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An examination of the influence of cognitive, motivational, and behavioural factors on children's reading skill and development.

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ABSTRACT
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The aim of this thesis is to develop a better understanding of the factors influencing children's reading skill and reading development. In particular, the experimental studies were designed to investigate the influence of cognitive skills, motivational factors, and behavioural factors on children's reading attainment. The results illustrate that both cognitive and non-cognitive factors (i.e. motivation and behaviour) influence children's reading skill. The studies also show that the relationship between motivation and reading attainment is domain specific. Furthermore, considering a multi-dimensional approach to reading motivation, the results suggest that whilst intrinsic reading motivation and reading competency beliefs are generally associated with children's reading skill, extrinsic motivation is unrelated. In addition, the predictors of children's motivation to read were examined. The results suggest that children's motivation to read is shaped by their reading competency beliefs and personality characteristics (particularly openness to experiences). Regarding behavioural factors, of all the classroom behaviours assessed, hyperactive/inattentive behaviour was found to be most closely associated with children's reading skills. In addition, hyperactive/inattentive behaviour was associated with children's emergent reading-related abilities. Finally, the studies examined the cognitive skills that support reading development when children are taught to read by a synthetic phonics approach. It was found that early word reading skill was largely underpinned by children's letter sound knowledge, phoneme awareness (particularly phoneme synthesis), and verbal short term memory. These skills are consistent with the idea that the way in which children are taught to read influences the cognitive skills underpinning reading.

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PUBLICATIONS
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Journal Articles

In preparation

Medford, E., & McGeown, S. P. (in preparation). Understanding the skills supporting children's early reading development when learning by a systematic synthetic phonics approach.

Medford, E., & McGeown, S. P. (in preparation). The influence of cognitive and behavioural factors for children's early reading development.

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Published

McGeown, S. P., Johnston, R. S., & Medford, E. (2012). Reading instruction affects the cognitive skills supporting early reading development. Learning and Individual Differences, 22, 360-364.

Logan, S., & Medford, E. (2011). Sex differences in the strength of association between motivation, competency beliefs and reading skill. Educational Research, 53, 85-94.

Logan, S., Medford, E., & Hughes, N. (2011). The importance of intrinsic motivation for high and low ability readers' reading comprehension performance. Learning and Individual Differences, 21, 124-128.

Book Chapters

Medford, E., & McGeown, S. P. (2012). Cognitive and motivational factors for reading: The need for a domain specific approach to motivation. In Psychology of Motivation, Nova Science Publishers.

Conference Abstracts

Medford, E., & McGeown, S. P. (2011). The effects of behaviour on the development of emergent literacy skills. Poster presented at the Society for the Scientific Study of Reading.

Medford, E., & McGeown, S. P. (2011). Intrinsic motivation is particularly important for low ability readers. Paper presented as part of a symposium at the British Psychological Society.

Medford, E., & Logan, S. (2010). Investigating the importance of motivation in children's reading comprehension performance. Poster presented at the British Psychological Society.

ACKNOWLEDGEMENTS

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CHAPTER 1: INTRODUCTION (COGNITIVE FACTORS)
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The ability to read is essential for children to succeed in school and perform well academically, as the majority of school subjects require children to engage in reading activities in order to independently develop their knowledge. Therefore, a child without proficient reading skill is likely to progress more slowly academically, and develop a poorer understanding of a range of topics. Indeed, research suggests that poor readers are likely to achieve more depressed educational qualifications than their high ability counterparts (Maughan, Hagell, Rutter, & Yule, 1994; Savolainen, Ahonery, Aro et al., 2008). Due to the importance of reading skill for school attainment, educators are interested in identifying ways to improve children's reading abilities by developing an understanding of the factors influencing reading attainment. As a result, there is great interest in scientific studies of children's reading acquisition and development and in the factors that may have an influence on children's reading progress in school.

The purpose of the research in this thesis is to investigate a range of cognitive and non-cognitive factors which may influence children's reading acquisition and development during primary school. To define these terms specifically, single word reading, reading comprehension and overall reading attainment are used in different chapters as measures of reading skill, which are assessed using standardised assessments and school reading grades. Cognitive factors refer to the cognitive skills which are commonly reported to underpin reading at various stages of reading development, for example phonological awareness or language skills. Non-cognitive factors refer to factors that are considered to be separate from cognitive processes; the studies in this thesis specifically examine reading motivation and classroom behaviour. Reading motivation

refers to children's drive to engage in reading activities and classroom behaviour refers to the negative and positive classroom behaviours that may influence children's reading acquisition and development. In addition to studying how these factors influence reading attainment, the relationships between cognitive, motivational and behavioural factors are also examined. In addition, to investigate how teaching method may alter the skills that underpin reading acquisition and development, the influence of method of reading instruction on the cognitive skills that predict early reading success is investigated. Finally, to better understand the factors that predict children's motivation to read, the relationship between child specific characteristics and reading motivation is examined.

Both cognitive and non-cognitive factors were investigated in order to gain a more comprehensive understanding of the influences on children's reading acquisition and development. Cognitive and non-cognitive factors represent theoretically different influences on children's reading achievement, highlighting the multi-faceted nature of reading research. A comprehensive review of each of these areas will be presented in the introduction to each experimental chapter. The main introduction for this thesis is split into three chapters: 1) cognitive theories of reading development, and the cognitive skills that support reading, 2) non-cognitive influences on reading skill, 3) a thesis overview.

Cognitive theories of reading development

A number of developmental theories have been posited in order to explain how children acquire and develop their reading skills. A common theme of most of these models is that children's reading skill progresses along a series of stages or phases, with the

strategies used for word reading becoming increasingly refined. Progression along these reading stages is thought to be catalysed by children's chronological age and literacy instruction. As children's cognitive and reading-related skills develop, they are able to progress into using more efficient word-recognition strategies. Models of reading development can therefore be useful for considering the cognitive and reading-related skills that underpin children's reading acquisition and progress during different developmental stages. The following section will briefly outline some of the main developmental models of children's reading acquisition and development.

Chall (1983) outlines a six stage framework of children's reading development. The initial stage is the pre-reading stage, in which children's oral language skills and an awareness of literacy are thought to develop. Following this, children begin using letter-sound associations for word reading. These skills are then thought to extend and develop in the third stage, and are used for reading accessible texts. In the fourth stage, children begin reading in order to learn, and in the fifth stage, children develop the ability to read texts using multiple viewpoints, to analyse texts, and to react critically towards them. Finally, in the sixth stage, children develop the ability to construct and reconstruct text information.

Focusing more specifically on word reading development, Marsh, Friedman, Welch, and Desberg (1981) outline a four stage model of reading acquisition. In the initial stage, children are proposed to read through rote-learning (i.e., to recognise words as visual wholes from memory). Following this, children use 'discrimination net learning', which involves using graphemic features (letter sequences) of words, and comparing them to those already in the lexicon. In the third stage, more emphasis is placed on letter

sound rules for word reading. Finally, in the fourth stage, children are thought to read words using more complex rules and analogies.

A more commonly cited theory of reading acquisition is Frith's (1986) model, in which there are three stages that the beginner has to master in order to become a competent reader. In each stage, the child does not start from scratch in learning a new strategy for word reading, but builds on pre-existing strategies. The initial stage is termed the 'logographic' stage, in which children are thought to recognise words instantly on the basis of salient visual features, such as the initial letter. Following this, children progress into the 'alphabetic' stage, in which they make connections between letters and sound to read words. The final stage is the 'orthographic' stage, where children read by instantly recognising morphemic segments of words. In this stage, letter-sound analysis is used less frequently, as children are able to recognise morphemes or whole words automatically by sight.

Ehri (1995; 2005) proposes an alternative model of sight word reading acquisition, consisting of four developmental phases. Each phase is named after the dominant type of alphabetic knowledge used for word recognition. The initial phase is the pre-alphabetic phase, in which children have little knowledge of the English alphabetic system, and therefore do not use letter-sound correspondences in order to read words. It is suggested that some children may read words in this phase by recognising salient visual features of words. The second phase is the partial alphabetic phase, in which children use the names or sounds of some alphabet letters in order to aid word reading. However, in this phase, connections are only formed between some letters and sounds, such as the initial letter sound of words. Therefore, in this phase, children have very limited word reading skills, and have difficulty in decoding unfamiliar words. The third

stage is the full alphabetic stage, in which children read words by using letter-sound (i.e. grapheme-phoneme) correspondences which are present throughout the whole word. Finally, the fourth stage is the consolidated alphabetic phase, in which children retain an increasing number of sight words in memory, and consolidate grapheme-phoneme connections into larger units such as rimes, syllables and morphemes. However, Ehri posits that children may use strategies from more than one phase in order to read words, and that each phase is not necessarily a prerequisite for the next. In other words, the four phases represent the most dominant type of alphabetic knowledge used for word reading, rather than the sole strategy used.

An alternative theory of sight word reading development, by Share (1995; 1999), posits that sight word reading develops in the context of word-specific (item-based) reading processes rather than global changes in word reading strategies. It is proposed that phonological recoding (i.e. print to sound translation) of an unfamiliar word enables the learner to acquire the orthographic representations of the word in sight vocabulary. In this way, phonological recoding is thought to function as a self-teaching mechanism, as children are able to independently acquire orthographic knowledge of words through letter-sound conversion processes. Each time an unfamiliar word is successfully decoded by a child, the word-specific orthographic information becomes increasingly secured in their sight vocabulary. Therefore, high frequency words (which are encountered more often) are likely to be recognised visually from the earliest stages of reading acquisition with minimal phonological processing. However, low frequency words will be more dependent on phonological recoding to secure the word-specific orthographic information in memory.

Research suggests that Ehris's phase theory and Share's self-teaching hypothesis may be more appropriate than traditional stage theories (e.g. Chall, 1983; Marsh et al., 1981) in explaining children's reading acquisition and development. For example, in a study by Farrington-Flint, Coyne, Stiller, and Heath (2008), Year 1 and 2 children read the same word list four separate times with three week intervals (in order to mimic word learning processes), and provided self-reports of word reading strategies. Results showed that children used a variety of different strategies across trials and were able to choose selectively from these strategies. For example, at all stages of word learning (i.e. across all trials), children read some words using a phonological decoding strategy and some words by sight. In accordance with Ehri's model, this suggests that children in different stages of word reading development are able to utilise a variety of alternative word recognition strategies and furthermore, to choose the most appropriate strategy to use. However, in accordance with Ehri (1995; 2005), and with Frith (1986), younger children (Year 1) relied more heavily on phonological strategies for word reading, whereas the more skilled older children (Year 2) read more words from sight, indicating the increasing reliance on a sight vocabulary for word reading. Furthermore, in accordance with Share (1995), children relied more on a phonological strategy for low frequency than high frequency words, indicating that the strategies used for word reading are item-specific.

