays a causal role in reading development.

1.2.4.2 The role of phonological awareness in learning to read

Research has debated the exact nature of the relationship between phonological awareness and word reading. Ehri (1979) postulated four alternative associations between learning to read and specific capabilities in phoneme consciousness. Firstly, phoneme awareness might be a prerequisite skill for reading; therefore a beginner reader would find it almost impossible to make progress in reading unless he possessed this capability. Alternatively, phoneme awareness might act as a facilitator (i.e. those who have this capability, develop skills in word reading more quickly, but those who do not, still learn to read). On the other hand, phoneme awareness skills could develop as a consequence of learning to read. Finally, phoneme awareness could be an incidental correlate of reading ability. Therefore the capability develops independently from learning to read, but seems to have a direct relationship because there is a common link (Ehri, 1979).

Considerable research studies have investigated the nature of the relationship between phonological awareness and reading, with the majority of the research in this area using a longitudinal, correlational design or an experimental or training study approach (Wagner & Torgesen, 1987). An alternative approach, known as the reading level design, has also been used. This involves matching children with reading difficulties with typically developing younger children at the same level of reading achievement, to then compare their performance on various tasks. A control group of normal readers matched for chronological age is also often included (Backman, Mamen & Ferguson, 1984). A number of studies using these different types of methodologies will be described and reviewed.

1.2.4.3 Cross-sectional reading level design

Despite the power and robustness of this methodology, only a few studies have employed the reading level design in studying the relationship between phonological awareness and reading ability. One study used a sample of German-speaking and English-speaking children aged 5 - 7 years. In Germany, children in kindergarten (aged 5 years) do not receive instruction in reading; therefore it was possible to compare them

with English-speaking children of the same age with different experiences of phonological awareness instruction. Older children (6 and 7-year-olds) in Germany experience a systematic phonics approach equivalent to that received by English speakers. As expected, the 5-year-old English-speaking children outperformed their same-age German peers in measures of phonological awareness and letter knowledge. However, the children in the older year groups performed equivalently on these measures and on general reading ability measures. The authors argue that this evidence suggests that phoneme awareness skills develop primarily as a product of literacy experiences (Mann & Wimmer, 2002).

1.2.4.4 Longitudinal correlational research

Longitudinal studies involve measuring phonological abilities in early or pre-readers, and then measuring reading ability years later to consider the predictive power of early phonological skills. Numerous studies have used longitudinal designs to explore the relationship between phonological skills and reading ability since the 1970s (Castles & Coltheart, 2004). Longitudinal research, although not able to demonstrate definitive causal relations, can support the refinement of hypotheses about the relationships between phonological skills and reading ability (Castles & Coltheart, 2004).

A number of studies have demonstrated a positive predictive relationship between phonological awareness (incorporating different combinations of measures of alliteration, rime and phoneme awareness) at 5 years old and later reading achievement (de Jong & van der Leij, 2002; Demont & Gombert, 1996; Jorm, Share, Maclean & Matthews, 1984). Interestingly, de Jong and van der Leij (2002) conducted their longitudinal research with 4-year-old Dutch children and found that the significant positive effects of phonological awareness skills on word-decoding were time-limited. Positive effects existed when the children were aged 7 years, but were no longer apparent two years later. The authors suggest that this provides evidence that for children learning to read Dutch, the effects of phonological abilities are time-limited. However they do not suggest that phonological abilities cease to be important.

In other longitudinal studies, the specific contribution of phoneme awareness has been explored. In one study, phoneme deletion, segmentation and blending measures were used with the same children aged between 7-10-years-old (Torgesen, Wagner, Rashotte, Burgess & Hecht, 1997). Findings of this study demonstrated a significant and independent contribution of phoneme awareness on reading ability, after accounting

for general verbal ability (Torgesen et al., 1997). Similarly, in a five year study beginning with 5-year-old children that used the same measures, evidence was found to suggest that individual differences in phonological awareness influence the subsequent development of individual differences in word reading (Wagner et al., 1997). Evidence from this study also suggested that the influence of phonological awareness is not developmentally limited to children at the beginning stages of learning to read (Wagner et al., 1997). These findings directly contradict those of de Jong and van der Leij (2002) who found time-limited effects of phonological abilities. The researchers suggest that this difference in findings perhaps reflects the difference in alphabetic language studied (i.e. the Dutch language has more consistent grapheme-phoneme relations compared with English) and that the cognitive abilities required for reading acquisition might be different depending on the orthography of the language (de Jong & van der Leij, 2002).

Additionally, further longitudinal studies have divided phonological awareness into component parts to consider the unique contribution of specific skills, such as rhyme detection and phoneme detection, on reading and spelling ability (Bryant et al., 1990). Bryant and colleagues (1990) found that that rhyme and alliteration detection were strong predictors of reading and spelling, consistently accounting for 65% of the variance in reading of 4-6-year-olds. This contribution was distinct and independent from that made by the children's sensitivity to phonemes; providing evidence for the developmental trajectory of phonological skills (from larger units to smaller units) suggested by Goswami and Bryant (1990).

Some researchers have specifically attempted to investigate the developmental trajectory of phonological skills. Duncan and colleagues (1997) conducted a series of studies and evidence from their research with 4-5-year-olds provided support for the small-unit theories, as they found that early readers were better able to identify units of words at the phoneme level as opposed to the rime level. These findings were replicated in further experimental and longitudinal studies (Duncan, Seymour & Hill, 2000; Seymour, Duncan & Bolik, 1999). These authors referenced Gombert's (1992) theory of metalinguistic development to explain their findings. In this theory, a distinction is made between epi-phonological skills (which are thought to develop very early) and meta-phonological skills (which can be stimulated by simple training; Gombert, 1992). Epi-linguistic control refers to internal representations of linguistic information inaccessible to conscious awareness, whereas, meta-phonological behaviour requires conscious awareness of linguistic components and intention to manipulate them. Duncan and colleagues (1997) explained their findings using this theory. They

suggested that in their study, phonemes were at the meta-phonological control stage, due to the children's experience of literacy instruction, whereas the participants may only have had epi-linguistic control for rime units.

1.2.4.5 Training studies

Training studies involve specific instruction. However, there are distinctly different roles of training studies depending on whether they are educational or experimental (Goswami & Bryant, 1990). Educational studies are carried out with the intention of investigating whether a particular teaching method is effective in improving a skill. Experimental studies are undertaken to test specific hypotheses and provide insights into the causal relationships between variables (Goswami & Bryant, 1990). One of the most often cited studies that suggests a causal relationship between phonological skills and reading ability is a longitudinal training study with pre-readers (Bradley & Bryant, 1983). In this study, four groups of children aged between 4-5-years-old received different types of training: one group was trained in sound categorisation; one in sound categorisation and alphabetic letters. The other two groups were control groups; one with no training at all and the other trained using conceptual categorisation as opposed to sound categorisation. The findings showed that both groups who received specific instruction in sound categorisation performed better in reading measures than either of the control groups; although only the group that received the sound categorisation with alphabetic letters performed significantly better than the control groups (Bradley & Bryant, 1983).

Other research has demonstrated similar positive effects of phoneme awareness training on reading skills. In another study, 5-year-old children received a phonemic awareness intervention and were given follow-up assessments over a period of two years (Byrne & Fielding-Barnsley, 1995). Throughout this study, the children who had received the intervention consistently achieved a higher level of decoding and reading comprehension compared with the control group (Byrne & Fielding-Barnsley, 1995). In further research, the positive effects of phoneme awareness training have been found to continue over time; with some showing persistent effects several years after the training programme had been delivered (see Elbro & Peterson, 2004). The results of this study were particularly powerful as the training had been provided by class teachers to a whole kindergarten class of Danish children aged 5- years-old identified as at risk of reading difficulties.

Some researchers have argued that making explicit links between phonology and reading experience is the most effective way of improving reading (Hatcher et al., 1994). Hatcher and colleagues (1994) developed the phonological linkage hypothesis and in their longitudinal training study found that spending equal amounts of time on reading and phonological awareness did not have the same effect as making explicit links between phonology and reading. This study suggests that phonological skills alone do not help reading; rather that phonological skills are necessary, but not sufficient for skilled word reading (Hatcher et al., 1994). Correspondingly, the findings of a meta-analysis of phonological training studies also indicated that purely phonological training is less powerful than that which includes letter training (Bus & van Ljzendoorn, 1999). These findings reflect those previously demonstrated by Bradley and Bryant (1983).

1.2.4.6 Summary

Overall, these studies demonstrate that a relationship exists between performance in phonological awareness tasks and reading ability (Castles & Coltheart, 2004). Longitudinal studies have shown a predictive effect of phonological awareness on later reading development (de Jong & van der Leij, 2002; Demont & Gombert, 1996; Jorm et al., 1984). However, other research suggests differences in the direction of the relationship (Mann & Wimmer, 2002) and there are differing accounts of the long-term influence of phonological awareness skills on reading ability (de Jong & van der Leij, 2002; Wagner et al., 1997). Despite evident inconsistencies, many researchers argue that phonological awareness should be considered a plausible causal factor in reading development (Castles & Coltheart, 2004; Melby-Lervag et al., 2012). As it is also impossible to rule out the possibility of a reciprocal relationship (Wagner & Torgesen, 1987), the nature of the association between phonological awareness and reading ability remains unclear (Muter, Hulme, Snowling & Stevenson, 2004). Notwithstanding this controversy, research in this area has provided important implications for educational initiatives to support reading development.

1.2.5. Educational implications of reading research

Reading research and theory have considerable educational implications, particularly for reading instruction and intervention. Skilled word reading research provides detailed information about the goal of reading instruction (Rayner et al., 2012). Theories of reading development attempt to describe the phases through which beginner readers progress as they learn. By developing an understanding of the word learning

process, it may then be possible to identify processes that learners employ at different phases (Ehri & McCormick, 1998). Consequently, understanding the processing at different phases may help to inform educators in supporting their students (Ehri & McCormick, 1998). If we know which skills are required in learning to read then we can ensure that we teach those skills (Goswami & Bryant, 1990). Nonetheless, for more than a century, researchers have debated the best approach to teaching reading; with methods including alphabetic, phonics and whole word approaches (Huey, 1908).

Many reading instructional approaches are based on evidence that training in phoneme awareness skills contributes to improvements in reading ability (Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1995; Elbro & Petersen, 2004; Hatcher et al., 1994). Large-scale government-led studies of reading instructional approaches in American schools have also confirmed that instruction in phonemic awareness (involving teaching children to manipulate phonemes) and phonics (with a focus on letter-sound correspondences such as Synthetic and Analytical Phonics approaches) are both highly effective ways of teaching reading (National Reading Panel, NRP, 2000). Many phonics approaches involve making explicit links between letters and sounds, which has been consistently demonstrated in training studies as one of the most effective ways of improving reading (Bradley & Bryant, 1983; Hatcher et al., 1994). In the case of phoneme awareness training, evidence consistently demonstrated that this instructional method improves not only phoneme awareness skills, but also broader reading and spelling skills (NRP, 2000).

Numerous reading interventions have also been developed which aim to improve reading abilities in children who have already acquired basic reading skills, but are still struggling with reading. Researchers have argued that children with literacy difficulties need more than just everyday teaching to make improvements or to catch up and that additional help is required (Brooks, 2002; 2007). Several recent reviews of reading interventions have been undertaken and these have provided insight into the aspects of reading interventions most important for supporting struggling readers, as well as those diagnosed with dyslexia, to improve their reading skills (e.g., Brooks, 2007; Rose, 2009). In his most recent review, Brooks (2007), for example, evaluated more than 40 reading interventions for struggling readers. Twenty focused on targeting phonological awareness skills, such as the programs Phono-Graphix (McGuinness & McGuinness, 1998) and Toe by Toe (Cowling). Brooks (2007) concluded that approaches which target phonological awareness were generally effective in improving reading skills (where it was possible to calculate effect sizes, they ranged from $r = .25 - 65$). Overall

from the reviews of traditional reading instruction and intervention approaches, it is apparent that a structured focus on alphabetic principles continues to be beneficial.

1.3 Computer Technology, Children and Young People

Before considering how computer technology has been specifically implemented to support the development of literacy skills, it is important to consider when and how children and young people experience technology at home and at school; the types of equipment they engage with, and how technology is already being used within educational environments.

1.3.1 Technology in the home

Children are exposed to a range of technologies within the home (McPake, Stephen & Plowman, 2007) and from as young as 6 months old (Marsh et al., 2005; Wartella & Jennings, 2000). A recent and comprehensive survey of the access to new technologies in the UK by children aged between 0-6 years highlighted that ownership of TVs and DVD players was almost universal across the families they surveyed (Marsh et al., 2005). The survey found that the average amount of screen time for these young children was just over two hours in a typical day. Similar amounts of screen time were reported in a recent survey of American parents of 0-8-year-old children, where the average amount of time spent with media each day was three hours (two hours of which were screen time; Rideout, 2011).

A questionnaire survey of 7-11- year-old pupils investigated engagement with ICT both inside and outside school (Selwyn, Potter & Cranmer, 2009). Outside school, 89% of the participants reported having access to a computer, 86% had access to a games console, 61% had a television in their bedroom and 51% owned a mobile telephone (Selwyn et al., 2009). Furthermore, an OfCom (2010) report of UK children's media literacy found that between 2007 and 2010, there was an increased uptake of digital television, internet, games consoles and digital video recorders by children and young people aged 5- 15-years old.

Research has found that ownership, access and levels of home media and technology use vary according to several factors, including age, gender and socio-economic status (Wartella, Caplovitz & Lee, 2004). For example, studies have found that levels of access to technologies outside school increase with age (Selwyn et al., 2009) and as children get older, the type and amount of technology they use also

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increases (Marsh et al., 2005). In addition, older children use interactive media more than younger children (Wartella et al., 2004) and internet usage per day has also been reported to increase with age (Livingstone et al., 2011).

Gender differences in technology use have also been described (Wartella et al., 2004). For example, boys have consistently been reported to be more likely to play online games (Selwyn et al., 2009) and video games (Roberts, 2000) compared with girls and these differences were evident even in pre-schoolers (Wartella et al., 2004). In comparison, girls have been reported to be more likely to use MSN (MicroSoft Network) and other computer-mediated communication applications (Selwyn et al., 2009).

Differences in technology use and access have also been linked to differences in socio-economic status. The digital divide still exists, with large variations in access and use between those families who are media-rich and those who are media-poor (Thurlow & McKay, 2003). However, socio-economic disadvantage is not the only factor integral to the digital divide (McPake, et al., 2007). Parental beliefs about the importance of technology and their own experiences with using it, along with children's preferences, have been found to exert a stronger influence on the development of children's digital literacy than economic factors (McPake et al., 2007).

1.3.2 Parental perceptions of ICT in children's lives

Studies of young children's digital media use have also explored the views and practices of parents with regard to their children's access and engagement with technologies. In one survey, parents of pre-school children reported a number of beliefs about how technology should be incorporated into their children's lives (McPake et al., 2007). Some parents were concerned about detrimental consequences to their child's health and social development, and therefore limited their child's access to technology. Similarly, in another survey of the views of parents of 0-6 year olds, some parents reported concerns about exposure to violence and the lure of advertising and the impact on children (Marsh et al., 2005).

Conversely, other parents were positive about the role of media and technology (Marsh et al., 2005). Some said they wanted to be proactive in supporting their children's use of technology; to prevent their child being disadvantaged in school (McPake et al., 2007). In a survey of parents of young children in the US, a variety of reasons for the encouragement of media use were reported (Rideout & Hamel, 2006). Some parents believed that engaging with technology, including television programmes,

helped their children to learn (Rideout & Hamel, 2006). Parents have also highlighted their child's learning as a reason for providing home internet use (Livingstone & Bober, 2003).

1.3.3 ICT and schools

The UK Government has also recognised the benefits of children's access and engagement with technology. For example, the "Microcomputers in Schools Scheme" (1981) was promoted by the Conservative government, both with policy and financial support, with the premise that young people needed to be equipped with the vocational skills that would support them in future employment (Wellington, 2005). The commitment to the integration of ICT into schools has stayed broadly constant over time (Wellington, 2005). For example, schools spent £880 million on ICT in 2008/2009 and nearly one third of this funding came from the government through the 'Harnessing Technology Grant' (Livingstone, 2011) - a national strategy developed to support technology use within education (Becta, 2009).

In a recent survey of 7-11 year old British pupils, all participants indicated that they had access to a computer in school (Selwyn et al., 2009). At the pre-school level, a project exploring 3-4 year olds' experience with ICT reported that there was at least one desktop computer in each pre-school they visited; interactive whiteboards were beginning to be introduced and digital cameras were also used frequently (Plowman & Stephen, 2005).

These data suggest that government policy has been instrumental in improving access to computers and technology within schools and pre-schools. However, recent studies suggest that increasing resources in schools is not enough to improve educational outcomes or to enhance learning (Livingstone, 2011; Roschelle, Pea, Hoadley, Gordin & Means, 2000). A better understanding of how these resources can be used to support teaching and learning in the classroom is required (Roschelle et al., 2000).

One challenge in developing the use of media for teaching and learning concerns the knowledge and skills of the individuals who are charged with delivering the curriculum. Some research has shown that the characteristics (i.e. age and level of qualification) and attitudes (i.e. about the importance of media in children's lives) of pre-school practitioners can influence the extent to which they use and facilitate the use of technology (Marsh et al., 2005). In one survey of early years' practitioners, the more highly qualified practitioners (such as those with a degree or NVQ qualifications) were

more likely to use technology, and the older staff members (45-65-years) generally reported feeling less confident about integrating computer use into their practice (Marsh et al., 2005). Similarly, in another pre-school setting, despite there being a variety of technologies available, one study reported that practitioners' engagement with children and ICT was consistently reactive and supervisory as opposed to reflecting a clear pedagogical strategy (Plowman & Stephen, 2005).

In one study, school-aged pupils commented on the level of expertise of the teachers: teachers were not viewed as knowledgeable about technology and therefore many pupils reported that they would not ask them for help (Goodison, 2002). This finding highlights the concern expressed by some researchers at the gap between the "tech-savy" younger generation and those who teach them (Bennett & Maton, 2010, p.2). One further limitation in developing this agenda relates to what students are asked to do with computers. The computer activities that children are given to complete, for example, are reported to be closely related to the main classroom activity (Kerawalla & Crook, 2002). It is argued that if technology is going to support children's learning, it needs to support *how* they learn, in addition to expanding *what* they learn (Roschelle et al., 2000). For example, technology use may be able to support some of the fundamental aspects of learning, such as active engagement and connections to real-world contexts (Roschelle et al., 2000).