The influence of reading instruction

Models of reading development can be useful for understanding children's reading strategies and considering the cognitive skills that underlie children's reading acquisition and development. However, these developmental models do not typically take into account the influence that method of reading instruction may have on

children's strategies and the cognitive skills that underpin reading acquisition. Whilst Frith, Ehri, and Share would all argue that reading instruction is necessary for developmental changes in reading skill, how reading instruction shapes these changes is not considered.

For example, regarding Ehri's developmental theory, a critique by Beech (2005) notes that Ehri does not mention how the teaching style that children experience may interact with the phases and strategies that children use to recognise words. For example, a child who receives systematic phonics instruction as their initial method of reading instruction is likely to spend no, or very little, time using the strategies consistent with Ehri's pre-alphabetic stage, Frith's logographic stage, or Marsh et al.'s rote-learning stage. However, a child who receives whole word reading instruction (i.e., learns to recognise words as visual wholes via flashcards) may spend a greater length of time using the strategies proposed in these stages or phases of development.

Indeed, research indicates that the method of reading instruction that children receive plays a significant role in determining the strategies they use for word reading (e.g. Deavers, Solity, & Kerfoot, 2000; Sowden & Stevenson, 1994; Walton & Walton, 2002). For example, Sowden and Stevenson (1994) found that children taught to read with a whole word (visual) teaching approach relied exclusively on whole word reading strategies, whereas those taught with a mixed methods approach (with some phonics instruction) also relied on phonological recoding strategies. Similarly, Deavers et al. (2000) found that children taught to read with a small units (i.e. phoneme level) approach made greater use of a phoneme level strategy for decoding unfamiliar words, whereas those taught with a large unit (i.e. rime level) approach showed greater reliance on a rime-based analogy strategy. Therefore, as instructional approach appears to

influence the strategies that children use to read unfamiliar words, it is likely that method of reading instruction also influences the skills that children draw upon when learning to read.

Word recognition and reading comprehension

The cognitive skills supporting children's reading development will also differ depending on the type of reading skill being examined. It is important to make a distinction between word recognition and reading comprehension. Word recognition tasks assess children's ability to read individual words presented out of context (e.g. 'cat' or 'sandwich'). However, as the main purpose of reading is to gain information and understanding from text (rather than solely to recognise individual words), reading comprehension (i.e. independently reading and understanding text) is generally considered to be the more important skill.

As discussed, the majority of models of reading development focus on the development of children's early word recognition skills (e.g. Ehri, 1995; Frith, 1986; Marsh et al., 1981; Share, 1995). Of the models cited previously, the only exception is Chall's (1983) model which also considers the development of higher level reading skills, such as reading comprehension. Chall proposes that the ability to understand texts develops at a later stage than word reading skills. For example, in stage 2 of Chall's model, children are proposed to develop word recognition skills, and in stage 3, children are proposed to apply these skills to reading accessible texts. Following this, children are then proposed to be able to read texts in order to learn (stage 4).

Indeed, sufficient word reading skill is essential for reading comprehension. A child unable to independently read words within a text will not be able to understand the passage of text. This is consistent with Vellutino (1991), who found that word recognition skill was the best single predictor of reading comprehension. However, it is not the case that proficient word reading skill always generalises to good reading comprehension. For example, a number of other skills have been associated with children's reading comprehension ability, such as broader language skills and working memory (Cain, Oakhill, & Bryant, 2004). The following sections will outline previous research examining the cognitive and reading-related skills supporting children's early reading acquisition and later reading skills.

Early reading acquisition

There are two main skills which are generally regarded as essential for early reading acquisition: letter knowledge and phonological awareness. This section will focus initially on the importance of letter knowledge for early reading acquisition. Following this, phonological awareness (sensitivity to the sound structure of words) will be examined and evidence concerning the importance of large (syllable and rhyme) or small (phoneme) word segments for word reading development will be discussed.

Letter knowledge

Research indicates that letter knowledge is one of the most important determinants of children's early word reading skill (e.g. Muter, Hulme, Snowling, & Taylor, 1998; Scanlon & Vellutino, 1996; Schatschneider, Fletcher, Francis et al., 2004). For example, McGeown, Johnston, and Medford (2012) found that regardless of method of

reading instruction, children's letter sound knowledge prior to formal reading instruction predicted their later word reading ability. Other studies have also found that children's early letter knowledge is a strong predictor of their early reading performance (Scanlon & Vellutino, 1996), and a powerful longitudinal predictor of later word reading skills during the primary school years (Leppänen, Aunola, Niemi, & Nurmi, 2008). Knowledge of letters is essential for children to be able to make use of the alphabetic principle, in which letter-sound correspondences are used to aid word reading (e.g. Ehri, 2005). Children with a good knowledge of letter sounds are better equipped to read unfamiliar words by forming connections between the letters in the spellings of words and the sounds in the pronunciation of words. Although knowledge of letter names has been found to have some beneficial purposes in regards to learning letter sounds (Cardoso-Martins, Mesquita, & Ehri, 2011; Treiman, Pennington, Shriberg, & Boada, 2008), letter sound knowledge is thought to be more important for word reading than letter name knowledge as the letter sounds map more closely with spoken words (McBride-Chang, 1999).

Phonological Awareness

An additional skill necessary to make full use of the alphabetic principle is phonological awareness, the ability to differentiate and manipulate the sound segments in spoken words. Phonological awareness is strongly associated with early reading development (Anthony, Williams, McDonald, & Francis, 2007; Bryant, Maclean, Bradley, & Crossland, 1990; de Jong & van de Leij, 1999; Lonigan, Anthony, Phillips et al., 2009; Wagner & Torgeson, 1987) and has been found to be an excellent simultaneous and longitudinal predictor of word reading in the early years of school (Hulme, Hatcher, Nation et al., 2002; Schatschneider et al., 2004; Wagner, Torgeson, Rashotte et al.,

1997). Such findings have led researchers to conclude that the development of children's word recognition skills is likely to be critically dependent on their phonological ability (Muter, Hulme, Snowling, & Stevenson, 2004). Indeed, phonological awareness is considered to be necessary in order to translate a printed representation of an unfamiliar word into a pronunciation (phonological recoding; e.g. Share, 1995).

Syllable, rhyme, and phoneme awareness

Spoken words can be segmented into linguistic units of different sizes, ranging from larger syllable and rhyme units to phonemes, the smallest sound segments. However, there is some disagreement within the literature as to whether phonological awareness is a global skill that encompasses awareness of all linguistic units, or whether awareness of different linguistic units can be separated into distinct skills showing varying associations with early word reading. Anthony, Lonigan, Burgess et al. (2002) found that young children's sensitivity to words, syllables, rhymes and phonemes represented a single, underlying phonological ability. In this study, it was the variance that was common to higher and lower levels of phonological sensitivity that was related to reading skills. Similarly, an examination of four phonological awareness studies, by Anthony and Lonigan (2004), concluded that levels of sensitivity to different linguistic units were not distinct phonological abilities but that they represented a global phonological awareness skill. However, the majority of studies conceptualise sensitivity to syllables, rhymes, and phonemes as being distinct phonological abilities (e.g. Bryant et al., 1990; Castles & Coltheart, 2004; Hulme et al., 2002; Muter et al., 2004; Savage & Carless, 2005). Indeed, there is a wealth of evidence indicating that they are independent skills (Foy & Mann, 2001; Muter et al., 1998; Muter & Snowling, 1998)

and that they are differentially related with children's word reading ability (Bryant et al., 1990; Castles & Coltheart, 2004; Foy & Mann, 2001; Hulme et al., 2002; Muter et al., 2004; Savage & Carless, 2005).

Regarding syllabic awareness, there is little evidence for an independent relationship between children's sensitivity to the syllables in spoken words and subsequent word reading skill (see Castles & Coltheart, 2004, for a review). However, evidence regarding the importance of rhyme awareness for children's early word reading is mixed. Bryant et al. (1990) found a direct connection between sensitivity to rhyme and word reading that appeared to be separate from phoneme awareness. It was suggested that sensitivity to the rhymes in spoken words may be useful for early word reading as children may group words with similar spelling patterns. In this way, children may utilise learnt spelling sequences that have a rhyming sound unit in order to help with the pronunciation of unfamiliar words with the same spelling sequence. However, the majority of evidence indicates that rhyme awareness, when studied alongside phoneme awareness, does not independently predict children's early word reading skill. For example, Savage and Carless (2005) found that whilst both onset-rime and phonemic manipulation abilities predicted reading at age 5, onset-rime manipulation did not predict early reading after controlling for phoneme manipulation skill. Conversely, after accounting for onset-rime awareness, phonemic awareness did predict significant variance in word reading ability. This suggests that it is phonemic awareness, rather than rhyme awareness, that is particularly important for children's early word reading. Many other studies have also found that whilst phoneme sensitivity is a powerful simultaneous and longitudinal predictor of word recognition, rhyme awareness appears to be less crucial (Blaiklock, 2004; Foy & Mann, 2006; Hulme et al., 2002; Muter et al., 2004; Muter et al., 1998; Muter & Snowling, 1998). Such evidence has led researchers

to conclude that it is most likely children's ability to perceive and manipulate phonemes that plays a causal role in reading acquisition (Castles & Coltheart, 2004).

Skills supporting later reading development

Although letter sound knowledge and phonological awareness are regarded as important for children to decode new words, during later reading development, children read for meaning and therefore need to have sufficient skills to process and understand what they read. This ability is considered to be supported by other skills. The next section will initially outline the importance of oral language skills for children's later reading development. Following this, the influence of working memory and component comprehension skills will be discussed.

Oral language skills

In addition to possessing sufficient word recognition skills, research suggests that in order for children's later reading skills to develop, broader language skills are also necessary (Hulme, Snowling, Caravolas, & Carroll, 2005; Nation & Snowling, 2004). For example, Nation and Snowling (2004) administered a range of tests relating to reading, oral language and phonological skill to the same children at aged 8 and aged 13. Results showed that oral language skills (vocabulary, listening comprehension and semantic skills) predicted children's reading comprehension even after controlling for decoding and phonological skills, highlighting the importance of both broader language skills and phonological skills for children's later reading development.

In addition to explaining variance in children's ability to understand text, oral language skills have also been found to be important for word recognition, particularly for reading irregular words (words which do not have regular letter sound correspondences, e.g. 'pint'). For example, Ricketts, Nation, and Bishop (2007) found that oral language skills predicted reading comprehension and exception word reading, but not text reading accuracy, nonword reading, or regular word reading. Indeed, as irregular words do not follow regular letter sound correspondences, the process of phonologically decoding an irregular word is more likely to produce an incorrect pronunciation. Therefore, vocabulary knowledge and oral skills may be relied upon to select the correct pronunciation of a known word.

The importance of both phonological and language skills for reading is highlighted in the simple view of reading (Hoover & Gough, 1990), which argues that in order to understand a text, a child must be able to read the individual words (decoding skills) and understand the meaning (linguistic comprehension). These two elements are proposed to be equally important for reading comprehension. This model is often cited and studies have consistently shown that both skills are crucial for children's reading comprehension skill. For example, Kendeous, Van den Broek, White, & Lynch (2009) found that both oral language skills and decoding skills each independently predicted children's reading comprehension, illustrating that both were important contributors.

Working memory and component skills of comprehension

However, the simple view of reading (Hoover & Gough, 1990) has been criticised for being overly simplistic, and in addition to decoding skill and verbal ability, working memory (the ability to store and process information) has also been associated with

children's reading comprehension skills. For example, Cain et al. (2004) found that working memory explained unique variance in children's reading comprehension even after controlling for word reading skill, vocabulary, and verbal ability, suggesting that working memory plays a significant role in determining children's reading comprehension performance. This is consistent with Swanson and Berninger (1995) who found that children with reading comprehension deficiencies performed more poorly on verbal working memory tasks.

In addition to working memory, children's component comprehension skills have also been found to be associated with their ability to understand text. For example, integration skills (of information in the text to establish coherence), inference skills, comprehension monitoring, and story structure knowledge have all been found to be significantly related with children's reading comprehension skills (Cain et al., 2004; Cain & Oakhill, 1999). These results (and the results of previously cited studies) therefore suggest that whilst decoding skills and oral language skills are important for reading comprehension, they may not be sufficient for a child to develop proficient reading comprehension ability.

In summary, whilst not exhaustive, letter knowledge and phoneme awareness are generally considered to be the most important skills underpinning children's early reading acquisition. However, as children's reading skills develop, a number of other skills, such as oral language abilities, working memory, and component comprehension skills, are thought to become increasingly important for children's reading.

CHAPTER 2: INTRODUCTION (NON-COGNITIVE FACTORS)

Whilst models of children's reading development are relevant if focusing solely on cognitive or reading-related abilities, they do not take into account the influence of non-cognitive influences on children's reading skills. Similarly, reading researchers have generally focused on the more cognitive aspects of reading, and paid less attention to the role that non-cognitive factors may play in shaping children's reading development. As reading is a learnt skill and something that takes effort and years to master, children's reading development will arguably be influenced by non-cognitive factors such as motivation. Therefore, it is important to investigate both cognitive and non-cognitive influences in order to obtain a more comprehensive understanding of children's reading development. As mentioned earlier, whilst the current thesis placed some emphasis on the cognitive skills supporting children's reading, a broader range of factors influencing reading development, such as motivation and behaviour, were also examined.

Motivated cognition

The importance of motivation for cognitive tasks such as reading is highlighted in theories of motivated cognition (e.g. Kruglanski, Bélanger, Chen et al., 2010), which suggest that an individual's cognitive processes are influenced, to some extent, by their level of motivation (i.e. by their drive to engage in an activity). Indeed, whilst some children will be more motivated to put cognitive effort into reaching their achievement objectives, other children will be more reluctant to do so. As reading is an effortful

activity that children can choose to engage in to varying degrees, it is likely that its development is dependent on motivation as well as cognitive skill.

The Cognitive Energetics Theory of motivated cognition (Kruglanski et al., 2010) pertains to all motivated cognitive activities that occur within a temporally bounded context. Therefore, this theory can be applied to the cognitive and motivational processes that drive children's reading development. It is proposed that the effort and energy that an individual invests in a task or objective is determined by two elements: their 'potential driving force' and their 'effective driving force'. The potential driving force refers to the maximum amount of energy that an individual is prepared to invest in a task or goal, and is determined by the individual's goal importance and resource availability (i.e., the mental resources available to invest). This force can be influenced by restraining elements such as task demands and the pull of competing goals. For example, with regards to reading, a child may be less motivated to engage in a reading activity if they perceive the task to be of a high difficulty level. They may also be less motivated to engage in reading if they have competing goals to engage in, for example, more preferable classroom activities or leisure activities. The effective driving force is the actual amount of energy that an individual invests in a task or goal. To achieve the optimum driving force and optimum motivation, any increase in restraining elements must be offset by an equivalent increase in the individual's goal importance or resource availability.

According to Cognitive Energetics Theory, when an individual's potential driving force is low, they are more likely to select lower-demand means to their cognitive or achievement goals. For example, if a child does not value the goal of becoming a proficient reader, they are more likely to choose to engage in a reading activity that they

perceive to be of an easier level, even if they do not think that this will be most beneficial for their reading development. Alternatively, if an individual has a high potential driving force, they are more likely to select highly effective means to achieve their goal, even if the task is perceived as demanding. Therefore, a child who values the goal of becoming a proficient reader would be more likely to select a difficult text to read if they believe that it will help them to develop their reading skills.

However, Cognitive Energetics Theory recognises that motivation alone is not sufficient for an individual to attain their achievement goals. Whilst having the required energy or effort is necessary to attain a goal, it is also necessary for the individual to possess sufficient skill or aptitude in a domain. For example, no matter how motivated a child is to become a proficient reader, they will not become one without appropriate instruction in reading and the required cognitive skills. Similarly, no matter how advanced a child's cognitive and reading-related skills are, the likelihood of them reaching their full reading potential is small if they have little motivation to read. However, it is assumed that an individual with high cognitive ability will require less effort or motivation to attain a goal than an individual with lower cognitive skill. Due the importance of both cognitive skills and motivation for children's reading skill, it is essential that researchers and educators consider both factors when assessing influences on children's reading development.

Theories of reading motivation

Theories of motivated cognition (e.g. Kruglanski et al., 2010) provide a strong theoretical background for the importance of motivation for cognitive tasks such as reading. However, a number of motivational theories have been developed specifically

in relation to children's academic achievement or reading skill. Motivation is a very complex concept that is thought to consist of a number of different constructs. With regards to reading motivation, a variety of different theories have been posited in order to explain children's motivation to read. It is commonly accepted within reading research that children's motivation to read is multi-faceted and comprised of a number of different elements (e.g. Eccles & Wigfield, 2002; Murphy & Alexander, 2000; Wigfield & Guthrie, 1997). Due to the complex nature of reading motivation, and because motivation is often not directly observable, it is typically difficult to measure. However, most reading research studies use self-report measures to assess children's level of reading motivation. The current section will describe some of the key themes in achievement motivation theory and reading motivation research, and some of the assessments that have been developed in order to assess children's motivation in the context of reading.

Achievement goal theory proposes that student's achievement goals are the driving force behind individual differences in motivational patterns (e.g. Ames, 1992; Covington, 2000). It is posited that all actions that an individual engages in have a specific purpose that is determined by the goals that the individual is seeking to achieve (Covington, 2000). An achievement goal therefore represents the purposes of a student's achievement behaviour, and comprises belief patterns, attributions, and affective components relating to the behaviour (Ames, 1992). These goals are thought to influence the effort that an individual puts toward using high quality and appropriate cognitive strategies for a task, which in turn influences academic achievement. As such, in the domain of reading, a child's achievement goals may determine how motivated they are to engage in and succeed in reading tasks.

Two main achievement goals are thought to influence a student's educational performance: mastery goals and performance goals (e.g. Ames, 1992). A child with a mastery goal is motivated to develop new skills, to understand their work, and to improve their level of competence in a domain. Therefore, a child with a mastery goal in the area of reading will seek to develop their reading skills and develop a sense of mastery in reading. Conversely, a child with a performance goal is motivated to achieve in order to improve their sense of self-worth in comparison to others, rather than to become competent in a domain for mastery purposes. Therefore, a child with a performance goal in the domain of reading will be motivated to achieve higher reading grades than other children in their class, and to boost their self-worth by being observed to achieve reading success with little effort. It is thought that mastery goals are more beneficial than performance goals for children's motivation and learning. Whilst mastery goals are likely to encourage deep-level processing of information, performance goals are more likely to encourage superficial, rote-level processing (Covington, 2000). In addition, a child with a performance goal in reading may avoid reading tasks that they perceive to be challenging in order to avoid failure and therefore to preserve their perceived sense of competency.

In addition to mastery and performance goals, other goals that are less directly associated with academic achievement are also related to children's reading skill. For example, Wentzel (1989; 1991) found that a child's social goals also have an effect on their reading progress. Indeed, a child that seeks to adhere to social responsibility goals, for example, by being cooperative and compliant, is also likely to work harder at school and therefore to achieve higher reading grades. As a result, Wentzel posits that a child's reading performance reflects the pursuit of multiple goals, including both academic achievement goals and social goals.

Other reading researchers have focused more on the motivational consequences of children's reading attitudes (e.g. McKenna & Kear, 1990; McKenna, Kear, & Ellsworth, 1995). Reading attitudes are conceptualised as the affective component of reading motivation and refer to an individual's feelings toward reading (McKenna et al., 1995). McKenna et al. (1995) propose that a child's reading attitudes are related to three concepts: the child's beliefs about reading, the child's behavioural intentions concerning reading, and the feelings that the child experiences because of reading. Furthermore, McKenna et al. (1995) propose that a child's attitudes toward reading develop as a result of three factors: normative beliefs about reading, beliefs about the outcomes of reading, and reading experiences. A child's attitudes towards reading are thought to determine whether they choose to approach or avoid reading situations. The more positive attitudes a child has about reading, the more motivated they will be to engage in reading tasks. Due to the importance of reading attitudes for reading performance, McKenna and Kear (1990) developed the Elementary Reading Attitude Survey, which can be used to attain an indication of a child's reading attitudes.

Children's beliefs about their academic abilities are considered to be another component of their motivation in school (e.g. Bandura, 1997; Chapman & Tunmer, 1995). Bandura (1997) developed a social-cognitive model of motivation, which focuses on the role of an individual's self-efficacy beliefs. Self-efficacy beliefs refer to an individual's beliefs about their competency in a domain, their confidence to achieve in a task, and their expectancies for success. If an individual believes that they are unlikely to succeed in a task, they will have little incentive to engage in and put effort into a task or to persevere when faced with difficulties (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001). Therefore, a child's beliefs about their reading ability are likely to play a substantial role in determining their level of reading motivation. For example, if a child believes that

they are likely to experience failure in a reading task, they are likely to put little effort into the task, or to avoid the task completely.

Similar to self-efficacy theory, children's reading self-concept has also been linked to their reading skill (e.g. Chapman & Tunmer, 1995). Reading self-concept refers to children's self-perceived reading ability and reading attitudes, and is thought to consist of three subcomponents: self- perceptions of competency in reading, self-perceptions of difficulty with reading, and attitudes towards reading (Chapman & Tunmer, 1995). These three factors are proposed to influence a child's reading progress and development. If a child has a positive reading self-concept they are likely to put more effort into learning to read, whereas if a child has a negative reading self-concept, they are more likely to avoid reading situations. A reading self-concept scale was therefore developed in order to assess the three sub-components (Chapman & Tunmer, 1995), and can be used to assess the influence of self-concept on children's reading skill.