1.3.4 Changing practice in schools

Some researchers have argued that for technology to play a successful role in children's learning, it needs to be embedded in a clear educational policy (Cox & Marshall, 2007). Another important factor in pushing an agenda linked to integrating technology into teaching and learning is the establishment of a clear evidence base to supports its development and use. The amount of empirical research investigating the effects and influences of interactive media has not yet corresponded to the number of concerns and questions about this topic (Wartella et al., 2004). Previous research has often taken the form of large-scale surveys of access and use and, although these studies are valid, it is important to extend these findings with more qualitative methods to develop detailed insights into what technology means in the lives of individuals (Bennett & Maton, 2010). Equally, because the new media landscape is constantly shifting, more research is consistently needed (Thurlow & McKay, 2003).

Further research faces challenges in relation to the use of the term ICT – this term has been applied to a wide range of technologies, which makes it very difficult to make

comparisons across studies or pinpoint which technologies might be most beneficial in school (Livingstone, 2011). Additionally, children and young people use technology in multiple and diverse ways (e.g. using the Internet for a wide range of activities) and this diversity raises measurement issues for researchers (Eynon & Malmberg, 2011). One epistemological perspective that has frequently been adopted in research is that of technological determinism; the notion that technology impacts on children regardless of the situation (Selwyn, 2011). This approach, however, fails to consider the social and contextual (i.e. political, economic or cultural) factors that impact on how technology might influence children and their learning (Selwyn, 2011).

1.3.5 Summary

Children and young people's levels of access and engagement with digital technology continue to increase over time. Parents, educators and governments alike recognise that children and young people need to develop competence and operational skills with computers to be able to utilize any potential benefits for supporting and enhancing learning. Recent experience has shown that resources and funding are not enough for the meaningful integration of technology into pedagogy and the curriculum. Careful consideration of how the strengths and opportunities provided by interactive media can be combined and embedded across the curriculum is necessary before the impact of these attempts can be measured and evaluated.

1.4 Computer technology and reading interventions

1.4.1 Current use of computer-assisted literacy instruction

Computer technology is increasingly employed to target and support reading and literacy skills. Computer-assisted instruction (CAI) programs are frequently reviewed in contemporary research, and numerous papers have been published exploring the efficacy of specific programs (Blok, Oostdam, Otter & Overmaat, 2002). Many review papers have also attempted to determine the overall success of computer technology in reading instruction. Despite the diverse scope and focus of computer interventions, researchers who have developed computer packages maintain that they effectively improve literacy skills. However, research papers have typically evaluated individual, commercial products, making comparisons between studies difficult. The NRP (2000) review of reading instruction approaches summarised 21 studies that specifically evaluated technology-based programs. The review suggested that computer technology

could be used effectively to support reading development, although a lack of innovative uses of computer technology as literacy instruction was noted (NRP, 2000).

A more recent meta-analysis of 75 studies assessed the impact of CAI programs for beginner readers (5 to 9 years old) and struggling readers (up to 12 years old) (Blok et al., 2002). This review concluded that CAI programs were generally effective, although, they only had a small positive effect (estimated overall effect size 0.10 ± 0.06) on children's reading abilities. The authors suggested that this small effect size should be interpreted with caution because many of the studies they reviewed were of poor quality (e.g. some studies had very small samples and others lacked a control group; Blok et al., 2002).

Providing opportunities for students to develop and practise specific skills has been the focus of many computer programs (Blok et al., 2002), with decoding skills and letter-sound knowledge commonly targeted. For example, in one study, 7-year-old Finnish children either received a computer-assisted reading intervention targeting phonological skills, or a traditional remedial reading intervention. Children in the computer-based intervention were found to make significantly greater gains in both letter-sound knowledge and in more general reading skills (Saine, Lerkkanen, Ahonen, Tolvanen & Lyytinen, 2011). Similarly, an American study of 5-year-olds who used *Early Reading* (Lexia Learning Systems, 2003 cited in Saine et al., 2011) for a period of four months demonstrated that these children benefited from the intensive, systematic practice of phonological and letter-sound mapping skills provided by the CAI program (Macaruso & Rodman, 2011). The authors argued this approach was highly motivating because children were able to work through activities at their own pace (Macaruso & Rodman, 2011).

Positive results of computer-based programs that target specific skills have also been found with groups of older children. For example, 8-year-old children working with *Reader's Interactive Teaching Assistant* systems (RITA; Nicolson, Fawcett & Nicolson, 2000) for 30 minutes twice a week for 10 weeks made significantly more progress than the passive control group; matched for reading ability and chronological age. The experimental group also had significantly higher levels of enthusiasm for reading post-intervention, as measured by teacher ratings (Nicolson et al., 2000). Similarly, a group of 11-13-year-old pupils attending 30 minute sessions with *Lexia Strategies for Older Students* (Lexia Learning Systems, 2001 cited in Macaruso & Rodman, 2009) two or three times a week for one school year showed significantly larger gains in decoding compared with control pupils who simply received whole class

instruction from the teacher without the supplementary computer technology (Macaruso & Rodman, 2009). The authors suggested that computer technology may be successful because it allows pupils to progress independently (Macaruso & Rodman, 2009).

Other computer programs deliver a full reading curriculum. For example, the intervention, '*Academy of Reading*', includes explicit instruction in phonemic awareness, sound-symbol association knowledge, development of fluent decoding and comprehension practice (AutoSkill International Inc, 2007). One study including a wide age range of pupils (7-17-year-olds) within special education provision, demonstrated that after receiving the 30 minute intervention sessions of '*Academy of Reading*' three to five times a week for five months, the intervention group showed significant gains in vocabulary and comprehension, compared with controls who had engaged in a variety of reading activities but not this intervention (Torlakovic, 2011). Equivalent improvements have been demonstrated with other computer programs such as the Integrated Learning system *Waterford Early Reading Program* (WERP, Pearson Digital Learning, 2003 cited in Cassady & Smith, 2005). Over the course of a school year, with children aged 6-7 years old, the experimental group (who received the WERP intervention) outperformed the control group (who received only traditional reading instruction) on reading change scores. The greatest gains were made by those pupils at greatest risk of reading failure; those who had the greatest need for reading instruction. The importance of the teacher's role in monitoring the program was noted by the authors (Cassady & Smith, 2005). Similarly positive findings have been reported with programs in other languages, such as in Hebrew ('*I have a secret- I Can* Read*;* CET, 1996 cited in Mioduser, Tur-Kaspa, & Leitner, 2000) and in Dutch (*Leescircus*; PI Research cited in van Daal & Reitsma, 2000).

Alternative programs have incorporated computer-mediated technology into whole word approaches to supporting literacy skills, often through the use of talking books or speech recognition software. *Aural-Read-Respond-Oral-Write* (A.R.R.O.W) developed by Lane (1978; cited in Brooks, 2007) is an approach that incorporates speech recognition technology. With this program, children work individually; listening to the reading of a piece of text, reading it back, recording their own voice and then writing it down. Brooks (2007) reported on unpublished data that highlighted considerable benefits for children aged 6-11 years old in both reading and spelling following only a ten day intervention with A.R.R.O.W. In another study, specifically targeting Traveller children aged between 6-17 years old, A.R.R.O.W. was compared with other reading interventions; *AcceleRead AcceleWrite* (Clifford & Miles, 1994 cited

in Nugent, 2010) and Paired reading (Topping; a non-computer based programme). The structured implementation of all of the programmes was found to improve literacy skills in this population. However, the author noted that A.R.R.O.W. was particularly advantageous because it can be delivered to groups of children, reducing the amount of time needed for teacher input (Nugent, 2010).

In another recent study, 5 and 6-year-old pupils who had been identified as struggling readers used talking books called "Clicker" and traditional Oxford Reading Tree Big Books during the literacy hour for one school week (Karemaker, Pitchford & O'Malley, 2009). Compared to their baseline scores, after both interventions the children had made significant gains in all literacy measures; with greater gains made with "Clicker" in written word recognition, naming words and awareness of rhyme. The authors suggested that this may be due to specific features of the technology that highlight individual words or sentences while they are read aloud by the narrator. Other research supports the suggestion that the nature and format of the technology is important in determining whether positive literacy gains are made. Kegel and Bus (2012), for example, found that Dutch children aged 4 years old showed an improvement in literacy skills only when the computer program included an online tutor which provided feedback on the correctness of responses and suggestions for how to improve.

In contrast to some positive findings, further studies have found no positive effects of computer-based interventions. In a meta-analytic review of six papers evaluating "FastForWord" (Scientific Learning Corporation, 1997 cited in Strong, Torgeson, Torgeson & Hulme, 2011), a suite of computer-based intervention programs specifically designed to improve literacy and language skills, it was concluded that there was no evidence that this program was effective in supporting reading or language development.

Comparably, in one study, children aged 8-14-years-old received 'drill and practice' activities from an Integrated Learning system named "SuccessMaker" (Computer Curriculum Corporation cited in Underwood, 2000). The results showed no significant differences between the passive control group and the intervention group following the program (Underwood, 2000). A number of schools participated in this study and data from each school were explored. For some schools, the intervention group did outperform the control group; conversely in another school those who received the intervention actually performed worse in the outcome measures than the controls. The authors attributed the poor performance of the students in this school to a

number of factors, most pertinently the way in which the intervention was implemented; students in this school were withdrawn from their normal classes to receive the intervention. Other researchers argue that programs need to be integrated into the teaching process to be successful (Nicholson et al., 2000). Despite mixed findings about the impact of "SuccessMaker" on literacy outcomes, another study reported considerable motivational factors reported by students associated with this program. These included perceptions around making progress, high scores (because the program was targeted at an appropriate level) and linked incentives and rewards (e.g., certificates; see Presland & Wishart, 2004)

1.4.2 Summary

Considerations of current computer-based reading interventions highlight predominantly positive findings. While most studies have found positive effects of CAI, others have reported only small effect sizes (Blok et al., 2002) or no significant effects at all (Strong et al., 2011). However, taken together, most studies suggest that the integration of technology into a literacy curriculum can be beneficial, leading to positive learning outcomes, particularly in contexts in which technology targets specific skills and abilities, is supported by teachers, and meets the needs of individual children (Brooks, 2002).

1.5 Innovative approaches to using technology in literacy interventions

In recent years, there have been improvements in both the functionality of computer technology and the integration of this technology into classrooms. However, the NRP (2000) reported that the majority of computer-based programs for literacy used a computer interface to provide traditional reading instruction or provide an opportunity to practise skills. Similarly a recent survey of 7-11 year old pupils, reported that there was little evidence that ICT use in schools was transforming and empowering children's learning (Selwyn et al., 2009).

In future, computer technology could offer children different learning experiences. For example, by offering children activities in different formats (i.e. electronic vs. regular books) it may be possible to deliver different reading experiences (de Jong & Bus, 2002). In one study of 4-6-year-olds who used books in both formats, it was concluded that electronic books may offer an overlapping and complementary experience of the written form and story content (de Jong & Bus, 2002). It was not

suggested that use of electronic materials should replace regular book reading, but that they might provide valuable and novel experiences for early readers.

Children and young people are already using a wide range of technology, and research has found positive links between literacy skills and use of technological devices, in particular mobile phone text-messaging (Plester, Wood & Bell, 2008; Plester, Wood & Joshi, 2009). These findings raise the possibility that mobile phones could be used as a tool for supporting the development of literacy skills in children and young people.

During the 1980s, mobile telephones were first introduced (Engineering and Physical Sciences Research Council, 2006) but text-messaging or the short messaging service (SMS) was not developed until the early 1990s (Baron, 2003). Recently, it has been reported that children are learning about and interacting with mobile technology from a very young age, with children aged from 0-6-years seeming to understand the role, nature and uses of mobile phones in social contexts (Marsh et al., 2005). OfCom (2011) reported that mobile phone ownership has been fairly stable among children and young people since 2007; with around 50% of 5-15 year olds owning a mobile phone. For 11-12 year olds, 78.5% reported regularly using a mobile phone and 62.7% of these children reported text-messaging as their primary use (Plester et al., 2008). A more recent study indicated an earlier trend for mobile phone usage; with 93.4% of a sample of 10-12 year-olds reporting that they either owned or had access to a mobile phone (Plester et al., 2009). These statistics suggest that children and young people are motivated to use mobile phones and text-messaging. Social and communicative benefits of this type of interaction for young people have also been reported (Reid & Reid, 2010).

Considerable attention has been given to the language used in text-messages. It has been argued that as mobile technology has been adopted as a mode of communication, written forms and conventions have been adapted to create an abbreviated form of writing sometimes referred to 'text speak' or 'textese' (Kemp, 2011). The primary motivation for using 'text language' has been assumed to be about saving typing time, rather than a specific intention to create a 'new language' (Neville, 2003).

'Text language' incorporates features of spoken and written language (Plester et al., 2008). Words are often heavily abbreviated (Coe & Oakhill, 2011) and include contractions and colloquial language like speech (Plester & Wood, 2009). This style can be achieved in a number of ways: omitting letters, using only initials, or shortening

words (Crystal, 2008). (Hereafter in this review, abbreviated words in text messages will be referred to as textisms.) Many textisms are dependent on a certain level of phonological awareness and alphabetic knowledge (Plester et al., 2008; Plester & Wood, 2009). Even when words are spelled in non-conventional ways in text messages, they still tend to follow consistent orthographic patterns in English (Neville, 2003). Some of these are similar to the invented spellings of beginner spellers, but the key difference is that the error in spelling found in text messages is intentional and reduces the number of letters (i.e., 'u' for 'you' versus 'tabil' for table' Read, 1986 cited in Neville, 2003). English has a variety of 'legal' forms that phoneme-grapheme conversions can take, which means that it can provide a solid base from which play with textisms can expand (Plester, Lerkkanen, Linjama, Rasku-Puttonen & Littleton, 2011). But, in text messages, as in all communication, the text needs to be able to be deciphered and understood by others (Crystal, 2008). This process has been reported to be problematic for some teenagers (Eldridge & Grinter, 2001).

The uniqueness and distinctness of this type of 'new language' has been emphasised in the media (Thurlow, 2006), with some commentators expressing concern about this evidence of reinvention of traditional linguistic and communication practices (Thurlow & McKay, 2003). In a study which reviewed over 100 articles that mentioned young people, computer-mediated technology and language, the impact of this 'new language' on standard English was generally perceived to be negative (Thurlow, 2006). However, some linguists have argued that this online language has been sensationalised (Baron, 2009). Researchers studying electronically mediated communication have explored how this type of language is changing traditional speech and writing, and have found only a few minor effects on vocabulary and sentence structure (Baron, 2009). The key issue is whether students know which styles of language are appropriate at different times. Some researchers argue that if intrusions of this new language are found in standard writing, then it is more likely to be due to a lack of attention to the appropriate register rather than an inability to write (Plester et al., 2011). Additionally, others have argued that experience with texting could raise awareness about differing language registers and therefore be beneficial (Plester et al., 2008).

Empirical research shows that children and young people are using shortenings and abbreviations in their texting and online writing. For example, similar proportions of textisms were used by English children and Finnish children aged between 9-11-years-old in one study, although the types of textisms they used varied, perhaps due to the different orthographies of the languages (Plester et al., 2011). Another study found

evidence of pragmatic devices in language from the internet messages of adolescents (Varnhagen et al., 2010). However, they found no evidence of detrimental effects of use of this language on formal spelling ability (Varnhagen et al., 2010). Similarly, 43% of college students who reported using 'text speak' did not show any difference in performance on standard literacy measures compared with students who did not use 'text speak' (Drouin & Davis, 2009). However, some students did report feeling that using 'text speak' was undermining their Standard English skills (Drouin & Davis, 2009).

Research with different age groups has shown mixed findings regarding the relationship between texting and standard literacy skills. Research with college students found a significantly positive relationship between frequency of texting and spelling and reading fluency (Drouin, 2011). Another study with a similarly aged population of university students reported a significant negative association between texting behaviours and standard literacy skills (De Jonge & Kemp, 2012). (However, when overall frequency of text-messaging was accounted for, this negative association was no longer significant.) Similarly, in a study with 11-12-year-olds, Plester and colleagues (2008) found a negative relationship between high levels of texting and verbal and non-verbal reasoning scores. However, in the same study, positive associations between use of textisms and verbal-reasoning measures were demonstrated. Following these findings, the researchers emphasised the need to distinguish between texting behaviours and knowledge of textisms (Plester et al., 2008). From this evidence, it seems possible that excessive time spent texting could be negatively correlated with literacy, whereas the use of 'textisms' could have a different more positive relationship with standard literacy skills.

Positive associations between use of textisms and literacy skills have been consistently found. Coe and Oakhill (2011), for example, found that good readers aged 10-11 years were able to produce more textisms compared with poorer readers. In a similar study with 11-16-year-olds, better spellers were found to use more textisms (Neville, 2003). Comparably, in a sample of 10-12-year-old Australian children, better literacy skills were associated with greater reading speed and accuracy of text language (Kemp & Bushnell, 2011). In a longitudinal study with 8-12-year-olds, textism use at the beginning of an academic year accounted for unique variance in spelling performance at the end of that year, after accounting for other outcome measures (such as general academic ability and phonological awareness). Conversely, reading and spelling ability were not able to predict variance in textism usage. The authors argue

that this suggests textism use has a causal relationship with spelling performance (Wood, Meacham, et al., 2011).

More recently, correlational research has been extended through the use of experimental approaches. Wood, Jackson and colleagues (2011), for example, worked with 9-10- year-old children who did not have any experience with phones. The children were given mobile phones over weekends and one holiday (one week) to use for text-messaging for a total of 10 weeks. Reading and spelling ability was measured and IQ was controlled. Findings showed that the children did not benefit significantly from use of mobile phones compared with the control group who did not receive phones. However, the use of textisms predicted a significant amount of variance (8.6%) in spelling development for the intervention group (Wood, Jackson, Hart, Plester & Wilde, 2011). Similarly, an experimental approach was used with undergraduate students in which participants were given a pre-exposure spelling test. They were then exposed to the same words in textisms, misspellings or correctly spelled and then took a further spelling test (Powell & Dixon, 2011). The mean spelling scores for the groups who had been exposed to the words written in textisms or words spelled correctly increased from pre to post. The spelling scores of the group who had seen the words misspelled worsened. The authors argued that there is something about the format of the textisms that led to explicit reflection on both the phonology and the orthography of the words which was beneficial for spelling. Arguably, if textism knowledge supports phonological awareness then this in turn could support the development of broader literacy skills (Powell & Dixon, 2011).