The expectancy-value theory of motivation also considers an individual's self-perceived competency beliefs to play a key role in determining levels of motivation (e.g. Wigfield & Eccles, 2000). It is proposed that an individual's level of motivation is a product of two main factors: their expectancies for success, and the extent to which they value the activity. These factors are influenced by an individual's ability beliefs, their perceived task difficulty, and their achievement goals, and are thought to directly influence an individual's effort and persistence at a task. The extent to which an individual values a task may be determined by their achievement values (i.e. the extent to which they value attainment), utility values and costs (i.e. how useful they think the task is), and intrinsic values (i.e. how enjoyable they perceive the task to be). Within the domain of reading, some researchers consider expectancy-value theory to be the main underpinning of

children's motivation to read. For example, based on expectancy-value theory, Gambrell, Palmer, Codling, and Mazzoni (1996) developed a measure of children's reading motivation that focuses solely on children's self-concept as a reader and value of reading.

Other motivational theorists focus on the distinction between intrinsic and extrinsic dimensions of motivation, and their differing associations with academic performance and reading skill (Deci, Vallerand, Pelletier, & Ryan, 1991; Ryan & Deci, 2000; Wang & Guthrie, 2004; Wigfield & Guthrie, 1997). Deci et al. (1991) and Ryan and Deci (2000) propose a self-determination theory of motivation, in which there are contrasting types of motivation that can be differentiated based on the reasons as to why an individual carries out a behaviour. It is posited that behaviours vary in the extent to which they are self-determined (i.e. in the extent to which they are engaged in by the individual's own volition and endorsed by the individual), or controlled (i.e. the extent to which they are engaged in due to an external force, e.g. for interpersonal reasons). Therefore, whereas both types of behaviours are motivated and intentional, the motivational processes behind them are very different. It is proposed that it is more beneficial in regards to achievement for behaviour to be self-determined rather than controlled, as it will encourage a deeper level of learning.

Self-determination theory also distinguishes between intrinsically and extrinsically motivated behaviours. An individual is intrinsically motivated to engage in a behaviour when they find it to be inherently enjoyable, and extrinsically motivated when they engage in a behaviour because of a separable outcome, such as receiving a reward or punishment. In the context of reading, for example, a child may be intrinsically motivated to read if they find the topic of a text to be inherently interesting, or

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extrinsically motivated to read if they are reading a text in order to achieve good grades. Intrinsically motivated behaviours are considered to be more self-determined and autonomous than extrinsically motivated behaviours, and are therefore more beneficial for achievement. However, it is proposed that some types of extrinsically motivated behaviours are more self-determined than others. For example, a child may engage in an academic activity for extrinsic reasons with resentment and disinterest, or alternatively, with some willingness and acceptance of the value or utility of the task. In the context of reading, a child who is engaging in a reading task because they believe that it is beneficial for them to achieve good grades is demonstrating a higher level of self-determined behaviour than a child who is engaging in reading purely to receive a separable reward or to avoid a punishment. Therefore, some types of extrinsically motivated behaviours may be more beneficial for achievement than others, depending on the degree of self-determination.

The theory of reading motivation focusing on intrinsic and extrinsic dimensions is the most commonly used in reading motivation research (e.g. Baker & Wigfield, 1999; Guthrie, Wigfield, Metsala, & Cox, 1999; Wang & Guthrie, 2004; Wigfield & Guthrie, 1997), and will therefore be used to study reading motivation in the current thesis. Wigfield and Guthrie (1997), and Baker and Wigfield (1999) conducted a review of all motivational constructs that may pertain to children's reading development, including intrinsic-extrinsic dimensions, efficacy and competency beliefs, and the purposes or goals of reading. This information was then used to create a self-report scale to assess children's motivation to read, the Motivation for Reading Questionnaire (MRQ). Questionnaire data provided support for the presence of 11 dimensions of children's reading motivation: self-efficacy (e.g. reading competency beliefs), challenge (e.g. the desire to work with complex materials), work avoidance (e.g. avoiding reading

activities), curiosity (e.g. being curious about a text), involvement (e.g. becoming involved in a story), importance of reading (e.g. valuing reading), recognition (e.g. reading in order to receive praise), grades (e.g. reading in order to achieve good grades), competition (e.g. reading for competitive reasons), social reasons (e.g. reading in order to interact with others), and compliance (e.g. reading in order to be compliant). As the MRQ assesses a wider variety of possible dimensions of reading motivation than other measures (e.g. Chapman and Tunmer,1995; Gambrell et al., 1996), it is considered to be a more comprehensive assessment than other measures of motivational factors for reading (Baker & Wigfield, 1999).

Regarding intrinsic and extrinsic dimensions of reading motivation, Baker and Wigfield (1999) found that the questionnaire data fitted best with an intrinsic composite containing three sub-components: curiosity, involvement, and importance of reading, and an extrinsic composite containing three sub-components: recognition, grades, and competition. However, further work by Wang and Guthrie (2004) found that questionnaire data fitted best with alternative composites, resulting in a revised version of the MRQ. Intrinsic motivation was comprised of curiosity, involvement, and challenge, and extrinsic motivation was comprised of recognition, grades, social, competition, and compliance.

In order to assess children's levels of intrinsic and extrinsic reading motivation in this thesis, the MRQ-revised version was used (Wang & Guthrie, 2004). In addition, due to the importance of children's competency beliefs in most motivational theories (e.g. self-efficacy theory, expectancy-value theory, self-concept theory), the current research also examined the influence of competency beliefs on children's reading skill and motivation. In order to do so, the reading self-concept scale from Gambrell et al.'s

(1996) reading motivation questionnaire was administered, as it provides a more comprehensive assessment of reading competency beliefs than Baker and Wigfield's (1999) self-efficacy sub-scale.

The relationship between reading skill and motivation to read

In the reading research literature, many studies have investigated the association between children's reading motivation and reading attainment and have consistently found that these are significantly associated (Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004). Regarding intrinsic-extrinsic dimensions of reading motivation, Wang and Guthrie (2004) found that whilst children's intrinsic reading motivation was positively correlated with their reading skill, their extrinsic reading motivation was negatively correlated with their reading ability. It was suggested that extrinsically motivated readers, who may be reading with disinterest or through coercion, use more surface level reading strategies for reading comprehension, such as guessing or memorisation of the text, rather than more deeper level strategies that result in better understanding of the text. Other studies have also highlighted the positive relationship between intrinsic reading motivation and reading attainment and the negative relationship between extrinsic reading motivation and reading attainment (Becker, McElvany, & Kortenbruck, 2010; Mucherah & Yoder, 2008). However extrinsic motivation may not necessarily be detrimental to children's reading attainment. For example, Logan and Medford (2011) found no relationship between extrinsic reading motivation and reading skill. In addition, Park (2011) found that extrinsic reading motivation was only detrimental to reading attainment if the student had low levels of intrinsic motivation. Furthermore, a moderate level of extrinsic reading motivation was actually found to benefit reading skill if coupled with a

moderate level of intrinsic reading motivation. Nevertheless, the results of these studies clearly stress the importance of intrinsic reading motivation for children's reading success.

In addition to intrinsic-extrinsic dimensions of reading motivation, children's competency beliefs have also been found to be closely associated with their reading attainment (Aunola, Leskinen, Onatsu-Anilommi, & Nurmi, 2002; Chapman & Tunmer, 1995; 1997; Katzir, Lesaux, & Kim, 2009; Logan & Johnston, 2009; Logan & Medford, 2011). Furthermore, reading competency beliefs have been found to be associated with reading attainment even after controlling for other dimensions of intrinsic motivation (Bouffard, Marcoux, Vezeau, & Bordeleau, 2003), suggesting that competency beliefs make an independent contribution to children's reading skill.

The direction of the relationship between reading motivation and reading attainment is yet to be fully established, although research suggests that the relationship is bidirectional (Morgan & Fuchs, 2007). It is likely that children who are more intrinsically motivated to read spend more time reading and put more effort into learning to read, and thus become better readers. Similarly, it is likely that children who are better readers are more intrinsically motivated to read because they find reading to be easier and are thus more likely to enjoy reading. Some studies indicate that the link between reading motivation and reading attainment may be mediated by children's reading frequency and amount of reading. Reading motivation has been found to predict the amount of reading that children engage in (Guthrie et al., 1999; Wigfield & Guthrie, 1997), which in turn has been found to predict reading comprehension (Guthrie et al., 1999). It may be that children who are more motivated to read engage in reading activities more, which thereby facilitates the development of their reading

comprehension skills. Indeed, research has shown that children and adolescents who engage more often in reading activities have better literacy skills (Anderson, Wilson, & Fielding, 1988; Cunningham & Stanovich, 1997; Guthrie et al., 1999).

The relationship between reading skill and classroom behaviour

As discussed, if a child is motivated to learn to read and possesses the necessary cognitive abilities, they are likely to develop their reading skills more quickly than a child who is unmotivated to read or who does not possess the necessary cognitive skills. However, these factors alone may not be sufficient for a child to become a proficient reader. In addition to possessing sufficient cognitive skills and reading motivation, a child also needs to demonstrate the behavioural skills that are conducive to learning to read. For example, as reading is a learnt skill, a child needs to allocate sufficient amounts of attention to classroom reading instruction and activities in order to benefit. If a child demonstrates negative classroom behaviours during reading instruction or activities, they will consequentially spend less time being actively engaged in learning to read, and will therefore likely progress more slowly in reading, regardless of their cognitive ability. Alternatively, positive classroom behaviours, such as being attentive and compliant, are necessary in order for a child to engage in high quality and appropriate cognitive processes and strategies when learning to read.

Indeed, research suggests that there is a close relationship between behavioural problems and literacy difficulties in childhood (Adams, Snowling, Hennessy, & Kind, 1999; Carroll, Maughan, Goodman, & Meltzer, 2005; Dahle, Knivsberg, & Andreassen, 2011; Maughan & Carroll, 2006). For example, children with reading difficulties have been found to score more highly than controls on a range of behavioural/emotional

problems such as anxiety, somatic complaints, social problems, aggression and inattention (Dahle et al., 2011). In addition, behavioural problems have been found to explain significant variance in children's reading skill (Adams et al., 1999), suggesting that these factors may play a role in shaping children's reading progress in school.

In addition to influencing children's reading achievement, negative classroom behaviours are also likely to play a role in shaping the development of children's early reading-related skills, such as letter knowledge and phoneme awareness. For example, Giannopulu, Escolano, Cusin et al. (2008) found that for children aged 5 to 7 years, inattention was associated with lower scores on reading-related and cognitive tasks such as phonological awareness, vocabulary, letter recognition, and verbal short term memory. Similarly, a study by Dally (2006) found that inattentive behaviour in kindergarten disrupted the acquisition of phonological analysis abilities.

Unlike achievement motivation, children's behavioural problems are typically easier to measure, and are often assessed using informant-based rating scales. There are many classroom behaviours, both negative and positive, that may have an influence on children's reading acquisition and development. The current research focused on the influence of five main categories of behaviour for children's early reading skill: inattention/hyperactivity, conduct problems, emotional problems, peer relationship problems, and pro-social behaviour, and on the influence of three main categories of behaviour for children's later reading attainment: ADHD (Attention Deficit Hyperactivity Disorder)-type behaviours, hyperactivity, and oppositional behaviour.