Within this field of research, authors have suggested that an intervention incorporating text-messaging could be beneficial for children and young people. With regard to special populations, Durkin and colleagues (2011) suggested that teaching children with specific language impairments about the benefits of texting and how to do it could have social and interpersonal benefits. Equally, it has been suggested that text-messaging based exercises could be effective in fostering phonological awareness for pupils with dyslexia (Veater, Plester & Wood, 2011). Other researchers argue that there are a number of ways that texting and literacy development could be linked - engaging with text-messaging leads to increased exposure to print, which has been robustly linked with ease of learning to read (Plester & Wood, 2009). Additionally, texting could provide a platform for word play which may help children to develop sensitivity, confidence and flexibility with written language (Plester & Wood, 2009).

1.6 Future Research

At present the amount of empirical research investigating the effects of technology has not yet corresponded to the number of questions about this topic (Wartella et al., 2004). One key methodological issue within previous research has been the use of the term ICT to encompass a vast array of technology (Livingstone, 2011). Future research would benefit from more clearly defining the technology that is being evaluated. Correspondingly, research should be targeted and focused on measuring the outcomes of specific interventions and approaches that use technology, in order to try to understand the unique contribution technology and media might make to teaching and learning.

Studies that specifically evaluate computer-assisted instructional programs will continue to be vital in progressing our understanding of the best ways of supporting literacy learning through technology. In particular, it will be important for studies to consistently evaluate the same computer programs in order to provide evidence about a program's efficacy and generalisability, and ultimately to enable evidence-based practice in schools. Research will also need to continue, in order to develop an understanding of the optimal requirements for embedding computer technology into pedagogical approaches in the classroom. In this way, empirical research can have more significant and useful implications for practice in schools.

Future research should also aim to develop and improve intervention programmes by using a wide range of technology that will engage children and young people; including mobile phones. As children and young people are already engaging with many technological devices, it will be important to develop research into whether these could be successfully incorporated into the classroom. In the case of mobile phone text-messaging, there is potential for their use in schools to support literacy. However, before an intervention could be implemented, continued research to explore the causal relationships between textism use and standard literacy skills is needed. To do this, experimental training studies are required.

1.7 Conclusion

Despite much debate in reading research, there is broad agreement that phonological awareness is important in reading development (Castles & Coltheart, 2004) and that the influence of these skills is not developmentally limited to beginner readers (Wagner et al., 1997). Many computer-based programs have successfully targeted these skills, with a variety of age groups. In the last decade there have been

considerable government-led initiatives to increase technology resourcing in schools (Wellington, 2005) and children today have unprecedented access to a wide range of technologies (Livingstone et al., 2011). However, there has been a lack of evidence that technology has significantly improved and enhanced teaching and learning practices (Selwyn et al., 2009). In the case of computer-based literacy interventions, overall engagement with different programs has had positive influences on literacy skills for children of a variety of ages; demonstrating that computer technology is able to support the development of skills in this area. However, limitations in the research, such as a vast number of studies evaluating different individual programs means that it is difficult to draw conclusions about which interventions are most effective. Equally, children and young people's engagement with technology goes far beyond just computers. Consequently, there is the potential for using different technological devices in the classroom. The positive correlational findings between textism use and standard literacy skills suggest that integrating text-messaging into an intervention has the potential for supporting phonological awareness and broader literacy development. However, more experimental research is needed in this area before the potential efficacy of such an intervention could be determined.

Chapter 2: Empirical Study

PlayN wit letAs N sounds: The effects of a textism intervention on children's literacy skills

2.1 Introduction

Evidence from reading research suggests that phonological awareness and alphabetic knowledge are highly influential during the process of learning to read. For example, phase theories of reading development, (e.g., Ehri's, 2005b) emphasise the type of alphabetic knowledge that children develop through each phase of learning, suggesting that there are qualitative differences in alphabetic knowledge between beginner and skilled readers. Additionally, numerous longitudinal and training studies have demonstrated a consistent, positive relationship between phonological awareness skills at one time point (usually with beginner readers) and reading development over time (Bradley & Bryant, 1983; Elbro & Peterson, 2004; Wagner et al., 1997). Furthermore, some researchers have argued that phonological awareness should be considered as a causal factor in reading development (Castles & Coltheart, 2004).

Researchers have started to consider the impact of using technology on the development of reading and learning more generally, particularly as children today have unprecedented access to electronic media (Livingstone et al., 2011). Engagement with mobile phones and text-messaging, for example, is part of the everyday life of children and young people (Wood, Meacham, et al., 2011b). OfCom (2011) reported that two thirds of young mobile phone owners had acquired this technology by 10-years-old and 50% of 5-15-year-olds had their own mobile phone (OfCom, 2011). Taking photos, listening to music and playing games on mobile phones are all popular activities for 8-11-year-olds (OfCom, 2011). However, the short messaging service (SMS) or text-messaging, which was introduced in the 1990s (Baron, 2003), has become one of the key functions of mobile phone use among young people (OfCom, 2010). In a recent study of 11-12-year olds, text-messaging was reportedly the primary function for which they used their mobile phones (Plester et al., 2008). Considerable space restrictions apply in text-messaging (Baron, 2003), as usually only 160 characters are permitted per message. As a result, and as mobile phone technology has been adopted, an abbreviated form of writing sometimes referred to as 'text speak' has emerged (Kemp, 2011). Text writing includes features of spoken and written language (Plester et al., 2008) and words are often heavily abbreviated (Coe & Oakhill, 2011). This style can be achieved in a number of ways: omitting letters, using only initials, or shortening words (Crystal, 2008). Abbreviated words in text-messages are often known as textisms.

Researchers have suggested that textism use and literacy development in English could be linked in a number of ways. English is an alphabetic language in which single

symbols (letters or letter combinations; graphemes) represent the spoken sounds (phonemes) of language (Adams, 1990). In addition, English is a non-transparent writing system because there is not a consistent relationship between graphemes and phonemes (Adams, 1990; Coltheart, 1978). Consequently in English there are a variety of 'legal' forms that phoneme-grapheme conversions can take, which means that it can provide a solid base from which play with textisms can expand (Plester et al., 2011). Many abbreviations are dependent on a certain level of phonological awareness and alphabetic knowledge (Plester et al., 2008; Plester & Wood, 2009).

Recent studies have started to explore the relationships between text-messaging and literacy skills. For example, one study found positive associations between use of textisms and phonological awareness (Plester et al., 2009). In addition, Coe and Oakhill (2011) found that good readers, aged 10-11 years, produced more textisms in elicited text messages, compared with poorer readers. In this study the children were required to complete three activities; translating words into textisms, writing a text message and reading messages written in Standard English and text. Good readers produced the most textisms in the writing tasks and were faster at reading all of the messages. In a similar study of 11-16-year-olds, better spellers were found to use more textisms (Neville, 2003). Comparably, in a sample of 10-12-year-old Australian children, better literacy skills were associated with greater reading speed and accuracy of text language (Kemp & Bushnell, 2011). In a sample of adolescent participants, including those with specific language difficulties, a positive correlation was also found between the use of a wide variety of textisms and better literacy skills (Durkin et al., 2011).

While generally studies have found positive relationships between textism use and literacy skills, some studies have highlighted significant negative associations between texting behaviours and standard literacy (De Jonge & Kemp, 2012). Explanations for differences in results between studies have focused on differentiating between types of texting behaviours. For example, the amount of time spent texting, versus knowledge of textisms (Plester et al., 2008). The importance of this distinction was highlighted in one study of 11-12-year-olds (Plester et al., 2008). In this research, a negative relationship was found between high levels of texting and verbal and non-verbal reasoning scores. However, in the same study, positive associations between use of textisms and verbal-reasoning measures were demonstrated. Additionally, the study of adolescents and adults that found significant negative associations between texting behaviours and

standard literacy skills used a sample of participants who used predictive text[1] (De Jonge & Kemp, 2012). It is possible that the method of texting may influence the type and number of textisms that are produced, because textisms need to be programmed into phones if predictive text is used (De Jonge & Kemp, 2012). Correspondingly this may also influence the relationship between texting and literacy.

Positive associations between textism knowledge and literacy have been consistently found, however causal predictions have not been possible, due to the correlational nature of previous research. Wood, Meacham and colleagues (2011) conducted a longitudinal study to assess the predictive power of textism use on reading and spelling performance. Participants aged 8-12-years-old were assessed on general cognitive ability, in addition to a variety of reading, spelling and phonological measures at the beginning of a school year. At this time participants also provided samples of text messages that they had sent over a two day period. All measures were repeated at the end of the academic year. Textism use at the beginning of the year was found to account for unique variance (1.5%) in spelling performance at the end of the year, after accounting for the other outcome measures. Conversely, reading and spelling ability were not able to predict variance in textism usage. The authors concluded that this study provides evidence that textism use is causally related to spelling performance.

Experimental approaches have also been implemented, despite some concerns about the practical and ethical issues of conducting these types of studies (Plester et al., 2009). One study with 9-10-year-old children inexperienced with phones, gave these children mobile phones over weekends and one holiday (one week) to use for text-messaging for a total of 10 weeks (Wood, Jackson, et al., 2011). Reading, spelling and phonological awareness were measured, and IQ was controlled. The children did not benefit significantly, in terms of improvements in reading and spelling scores, from use of mobile phones, compared with the control group who did not receive phones. However, use of textisms predicted a significant amount of variance (8.6%) in spelling development for the intervention, compared to the control group (Wood, Jackson, et al., 2011). Similarly, an experimental approach with undergraduate students was implemented to investigate the effect of exposure to textisms on standard spelling (Powell & Dixon, 2011). Using a test-retest design participants were given a pre-exposure spelling test and were then exposed to the same words written as textisms, misspelled or correctly spelled. They then took a further spelling test. The mean spelling

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[1] Predictive text is an input method for texting in which words are chosen from an existing dictionary in the phone based on the initial letters entered into the keypad (How & Kan, 2005).

scores for the group who had been exposed to words written in textisms increased from pre to post test, as did the group who had seen the words spelled correctly. Exposure to misspellings decreased spelling scores. The authors argued that there is something about the format of textisms that led to explicit reflection on both the phonology and the orthography of the words that was beneficial for spelling.

Engaging with phonological abbreviations or textisms could provide a platform for word play, which may help children to develop sensitivity, confidence and flexibility with written language (Plester & Wood, 2009). Consequently, if textism knowledge supports phonological awareness then this in turn could support the development of broader literacy skills (Powell & Dixon, 2011). Other mechanisms may also underlie the relationship between texting and literacy. The lack of grammatical constraints may motivate children struggling with literacy to engage in written communication (Plester et al., 2009) and increase exposure to print, which has been robustly linked with learning to read (Plester & Wood, 2009). Texting may also be less risky for children than formal writing, allowing them to build confidence (Plester & Wood, 2009). Alternatively, experience with texting might contribute to children's literacy development by improving their metalinguistic knowledge because they are learning when and how to use textisms to the best effect (Wood, Meacham et al., 2011).

2.1.1 Current study

In order to provide further insights into the relationships between use of textisms and literacy skills, the current study aimed to provide children with opportunities to engage with textisms and to explore the potential impact of this experience on children's literacy skills. Previous findings suggest that children and young people might benefit from intensive exposure to textisms to improve literacy skills; because textism exposure might lead to an explicit reflection on the phonology and orthography of words (Powell & Dixon, 2011). The present study implemented an experimental, intervention approach to control exposure to textisms. A successful intervention protocol would have implications for supporting literacy development. It utilised a 6-week textism intervention consisting of translating and composing messages and discussing different types of textisms within a small group. Children were matched for reading ability and randomly allocated to a textism intervention group and an active control group (controlling for time spent texting). Although, this intervention fits well with recent government initiatives to increase the level of technology use in schools

(Wellington, 2005), the intervention was implemented primarily in order to address some specific research questions and hypotheses.

2.1.2 Research questions and Hypotheses

In line with previous research, this study reviewed mobile phone practices for 9-10-year-old children. The present study also addressed two key research questions to explore whether a textism intervention significantly improved children's ability to make use of textisms within elicited text messages; and improved their phonological awareness, word reading and spelling. It was predicted that children in the experimental group, who received an explicit textism intervention, would include more textisms overall, and specifically more phonologically-based textisms (targeted in the intervention), in their elicited messages after the intervention compared with the control group. It was also hypothesised that textism use would be positively correlated with literacy skills. Children in the experimental group were predicted to improve significantly in all literacy measures compared with the control group following the intervention.

2.2 Method

2.2.1 Participants

Seventy-eight children aged 9-10-years-old (38 males and 40 females) in Year 5 at one school in the south of the UK completed a screening questionnaire to find participants who had no previous access to a mobile phone. This questionnaire asked children about access to mobile phones, frequency and types of use and Internet messaging (see Appendix A). Parents were sent information about the questionnaire and were given the opportunity for their child not to take part (Appendix B & C). No parent withdrew their child at this stage.

Of the 78 children who completed the questionnaire, 31 indicated that they did not personally own, or have access to, a mobile phone. All participants spoke English as their first language and none were listed on the Special Educational Needs register. All 31 children were given the opportunity to participate in the study and parents were contacted to obtain written permission for their child to take part in the study (Appendix D). Sixteen parents (52%[2]) gave their consent for the involvement of their children;

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[2] Note that according to power calculations using G*power version 3 (Faul, Erdfelder, Lang & Buchner, 2007) for a moderate effect size to be found, $r = 0.30$, a minimum total sample of 26 participants would be required to test a one-tailed hypothesis with 95% power and 5% significance level. Consequently, the final sample size in this study does not meet the requirements for calculating a moderate effect size.

(mean age = 9.78, SD =0.26, 8 males and 8 females). Participants came from three different classes at the same school. All 16 children completed the pre-measures to measure use of textisms in an elicited text message, phonological awareness, reading and spelling (see below). Children were matched in pairs for reading scores and one of each of the matched pair was randomly allocated to either the control or the experimental group.

The experimental and control groups each consisted of eight children; four females and four males (Mean = 9.73, SD = 0.30, range = 9.25 to 10.08 and Mean = 9.83, SD = 0.23, range = 9.42 to 10.08 respectively). Mean standard reading scores for both groups were above the average range for children of this age. Only the Rhyme subscale of the Phonological Assessment Battery showed a group difference at pre-test, with the experimental group showing a higher score on this test. Table 1 shows the pre-intervention scores for the control group and the experimental group for each outcome measure[3].

Table 1.

Pre-intervention means and standard deviations (in parentheses) for use of textisms (percentage of message written in textisms), standardized scores for the Phonological Assessment Battery subscales (PhAB: Alliteration, Rhyme, Non-word reading, Spoonerisms), the British Ability Scales (Second Edition; BAS II) word reading subscale and the Graded Spelling test for the control group (N = 8) and the experimental group (N = 8).

Measure	Control group	Experimental group
Use of Textisms (%)	8.53 (8.32)	15.24 (13.86)
PhAB: Alliteration	98 (3.85)	98.75 (3.536)
PhAB: Rhyme	96.63 (11.26)	115.5 (13.12) [*]
PhAB: Non Word reading	115 (14.14)	115 (14.36)
PhAB: Spoonerisms	111.5 (7.76)	108 (6.72)
BAS II: Word Reading	113.88 (10.33)	115 (12.98)
Graded Spelling test: Spelling	88.71 (12.16)	87.29 (15.01)

Note. [*] $p < .05$.

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[3] Non-parametric statistics were used where measures for either the experimental or the control group were not normally distributed.

2.2.2. Measures

2.2.2.1 Mobile phone ownership and usage

A background questionnaire (adapted from Coe & Oakhill, 2011) consisting of 15 items was administered to all Year 5 children to measure ownership and usage of mobile phones (see Appendix A for the full questionnaire). For inclusion in the study children were required to indicate that they did not own, or have regular use of a mobile phone (items 1 and 2, requiring a yes or no response). If they indicated that they did use a mobile phone, they were asked to provide estimates of the frequency of their usage, the age at which they first had access and indicate whether they use predictive texting and explain their reasons for using or not using this function (items 3 to 11). In addition, information that indicated a broader awareness of computer-mediated communication (e.g., via the internet[4]) was also collected (items 12 to 15).

2.2.2.2. Use of Textisms

To assess participants' ability to write a text message and use textisms, each child was asked to individually compose a text message. Participants completed this activity in groups of no more than eight children and were required to write their messages by hand on a piece of paper. To facilitate this activity, participants were given a scenario (as used by Coe & Oakhill, 2011; see Appendix E) asking them to write a text message to someone at home (i.e., to communicate that they were staying at a friend's house for dinner). In addition, they were given essential information to be included in the message (i.e., you will be home at 7pm), which was read to all children and printed out on a piece of paper.

Messages were coded for number of words, including individual letters (i.e. 'a'). Ideograms such as 'x' for kiss and emoticons were not counted as words (see Coe & Oakhill, 2011). Messages were also coded for the number and type of textisms based on categories adapted from Thurlow (2003), including repetitions. Textisms were coded into eight distinct categories: letter/number homophones (e.g., 4 - for), g clippings (e.g., goin- going), other clippings (e.g., hav - have), shortenings (e.g., din- dinner), contractions (e.g., im - I'm), initialisms/symbols (e.g., @ - at), accent stylizations (e.g., gonna- going to) and misspellings (e.g., diner - dinner). Numerals used to represent numbers were not considered to be textisms (e.g. home at 7) unless they were used as

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[4] As this activity has many similarities with text-messaging, it was deemed to be informative to collect information on usage of Internet messaging. However, inclusion in the study was not determined by the use of Internet messaging; there are fundamental differences between the two forms of communication. During instant messaging on a computer the user has access to a full QWERTY keyboard and users are not restricted by the number of characters they can send in one message.

homophones (e.g., 4 - for). Nicknames were not included as they could be used in standard writing, but initials for names were counted as textisms, as long as they clearly corresponded to the child's name (e.g., J.S - John Smith). Individual letters were only considered textisms if they would not be used alone in Standard English (e.g., u); the case of letters (upper or lower) did not matter. The proportion of textisms in each message was calculated from the overall number of words used (expressed as a percentage) and this was used in the analysis.

2.2.2.3 Phonological Awareness

Phonological awareness was assessed using a selection of subscales from the Phonological Assessment Battery (PhAB; Frederickson, Frith & Reason, 1997). The PhAB was developed for use with 6- to 14-year-olds. This battery contains eight main subscales, four of which have been identified as measuring phonological awareness; alliteration, rhyme, Spoonerisms and non-word reading. All subscales are reported to have a reliability coefficient above 0.80 (Frederickson et al., 1997). Scales were administered to the children individually by the researcher in a quiet room following the standardised instructions. Corrective feedback was not given at any time. The alliteration test (range= 0-10) requires the child to listen to three words and say which two start with the same sound - to isolate the initial sounds. The rhyme test (range= 0-20) asks the child to listen to three words and say which two end with the same sound- to isolate the rhyme in words. The non-word reading (range = 0-20) requires the child to read nonsense words by decoding letter strings: this taps phonological processing. In the Spoonerisms test (range = 0-30), children are asked to replace the first sound of a word with a new sound, then to exchange the initial sounds of two words (e.g. 'sad cat' makes 'cad sat') which assesses phoneme manipulation. Raw scores for each of the subscales were converted into standard scores for each subscale before analysis. Standard scores between 86 and 114 are deemed to fall within the average range. Additionally a phonological awareness composite score was constructed and analysed.

2.2.2.4 Word reading

To assess the children's reading ability, the British Ability Scales, Second Edition (BAS II; Elliot, Smith & McCulloch, 1997) word reading achievement subscale, developed for 6-17-year-olds, was administered to participants individually. The children read up to 70 words from a card, graded in difficulty. The test was administered as per the standardised instructions and the discontinuation procedures

were followed (i.e., stopping administration after eight failures in a block of ten items). Corrective feedback was not given at any time. This subscale has a reliability coefficient of .86 or above (Elliot et al., 1997). Raw scores (range = 0-70) were converted into standard scores before analysis, these have a mean of 100, and scores between 90 and 109 are considered within the average range.

2.2.2.5. Spelling

To assess spelling ability, the Graded Word spelling test, third edition (Vernon, 2009) developed for 5-18-year-olds was administered to the children in groups in a quiet room in school. It consists of 80 words graded in order of difficulty and a set of 47 age-relevant targeted words were presented to the children read aloud by the researcher. This test has a reliability coefficient of .86 (Savage, 2006). Raw scores (range = 0-47) and standard scores can be calculated for this test. Standard scores have a mean of 100, and scores between 85 and 115 are deemed to fall within the average range.

2.2.2.6. Evaluation questionnaire (Post intervention only)

A 9-item evaluative questionnaire (see Appendix F) was administered to both groups at the end of the final intervention session. Three items aimed to measured enjoyment of texting (items 1,4 & 6), three targeted the level of confidence in their ability to write clear messages (items 3,7 & 9) and the final three questions asked the children to indicate their thoughts about future use of texting (items 2, 5 & 8). All questions required a response on a 5-point likert scale ('Strongly Agree, Agree, I don't know, Disagree, Strongly Disagree'). There were three reverse-scored items (items 2, 6 & 7). The maximum score on this questionnaire was 45. A high score indicated a positive attitude to texting. In the current sample, the reliability for the total scale was questionable (α = .55).

2.2.3 The intervention

The intervention program was developed for this study. Prior to the main study, a one session pilot intervention was undertaken with parental informed consent required for participation (Appendix G). Six Year 6 children (aged between 10 and 11 years) from a school in the south of the UK took part in the pilot session which lasted for 30 minutes. This session was run to check the accessibility of the tasks and intelligibility

of the questioning. The intervention materials and structure were adapted as appropriate following the pilot session.

For the main study, children in the control groups (two groups of four children) and in the experimental groups (two groups of four children) attended a session with the researcher once a week for 6 weeks. All sessions took place during normal school hours in a quiet room within school. Each session lasted 30 minutes. During the sessions children had their own, identical mobile phones to use. The mobile phones were "T-mobile Zest E110" in black. This is a very basic phone, with a multi-press method required for texting. The children were only permitted to use the text function on the mobile phone. The initial introductory session was identical for both the control and experimental groups. An overview of each of the sessions for each group can be seen in Table 2. (For full details of the session content and standardised instructions please see Appendix H; control group and Appendix I; experimental group).

Table 2.

Details of the content of each of the six intervention sessions for the control and experimental groups .

Session No	Control Group	Experimental Group
Content of Sessions		
1	Familarisation with mobile phones with specific teaching in writing a text message.	
2	• Compose a message (Scenario 1) • Unstructured time to send messages to other members of the group	• Recognition of differences task (reading the same message in 'text' and standard English- see above) • Compose a message (Scenario 1)
3	• Compose a message (Scenario 2) • Unstructured time to send messages to other members of the group	• Starter activity (change a phrase into textisms) • Recognition of differences task • Compose a message (Scenario 2)
4	• Compose a message (Scenario 3) • Unstructured time to send messages to other members of the group	• Starter activity (change a phrase into textisms) • Recognition of differences task • Compose a message (Scenario 3)
5	• Compose a message (Scenario 4) • Unstructured time to send messages to other members of the group	• Starter activity (change a phrase into textisms) • Compose a message (Scenario 3)
6	• Unstructured time to send messages to other members of the group. • Evaluation Questionnaire	• Starter activity (change a phrase into textisms) • Unstructured time to send messages to other members of the group. • Translation task • Evaluation Questionnaire

2.2.3.1 Control group

The overall aim of the sessions for the control group was to give them an opportunity to use text-messaging for an equal amount of time as the experimental group. In sessions two to five, children in the control groups completed the "Compose a message" task in which they were given a scenario for them to respond to e.g.;

Scenario 1: "It is Saturday morning, it is a sunny warm day, and you don't have any plans, but you'd like to go somewhere with your best friend. Your parents have told you it's ok with them if you go out with your friend" (Plester et al., 2009)

The researcher read the scenario to the children and they were asked to produce a response individually, on their phones. Following completion of this task, the children spent the remainder of the session each week sending text messages to each other. The researcher was present for the unstructured time, but did not participate in texting. At the end of the final session the control group completed a short evaluation questionnaire.

2.2.3.2 Experimental group

The overall aim of the sessions for the experimental group was to give them opportunities to read and write a variety of textisms. Every week they responded to the same scenarios as the control group in the "Compose a message" task. However, following the initial activity the experimental group also shared their messages with each other and discussed their use of textisms.

In four out of the six sessions the experimental group also completed the "Recognition of Differences" task with two text messages saved onto their mobile phones for them to read. Both messages included the same content, but one was written in Standard English and the other using a variety of textisms. Examples of all of the types of textisms categorised by Thurlow (2003) were included in the messages for this activity. (The messages were the same as those used by Coe & Oakhill, 2011). E.g.

Text version: Hi Jon, do u want 2 go 2 the park & play footy? We cud hav dinna @ mine afta if u want. I've got a nu cmputA game mayb we can hav a competition. I'm gona invite Dan 2. Let me no if u can make it. Cul8r. Mike

Standard English Version: Hi John, do you want to go to the park and play football? We could have dinner at mine after if you want. I have got a new computer game maybe we can have a competition. I am going to invite Dan too. Let me know if you can make it. See you later. Mike.

The children read both the messages aloud and then discussed the differences and similarities between the two. This group also engaged in a starter activity each week.

They were given a common phrase from a text message (e.g. See you later) and asked to write down as many different ways of changing the spelling of the words. They completed this task individually and then discussed their ideas with the group, with the facilitation of the researcher. Phrases for this activity were specifically constructed to include a variety of textisms, particularly phonological abbreviations namely letter/number homophones, contractions, other clippings and accent stylizations. The researcher was actively involved in facilitating all of the discussions for the experimental groups. In the final session, this group completed a translation exercise (i.e. writing standard words as textisms) and a short evaluation questionnaire.

2.2.4 Procedure

Ethical approval was given by the University's Ethics' Committee and Research Governance for all parts of this study (See Appendix J and K). To screen the children to determine ownership and access to mobile phones all children in Year 5 completed the Mobile Phone Ownership questionnaire (adapted from Coe & Oakhill, 2011; Appendix A). The questionnaire was administered to the children in their normal class groups (there were three classes of approximately 26 pupils) in the presence of their class teachers and this process lasted approximately 20 minutes. Each child had a paper copy of the questionnaire and the researcher read each item aloud to the whole class.

Based on the screening questionnaire, letters were sent to parents of 31 children offering them an opportunity to participate and requesting consent for their child's participation. Parents were assured of data confidentiality and were informed that they can withdraw their child's data at any time. Participants also gave their own consent to participate (Appendix L). The final sample of 16 children completed the text message writing task, phonological awareness, reading and spelling assessments both before the intervention sessions and again around five months later. The spelling assessment and text message writing task were administered to the children in groups of no more than eight children; these lasted approximately 30 minutes per group. The researcher administered the word reading assessment and the phonological awareness tests to the children individually, and this took approximately 30 minutes per child.

The children received the intervention (either control or experimental version) for 30 minutes each week for six weeks in groups of four. At the end of the six-week intervention phase, the participants were re-assessed on all outcome measures using the same procedures as before the intervention. All participants were fully debriefed and a debrief letter was also sent home to parents (Appendix M and N).

2.2.5 Data analysis

Questionnaire data were available for 78 children and were quantitative but descriptive in nature; therefore frequencies, averages and percentages were calculated and reported. In the main study 16 pupils completed all of the pre and post-test measures. In terms of attendance at the intervention sessions, all children completed at least five of the six intervention sessions and the majority of the children (N = 14) were present for all six sessions. The data of the children who each missed one session were retained in the analysis.

Descriptive statistics were calculated to ascertain whether the data met the assumptions for parametric testing. Where parametric tests have been reported, the data were found to be normally distributed and to meet the assumption of homogeneity of variance. The data was also assessed for skewness and kurtosis and was considered to be parametric if the calculated z-score was less than 1.96 and $p > .05$ (Field, 2009). If the data violated the assumptions of parametric testing then non-parametric tests were performed. All statistical analyses were calculated using PASW Version 18.0.

2.3 Results

2.3.1 Questionnaire data

Of the 78 children who completed the questionnaire, 28 (35.90%) reported that they personally owned a mobile phone and a further 19 (24.36%) indicated that they have regular use of a mobile phone, a total of 60.26% of the participants.

Table 3 shows the reported usage of mobile phones and Internet messaging.[5] The children indicated that they spend more time, on average, texting than they do speaking on their mobile phones. All but one of the children (98.70%) indicated that they have access to the Internet at home. When asked whether they write messages to their friends on the Internet, 40 of the children who have Internet access indicated that they do (52.63%).

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[5] It is unclear as to whether all of the participants in this study were able to accurately estimate the amount of time they spend texting and talking on their mobile phones and this has been problematic in previous research (Coe & Oakhill, 2011; Kemp & Bushnell, 2011). Although, there was a wide range of estimates especially in terms of time spent talking and texting on their phones, all of the estimates were deemed to be practically possible and therefore all data were retained for analysis.

Table 3.

Means and standard deviations for the reported amount of time spent texting, speaking and using Internet messaging each day for children who use a mobile phone and the reported ages of first access

	N	Mean	Standard Deviation	Minimum	Maximum
Age of first access to mobile phone (years)	47	7.40	1.19	4	10
Number of texts sent per day	47	3.15	4.45	0	16
Number of texts received per day	47	3.40	4.72	0	20
Time spent texting per day (minutes)	46	15.59	32.50	0	150
Number of calls made per day	44	1.66	1.49	0	7
Number of calls received per day	47	1.91	2.11	0	9
Age of first use of internet messaging (years)	42	6.80	1.24	4	9
Time spent internet messaging (minutes)	47	19.51	29.69	0	120

Of the 47 children who indicated that they use mobile phones 43 reported using other functions in addition to texting and calling. Using games (n=41; 87%) was the most frequently reported function, followed by the camera (n=31; 66%) and then listening to music (n=27; 57%). The function that these children reported using the least was the calendar function (n=11; 23%). Some children also reported being able to use the Internet (n=20; 43%) on their phones.

Children were asked to state whether they used predictive text. Fifteen children (31.91%) indicated that they did use predictive text, but only nine children provided an explanation. The reasons most frequently mentioned for choosing to use predictive text were because it was quicker, and because the children reported that they felt that they could not spell (See Appendix O for all of the reasons given). The majority of the children (n= 29; 61.70%) indicated that they do not use the predictive text function, but fewer of these children provided a reason for their choice. Three children reported that they used predictive texting some of the time (6.38 %).

2.3.2 Assessing the effectiveness of the intervention

2.3.2.1 Use of textisms

One child in the experimental group appeared to have misunderstood the instructions for the pre-measure text message writing task and instead reproduced the information provided by the researcher. Consequently, the data for this participant were excluded before the analysis of textisms was conducted.

To determine whether or not there were significant differences between the control group and the experimental group on the percentage of the elicited text message written in textisms a 2 group (experimental and control) by 2 time (pre and post) mixed analysis of variance was performed. There was a significant main effect of time (F (1, 13) = 29.31, $p<.01$, $r = .83$), indicating that more textisms were used post- compared with pre-intervention (means for pre and post were 11.89 and 26.42 respectively). In addition, there was a significant main effect of group (F (1, 13) = 10.74, $p<. 01$ $r = .67$), highlighting that the experimental group used more textisms overall compared with the control group (respective means = 28.28 and 10.03). These main effects were qualified by a significant group by time interaction (F (1, 13) = 18.50, $p<. 01$, $r = .77$). Bonferroni corrected t-tests showed that both groups of children used more textisms in their elicited text message post versus pre-intervention, but the time difference was only significant for the experimental group. In addition, there was no significant group difference for textism use pre-intervention, but the group difference was significant post-intervention; see Figure 1.
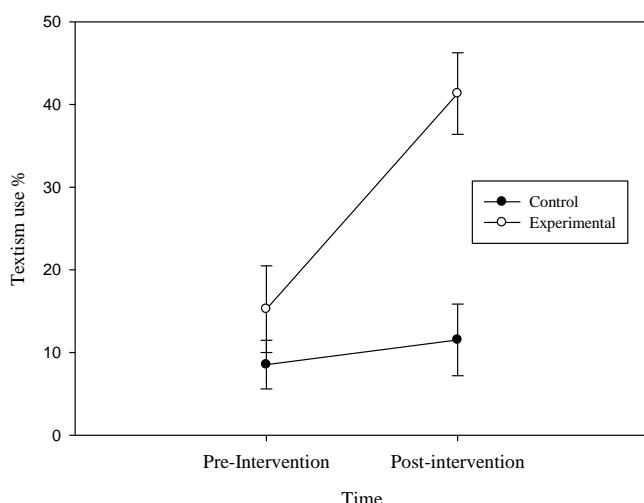
Figure 1.

Mean percentage of messages written in textisms pre- and post- intervention for the control and experimental groups.

Textisms were coded into eight categories based on those used by Thurlow (2003; letter/number homophones, g clippings, other clippings, shortenings, contractions, initialisms/symbols, accent stylizations and misspellings). Across all participants, there were 142 textisms used out of a total of 832 words in all of the text messages written at both pre and post testing. This constitutes a proportion of 17.07% (these numbers include repetitions of the same textisms in one message). Please see Appendix P for examples of the textisms coded into each of the categories. Table 4 shows that the most frequently used textisms were letter/number homophones and contractions, particularly following the intervention sessions.

To explore whether there were any significant differences in the types of textisms used between the control and experimental group, a series of Independent Samples Mann Whitney U tests were conducted. The textisms were divided into two groups, each consisting of four types of textism. A phonological textisms group included the four textism types that were specifically targeted in the intervention; accent stylizations, letter/number homophones, other clippings and contractions. An 'other' textism group included the remaining textism types; g-clippings, shortenings, misspellings and symbols. Pre-intervention there were no significant differences in the number of phonological or 'other' textisms produced by the control and the experimental groups ($p > .1$). Post-intervention there were still no significant differences in the number of 'other' textisms produced by the two groups, but the experimental group (Mdn =9.00) produced significantly more phonological textisms compared with the control group (Mdn =1.00); $U = 51.50$, $z = 2.74$, $p < .05$, $r = .71$.

Table 4.

Total number of each type of textism (letter/number homophones, g clippings, other clippings, shortenings, contractions, initialisms/symbols, accent stylizations and misspellings) used in the pre and post text writing task for the control group and the experimental group, with totals for the overall sample and percentages of total textisms for each type of textism.

	Accent Styl		L/N Hom		Other Clips		Contract		G Clips		Short		Miss		Sym		Phon textisms		Other textisms	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Total for Control group	2	2	4	6	2	0	4	7	0	1	2	1	3	1	2	4	12	15	7	7
Total for Experimental group	3	4	6	27	0	0	16	26	0	7	0	1	0	4	3	4	25	57	3	16
Total (for both groups)	5	6	10	33	2	0	20	33	0	8	2	2	3	5	5	8	37	72	10	23
Total (for both groups pre and post)	11		43		2		53		8		4		8		13		109		33	
Percentage of total textisms	7.75		30.28		1.41		37.32		5.63		2.82		5.63		9.16		76.76		23.24	

Note. T1, pre-test; T2, post-test; Accent Styl, Accent Stylisations; L/N Hom, Letter/Number homophones; Short, Shortenings; Contract, Contractions; G Clips, G clippings; Other clips, Other Clippings; Miss, Misspellings; Sym, Symbols/Initialisms.

Table 5.

Correlations between all outcome measures for all participants at pre-test and post-test

	TextismT1	TextismT2	Read T1	ReadT2	SpellT1	SpellT2	RhymeT1	RhymeT2	NonT1	NonT2	SpT1	SpT2
TextismT2	.519*											
ReadT1	.449*	-.033										
ReadT2	.309	-.150	.949**									
SpellT1	.253	-.051	.852**	.869**								
SpellT2	.021	-.058	.783**	.796**	.915**							
RhymeT1	.285	.563*	.388	.347	.243	.279						
RhymeT2	.405	.415	.591*	.420	.442*	.363	.495*					
NonT1	.452*	.077	.805**	.787**	.695**	.562*	.432	.667**				
NonT2	.012	-.158	.605**	.700**	.741**	.696**	.114	.147	.453*			
SpT1	-.049	-.163	.376	.400	.393	.428	.198	.338	.493*	.059		
SpT2	-.030	-.463*	.450*	.549*	.643**	.545*	-.080	.116	.330	.548*	.445*	
Phonological Composite	-.366	-.347	-.116	-.077	.131	.122	-.448*	-.204	-.388	.441*	-.303	.482*

Note. T1,pre-test; T2, post-test; Textism, percentage of message in textisms; Reading, BASII Word reading standardised score; Spelling, Graded Spelling test raw score; Rhyme, PhAB rhyme subscale standardised score; Non, PhAB non-word reading subscale standardised score; Sp, PhAB Spoonerisms subscale standardized score; Phonological Composite, Phonological Composite score.
*p<.05, **p<.001 (one-tailed)

Spearman's rho correlation coefficients were calculated to explore the associations between overall use of textisms and all literacy outcomes at pre and post test, for all participants; see Table 5. This analysis showed that at pre-test textism use was significantly associated with word reading and non-word reading. Textism use pre-test was also significantly related to textism use post-test. Additionally, the post-test textism use was significantly correlated with rhyme scores at pre-test and Spoonerisms scores at post-test.