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CHAPTER 3: THESIS OVERVIEW
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The previous two chapters were intended to provide an introduction to the thesis, by outlining models of reading development, briefly reviewing past literature on reading research, and introducing the cognitive and non-cognitive factors that may influence children's reading skill.

Thesis Aims and Objectives

The aims of this research are to develop a better understanding of the cognitive and non-cognitive factors which influence children's reading acquisition and development, to understand how method of reading instruction may influence these factors and to better understand the factors that predict children's motivation to read. The studies within this thesis were developed with these aims in mind and further details are provided below. Specific hypotheses based on existing literature are provided in each experimental chapter.

Outline of the Experimental Chapters

Chapter 4 presents results from a longitudinal study examining the effect of reading instruction on the cognitive and reading-related skills predicting early reading success (initial n = 88, initial average age = 4 years, 7 months (0.27 S. D.)).

Chapter 5 presents results from the same longitudinal study but examines the effect of negative and positive classroom behaviours on the development of children's early

reading and reading-related skills (initial n = 88, initial average age = 4 years, 7 months (0.27 S. D.)). More specifically, the influence of behaviour on children's early reading skills is examined, after accounting for cognitive and reading-related abilities.

Chapter 6 examines the extent to which children's reading and school motivation predicts reading attainment after taking into account the cognitive skills commonly associated with reading (n = 105, average age = 8 years, 8 months (0.28 S.D.)). The relative importance of these motivational factors for children's reading development is discussed, as is domain specificity when examining motivation.

Chapter 7 examines the relationships between reading skills, reading motivation and negative classroom behaviours (n = 133, average age = 10 years, 10 months (0.61 S. D.)). The influence of behaviour and motivation on children's reading comprehension skill after accounting for cognitive and reading-related abilities is examined.

Chapter 8 examines the influence of children's reading attainment, reading self-concept and personality characteristics on motivation to read (n = 295, 10 years, 7 months (0.58 S. D.)). The relative importance of these characteristics for intrinsic and extrinsic dimensions of reading motivation is discussed, as are the implications for enhancing motivation to read in the classroom.

General discussion and conclusions

Chapter 9 provides a summary of the results from all experimental chapters and combines the results with existing literature, integrating it into a discussion regarding

the influences and factors involved in reading acquisition and development. In addition,

suggestions for future research directions are suggested and discussed.

CHAPTER 4: EXAMINING THE COGNITIVE SKILLS SUPPORTING EARLY READING DEVELOPMENT WITH SYNTHETIC PHONICS INSTRUCTION

Abstract

Research indicates that a number of cognitive and reading-related skills, such as phonological awareness and letter knowledge, are important for children's reading acquisition. However, the majority of research has not taken into account the influence of reading instruction in shaping the skills that underpin early word reading. The current study assessed the cognitive and reading-related skills that support early reading ability when children are taught to read with synthetic phonics. New school entrants were assessed on a range of reading-related and cognitive assessments at three time points: school entry (T1), after 18 weeks of reading instruction (T2), and one year later (T3). It was found that letter sound knowledge, phoneme awareness (particularly phoneme synthesis), and verbal short term memory span underpinned children's early word reading skill. These results differ somewhat to previous findings when children were taught to read with other approaches. It is suggested that method of reading instruction should be taken into account to better understand the skills that support early word reading. Furthermore, it is suggested that by carrying out a cognitive analysis of method of reading instruction, it is possible to make more theoretically driven hypotheses about the skills supporting early reading success.

Introduction

A significant body of research has demonstrated the importance of a number of cognitive and reading-related skills, such as phonological awareness and letter knowledge, for early word reading (e.g. Lonigan et al., 2009; Lonigan, Burgess, & Anthony, 2000; Muter et al., 1998). However, the majority of studies examining the predictors of children's word reading development have not taken into account the potential role of reading instruction in shaping the cognitive abilities that support this learnt skill. It is possible that the cognitive skills underpinning early word reading are influenced by the strategies in which children are taught to read words during early instruction. The current study examined the cognitive and reading-related skills that support early word reading when children are taught to read with synthetic phonics. It was expected that the skills underpinning early word reading would differ when children were taught by this approach compared to previous results where children have been taught by other methods.

The skills related to early word reading development:

Letter knowledge and phonological awareness

As outlined in Chapter 1, letter knowledge and phonological awareness (the ability to perceive and manipulate the sound segments in speech) are considered to be the main skills that underpin children's early reading acquisition (e.g. Anthony et al., 2007; Bryant et al., 1990; de Jong & van de Leij, 1999; Lonigan et al., 2009; McGeown, Johnston, & Medford, 2012; Muter et al., 1998; Scanlon & Vellutino, 1996; Schatschneider et al., 2004; Wagner & Torgeson, 1987; see Chapter 1 for a more in-

depth review). These two skills are thought to be necessary for children to make use of the alphabetic principle, in which letter-sound correspondences are used to aid word reading (e.g. Ehri, 2005). Indeed, a combination of phonological awareness and letter sound knowledge has been found to account for 54% of the variance in kindergarten and 1st grade word decoding skills (Lonigan et al., 2000).

Regarding phonological awareness, as outlined in Chapter 1, research suggests that phoneme awareness is more important than rhyme awareness for children's early reading skills (e.g. Blaiklock, 2004; Castles & Colheart, 2004; Foy & Mann, 2006; Hulme et al., 2002; Muter et al., 1998; Muter et al., 2004; Muter & Snowling, 1998; Savage & Carless, 2005; although see Bryant et al., 1990, for contrasting findings). However, it is possible that some components of phoneme awareness are more important than others for early word reading. Phoneme awareness can be separated into two main elements: phoneme analysis (the ability to segment and delete phonemes), and phoneme synthesis (the ability to blend phonemes together). Wagner, Torgeson, and Rashotte (1994) found that only phonological analysis abilities had a unique influence on children's first grade reading skill, but only phonological synthesis abilities had a unique influence on second grade reading skill. This suggests that the ability to blend phonemes may become more important later on in a child's reading development. However, in this study, analysis and synthesis abilities were highly correlated; therefore, as the authors note, in the structural equation modelling method used, the variable with just slightly more predictive power may have received a substantial boost in the model. Therefore, these results need to be interpreted with caution. In addition, Castles and Coltheart (2004), in a review of the importance of analysis and synthesis abilities, conclude that evidence supports the importance of both phonological analysis

and synthesis for reading acquisition, with no strong case for the greater importance of one over the other.

Although the relationship between phonological awareness and early word reading is well established, it is possible that phoneme awareness holds stronger relationships with some types of word reading than with others. The English spelling system has an opaque orthography, as although it is an alphabetic system, some word spellings have inconsistent grapheme-phoneme connections (e.g., yacht). Words that do not follow typical spelling-sound mappings are considered to be irregular, whilst words possessing a letter sequence following a typical spelling-sound mapping are considered to be regular. It might be expected that phonological awareness would be a stronger predictor of variations in regular word reading than irregular word reading due to the more consistent spelling-sound correspondences in regular words. Indeed, Nilsen and Bourassa (2008) found that phonological awareness only accounted for unique variance in the acquisition of regular words. This is consistent with the dual route model of adult reading (Coltheart, Rastle, Perry et al., 2001), in which the pathways for the reading of irregular and regular words are considered to be largely independent. In this model, regular words are thought to be read largely using a grapheme to phoneme conversion pathway, whereas irregular words are thought to be read largely through a lexical-semantic pathway, which operates without letter-sound conversion processes. Conversely, other research findings suggest that phoneme awareness may also be important for the reading of some irregular words (Hulme, Goetz, Gooch et al., 2007), suggesting that some children may utilise the parts of irregular words that do follow letter-sound correspondence rules. This is in more in accordance with connectionist theories of word reading (e.g. Seidenberg, 2005), in which spelling-sound

correspondences are also thought to bear some contribution to the reading of irregular words.

Vocabulary knowledge

In addition to letter knowledge and phonological awareness, children's vocabulary knowledge has also been found to be related to their word reading skill (Kirby, Desrochers, Roth, & Lai, 2008; Nation & Snowling, 2004; Wagner et al., 1997). Wagner et al. (1997) found that individual differences in children's vocabulary knowledge influenced the subsequent development of individual differences in word level reading. Similarly, Nation and Snowling (2004) found that oral language skills contributed to children's word recognition ability both concurrently and longitudinally, even when the effects of decoding skill and phonological ability were controlled. It is likely that vocabulary knowledge aids word reading in a direct way by facilitating word identification skills (Kirby et al., 2008). When a child attempts to decode a word, the process of decoding may sometimes result in an inaccurate pronunciation. Therefore, vocabulary knowledge may be utilised in order to recognise the correct pronunciation of a known word from a number of alternatives.

However, evidence concerning the importance of vocabulary knowledge for early word reading is mixed, with some studies showing contrasting results. For example, Lonigan, et al. (2009) found that oral language skills did not contribute unique variance to the prediction of early reading skills after accounting for phonological processing abilities. Similarly, Muter et al. (2004) found that vocabulary knowledge was relatively unimportant for children's early word reading skill when compared to phoneme awareness. In addition, other findings suggest that the relationship between oral ability

and word reading may be restricted to phonological rather than semantic knowledge of words. Nation and Cocksey (2009) found that although there was an item level relationship between knowing a word in the phonological domain and being able to read that word aloud, there was no close relationship between the semantic knowledge of words and word reading skill.

As outlined in Chapter 1, it may be that vocabulary knowledge is more important for the reading of irregular words than regular words. As the spelling sequences of regular words follow normal letter-sound correspondence rules, the process of decoding will usually produce a correct pronunciation. Conversely, the process of decoding an irregular word is more likely to produce an incorrect pronunciation; therefore, vocabulary knowledge may be relied upon to select the correct pronunciation of a known word. Indeed, Ricketts et al. (2007) found that whilst oral vocabulary skills predicted children's irregular exception word reading, they did not predict children's regular word reading skill.

Verbal Short Term Memory

Verbal short term memory, the temporary storage of sound-based information, is another factor associated with children's reading skill (Alloway, Gathercole, Adams et al., 2005; Ellis & Large, 1987; Lonigan et al., 2009, Parilla, Kirby, & McQuarrie, 2004; Rapala & Brady, 1990). For example, Johnston, Rugg, and Scott (1987) found that children's memory span and reading age co-varied to a considerable extent and that poor readers had memory spans indistinguishable from their reading age controls. In addition, Brunswick, Martin, and Rippon (2012) found that verbal short term memory explained variance in children's subsequent reading skill even after controlling for

previous reading ability. Verbal short term memory is likely to be important for early word reading because the retention of information about words, such as the sequence of letters and their corresponding sounds, is necessary in order to form pronunciations.