In order to explore whether the increase in textism use led to differential benefits on phonological awareness, reading and spelling, these were each compared using a series of 2 Group (Control or Experimental) x 2 Time (Pre or Post) mixed analyses of variance. Please see Appendix Q for descriptive statistics. Where data were not normally distributed Independent Samples Mann Whitney U tests were performed to determine whether or not there were differences in scores at pre-test and post-test between the two groups and to explore the differences over time Wilcoxon Signed Ranked tests were performed.

2.3.2.2 Phonological awareness

For both the control and the experimental group all scores on the Phonological Assessment Battery (PhAB) were at least within the average range before and after the intervention (See Appendix Q). Initially, each subscale was considered separately in the analysis. For the alliteration subscale 13 of the 16 participants in the pre-test and 14 of the 16 participants in the post-test reached ceiling. Consequently, it was not possible to conduct any statistical analysis on the data for this subscale.

Data in the rhyme subscale of the PhAB violated the assumptions of parametric testing, consequently non-parametric tests were used to analyse this data. An Independent Samples Mann Whitney U test was performed to determine whether or not there were differences in scores at pre-test and post-test between the two groups. At pre-test, scores between the groups for the rhyme subscale were significantly different; the control group had significantly lower rhyme scores (Mdn = 100.50) than the experimental group (Mdn = 109.00), $U= 56.00$, $z = 2.54$, $p<.05$, $r = .64$. At post-test there was no longer a significant difference between the control group (Mdn = 107.00) and the experimental group (Mdn = 109.00). To determine whether there were any significant differences in rhyme scores within the groups over time, a Wilcoxon Signed Ranks test was performed on the data. For the experimental group, there were no significant differences between their scores on the pre and the post measure, $Ws =$

13.00, $z = -.170$, $p > .05$, $r = -.04$. Conversely, for the control group, there was a significant time difference ($Ws = 20.00$, $z = 1.99$, $p < .05$, $r = .50$); indicating that the scores increased over time (Mdn = 100.50 and Mdn = 107.00 for the pre-and post-test respectively); see Figure 2

Performance on the non-word reading subscale did not differ significantly between the control group (Mdn = 112.50) and the experimental group (Mdn =111.50) at pre-test, $U = 31.5$, $z = -.053$, $p > .05$, $r = -.01$ or post-test (Mdn =121.00 and Mdn =121.50 for the control and experimental groups respectively, $U = 36$, $z = .433$, $p > .05$, $r = .12$). In addition, there was no significant time difference for the experimental and control groups ($Ws = 12$, $z = .314$, $p > .05$, $r = .08$ and $Ws = 18$, $z = .689$, $p > .05$, $r = .17$ for the control and experimental groups respectively); see Figure 3.

With respect to Spoonerisms there were no significant main effects of time F (1, 14) = 3.52, $p > .05$, $r = .49$ or group F (1, 14) = 1.30 $p > .05$, $r = .30$ and there were no interaction effects F (1, 14) = .06, $p > .05$, $r = .07$; see Figure 4.

A phonological awareness composite score was constructed by subtracting the children's pre-test scores from their post-test scores on each of the phonological measures to create a 'difference' score. Difference scores were then converted into z-scores. The sum of the Rhyme, Spoonerisms and Non-word Reading z-scores created the variable Phonological Awareness composite[6]. There were no significant differences in phonological awareness composite scores between the control and the experimental groups, t (14) = 1.00, $p > .1$.

Figure 2.

Mean rhyme scores pre- and post- intervention for the control and experimental groups.

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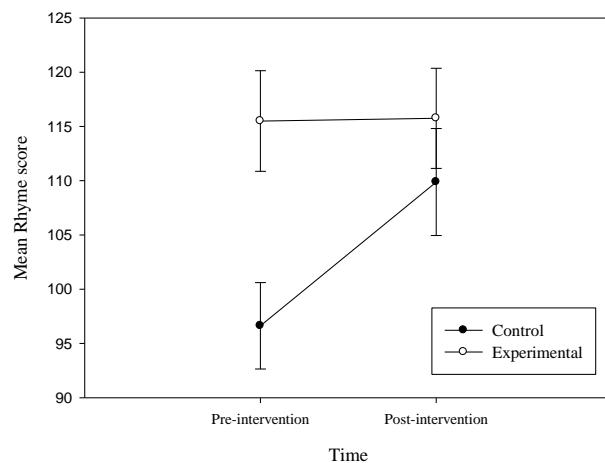
[6] To create this variable the same procedures were followed as those used by Wood, Jackson and colleagues (2011).

Figure 3

Mean non-word reading scores pre- and post- intervention for the control and experimental groups.
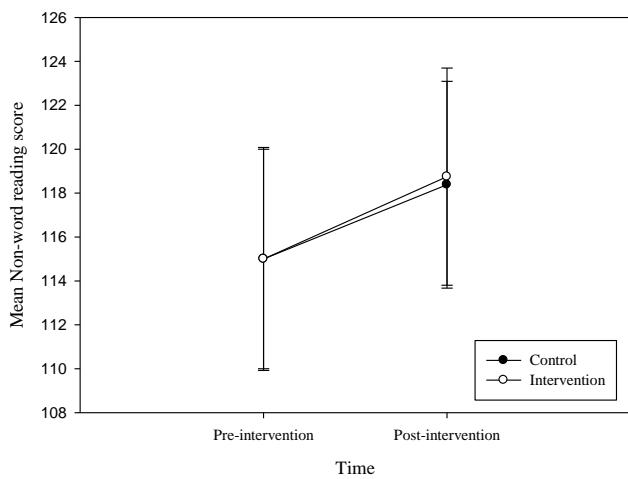
Figure 4

Mean Spoonerisms scores pre- and post- intervention for the control and experimental groups.
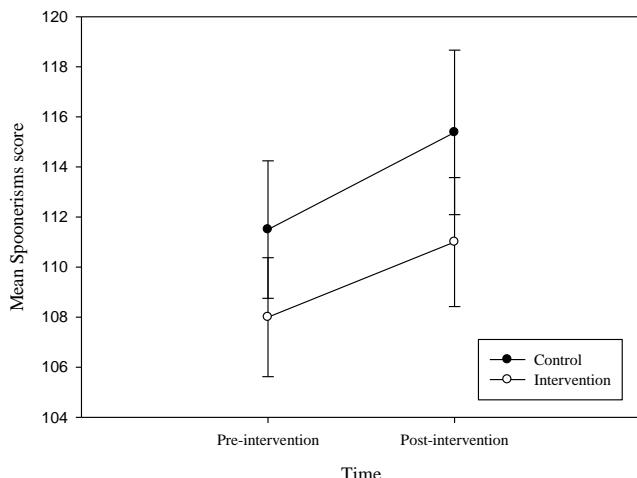
2.3.2.3 Word Reading

In order to explore the impact of the intervention on reading, a 2 group (experimental and control) by 2 time (pre and post) mixed analysis of variance was performed. This showed a significant main effect of time on standard reading scores, $F(1,14) = 12.31$, $p<.05$, $r =.68$; indicating that reading scores across both groups increased from pre- to post-test; see Figure 5. There was no significant main effect of group and the interaction between group and time was also not significant (in both cases $F< 1$ and $p> .1$).

Figure 5

Mean word reading scores pre- and post- intervention for the control and experimental groups.
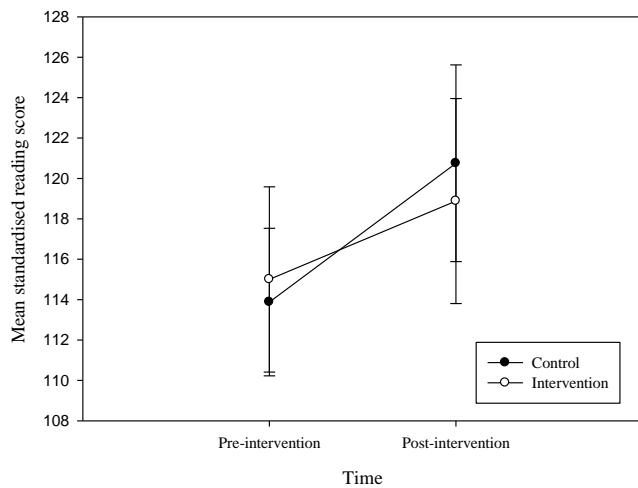
2.3.2.4 Spelling

Because targeted words were used in the spelling test a number of children (pre-test; one in each group; post-test; two in each group) failed to achieve a standard score. Consequently, in order to include data from all 16 participants in the analysis, the raw spelling score data was explored. A 2 group (experimental and control) by 2 time (pre and post) mixed analysis of variance was performed to determine whether there was a difference in raw spelling scores between the control and the experimental group following the intervention. A significant main effect of time was found, $F(1, 14) = 6.86$, $p<.05$, $r = .57$, indicating that spelling for both groups increased over time; see Figure 6. No significant main effect of intervention group was found and there was no significant interaction effect between group and time (in both cases $F<1$ and $p>.1$).

Figure 6

Mean raw spelling scores pre- and post- intervention for the control and experimental groups.
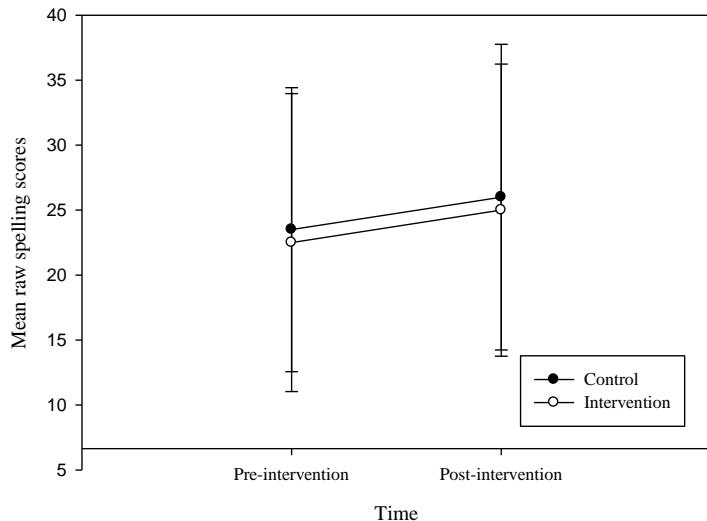

2.3.2.5 Evaluation questionnaire

Participants only completed this questionnaire following the intervention sessions. Analyses were conducted on the total score to compare the level of enjoyment, confidence and intention for future engagement with texting between the two groups. The reliability of the questionnaire was questionable ($\alpha = .55$). An Independent Samples Mann Whitney U test was performed to determine whether or not there were differences in scores at post-test between the two groups. Scores between the control group (Mdn = 42.50, M = 42.75, SD = 1.581, Range = 4) and the experimental group (Mdn = 42.50, M = 40.88, SD= 3.314, Range = 8) were not significantly different, $U = 25.00$, $z = -.745$, $p > .05$, $r = -.19$.

2.4 Discussion

The aim of this study was to provide further insights into the causal relationships between use of textisms and literacy skills, through the implementation of a textism intervention. Specifically, it explored whether a textism intervention improved children's ability to make use of textisms in an elicited text. In addition it considered whether engagement with textisms improved children's phonological awareness, word reading and spelling. Furthermore, this study reviewed current mobile phone practices in 9-10-year-old children.

The results showed that children who were taught how to use textisms via the six-week intervention used more spontaneous textisms, in particular phonological

textisms, post-intervention compared with a control group. In other words, the intervention successfully led to an increased use of textisms in text writing in this group of children. However, few of the literacy measures were correlated with textism use and no significant differences between the experimental group and the control group were found in any of the literacy measures following the intervention. However, for the reading and spelling assessments, there were significant changes over time; with scores for both measures increasing significantly between pre and post test; indicating that the children's reading and spelling improved over time.

Questionnaire data from the wider sample of mobile phone owners provided information about current patterns of usage for this age group. Similar percentages of children had access to mobile phones in this study as have previously been reported. For example, 60% of the current sample had access to mobile phones compared with 50% of 5-15-year-olds reported by OfCom (2011). The participants reported using a range of functions on their mobile phones and their most popular activities (e.g. playing games and taking photos) matched those of previous research (OfCom, 2011). The age of first access (7-years-old) is also generally in line with previous research which found that the average age of initial access was 6-years-old (Plester et al., 2009). Children in this sample spent more time texting than talking on their phones which reflects findings that suggest that texting is the primary function for many young mobile phone users (Plester et al., 2008).

Considerably fewer participants in this sample reported using predictive text than has been reported in previous research; 79% of Australian 13-15-year-old students (De Jonge & Kemp, 2012) to 53% of British 10-11-year-olds (Coe & Oakhill, 2011). This difference could be due in part to the age of the participants in this study. De Jonge and Kemp (2012) found that more of their undergraduate sample used predictive text compared with the adolescents, which perhaps suggest that predictive text is used more as people get older.

As predicted, the experimental group who received the specific textism intervention used more textisms in their elicited texts, after the intervention compared with the control group. It is possible that reading and writing textisms in the sessions helped the children to understand how to change words into decipherable textisms. This result indicates that the experimental group generalised their knowledge of how to manipulate words into textisms into their elicited texts to create spontaneous and novel textisms. Because a similar increase in textism use was not found in the control group, the findings further suggest that simply giving children a mobile phone and encouraging

them to text each other was not sufficient for them to increase their use of textisms. This supports the findings of Wood, Jackson and colleagues (2011) in which textism use was low amongst their participants who were inexperienced with phones. Equally, the control group in the current study were only able to text each other, which meant that they had no communication with experienced textism users. This result suggests that some level of exposure to textisms is necessary to facilitate their use and that for this age group the format of text-messaging (e.g. only being able to include 160 characters) does not itself lead to increased shortening and abbreviation of language.

The types of textisms that the participants produced were coded into eight categories based on those used by Thurlow (2003; letter/number homophones, g clippings, other clippings, shortenings, contractions, initialisms/symbols, accent stylizations and misspellings). These categories were further coded into two groups; phonological and other textisms. Phonological textisms (accent stylizations, letter/number homophones, contractions and other clippings) were specifically targeted in the intervention. The experimental group used significantly more phonological textisms than the control group following the intervention. This finding indicates that the teaching successfully targeted these types of textisms and the children in the experimental group were able to apply their knowledge of these textisms in their elicited texts.

There were very few correlations between textism use and the literacy measures either pre or post-intervention. However, the word reading and non-word reading scores were positively related to textism use pre-intervention, which perhaps reflects previous findings that demonstrated that good readers used more textisms (Coe & Oakhill, 2011). Overall, the lack of correlations between use of textisms and the literacy measures was unexpected considering the previously positive correlational evidence (Kemp & Bushnell, 2011; Neville, 2003).

The findings also showed that phonological awareness did not improve after the intervention. The results of this study replicate those of Wood, Jackson and colleagues (2011) who also found no significant differences in phonological awareness between their two groups over a similar period of time (one group who used text-messaging and a passive control group). There are a variety of explanations for these findings. Firstly, it should be noted that the sample as a whole had good average or above average phonological awareness skills at the outset of the study; so it is possible that the measure used was not sensitive to picking up change. Equally, an intervention over a longer period or with a larger sample may have led to different findings. Alternatively,

the textism intervention and more generally engaging with textisms, may not have any causal influence on phonological awareness skills. Therefore, the relationship between textism knowledge and broader literacy skills, may not be mediated by phonological awareness as has previously been speculated (Powell & Dixon, 2011).

Further results indicated that reading and spelling scores did increase significantly over time for both groups. Firstly, it could be argued that the participants simply got better at the measures on which they were tested. However, there was a period of five months between pre and post assessments and because no corrective feedback was ever given, the children did not know if they had read or spelt accurately in any of the tests. Consequently, it is unlikely that these changes would have been due purely to practice effects. Alternatively, the children could simply have improved in reading and spelling over time. One further explanation of the improvement in both groups is that they each spent the same amount of time with mobile phones, sending text-messages, so it is possible that something else about these sessions could have influenced their scores. Previous studies have suggested that text-messaging increases exposure to print which is known to support literacy (Plester et al., 2009) and that texting might help children build confidence in literacy (Plester & Wood, 2009). It is possible that these factors could have played a role in this study.

Evidence that suggests a causal relationship between textism use and spelling performance has been demonstrated in studies by Wood, Meacham and colleagues (2011) and Powell and Dixon (2011), but was not replicated in this study. There were no significant differences between the groups after the intervention, and spelling was not significantly correlated with textism use at any point in the study. A number of explanations for this lack of association have already been suggested. However, it is also possible that fundamental differences between this study and Powell and Dixon's (2011) research may, in part, explain the lack of findings here. The key difference between the exposure parts of this intervention and that of Powell & Dixon (2011) is that in their study the exposure items were the same as those that were later tested. In this study, participants were exposed to a wide variety of words written as textisms, but the words that were used in the assessments were not targeted in the sessions. Consequently, this study attempted to go further than previous research by engaging children with a variety of textisms, controlling this exposure and then exploring whether the exposure generalised to other words and spellings.

2.4.1 Limitations

The results showed that the textism intervention was successful in increasing use of textisms in the experimental group but did not extend to improvements in literacy skills. There were several limitations of this study. There were issues with the size of the sample and the literacy levels of participants at the outset of the study. Additionally, there were difficulties with some of the measures. In terms of the design, there were limitations regarding the active control group and the length of the intervention.

A larger sample size would have increased the power of this study to pick up changes in time between the experimental and the control groups. In addition, the sample consisted of a group of children with good average or above average abilities in phonological awareness at the outset of the study. It is possible that this sample already had such a strong grounding in phonological awareness that there was little likelihood of their skills increasing significantly.

All assessments used in the current study were age-appropriate and administered correctly; however there were issues with both floor and ceiling effects. Floor effects in the spelling assessment are likely to be attributed to the group administration procedure. In addition, ceiling effects were found in the subscales of the Phonological Assessment Battery. This was likely to be due to the age of the target sample. Although the PhAB is entirely appropriate for children aged 9-10-years, the ceiling effects in the majority of these subscales meant that the alliteration subscale could not be analysed and there was a lack of variability in the rhyme and the non-word reading subscales. The children all scored well on these subscales at pre-test leaving little room for improvement.

Additionally, the lack of inclusion of a wider variety of measures including metalinguistic knowledge, motivation for reading and confidence with writing is a limitation of this research. If these measures had been included alternative explanations for the links between text-messaging and literacy that have been postulated (Plester et al., 2009) could have been explored.

With respect to the study design, the inclusion of a passive control group would have provided a baseline measure of reading and spelling over time. Consequently, this would have aided the interpretation of the improvements in reading and spelling scores over time for both groups, and in this context it may have been possible to attribute the improvement in scores to the children's experiences with mobile phones.

The length of this intervention, although broadly in line with Wood, Jackson and colleagues (2011; six weeks compared with their 10 weeks) was still relatively short. It is possible that this brief experience with text-messaging was not sufficient to influence

literacy skills. In previous correlational research (such as Plester et al., 2009), many of the children may have been engaging with text-messaging for a number of years, before the positive relationships between knowledge of textisms and literacy were demonstrated.

2.4.2 Implications

There are practical implications of this research regarding the potential for an intervention using mobile phones in school. This study demonstrated that it is possible to teach 9-10-year-old children how to use text-messaging over a relatively short space of time in school. Consequently, it appears that for this age group, the practical and ethical issues around using mobile phones in school that have previously been discussed (Plester et al., 2009) are surmountable. The children were able to manipulate this technology with relative ease and were interested and motivated to take part in the sessions, as evidenced by their evaluation questionnaires. This suggests that inclusion of mobile phones as a tool for intervention in the future is viable. If further research was able to demonstrate that a longer intervention, with increased participant numbers, positively influenced literacy skills then there would be scope for the introduction of this type of intervention in schools.

Future research would also be likely to benefit from targeting a wider variety of participants in the intervention, for example those children struggling with literacy. Previous reading research suggests that the influence of phonological awareness skills is not developmentally limited to beginner readers (Wagner et al., 1997) therefore it is possible that older, struggling readers might benefit from an intervention of this type.

2.4.3 Conclusion

This study demonstrated that using a mobile phone for text-messaging for 30 minutes a week for six weeks does not advantage or disadvantage children's literacy skills. This study has been unable to provide evidence that use of textisms is causally related to literacy skills. Consequently the direction and nature of the relationship between literacy skills and knowledge of textisms remains unclear. However, due to a variety of limitations with the sample and measures in this research, it is not possible to rule out the chance that textism use does support phonological awareness, which may in turn support wider literacy skills. Additionally, the improvements in reading and spelling could suggest that textism use supports literacy through other mechanisms, which need to be further explored.

As a preliminary study, this research demonstrates that it is possible to teach children how to manipulate letters in words to produce textisms and that they are then able to apply this learning to their own text-message writing. The implementation of a texting intervention in this study also suggests that use of this technology with 9-10-year-old pupils is viable in schools. Future research should continue to use experimental methods to focus on exploring the relationship between textism use and literacy skills. Children and young people are using this technology frequently in their everyday lives, therefore it is vital that we understand the implications of this and continue to consider the potential for using this technology in education.

Appendix A

Mobile Phone use questionnaire

Name: …………………… Age: ………………………

Year group:...........................

1) Do you own a mobile phone? Yes/ No

· If you do not have your own phone, do you have regular access to a mobile phone?
      Yes/ No
(If you have answered No to questions 1 & 2 please move straight to question 12)

For those who do have access regularly to a mobile phone

3) At what age were you when you first began regularly using a mobile phone? ……….
Years old.

4) How many text messages do you normally send per day?

…………………………………………………………….
5) How many text messages do you normally receive per day?

…………………………………………………………………
6) How many minutes per day do you spend texting?

…………..Minutes

7) Do you use 'predictive text'? Yes/No

Please give the reason why you do or do not use 'predictive text'

....

8) How many calls do you usually make per day?

…………………………………………………………………

9) How many calls do you usually receive per day?

………………………………………………………………….

10) How long do you spend talking on the mobile phone every day? (minutes)

…………. Minutes

11) Please circle any other functions of your mobile phone that you use often.

Games   Internet   Calendar   Camera   Music

Other.......................

12) Do you have access to the internet at home?   Yes/No

13) Do you use the Internet to write messages to friends? For example using msn instant messenger.

Yes/No

For those who do regularly write to their friends on the Internet

14) How long do you spend each day writing messages to your friends on the Internet?

...............minutes

15) How old were you when you first started writing messages to your friends on the Internet?

……………..Years old.

Opt out Letter to Parents for Mobile phone questionnaire participation

Date

Dear Parent/Carer,

My name is Jamie Coe and I am a Trainee Educational Psychologist at the University of Southampton. I am carrying out a research study about the association between mobile phone use and literacy skills in children. Initially, I would like to ask all of the children in Year 5 to complete a questionnaire about their experiences of using mobile phones and instant messaging. The questionnaire consists of 15 short questions. If you would like to see the questionnaire then please get in touch with me on the email address below, and I would be happy to send you a copy. The children will be given the questionnaire to complete in the classroom during one of their normal lessons. The data collected from the questionnaires will be seen only by the researcher and will remain confidential. The data will be kept by the researcher in a locked cabinet for up to 5 years in accordance with the Data Protection Act and University policy. You have the right to withdraw your child's data from this study at any time with no implications for them in school.

If you are happy for your child to take part, then you do not need to do anything. If you are NOT happy for your child to complete this questionnaire, then please return the reply slip to school in a sealed envelope marked "Text project- Jamie Coe" by *date (tbc with school)*. If you have any questions about this research please do not hesitate to contact me, Jamie Coe, at <u>jelc1g09@soton.ac.uk</u>.

If you have questions about your child's rights as a participant in this research, or if you feel that he/she have been placed at risk [during participation], you may contact the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ. Telephone: (023) 8059 4663.

Yours faithfully

Jamie Coe
Trainee Educational Psychologist
University of Southampton

- -

_____

Study Title: Improving literacy skills with text-messaging   **Researcher's Name:** Jamie Coe
Study Reference: 736   **Ethics Reference:**   **Letter Reference**: 1

I **DO NOT** give consent for my child to take part in this research project and **DO NOT** agree for his or her data (responses and comments) to be used for the purpose of this study

Name of parent/guardian (print name) ……………………………………………

Your child's name……………………………………………………

Signature of parent…………………………………………Date…………
_____

CONSENT FORM -Head teacher

Improving literacy skills with text-messaging (Questionnaire)
Study ID: 736

_____

Please initial the box(es) if you agree with the statement(s):

I have read and understood the parent letter (Opt-out -Version 3, 23/09/11,
Letter reference:1) and have had the opportunity to ask
questions about the study.

Parents of children in this school have been sent information about
this study and what it involves for them and their child.

I agree that my school can take part in this research project
and for data to be collected for the purpose of this study.

I understand children's and parents' participation is voluntary and
they may withdraw at any time without their legal rights being affected.

I am happy for the questionnaire completion to use opt-out consent and
for parents to inform the school only if they do not want their
child to take part.

I am happy to address any parent concerns regarding their child's participation
in this project.

Name of Head teacher (print name)…………………………………………………

Signature of Head teacher…………………………………………………………...

Name of researcher:…………………………………………………………………

Signature of Researcher: …………………………………………………………

Date…………………………………………………………………………………

_____

Appendix D

Parent/Carer Letter (with opt-in consent form) and study information sheet

Date

Dear Parent/Carer,

My name is Jamie Coe and I am a Trainee Educational Psychologist at the University of Southampton. You may remember that I wrote to you on (*date*) to request the participation of your child in a questionnaire about mobile phone use. Further to that questionnaire and as your child DOES NOT own a mobile phone, I am writing to request your permission for the participation of your child in a text-messaging intervention. The aim of this intervention is to explore whether using text-messaging improves reading and spelling ability. Findings about the relationship between texting and literacy in previous research suggests that children might benefit from exposure to texting as a mechanism to improve literacy skills.

This study will involve pupils completing some reading, spelling and phonological awareness tests after October half term. I will also be requesting access to the teacher assessments of reading and spelling for all children in this study throughout this academic year. The pupils will attend a 30 minute session each week with the researcher for six weeks during January and February. The children will be given a mobile phone to use during the duration of these sessions. In February and March the children will then complete the same reading, spelling and phonological awareness tests to see if significant improvements have been made. Additionally, the same measures will be completed in June and July. Please be aware that even if you agree for your child to take part in this study, you still have the right to withdraw your child at any time with no implications for them in school.

This study is for children who do not own a mobile phone only. It is also requested that these children are not given a mobile phone during the duration of the study, therefore until the end of July 2012. If you are considering giving your child a mobile phone before this time then please do not agree for them to participate in this research. If you later decide that you will give your child a mobile phone, please inform the researcher as soon as possible on the email address below or by leaving a message with the school reception.

Please read the summary of this study that is attached to this letter. If you ARE happy for your child to take part and they *do not own a mobile phone* then please return the reply slip to school in a sealed envelope marked "Text project- Jamie Coe" by *date (tbc with school)*. If you have any questions about this research please contact me, Jamie Coe at jelc1g09@soton.ac.uk.

If you have questions about your child's rights as a participant in this research, or if you feel that he/she have been placed at risk [during participation], you may contact the

Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ. Telephone: (023) 8059 4663.

Yours faithfully

Jamie Coe

Trainee Educational Psychologist

University of Southampton

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Study Title: Improving literacy skills with text-messaging   **Researcher's Name:** Jamie Coe

Study Reference: 736   **Ethics Reference:**

Letter reference: 2

I confirm that my child **DOES NOT** own a mobile phone and that I have no plans to get one for my child in the next 10 months. ☐

I confirm that if I change my mind and decide to get my child a mobile phone within the next 10 months, that I will inform the researcher immediately by email or through the school reception. ☐

I confirm that I have read the Parent Information Sheet 736 (Version 3, 23/9/11) ☐

I **DO** give consent for my child to take part in this research project and **DO** agree for his orher data (responses and comments) to be used for the purpose of this study ☐

    Name of parent/carer (print name) …………………………………………………

     Your child's name……………………………………………………

  Signature of parent………………………………………Date………………………

_____

Parent Information Sheet (736)

Study Title: Improving literacy skills with text- messaging
Researcher: Jamie Coe (Trainee Educational Psychologist)
Ethics number: 736

Please read this information carefully before deciding whether you would like your child to take part in this research. If you ARE happy for them to participate please return the slip on the previous page.

What is the research about?
This is a project to be carried out by a Trainee Educational Psychologist as part of a doctorate in Educational Psychology at the University of Southampton. This study aims to explore whether there is a relationship between text-messaging and children's standard literacy scores, as previous research suggests that exposure to texting can be linked to improved literacy skills.

Why has my child been chosen?
Your child has been invited to participate because they do not own a mobile phone and they are in Year 5 which is the year group that has been chosen for this study.

What will happen to my child if they take part?
If you agree for your child to take part, please return the permission slip on the previous page.
If you agree for your child to take part, they will be asked to meet with the researcher and a group of other children and they will be told about the study and asked if they wish to participate. If they agree to participate, they will be asked to complete a spelling assessment and a writing task with the other children in the group. The writing task involves composing a text message based on some information provided by the researcher. This will simply be recorded on a piece of paper. Your child will then be asked to work with the researcher 1:1 and complete a word reading and phonological awareness assessment. The researcher is qualified to administer these assessments.

After the initial assessments your child will join a group of six other children every week for 6 weeks for a 30 minute session. During these sessions they will be given a mobile phone to use, but they will not be allowed to take the phones away from the sessions. The children will be taught how to write and send text messages and will be able to practice this during the sessions.

Following the 6 week intervention your child will then complete the spelling, reading and phonological awareness assessments again during February and March at the end of the school year. A debrief statement will be read to your child explaining the purpose of the study.

On all of the occasions that your child attends sessions with the researcher, the times will be agreed with your child's class teacher so that they do not miss vital aspects of their class work.

Are there any benefits in my child taking part?
It is hoped that the group sessions your child takes part in will be fun! It is also intended that through the use of texting the children's literacy development will be supported.

This study also hopes to enable the relationships between text messaging in children and their literacy skills to be better understood.

Are there any risks involved?
No risks have been identified for this research.

Will my child's participation be confidential?
This study complies with the Data Protection Act and University policy. All data collected will remain confidential. All written data such as the questionnaires, the writing task and the assessment record sheets will be seen only by the researcher and kept in a locked filing cabinet. Electronic data will be kept on a password protected USB accessible only by the researcher and in a locked filing cabinet. On completion of the project, data will be kept in a locked cabinet for up to 5 years.

What happens if I change my mind?
If you change your mind about your child participating in this study they can be withdrawn at any time and their data will not be included in the study. This will have no implications or impact in school for your child.

What happens if something goes wrong?
If you have a concern or complaint about this study, you may contact the Chair of the Ethics Committee, School of Psychology, University of Southampton, Southampton, SO17 1BJ. Phone: (023) 8059 4663

Where can I get more information?
If you would like more information or have any questions about this study please contact the researcher, Jamie Coe; jelc1g09@soton.ac.uk

Appendix E

Writing a text message task- Standardised Instructions

I am now going to ask you to write a text message on the piece of paper in front of you.

Imagine that you are at your friend Rob's house. He has kindly said that he will lend you his mobile phone so that you can text someone at home and tell them what you are doing that evening.

In the text message you need to include:

You are going to be late

Tell the person at home that you will be staying at Rob's house for dinner

You will be home at 7pm

Rob's mum will give you a lift home.

Remember that the person at home will not know who the message is from so you must tell them. Also remember that in a text message you can only use a certain number of letters in one message, so if you can, shorten the message. The message must still make sense and include all the information.

(This information will be read out and will be printed in a large font on an A4 piece of paper so that all of the children can see the information and refer back to it if they need to)

Please write your message on the piece of paper provided.

Appendix F

Evaluation Questionnaire

Please read each statement carefully and circle the answer which shows how much the statement applies to you.

1) I really enjoyed learning how to use texting on a mobile phone

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

2) I do not think I will use text messaging in the future

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

3) I feel very confident that I can write text messages that are clear and easy to read

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

4) I enjoyed learning about how to change words in text messages

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

5) I think that I will continue to use text-messaging if I get my own mobile phone

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

6) I did not enjoy using mobile phones to send text messages

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

7) I do not feel confident about using text messages

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

8) I would like to have a mobile phone in the future to practice texting

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

9) I am confident that I could have a conversation through text-messages

Strongly Agree   *Agree*   *I don't know*   *Disagree*   *Strongly Disagree*

Parental consent letter and information sheet for pilot study

Tuesday 12th July
Dear Parent/Carer,

My name is Jamie Coe and I am a Trainee Educational Psychologist at the University of Southampton. I am writing to request your permission for the participation of your child in a pilot study exploring the suitability of a text-messaging intervention. The aim of this group intervention is to use mobile phones and text messaging to support the pupils' understanding of different ways language can be used and changed. This study will involve pupils taking part in a 1 hour group session during which they will work with myself and their peers on a range of activities involving the manipulation of language to produce textisms. The children will be given a mobile phone to use during the duration of this session. Personal data will not be collected about your child but they will be asked as part of the group to give their feedback on the activities they have participated in. You have the right to withdraw your child from this pilot study at any time with no implications for them in school.

This pilot study is for children who do not own a mobile phone only. If your child has their own mobile phone then unfortunately they cannot be selected for this study.

Please read the detailed summary of this study that is attached to this letter. If you ARE happy for your child to take part and they *do not own a mobile phone* then please return the reply slip to school as soon as possible. If you have any questions about this research please contact me, Jamie Coe at jelc1g09@soton.ac.uk. If you indicate that you are happy for your child to participate you will receive a follow-up letter detailing on which date the group session will run.

If you have questions about your child's rights as a participant in this research, or if you feel that he/she have been placed at risk [during participation], you may contact the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ. Telephone: (023) 8059 5578.

Yours faithfully

Jamie Coe
Trainee Educational Psychologist
University of Southampton

- -
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Study Title: Text messaging and literacy skills- Pilot study **Researcher's Name:** Jamie Coe
Study Reference: JC2   **Ethics Reference:** 683

I confirm that my child **DOES NOT** own a mobile phone.
I **DO** give consent for my child to take part in this research project and **DO** agree for his or her data (responses and comments) to be used for the purpose of this study

   Name of parent/guardian (print name) ……………………………………………………

Your child's name………………………………………………………

Signature of parent…………………………………………Date…………………………
_____

Parent Information Sheet

Study Title: Text messaging and literacy skills- Pilot study
Researcher: Jamie Coe (Trainee Educational Psychologist)
Ethics number: 683

Please read this information carefully before deciding whether you would like your child to take part in this research. If you ARE happy for them to participate please return the slip on the previous page.

What is the research about?
This is a project to be carried out by a Trainee Educational Psychologist as part of a doctorate in Educational Psychology at the University of Southampton. This one-off session is a pilot study aimed at exploring the suitability of a textism intervention intended to be used for my thesis. I am interested in finding out whether there is a relationship between text-messaging and children's standard literacy scores as previous research suggests that exposure to texting can be linked to good literacy skills. Your child will be asked to take part in a group session consisting of a number of practical activities and discussion tasks. They will be given a mobile phone to use for the duration of the session. Your child will also be asked some questions about how they found the activities and if they all made sense. It is hoped that by providing this information your child can help inform an intervention that will be run with other children next year and ultimately it is hoped that this study will provide insights into the relationships between text-messaging and standard literacy measures.

Why has my child been chosen?
Year 6 pupils have been invited to participate in this research.

What will happen to my child if they take part?
If you agree for your child to take part, please return the permission slip on the previous page. If you agree for your child to take part they will be asked to join a group of seven other children from their school for a group session. The children will also be asked to indicate that they are happy to take part. They will then be asked to complete some activities and talk through some discussion questions with the group which is estimated to take approximately 1 hour. When they have completed the session a debrief statement will be read to the children and they will be able to take a copy if they wish.

Are there any benefits in my child taking part?
It is hoped that the group session your child takes part in will be fun! It is also hoped that the full study that this session is part of will enable the relationships between text messaging in children and their literacy skills to be better understood.

Are there any risks involved?
No risks have been identified for this research.

Will my participation be confidential?
This study complies with the Data Protection Act and University policy. All data collected will remain confidential and the pupils' names will not be used. Data will be stored on a password protected computer accessible only by the researcher. On completion of the project, data will be saved on a password protected USB stick and kept in a locked cabinet for up to 5 years.

What happens if I change my mind?
If you change your mind about your child participating in this study they can be withdrawn at any time and their comments will not be included in the study write up. This will have no implications or impact in school for your child.