However, verbal short term memory span has been found to be relatively unimportant for early word reading when compared to other reading-related skills. Parilla et al. (2004) found that short term memory did not account for significant variance in children's reading ability when the effects of other phonological processing skills were controlled. In addition, Rohl and Pratt (1995), and de Jong and van der Leij (1999) found similar results, with findings indicating that verbal memory span was not a good or consistent predictor of reading ability after accounting for phonological awareness. Similarly, Shapiro, Hurry, Masterson et al. (2009) found that whilst children's reading and phoneme skills (letter knowledge, sight word reading, digit naming, phoneme isolation) and initial speech and auditory skills (phoneme discrimination, speech rate, nonword repetition, rapid naming, sound order, auditory temporal processing) at the start of the reception year predicted their reading skills at the end of the year, their memory span did not directly influence literacy development at this stage. Such findings suggest that children's verbal short term memory may only play a minor role in explaining children's early word reading skill.

Some researchers consider verbal short term memory to be part of a more general phonological processing factor that is involved in literacy acquisition (Ramus, Rosen, Dakin et al., 2003), rather than an independent predictor. However, Martinez Perez, Majerus, and Poncelet (2012) make a distinction between the importance of item short term memory (remembering the items) and order short term memory (remembering the order of the items) for word reading. They found that whilst both item short term

memory and order short term memory capacities at kindergarten predicted reading abilities one year later, only order short term memory span remained an independent predictor of reading skills when controlling for phonological abilities. It was suggested that whereas item short term memory abilities are strongly dependent on the child's level of phonological development, order short term memory abilities are independent from phonological skill. Furthermore, it was suggested that order short term memory span may be particularly involved in early reading decoding processes that require the temporary storage of letter to sound conversions in an ordered succession before blending.

Visual Discrimination

Although given less attention in the literature, children's visual discrimination abilities have also been found to be associated with their early word reading. For example, Feagans and Merriwether (1990) found that children with visual discrimination deficiencies in the early years performed more poorly on measures of reading ability up to the age of 12 years. It is likely that visual discrimination skill contributes to word reading ability by facilitating the acquisition of letter knowledge. Indeed, Woodrome and Johnson (2009) found that children's early visual discrimination skills significantly correlated with their letter identification abilities. Furthermore, Brunswick et al. (2012) found that children's early ability to distinguish between letter-like forms correlated with their subsequent reading skill, suggesting that the visual discrimination processes needed to distinguish between letter shapes may be important for early reading development. However, analysis of the importance of visual discrimination abilities for early word reading has been supplanted in the literature by the analysis of other reading-related skills such as phonological awareness. This is perhaps unsurprising, as visual

discrimination skills have been found to play only a modest role in children's reading ability (Kavale & Forness, 2000). Furthermore, visual discrimination skills have been found to be only weakly related to measures of word recognition after accounting for phonological awareness (Schatschneider et al., 2004).

The influence of reading instruction

In summary of the literature, letter sound knowledge and phoneme awareness are generally considered to be the most important skills underpinning children's early word reading development. In comparison, vocabulary knowledge, verbal short term memory span, and visual discrimination are considered to exert relatively smaller influences on children's word reading skill. However, although there has been substantial research examining the skills supporting early reading development, little research has examined the potential influence of reading instruction on the cognitive and reading-related skills that support early word reading.

As outlined in Chapter 1, research indicates that the method of reading instruction received by children has a significant influence on the way in which they process print (Connelly, Thompson, Fletcher-Flinn, & McKay, 2009; Johnston & Thompson, 1989) and on the strategies that they use to read words (Deavers et al., 2000; Sowden & Stevenson, 1994; Walton & Walton, 2002). For example, Deavers et al. (2000) found that teaching children with a small units (i.e. phoneme level) instructional approach encouraged the use of a small units strategy for reading unfamiliar words, whereas teaching children with a larger unit approach (i.e. rhyme level) encouraged the use of a rime-based analogy strategy. Similarly, Sowden and Stevenson (1994) found that children taught to read with a whole word (visual) teaching approach relied exclusively

on whole word reading strategies, whereas those taught with a mixed methods approach (with some phonics instruction) also relied on phonological recoding strategies. Therefore, as instructional approach appears to influence the strategies that children use to read unfamiliar words, it is likely that method of reading instruction also influences the skills that children draw upon when learning to read.

Previous studies examining the skills supporting early word reading have typically involved children taught to read with mixed, eclectic methods of reading instruction, (including analytic phonics, whole word teaching, and language-based approaches), or the type of reading instruction has not been described. Thus, any conclusions about the skills underpinning early word reading may be limited to reading when children are taught with these particular methods.

Since 2006, primary schools in England have been advised to teach children to read with synthetic phonics, a systematic approach which teaches children to read unfamiliar words by blending grapheme-phoneme correspondences. As synthetic phonics is a relatively new method of reading instruction in England, there has been very little research investigating the skills that underpin reading development when children are taught to read with this approach.

One of the only known studies to date that has examined the skills supporting synthetic phonics word reading was conducted by McGeown, Johnston, and Medford (2012). This study examined the skills supporting word reading when children were taught by one of two different methods: synthetic phonics, or an eclectic method of instruction that taught a variety of strategies for reading (including analytic phonics). Children were assessed on a range of cognitive and reading-related skills prior to reading instruction

and again on the same assessments after 18 weeks of instruction. Results showed that the skills supporting early word reading differed based on the type of reading instruction that the children had received. Whereas letter knowledge and rhyme awareness predicted word reading for the eclectic group, letter knowledge and phoneme awareness predicted word reading for the synthetic phonics group. In addition, whereas vocabulary knowledge predicted early reading success for the eclectic group, verbal short term memory predicted early reading success for those taught to read with synthetic phonics. However, visual discrimination ability did not explain significant variance in word reading for either group. It was suggested that phoneme awareness and verbal short term memory span may be particularly important when children are taught by a synthetic phonics approach because children are taught to sound and blend phonemes sequentially in order to read words. The demands on verbal short term memory are likely to be greater therefore as the sequence of letters and corresponding letter sounds need to be stored in short term memory before blending.

Aims and hypotheses

The current study was a partial replication of McGeown et al. (2012). However, as the eclectic method of reading instruction was no longer being taught in the U.K when this study was carried out, the current study focused only on the skills supporting early word reading when children were taught to read with synthetic phonics. In addition, the current study examined a larger sample of children, and assessed children's word reading progress over a longer period of time, beginning at the start of the reception year and continuing until halfway through the 1st year of primary school. Furthermore, the skills underpinning regular and irregular word reading were examined, and word length effects were also investigated.

Whilst the current study included the same variables as McGeown et al. (word reading, letter sound knowledge, phoneme analysis, rhyme awareness, vocabulary, verbal short term memory, visual discrimination), the additional measure of phoneme blending skill was also included. After carrying out a cognitive analysis of the synthetic phonics approach, it was thought that the blending component of phoneme awareness may be particularly important for synthetic phonics word reading as children are taught specifically to blend phonemes in order to read words.

Children were assessed at three time points. Initial assessment took place prior to formal reading instruction (T1) in order to account for any pre-existing reading-related skills. The children were then assessed again after 18 weeks of reading instruction (T2), and again one year later (T3). It was expected that the skills supporting early word reading when children were taught to read with synthetic phonics would differ from previous results reported in the literature when children were taught with other methods.

Firstly, it was expected that children's phoneme awareness skills would be important for their early word reading development. Although synthetic phonics instruction does not teach explicit phoneme awareness skills separately from, or in the absence of, text, it is likely that children develop phonological awareness abilities as a result of phonics instruction. Children may be able to apply these phonological skills to phonological awareness tasks in which there is an absence of print. It is likely that these phonological skills consequently allow more advanced progress in phonological decoding ability. As children are taught to sound and blend on the level of the phoneme, it was expected that children's phoneme awareness would be important for their early reading skill. However, phoneme synthesis (blending) was expected to be more important than phoneme analysis. As synthetic phonics teaches children to look for the parts of

irregular words that follow letter-sound correspondence rules, it was expected that phoneme awareness would be important for reading both regular and irregular words. In contrast, rhyme awareness was not expected to be important for early word reading as children were taught to read purely with a small units (i.e. phoneme level) approach.

As synthetic phonics teaches children to use letter-sound correspondences in order to read words, it was expected that letter sound knowledge would explain significant variance in children's reading skill. In addition, it was thought that children would rely on their verbal short term memory in order to retain the series of grapheme-phoneme correspondences before blending. It was therefore expected that verbal short term memory would explain significant variance in children's word reading skill after accounting for letter sound knowledge and phonological awareness. Furthermore, it was thought that verbal short term memory span may be particularly important for the decoding of longer length words.

Vocabulary knowledge was expected to be less important, as children were taught to read with a purely phonological approach that placed little emphasis on language skills. If vocabulary knowledge was found to influence word reading, it was thought that this influence would be specifically on the reading of irregular words. Finally, visual discrimination ability was expected to be relatively unimportant for word reading when compared to other cognitive and reading-related skills.

Method

Participants

Eighty eight new school entrants took part in this study (46 girls, 42 boys). The children were from two different intakes from the same school and were taught to read by the same teachers in the same classrooms, therefore the two intakes were grouped together for all analyses. Consent from the head teacher and class teachers were obtained prior to testing. The school was in an area of severe deprivation: 47.4% of children at the school were entitled to free school meals (national average is approximately 18%). Children were first tested during their second week of the reception year, prior to any reading instruction (T1; mean age 4 years, 7 months, 0.27 S.D.), on measures of reading related and cognitive skills (see materials). Children were then tested on the same assessments after 18 weeks of teaching (T2; mean age 5 years, 1 month, 0.27 S.D.). At this stage of testing, 3 children were absent from the original sample as they had left the school, resulting in a sample size of 85 (43 girls, 42 boys). Children were then tested one year later (T3; mean age 6 years, 1 month, 0.29 S.D.) on word reading abilities. At this stage of testing, an additional 12 children from the original sample were no longer pupils at the school, resulting in a sample size of 73 (36 girls, 37 boys).

Details of reading instruction

Children were taught to read on a whole class basis with a systematic synthetic phonics reading program named 'Fast Phonics First' (Watson & Johnston, 2007), by their class teacher. Fast Phonics First is an interactive computer program designed to teach children to read using sounding and blending techniques in the context of print.

Children receive no phonological awareness training, but may develop phonological awareness skills as a result of training in the context of printed words. Children were taught letter sounds rapidly, right from the beginning of instruction. Once three letter sounds had been learnt, children were taught to sound and blend the sequence of letter sound correspondences to read unfamiliar words consisting of consonants and simple vowels (e.g. c-a-t). Therefore, the technique of sounding and blending was taught very early on in instruction. Different combinations of learnt letters were used to form many different words, ensuring that the children learnt each letter sound in all positions of the word. Irregular words (e.g. pint), which cannot be taught through simple letter-sound correspondences, were taught separately, but not by sight; children were taught to look for parts of irregular words that do follow consistent letter-sound correspondence rules. Thus, children were taught to read all words with a phonological approach (i.e., blending of grapheme-phoneme correspondences). The teacher did not promote any other strategies for reading, such as guessing from pictures, using context cues, word length or initial letter cues to predict the word. In addition, children were not taught at all with a whole word 'flashcard' approach, which is typically used for early word reading instruction with more eclectic methods to teach high frequency words in particular.