What happens if something goes wrong?
If you have a concern or complaint about this study you may contact the Head of research Governance at the University of Southampton; Dr Martina Prude, Head of Research Governance (02380 595058, mad4@soton.ac.uk).

Where can I get more information?
If you would like more information or have any questions about this study please contact the researcher, Jamie Coe; jelc1g09@soton.ac.uk

Appendix H

Control group intervention sessions

Session 1

Thank you for agreeing to take part in these sessions. If you remember, you each read and signed a consent form *(Show the children their consent forms)* to show that you are happy to take part in these sessions with me, which will run at this time every week for the next six weeks. Please remember that if you decide you do not want to take part then just let me know and you can leave the group at any time. If you do decide not to take part I am afraid you will not be able to re-join the sessions at another time or during another week.

Okay, now we can begin, let's start with some short introductions. We want everyone to get to know each other, so let's introduce ourselves and tell the group one thing we like doing at school. So, I'll start, my name is Jamie and I liked doing PE at school.

Before we have a go with the phones, I would first like to find out about your experiences of using mobile phones up until now. We are going to go around the table and I would like each person to tell me whether they have ever used a mobile phone before and if they have, what they used it for.

For the rest of this session we will practice using the phones-
Each child will be given a mobile phone. The phones will be numbered and the numbers of all of the other phones will be stored in the address books. I will also have a phone and my number will be stored by name. The children will be shown how to switch the phone on and move through the menus to access text-messaging- as we will all have the same phone it will be possible to talk all of the children through the process together. The children will be shown how to write a message and how to send it to someone else in the group. Predictive text will not be allowed. (The researcher will have a prompt card on the table with symbols to support the children with using the phone).
In order for them to practice they will be asked to write a message like the one below:
Hello my name is .... and I am....years old. I go to .... school. I like ...... and ...... but I don't like.... (If they complete this message they can continue writing their own messages)
Thank you all very much, please put the phones in the box and I will see you next week.

Hello, welcome back for another session together. Can anyone tell me what we did last week?

(If no-one answers- last week we spent a bit of time introducing everyone, talking about whether we had used mobile phones before and practising how to write a text message).

Today, and for the next four weeks I am going to give you the opportunity to practice sending texts during these sessions. There is just one rule about these sessions and that is when you are using the mobile phone you must only use the text function.

Here are your phones. To start you off I have an activity for you-

I am going to give you some information about a situation *(written in large print on a piece of paper)* and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the way you might want to change the words to make sure you can fit all of the words into your message.

Situation 1 (created by Plester et al., 2009)

It is Saturday morning, it is a sunny warm day, and you don't have any plans, but you'd like to go somewhere with your best friend.Your parents have told you its ok with them if you go out with your friend.

When you have finished this message, please send it to my number on your phone. Once you have finished this message you can spend the rest of the session texting each other. You can only send a maximum of four messages each and after you leave the session all of the messages will be deleted. I will be here so you can ask me any questions if you get stuck.

....

Thank you very much for coming to this session. Please remember that the language we use in texts is not always appropriate in your school work. Please put your phones in the box and I will see you next week.

Sessions 3

Hello. You can come straight in and pick up your phone. Just like last week there is some information on this piece of paper (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the

way you might want to change the words to make sure you can fit all of the words into your message.

Situation 2 (created by Plester et al., 2009)
You are on your way to meet your friend, waiting at the bus stop, and the bus has just gone by and not stopped, so you are going to be late.

When you have finished this message please send it to my number on your phone. Once you have finished this message you can spend the rest of the session texting each other but you can only send a maximum of four messages each and after you leave the session all of the messages will be deleted. I will be here so you can ask me any questions if you get stuck.
....
Thank you very much for coming to this session. Please remember that the language we use in texts is not always appropriate in your school work. Please put your phones in the box and I will see you next week.

Sessions 4
Hello. You can come straight in and pick up your phone. Just like last week there is some information on this piece of paper (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the way you might want to change the words to make sure you can fit all of the words into your message.

Situation 3 (created by Plester et al., 2009)
It is Tuesday. You just got home from school, and you have so much homework to do that you don't think you will be able to go to the club you usually go to on Tuesday nights, but you know one of the others in the club will be coming by to pick you up. [You decide what kind of club: swimming, judo, tennis, music, scouts, guides, and the local youth club.]

When you have finished this message please send it to my number on your phone. Once you have finished this message you can spend the rest of the session texting each other but you can only send a maximum of four messages each and after you leave the session

all of the messages will be deleted. I will be here so you can ask me any questions if you get stuck.

....

Thank you very much for coming to this session. Please remember that the language we use in texts is not always appropriate in your school work. Please put your phones in the box and I will see you next week.

Sessions 5

Hello. You can come straight in and pick up your phone. Just like last week there is some information on this piece of paper (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the way you might want to change the words to make sure you can fit all of the words into your message.

Situation 9 (created by Plester et al., 2009)

You've just had a text from your Mum.She's in the middle of the supermarket and wants to know what you'd like for dinner. She's also forgotten to feed the dog and you know he's out of food.

When you have finished this message please send it to my number on your phone. Once you have finished this message you can spend the rest of the session texting each other but you can only send a maximum of four messages each and after you leave the session all of the messages will be deleted. I will be here so you can ask me any questions if you get stuck.

....

Thank you very much for coming to this session. Please remember that the language we use in texts is not always appropriate in your school work. Please put your phones in the box and I will see you next week.

Session 6

As this is our last session you can have some free time to text each other. The same rules apply from the earlier sessions. Please only use the text function on your phone and you each have a maximum of four texts that you can send during this session. At the end we will come together to do a final activity.

....

As this is our last session and we only have five minutes left I am going to ask you to complete a very short questionnaire. So, please finish what you were doing and put your phones in the box.

You each have a piece of paper with five statements on. For each statement please circle whether you *Strongly Agree/ Agree/ I don't know/ Disagree/ or Strongly Disagree*. Please complete your own page and do not look at other people. Please put your name on the top of the page. I will read each of the statements.

Please read each statement carefully and circle the answer which shows how much the statement applies to you.

1) I really enjoyed learning how to use texting on a mobile phone

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

2) I do not think I will use text messaging in the future

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

3) I feel very confident that I can write text messages that are clear and easy to read

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

4) I enjoyed learning about how to change words in text messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

5) I think that I will continue to use text-messaging if I get my own mobile phone

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

6) I did not enjoy using mobile phones to send text messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

7) I do not feel confident about using text messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

8) I would like to have a mobile phone in the future to practice texting

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

9) I am confident that I could have a conversation through text-messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

Thank you very much for coming to all of these sessions. I hope that you have enjoyed coming to them. I will see you all again soon.

The prompt sheet with symbols from the mobile phones and help with how to text will be visible during each of the control group sessions.

Appendix I

Experimental Group Intervention Sessions

Session 1

Thank you for agreeing to take part in these sessions. If you remember, you each read and signed a consent form *(Show the children their consent forms)* to show that you are happy to take part in these sessions with me, which will run at this time every week for the next six weeks. Please remember that if you decide you do not want to take part then just let me know and you can leave the group at any time. If you do decide not to take part I am afraid you will not be able to re-join the sessions at another time or during another week.

Okay, now we can begin, let's start with some short introductions. We want everyone to get to know each other, so let's introduce ourselves and tell the group one thing we like doing at school. So, I'll start, my name is Jamie and I liked doing PE at school.

Before we have a go with the phones, I would first like to find out about your experiences of using mobile phones up until now. We are going to go around the table and I would like each person to tell me whether they have ever used a mobile phone before and if they have, what they used it for.

For the rest of this session we will practice using the phones-

Each child will be given a mobile phone. The phones will be numbered and the numbers of all of the other phones will be stored in the address books. I will also have a phone and my number will be stored by name. The children will be shown how to switch the phone on and move through the menus to access text-messaging- as we will all have the same phone it will be possible to talk all of the children through the process together. The children will be shown how to write a message and how to send it to someone else in the group. Predictive text will not be allowed. (The researcher will have a prompt card on the table with symbols to support the children with using the phone).

In order for them to practice they will be asked to write a message like the one below:

Hello my name is .... and I am....years old. I go to .... school. I like ...... and ...... but I don't like ... (If they complete this message they can continue writing their own messages)

Thank you all very much, please put the phones in the box and I will see you next week.

Hello, welcome back for another session together. Can anyone tell me what we did last week?

(If no-one answers- last week we spent a bit of time introducing everyone, talking about whether we had used mobile phones before and practising how to write a text message).

So today we are going to do some different activities and some of them involve talking as a group. Because we will be working as a group, I think it would be helpful if we had some group rules. Do you have any rules in your class that you think we could use?

(Rules will be recorded for the group on A3 paper and the children will come up with ideas, but I will make sure that the rules include – stay sitting in your seat, listen to what other people say and don't talk when someone else is talking, respect what other people say and do not talk about what we did in the sessions outside of the group (confidentiality).

Task: Recognition of differences (15 minutes)

All the children will be given a phone. The phones will have two messages saved on them which I have sent to each child- they will be the same message but one will be written in Standard English and the other will be written in 'text'.

1) Text: Hi Jon, do u want 2 go 2 the park & play footy? We cud hav dinna @ mine afta if u want.

I've got a nu cmputA game mayb we can hav a competition. I'm gona invite Dan 2. Let me no if u can make it. Cul8r.Mike.

1) Standard English: Hi John, do you want to go to the park and play football? We could have dinner at mine after if you want. I have got a new computer game maybe we can have a competition. I am going to invite Dan too. Let me know if you can make it. See you later. Mike.

- Would anyone like to volunteer to read the first message from your phone? (Text)- thank you.

- Would anyone like to volunteer to read the second message from you phone? (Standard English)

(If no-one volunteers then I will read the messages to the group but I will make sure that they are all following on their own phones).

To aid the discussion about the differences between the two messages they will be typed in large print on A4 paper and presented so that the children can see them on the page

as well as on the screen- this way they will be able to make direct comparisions between the messages.

- Are these messages the same?

- What is the same about these two messages? *(When read aloud these two messages say almost exactly the same thing)*

  - What is different about these two messages? *(it is hoped that the children will pick up on the different spellings of words)*

Okay, I would like to go around the table and for each person to tell me one word that has been changed.

- What is different about the two spellings? How has the word been changed?

- Does it sound the same when you read it?

E.g. These are the words that have been changed in this message.

John	Jon
you	u
to	2
and	&
football	footy
could	cud
have	hav
dinner	dinna
at	@
after	afta
I have	I've
new	nu
computer	cmputA
maybe	mayb
I am	I'm
going to	gona
know	no
See you later	Cul8r

Task: Scenarios- compose a message (10 minutes)

Now I am going to give you some information about a situation (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on

your phone. Think about the way you might want to change the words, like in the messages we read, to make sure you can fit all of the words into your message.

Situation 1 (created by Plester et al., 2009)

It is Saturday morning, it is a sunny warm day, and you don't have any plans, but you'd like to go somewhere with your best friend. Your parents have told you its ok with them if you go out with your friend.

If there is time, the children will be asked to swap phones with each other and see if they are able to read aloud the message that the other person has written.

We are out of time, thank you all very much, please put the phones in the box. Please remember that the language we use in texts is not always appropriate in your school work. I will see you next week.

Session 3

As the children enter the room they can get on with the starter activity.

Here is a phrase that you might see written in a text message

SEE YOU LATER

On the piece of paper in front of you write down as many different ways that this phrase could be written in a text message.

(Once all of the children have arrived and had a chance to attempt the task.)

Okay, let's all come together and share our ideas of how this phrase could be changed.

I will write down the different ways the words in the phrase can be changed so that all of the children can see.

As a group we need to decide which of these textisms works the best and why.

Which one do you think is the best textism? Why is that the best one? *If the group cannot have a discussion together then I will invite each child to voice their suggestion for which one is the best and why. Through this conversation I would like them to think about whether the textism is easy to read and whether it reduces the number of letters in the word and therefore saves space.*

 - Can we think of any other letters or numbers that we could change in the same way?

Let's make a list together of all of the letters and numbers that we can use in the same kind of way.

All the children will be given a phone. The phones will have two messages saved on them which I have sent to each child- they will be the same message but one will be written in Standard English and the other will be written in 'text'.

2) **Text:** Did u c the Simpson's last nite? It was really funny but my mum made me turn it off cos it

was time 4 dinna, which was annoyin. Hav u dun the homewk 4 Fri? I don't realy understand

wot we hav 2 do, can u help me?

2) **Standard English**: Did you see the Simpson's last night? It was really funny but my mum made me turn it off because it was time for dinner, which was annoying. Have you done the homework for Friday? I don't really understand what we have to do, can you help me?

- Would anyone like to volunteer to read the first message from your phone? (Text)- thank you.

- Would anyone like to volunteer to read the second message from you phone? (Standard English)

(If no-one volunteers then I will read the messages to the group but I will make sure that they are all following on their own phones).

To aid the discussion about the differences between the two messages they will be typed in large print on A4 paper and presented so that the children can see them on the page as well as on the screen- this way they will be able to make direct comparisions between the messages.

- Are these messages the same?

- What is the same about these two messages? *(When read aloud these two messages say almost exactly the same thing)*

  - What is different about these two messages? *(it is hoped that the children will pick up on the different spellings of words)*

Okay, I would like to go around the table and for each person to tell me one word that has been changed.

- What is different about the two spellings? How has the word been changed?

- Does it sound the same when you read it?

<u>Task: Scenarios- compose a message (10 minutes)</u>

Now I am going to give you some information about a situation (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the way you might want to change the words, like in the messages we read, to make sure you can fit all of the words into your message.

Situation 2 (created by Plester et al., 2009)

You are on your way to meet your friend, waiting at the bus stop, and the bus has just gone by and not stopped, so you are going to be late.

Share your message with the person next to you - ask them to read it aloud.

- Were there any words in your partner's text that you did not understand?

- Talk to them about why you found it difficult to understand what they were saying.

- Pick a word from your partner's text then make a suggestion about how they might have shortened this word in their message

We are out of time, thank you all very much, please put the phones in the box. Please remember that the language we use in texts is not always appropriate in your school work. I will see you next week.

Session 4

As the children enter the room they can get on with the starter activity.

Here is a phrase that you might see written in a text message

YOUR WORK LOOKED GOOD. TEXT ME BACK.

On the piece of paper in front of you write down as many different ways that this phrase could be written in a text message.

(Once all of the children have arrived and had a chance to attempt the task.)

Okay, let's all come together and share our ideas of how this phrase could be changed.
I will write down the different ways the words in the phrase can be changed so that all of the children can see.

As a group we need to decide which of these textisms works the best and why.

Which one do you think is the best textism? Why is that the best one? *If the group cannot have a discussion together then I will invite each child to voice their suggestion for which one is the best and why. Through this conversation I would like them to think about whether the textism is easy to read and whether it reduces the number of letters in the word and therefore saves space.*

- Can we think of any other words where we could take letters out of the middle to change them in a similar way?
- Let's make a list together of all of the words that we can contract in this way.

Task: Recognition of differences (10 minutes)

All the children will be given a phone. The phones will have two messages saved on them which I have sent to each child- they will be the same message but one will be written in Standard English and the other will be written in 'text'.

3) **Text:** I'm so Xcited! I jus got home from skool & my mum had a surprise 4 me. U wil neva gueS

wot it was! She has bought us a cat! Do u remembA I hav wanted 1 4 ages? We r goin 2 cal her Poppy. Mayb u can cme ova & c her sn.

3) **Standard English**: I am so excited! I just got home from school and my mum had a surprise for me. You will never guess what it was! She has bought us a cat! Do you remember I have wanted one for ages? We are going to call her Poppy. Maybe you can come over and see her soon.

- Would anyone like to volunteer to read the first message from your phone? (Text)- thank you.

- Would anyone like to volunteer to read the second message from you phone?

(Standard English)

(If no-one volunteers then I will read the messages to the group but I will make sure that they are all following on their own phones).

To aid the discussion about the differences between the two messages they will be typed in large print on A4 paper and presented so that the children can see them on the page as well as on the screen- this way they will be able to make direct comparisions between the messages.

- Are these messages the same?

- What is the same about these two messages? *(When read aloud these two messages say almost exactly the same thing)*

- What is different about these two messages? *(it is hoped that the children will pick up on the different spellings of words)*

Okay, I would like to go around the table and for each person to tell me one word that has been changed.

- What is different about the two spellings? How has the word been changed?

- Does it sound the same when you read it?

Task: Scenarios- compose a message (10 minutes)

Now I am going to give you some information about a situation (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the way you might want to change the words, like in the messages we read, to make sure you can fit all of the words into your message.

Situation 3 (created by Plester et al., 2009)

It is Tuesday. You just got home from school, and you have so much homework to do that you don't think you will be able to go to the club you usually go to on Tuesday nights, but you know one of the others in the club will be coming by to pick you up. [You decide what kind of club: swimming, judo, tennis, music, scouts, guides, and the local youth club.]

Share your message with the person next to you - ask them to read it aloud.
- Were there any words in your partner's text that you did not understand?
- Talk to them about why you found it difficult to understand what they were saying.
- Pick a word from your partner's text then make a suggestion about how they might have shortened this word in their message

We are out of time, thank you all very much, please put the phones in the box. Please remember that the language we use in texts is not always appropriate in your school work. I will see you next week.

Session 5

As the children enter the room they can get on with the starter activity.

Here is a phrase that you might see written in a text message

WILL YOU STILL CALL ME TONIGHT?

On the piece of paper in front of you write down as many different ways that this phrase could be written in a text message.

(Once all of the children have arrived and had a chance to attempt the task.)

Okay, let's all come together and share our ideas of how this phrase could be changed.
I will write down the different ways the words in the phrase can be changed so that all of the children can see.

As a group we need to decide which of these textisms works the best and why.

Which one do you think is the best textism? Why is that the best one? *If the group cannot have a discussion together then I will invite each child to voice their suggestion*

for which one is the best and why. Through this conversation I would like them to think about whether the textism is easy to read and whether it reduces the number of letters in the word and therefore saves space.

Can you think of any other words that we could take the last letters off in the same way? Let's make a list together of all of the words that we can change in this way.

Task: Scenarios- compose a message (10 minutes)

Now I am going to give you some information about a situation (written in large print on a piece of paper) and I would like you to imagine you are in this situation and you need to respond to whatever it asks you to do. I would like you to write the message on your phone. Think about the way you might want to change the words, like in the messages we read, to make sure you can fit all of the words into your message.

Situation 9 (created by Plester et al., 2009)

You've just had a text from your Mum.She's in the middle of the supermarket and wants to know what you'd like for dinner. She's also forgotten to feed the dog and you know he's out of food.

Share your message with the person next to you - ask them to read it aloud.
- Were there any words in your partner's text that you did not understand?
- Talk to them about why you found it difficult to understand what they were saying.
- Pick a word from your partner's text then make a suggestion about how they might have shortened this word in their message.
- Can anyone tell about any words they found difficult to read in their partners text?
- Tell me about the word that you suggested that they change and how you suggested that they change it.

We are out of time, thank you all very much, please put the phones in the box. Please remember that the language we use in texts is not always appropriate in your school work. I will see you next week.

Session 6

As the children enter the room they can get on with the starter activity.

Here is a phrase that you might see written in a text message

YOU SHOULD COME OVER AFTER SCHOOL

On the piece of paper in front of you write down as many different ways that this phrase could be written in a text message.

(Once all of the children have arrived and had a chance to attempt the task.)

Okay, let's all come together and share our ideas of how this phrase could be changed. *I will write down the different ways the words in the phrase can be changed so that all of the children can see.*

As a group we need to decide which of these textisms works the best and why.

Which one do you think is the best textism? Why is that the best one? *If the group cannot have a discussion together then I will invite each child to voice their suggestion for which one is the best and why. Through this conversation I would like them to think about whether the textism is easy to read and whether it reduces the number of letters in the word and therefore saves space.*

Can you think of any other words that we could spell differently but that sound the same?

Let's make a list together of all of the words that we can change in this way.

Great, Okay as this is our last session you are able to spend the next 15 minutes using your phones to text each other about whatever you like. You have a maximum of four messages each.

....

Okay let's come back together for two final activities-

Here is a list of words or phrases that are commonly used in text messages. Your task is to change the word written in this list into one that you might see in a text message. If you can think of more than one way to change the words then write as many as you can and put a star (*) next to the one you think makes the best textism.

If you are unsure of how to change any of the words then just leave them out.

School	....
See you	....
Please	....
Later	....
By the way	....
should	....
Anyone	....
come	....
Wednesday	....
Over	....

Coming	....
After	....
Give	....
work	....
Sorry	....
Looked	....
Are you?	....
Good	....
Have	....
Will	....
Laugh out loud	....
Still	....
Phone	....
Want to	....
Call	....
Weekend	....
Tonight	....
Minute	....
Morning	....

Each child will have there own A4 paper with this task on it and will be asked to write their name at the top of the page.

As our last activity I am going to ask you to complete a very short questionnaire. You each have a piece of paper with five statements on. For each statement please circle whether you *Strongly Agree/ Agree/ I don't know/ Disagree/ or Strongly Disagree*. Please complete your own page and do not look at other people. Please put your name on the top of the page. I will read each of the statements.

Please read each statement carefully and circle the answer which shows how much the statement applies to you.

1) I really enjoyed learning how to use texting on a mobile phone

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

2) I do not think I will use text messaging in the future

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

3) I feel very confident that I can write text messages that are clear and easy to read

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

4) I enjoyed learning about how to change words in text messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

5) I think that I will continue to use text-messaging if I get my own mobile phone

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

6) I did not enjoy using mobile phones to send text messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

7) I do not feel confident about using text messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

8) I would like to have a mobile phone in the future to practice texting

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

9) I am confident that I could have a conversation through text-messages

Strongly Agree   Agree   I don't know   Disagree   Strongly Disagree

Thank you very much for coming to all of these sessions. I hope that you have enjoyed coming to them. I will see you all again soon.

Additional Notes
- If the group finishes all of the tasks in any session before the end of the 30 minutes then they will be given an opportunity to spend some free time texting on the phones.
- If the children are not able to have a discussion without talking over each other then I will stop them and invite each child to speak one at a time.

- There will be a box/tray in the middle of the table which the children will be asked to place their phones in at times when we are not using them, so that the focus can be on the task.
- The prompt sheet with symbols from the mobile phones and help with how to text will be visible during each of the intervention sessions.

Appendix J

Evidence of Approval from Ethics Committee

Appendix K

Evidence of Approval from Research Governance and Research Sponsorship
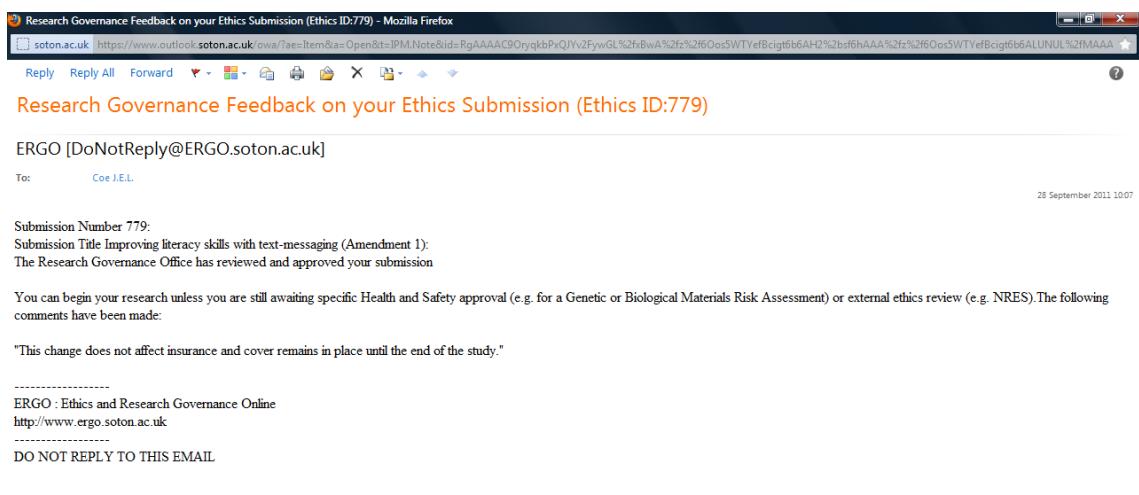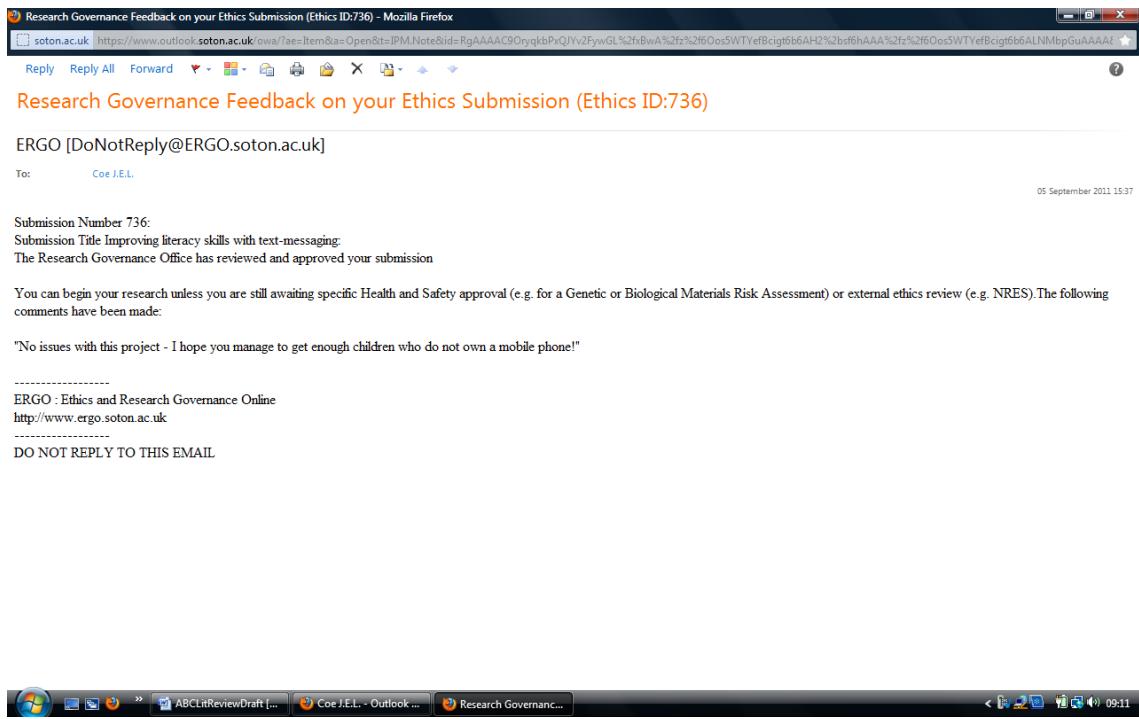
Miss Jamie Coe   RGO Ref: 8283
School of Psychology
University of Southampton
University Road
Highfield
Southampton
SO17 1BJ

05 September 2011

Dear Miss Coe

Project Title Improving Literacy Skills with Text-Messaging

This is to confirm the University of Southampton is prepared to act as Research Sponsor for this study, and the work detailed in the protocol/study outline will be covered by the University of Southampton insurance programme.

As the sponsor's representative for the University this office is tasked with:

1. Ensuring the researcher has obtained the necessary approvals for the study
2. Monitoring the conduct of the study
3. Registering and resolving any complaints arising from the study

As the researcher you are responsible for the conduct of the study and you are expected to:

1. Ensure the study is conducted as described in the protocol/study outline approved by this office
2. Advise this office of any change to the protocol, methodology, study documents, research team, participant numbers or start/end date of the study
3. Report to this office as soon as possible any concern, complaint or adverse event arising from the study

Failure to do any of the above may invalidate the insurance agreement and/or affect sponsorship of your study i.e. suspension or even withdrawal.

On receipt of this letter you may commence your research but please be aware other approvals may be required by the host organisation if your research takes place outside the University. It is your responsibility to check with the host organisation and obtain the appropriate approvals before recruitment is underway in that location.

May I take this opportunity to wish you every success for your research.

Yours sincerely

Dr Martina Prude
Head of Research Governance

Tel: 023 8059 5058
email: rgoinfo@soton.ac.uk

Corporate Services, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom
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Appendix L

Participant Information Sheet and Consent Form (Read to the pupils)

Study Title: Improving literacy skills with text-messaging
Researcher: Jamie Coe (Trainee Educational Psychologist)
Ethics number: 736

Please read/listen to this information carefully before deciding whether you would like to take part in this project.

My name is Jamie Coe and I am doing a project with some children in your school. I have invited you to meet with me today so that I can tell you about the project and what it will involve so that you can decide if you would like to take part. There are quite a lot of activities within this project so I am going to tell you about all of them before you decide whether or not you would like to take part.

Now, you might remember that I came into your classroom and asked you to answer some questions about mobile phones. That questionnaire was the beginning part of this project, and the reason you have all been invited to do some more work with me is because you do not have your own mobile phones. Can I just check that is still correct? Does anyone here own a mobile phone?
Great, so you have all been invited to take part because you do not own a mobile phone and you are in Year 5 which is the year group that has been chosen to take part in this study.

Now let me explain what the rest of the project will involve. Your parents have already signed a form to say that they are happy for you to take part and if you also agree, then the next thing I will do is ask you to tick some boxes on this page *(hold up consent form)* and sign so that I know that you definitely want to take part.

Then, together as a group, I am going to ask you to write a text message on a piece of paper and we will also do some spellings together as well. Then on another day, you will each come and see me one at a time and we will do some reading activities and look at the sounds in some words.

Then after Christmas, I will see you every week for half an hour in groups of 7 or 8 and we will do some activities using mobile phones. I have a mobile phone for each of you to use during the session and you will be able to learn how to send text messages and practice sending them to other people in the group. I hope you will have fun! We will meet every week for half an hour for 6 weeks.

After 6 weeks, you will all do the writing task, the spelling and reading activities with me again. I will also come back in the Summer term and do some more spelling, reading and writing tasks with you.

Before we do any of our sessions I will speak with your class teachers so that you do not miss important work in your classroom. Also, the sessions will never run into break or lunchtime so you will not miss out on any of your playtime.

Now, if you agree to take part and then you change your mind then that is okay. You can leave at any time and this will have not affect you in school in any way.

Does anyone have any questions about this project now?

If you can't think of any questions now, but you think of one later then you can ask at reception to speak with Jamie and when I am next in school you can ask me any questions that you have.

If you have any concerns or worries about this project at any other time then you can speak to your teacher or someone at home.

Improving literacy skills with text-messaging

Researcher name: Jamie Coe
Study reference: 736
Ethics reference: JC5

Name: _____

Thank you for coming to this session today and for listening to the information I just read to you about the project I am completing in school (Participant Information Sheet (Version 3, 23/9/11). If you think you would like to be involved in the sessions using mobile phones then please complete the form below.

Please ask if you are unsure about anything. By completing the form below, you are agreeing to take part in the individual and group reading and spelling sessions and in the group sessions using mobile phones. If you decide you do not want to take part then you can leave at anytime, so just let me know and this will not affect you in any way at school.

Please put a tick in the box(es) if you agree with the statement(s):

I have listened to/read the Participant Information Sheet (Version 3, 23/9/11)

I agree to take part in this research project - to complete the individual and group sessions with the researcher (Jamie Coe) and to participate in the group sessions using mobile phones.

I understand that I am allowed to leave the project at any time and that this will not affect me in school in any way.

I understand that information collected about me during this study will not have my name on and will only be seen by the researcher (Jamie Coe).

Signature   ....

If you have any questions or concerns about this study please ask Jamie or talk to your teacher or someone at home.

Improving literacy skills with text-messaging
(To be read to the pupils following the post-intervention assessments)

Thank you for taking part in this study.

We completed these sessions and activities together to see whether using mobile phones especially texting, helps children to develop their reading and spelling skills. I am hoping to find out whether, by coming to the sessions for 6 weeks, you have improved your reading and spelling. As I said before we started the sessions, I am the only person who will see the work that you have done with me and when I write this up into a report I will not use any of your names. It is still okay if you decide that you do not want me to use your scores on the tasks that you did, and I can remove these from the report at any time and this will not affect you in school in any way. Because I told you exactly what would happen in the sessions before we started and that is exactly what happened, this means that this study has not used deception.

Does anyone have any questions?

If you think of any questions later or would like a copy of this sheet then please ask me now or you can contact me through your school reception at a later point.

Thank you again for your participation in this research.

If you have any other questions or concerns or are worried about this project, please talk to your teacher or someone at home.

Appendix N

Parental Debriefing Letter

Date

Dear Parent/Carer,

Thank you for allowing your child to participate in the study "Improving Literacy Skills with Text-messaging". Your child has now completed all of the texting sessions and the first post-intervention reading, spelling and phonological awareness assessments. Your child will participate in follow-up assessments during the end of the Summer term.

The aim of this project was to explore how using text-messaging might influence literacy skills. It is hoped that attending the group sessions where we used mobile phones to text each other might have helped your child to develop their reading and spelling skills. It is also hoped that your child enjoyed the group sessions. Once again, results of this study will not include your child's name and will only be seen by the researcher. The study did not use deception. You may still withdraw your child's data from the study at any point without it affecting them in school in any way.

If you have any further questions about this research, please contact the researcher, Jamie Coe, at jelc1g09@soton.ac.uk. If you have questions about your child's rights as a participant in this research, or if you feel that he/she have been placed at risk [during participation], you may contact the Chair of the Ethics Committee, Department of Psychology, University of Southampton, Southampton, SO17 1BJ. Telephone: (023) 8059 4663.

Thank you again for your child's participation in this research.

Yours faithfully

Jamie Coe
Trainee Educational Psychologist
University of Southampton

Appendix O

Table showing reasons given for use or non use of predictive texting

Use predictive text	Reasons given
Yes	"so I don't make a mistake"
Yes	"it automatically does it"
Yes	"I don't know how to spell some words
Yes	"it's quicker and sometimes I can't spell words"
Yes	"it is easier"
Yes	"because they might not understand what you are saying"
Yes	"because I can't spell probably"
Yes	"because I don't like typing on the phone"
Yes	"it's quicker"
Sometimes	"sometimes I don't know how to spell a word"
No	"I do text talk"
No	"don't like it"
No	"I don't like it"
No	"because it is not the right one"
No	"I do not text"

Examples of each type of textism in the pre and post-intervention text messages

Type of Textism	Examples from the Pre and Post messages	Standard English
Accent Stylization	Gonna goina gona gunna sos 'cause dinna	Going to Sorry because dinner
Letter/Number homophones	2 l8 4 b cu l8er T	to late for be see you later Tea
Shortenings	din dins by	dinner bye
Contractions	gv gve lft styin stying staing hm dinr dnr dner gng bck wll	gv lift staying home dinner going back will
G Clippings	Goin stayin havin	going staying having
Other Clippings	she'l hous	she will house
Acronyms, Initialisms, Symbols	@ R's &	at Rob's and

Misspelling	diner	dinner
	k	(unknown but not an initial)
	gong	going
	robes	rob's
	ill'e	i'll

Appendix Q

Means and standard deviations for all outcome measures; Four subscales of the Phonological Assessment Battery (Alliteration, Rhyme, Non-word reading, Spoonerisms), Word reading (British Ability Scales, Second Edition) and Spelling (Graded Spelling test), pre and post the intervention, as a function of group

Outcome Measure	Group	Pre				Post			
		Mean	SD	Min	Max	Mean	SD	Min	Max
PHAB									
Alliteration	Control (n=8)	98*	3.85	90	100	96.88*	5.94	85	100
	Experimental (n=8)	98.75*	3.54	90	100	100*	0	100	100
Rhyme	Control (n=8)	96.63*	11.26	78	109	109.88*	13.96	96	131
	Experimental (n=8)	115.5**	13.12	30	101	115.75**	13.04	99	131
Spoonerisms	Control (n=8)	111.5*	7.76	100	121	115.38**	9.29	104	131
	Experimental (n=8)	108*	6.72	96	117	111.00*	7.29	103	125
Non Words	Control (n=8)	115**	14.14	95	131	118.38**	13.32	95	130
	Experimental (n=8)	115**	14.36	93	131	118.75**	13.99	92	131

British Ability Scales II

Word Reading	Control (n=8)	113.88	10.33	98	129	120.75	13.77	98	142
	Experimental (n=8)	115	12.97	97	137	118.88	14.36	92	137

Vernon Graded Spelling Test

Raw Spelling Score	Control (n=8)	23.5	10.93	4	34	26	11.76	7	40
	Experimental (n=8)	22.5	11.46	6	39	25	11.24	10	42
Standard Spelling Score	Control (n=6)	88.71	12.16	70	102	94	11.73	76	107
	Experimental (n=6)	87.29	15.01	70	108	93.5	10.82	83	111

PhaB Scores: average*, above average**, Well above average

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