Materials

T1 and T2

Children were tested on the following assessments at both T1 (prior to reading instruction) and T2 (after 18 weeks of instruction).

Letter sound knowledge

Children were presented with a card displaying all 26 lower-case letters in a random order. They were required to say the corresponding sound for each letter. If a child responded with the name of the letter, they were asked if they knew the letter's corresponding sound. One point was scored for each correct letter sound given. Raw scores out of 26 were used for the purposes of analysis.

Rhyme Awareness

Children's rhyme awareness was assessed using the Phonological Abilities Test (PAT) Rhyme Detection and Rhyme Production tasks (Muter, Hulme, & Snowling, 1997). For the Rhyme Detection task, children are required to indicate which of three words rhymes with or sounds like a stimulus word. The words are presented orally by the examiner and accompanied with corresponding pictures. This assessment consists of three practice/demonstration items and ten test items, providing a raw score out of 10. For the Rhyme Production task, children are required to supply orally as many words as possible in 30 seconds that rhyme with a stimulus word presented orally by the examiner. Both rhyming words and nonwords are accepted as being correct. Two stimulus words are used; 'day' and 'bell'. The numbers of correct responses for each stimulus word are summed to give a raw score for this assessment. For this study, the raw scores for the Rhyme Detection and Rhyme Production tasks were summed to give an indication of overall rhyme awareness.

Phoneme Awareness

Phoneme analysis

Children's phoneme analysis skill was assessed using the PAT Phoneme Deletion task (Muter et al., 1997). This assessment consists of two parts: deletion of beginning sounds

and deletion of end sounds. In the first part, children are required to remove (delete) the initial phoneme of a single syllable word to produce a new word. In the second part, children are required to delete the final phoneme of a single syllable word to produce a word or nonword. Stimulus words are presented orally by the examiner, with picture accompaniment, and the child is required to provide an answer orally. For each part, there are four practice/demonstration items followed by 8 test items. One point is scored for each correct response, and the scores for each part were summed to give a total raw score out of 16.

Phoneme Synthesis

This assessment was used to measure children's ability to blend and synthesise phonemes to produce words and nonwords consisting of consonants and simple vowels. Six real word stimuli were used: m-a-p, p-i-g, r-e-d, l-i-p, r-i-g, d-i-p, with three demonstration/practice items beforehand: l-i-ck, d-e-n, r-a-g. Following the real word stimuli, three nonword stimuli were used: s-e-p, d-a-g, m-i-t, with three demonstration/practice items beforehand: t-e-g, g-a-m, r-i-t. The individual phonemes for each word were presented orally in succession by the examiner and the child was required to blend the phonemes in order to produce the word or non-word orally. Small circles of card, placed a small distance apart from one another on a flat surface, were used as a visual aid in order to help children understand the task as no printed information (i.e., letters) was provided. The experimenter pointed to each circle one at a time whilst saying a letter sound/phoneme. The circles were then placed next to each other and the child was asked to say the word or nonword produced after blending the sound segments. One point was given for each correct response, providing a raw score out of 9.

Vocabulary

Children's vocabulary knowledge was assessed using the British Ability Scales II (BAS II) Naming Vocabulary test (Elliot, Smith, & McCulloch, 1996). For this assessment, children are required to name pictures presented visually to them. As the test progresses, an increasing breadth of vocabulary is needed to provide correct answers as the pictures become increasingly difficult to name. Standardised scores were used for the purposes of analysis.

Verbal Short Term Memory

Children's verbal short term memory was assessed using the BAS II: Recall of Digits Forward test (Elliot et al., 1996). This assessment requires children to repeat back orally presented sequences of digits. The length of the digit sequence increases across the assessment. Standardised scores were used for the purposes of analysis.

Visual Discrimination

Children's visual discrimination ability was assessed using the BAS II: Matching Letter-like Forms task (Elliot et al., 1996). This assessment requires children to select which letter-like abstract figure from a choice of six is identical to a stimulus letter-like abstract figure. The five distracter figures consist of rotations or reversals of the stimulus figure. Standardised scores were used for the purposes of analysis.

T3

Children were tested on the following assessments at T3 only (Year 1).

Regular/Irregular Word Reading

Children's ability to read regular and irregular words was assessed using a word regularity task. Ten regular and ten irregular printed words were presented to children on a card in a random order (the irregular words consisted of both exception and strange words). Children were required to read the words aloud to the examiner. All of the regular and irregular words consisted of three phonemes and the word lists were closely matched on average word length (number of letters). Using the Essex Children's Printed Word Database (Masterson, Stuart, Dixon, & Lovejoy, 2010), the word lists were also closely matched on the average frequency per million that the word is read by children aged 5-9 years (see appendix 1). All words were low frequency words in order to assess children's ability to read unfamiliar regular and irregular words. One point was given for each correct response, providing a raw score out of 10 for regular word reading and for irregular word reading.

Long Length Regular Word Reading.

Children's ability to read longer length regular words was also assessed. Ten regular printed words were presented on a card. Five of the words consisted of five phonemes, and five of the words consisted of six phonemes. Children were required to read the words aloud to the examiner. The words were all low frequency words and were closely matched to the regularity task words on average frequency per million (see appendix 2). One point was scored for each correct response and raw scores were used for the purpose of analysis.

T1, T2 and T3

Children were tested on the following assessment at all stages of the study (T1, T2 and T3).

Word Reading

Children's standardised word reading ability was assessed using the BAS II Word Reading Test (Elliot et al., 1996). This assessment consists of both regular and irregular printed words of increasing length and complexity. Children were presented with a card displaying the words and asked to read each word aloud to the examiner. Standardised scores were used for the purposes of analysis.

Procedure

All assessments were carried out individually and published assessments were carried out in accordance with manual guidelines. At T1 and T2, assessments were administered over two 15 minute testing sessions per child. Session 1 consisted of the following assessments in the following order: letter sound knowledge, standardised word reading, naming vocabulary, rhyme detection, and rhyme production. Session two consisted of the following assessments in the following order: visual discrimination, verbal short term memory, phoneme deletion (beginning and end sounds), and phoneme blending. At T3, testing took place over one 15 minute testing session per child in the following order: standardised word reading, regularity task, longer length regular word reading. Ethical approval was sought and granted from the Department of Psychology Ethics Committee at the University of Hull.

Results

The results are separated into three sections: 1) descriptive statistics and t-tests to examine changes in ability at different assessment stages, 2) correlations between cognitive/reading-related skills and word reading, 3) hierarchical regression analyses predicting word reading using cognitive and reading-related skills.

1) Descriptive statistics and T-tests

All children were non-readers prior to instruction (T1), and, on average, performed at floor on measures of phoneme analysis and phoneme synthesis (see Table 4.1). However, prior to instruction, children had some letter sound knowledge and rhyme awareness (although little), and had age appropriate short term memory capacity. At both T1 and T2 children's vocabulary knowledge, visual discrimination abilities, and word reading were, on average, slightly below age norms. However, at T3, children's word reading ability had reached age appropriate levels. All skewness and kurtosis values for the assessments are presented in Table 4.1.

Table 4.1. Descriptive statistics for the cognitive and reading-related assessments at each stage of testing

Assessment	Mean	S. D.	Skewness	Kurtosis
T1				
Letter Knowledge (raw)	3.24	5.57	2.06	3.54
Rhyme Awareness (raw)	3.83	2.64	.87	1.16
Phoneme Analysis (raw)	.57	1.62	3.27	10.22
Phoneme Synthesis (raw)	.16	.66	4.51	20.44
Vocabulary knowledge (SS)	92.41	13.68	-.25	1.16
Short term memory (SS)	101.97	13.23	.46	-.42
Visual discrimination (SS)	95.52	13.68	.44	.53
Word reading (SS)	83.00	.00	---	---
T2				
Letter Knowledge (raw)	18.81	7.32	-1.02	-.21
Rhyme Awareness (raw)	7.22	5.09	.93	.12
Phoneme Analysis (raw)	2.55	3.85	1.66	2.28
Phoneme Synthesis (raw)	4.64	3.77	-.13	-1.74
Vocabulary knowledge (SS)	92.66	12.47	-.34	.51
Short term memory (SS)	99.68	13.02	.40	-.45
Visual discrimination (SS)	98.92	14.73	.32	2.89
Word reading (SS)	89.36	9.37	1.28	1.71
T3				
Word reading (SS)	101.30	14.62	.36	.25
Irregular words (raw)	1.56	1.93	1.38	1.73
Regular short words (raw)	4.95	3.06	-.19	-1.17
Regular long words (raw)	2.42	2.97	.80	-.86

Paired sample t-tests were carried out to examine changes in cognitive and reading-related skills between T1 and T2. On average, children had significantly higher letter sound knowledge; $t(84) = -19.89$, $p < .001$, rhyme awareness; $t(84) = -6.96$, $p < .001$, phoneme analysis; $t(84) = -4.95$, $p < .001$, and phoneme synthesis; $t(84) = -11.02$, $p < .001$ at T2 compared to at T1. In addition, using raw scores, children had significantly better word reading; $t(84) = -5.99$, $p < .001$, vocabulary knowledge; $t(84) = -5.62$, $p < .001$, verbal short term memory; $t(84) = -3.00$, $p < .01$, and visual discrimination; $t(84) = -8.14$, $p < .001$ at T2. Finally, at T3, children's word reading ability was significantly better than at T2; $t(72) = -11.06$, $p < .001$.

2) Correlations

Correlations were carried out to determine the skills associated with children's standardised word reading, irregular word reading, and regular word reading (both short and long words) at T2 and T3 (see Table 4.2). Phoneme analysis and phoneme synthesis ability at T1 were not included in the analysis due to showing floor effects at this stage.

Table 4.2. Correlations between T1 and T2 skills and T2 and T3 word reading ability

	1	2	3	4	5	6	7
Correlations with T1 (prior to instruction) scores							
T2 word reading	.59**	.29**	---	---	.22*	.53**	.57**
T3 word reading	.39**	.19	---	---	.28*	.48**	.55**
T3 irregular words	.43**	.26*	---	---	.03	.34**	.39**
T3 regular short words	.36**	.35*	---	---	.30**	.43**	.45**
T3 regular long words	.29*	.26*	---	---	.11	.47**	.41**
Correlations with T2 (after 18 weeks of instruction) scores							
T2 word reading	.61**	.37**	.50**	.65**	.30**	.52**	.39**
T3 word reading	.66**	.32**	.51**	.66**	.34**	.54**	.40**
T3 irregular words	.45**	.07	.27*	.45**	.07	.31**	.13
T3 regular short words	.67**	.36**	.35**	.58**	.40**	.39**	.35**
T3 regular long words	.60**	.37**	.50**	.58**	.24*	.50**	.35**

Note: 1= letter sound knowledge, 2 = rhyme awareness, 3 = phoneme analysis, 4 = phoneme synthesis, 5 = vocabulary, 6 = verbal short term memory, 7 = visual discrimination; $*p < .05$, $**p < .01$

Children's letter sound knowledge, short term memory, and visual discrimination ability prior to instruction (T1) were significantly and most closely related with children's standardised word reading performance at both T2 and T3. Vocabulary knowledge at T1 was also related with word reading skill at T2 and T3, but showed only a weak association. In addition, whilst children's rhyme awareness at T1 was related with their word reading ability at T2, it was not associated with their word reading skill at T3. Regarding T2 abilities, all cognitive and reading-related skills showed significant associations with both concurrent and later (T3) standardised word reading. The T2

skills most closely associated with word reading at T2 and T3 were letter sound knowledge, phoneme analysis, phoneme synthesis, and verbal short term memory span.

Regarding word regularity effects, children's vocabulary knowledge prior to instruction (T1) was associated with regular word reading at T3, but not with irregular word reading. All other T1 skills were associated with both regular and irregular word reading. Regarding T2 skills, rhyme awareness, vocabulary knowledge, and visual discrimination were associated with regular but not irregular word reading. However, all other T2 skills were associated with the reading of both regular and irregular words.

Regarding word length effects, children's vocabulary knowledge prior to instruction (T1) was associated with the reading of short regular words at T3, but not with the reading of long regular words. All other T1 skills were associated with both long and short regular word reading. Regarding T2 skills, all skills were associated with the reading of both short and long regular words.

3) Regression analyses.

Due to the number of significant correlations found, the cognitive and reading-related skills were entered into a series of regression analyses to determine which skills were the best predictors of word reading. Separate regressions were conducted in order to predict standardised word reading, irregular word reading, regular short word reading, and regular long word reading. In addition, the variance explained by T1 and T2 skills was examined separately.

As letter sound knowledge is consistently found to be one of the most important underpinning factors of early word reading, this variable was entered into the regression analyses first. Following this, phonological awareness skills were entered into the second block. Finally, vocabulary knowledge, verbal short term memory, and visual discrimination were entered in the final block in order to examine whether these abilities could predict additional variance in word reading after accounting for letter knowledge and phonological awareness. As with the correlations, T1 phoneme analysis and phoneme synthesis were not entered into these analyses due to showing floor effects.

Table 4.3. Hierarchical regression analyses using T1 and T2 skills to predict T2 standardised word reading ability.

Criterion variable: T2 standardised word reading

Predictors: T1 skills

Enter	R^2	Finalβ	p
1. Letter knowledge	.34	.59	.00
2. Rhyme awareness		.13	.15
Phoneme analysis		---	---
Phoneme synthesis	.36	---	---
3. Vocabulary		.04	.61
Short term memory		.30	.00
Visual discrimination	.52	.26	.01

Predictors: T2 skills

Enter	R^2	Finalβ	p
1. Letter knowledge	.37	.61	.00
2. Rhyme awareness		.06	.44
Phoneme analysis		.26	.00
Phoneme synthesis	.57	.29	.01
3. Vocabulary		-.01	.91
Short term memory		.17	.07
Visual discrimination	.60	.09	.27

Children's letter sound knowledge prior to instruction (T1) explained significant variance in their standardised word reading ability 18 weeks later (T2), whereas their rhyme awareness did not. After accounting for letter knowledge and rhyme awareness,

children's verbal short term memory and visual discrimination predicted word reading at T2, whereas vocabulary knowledge did not.

Regarding T2 skills, children's letter sound knowledge, phoneme analysis, and phoneme synthesis all explained independent variance in their concurrent word reading ability, whereas rhyme awareness did not. Regarding phoneme awareness skills, phoneme synthesis explained more variance than phoneme analysis, although only slightly (Finalβs = .293; .255, respectively). After accounting for letter sound knowledge and phonological awareness, short term memory span, vocabulary knowledge, and visual discrimination did not explain significant additional variance in concurrent standardised word reading.

Table 4.4. Hierarchical regression analyses using T1 and T2 skills to predict T3 standardised word reading ability

Criterion variable: T3 standardised word reading

Predictors: T1 skills

Enter	R^2	Finalβ	p
1. Letter knowledge	.15	.39	.00
2. Rhyme awareness		.09	.42
Phoneme analysis		---	---
Phoneme synthesis	.16	---	---
3. Vocabulary		.19	.07
Short term memory		.30	.01
Visual discrimination	.41	.35	.01

Predictors: T2 skills

Enter	R^2	Finalβ	p
1. Letter knowledge	.43	.66	.00
2. Rhyme awareness		-.02	.82
Phoneme analysis		.22	.02
Phoneme synthesis	.59	.31	.01
3. Vocabulary		.05	.59
Short term memory		.23	.02
Visual discrimination	.63	.06	.50

Children's letter sound knowledge prior to instruction (T1) explained significant variance in their word reading ability at T3, whereas their rhyme awareness did not.

After accounting for letter knowledge and rhyme awareness, short term memory and visual discrimination prior to instruction predicted T3 word reading, whereas vocabulary knowledge did not.

Regarding T2 skills, children's letter sound knowledge, phoneme analysis, and phoneme synthesis all explained independent variance in their word reading ability one year later (T3), whereas their rhyme awareness did not. Regarding phoneme awareness, phoneme synthesis explained more variance in word reading than phoneme analysis (Finalβs = .314; .219, respectively). Finally, whilst short term memory at T2 explained significant additional variance in T3 word reading after accounting for letter knowledge and phonological awareness skills, vocabulary knowledge and visual discrimination did not.

A further regression analysis examined whether children's skills at T2 could explain significant variance in their standardised word reading ability one year later (T3) after accounting for previous word reading ability (Table 4.5). Due to the restricted sample size, only the variables that explained significant variance in the previous regression analysis (Table 4.4) were included in order to maintain statistical power.

Table 4.5. Hierarchical regression analyses using T2 standardised word reading and T2 skills to predict T3 standardised word reading

Criterion variable: T3 standardised word reading

Predictors: T2 skills

Enter	R^2	Finalβ	p
1. Standardised word reading	.48	.69	.00
2. Letter knowledge	.57	.39	.00
3. Phoneme analysis		.14	.14
Phoneme synthesis	.62	.22	.05
4. Short term memory	.64	.17	.06

After accounting for T2 word reading skill, letter sound knowledge and phoneme synthesis explained significant variance in the development of children's reading skills (i.e., T3 word reading), whereas phoneme analysis did not. After accounting for these skills, verbal short term memory did not explain additional significant variance in word reading ability.

The following regression analyses examined the skills supporting irregular word reading (Table 4.6), regular short word reading (Table 4.7), and regular long word reading (Table 4.8).

Table 4.6. Hierarchical regression analyses using T1 and T2 skills to predict T3 irregular word reading

Criterion variable: T3 irregular word reading			
Predictors: T1 skills			
Enter	R²	Finalβ	p
1. Letter knowledge	.19	.43	.00
2. Rhyme awareness		.15	.18
Phoneme analysis		---	---
Phoneme synthesis	.21	---	---
3. Vocabulary		-.13	.26
Short term memory		.17	.17
Visual discrimination	.27	.14	.32
Predictors: T2 skills			
Enter	R²	Finalβ	p
1. Letter knowledge	.20	.45	.00
2. Rhyme awareness		-.22	.06
Phoneme analysis		.02	.84
Phoneme synthesis	.30	.36	.02
3. Vocabulary		-.13	.31
Short term memory		.10	.45
Visual discrimination	.32	-.07	.57

Children's letter sound knowledge prior to instruction (T1) explained significant variance in their irregular word reading at T3, whilst their rhyme awareness did not. After accounting for letter sound knowledge and rhyme awareness, short term memory

span, vocabulary knowledge and visual discrimination at T1 did not explain any additional variance.

Regarding T2 skills, children's letter sound knowledge and phoneme synthesis explained significant variance in their irregular word reading, whereas their rhyme awareness and phoneme analysis did not. After accounting for these skills, vocabulary knowledge, short term memory span, and visual discrimination at T2 did not explain any additional variance.

Table 4.7. Hierarchical regression analyses using T1 and T2 skills to predict T3 regular short word reading

Criterion variable: T3 regular short word reading			
Predictors: T1 skills			
Enter	R²	Finalβ	p
1. Letter knowledge	.13	.36	.00
2. Rhyme awareness		.27	.02
Phoneme analysis		---	---
Phoneme synthesis	.20	---	---
3. Vocabulary		.18	.10
Short term memory		.30	.01
Visual discrimination	.35	.16	.21
Predictors: T2 skills			
Enter	R²	Finalβ	p
1. Letter knowledge	.45	.67	.00
2. Rhyme awareness		.06	.52
Phoneme analysis		.06	.54
Phoneme synthesis	.51	.23	.06
3. Vocabulary		.12	.24
Short term memory		.11	.33
Visual discrimination	.53	-.01	.92

Children's letter sound knowledge and rhyme awareness prior to instruction (T1) explained significant variance in their regular short word reading at T3. After

accounting for these skills, short term memory span explained significant additional variance, whereas vocabulary knowledge and visual discrimination did not.

Regarding T2 skills, children's letter sound knowledge explained significant variance in their regular short word reading, whereas rhyme awareness and phoneme analysis did not. Phoneme synthesis was marginally significant. After accounting for these skills, vocabulary knowledge, verbal short term memory span, and visual discrimination did not explain significant additional variance.

Table 4.8. Hierarchical regression analyses using T1 and T2 skills to predict T3 regular long word reading

Criterion variable: T3 regular long word reading			
Predictors: T1 skills			
Enter	R^2	Finalβ	p
1. Letter knowledge	.09	.29	.01
2. Rhyme awareness		.20	.09
Phoneme analysis		---	---
Phoneme synthesis	.12	---	---
3. Vocabulary		.01	.95
Short term memory		.35	.00
Visual discrimination	.29	.17	.20
Predictors: T2 skills			
Enter	R^2	Finalβ	p
1. Letter knowledge	.36	.60	.00
2. Rhyme awareness		.09	.38
Phoneme analysis		.26	.01
Phoneme synthesis	.5	.20	.11
3. Vocabulary		-.09	.38
Short term memory		.18	.10
Visual discrimination	.53	.03	.75

Children's letter sound knowledge prior to instruction (T1) explained significant variance in their regular long word reading at T3, whereas rhyme awareness did not.

After accounting for these skills, short term memory span explained significant additional variance whereas vocabulary knowledge and visual discrimination did not.

Regarding T2 skills, children's letter sound knowledge and phoneme analysis explained significant variance in their regular long word reading whereas their rhyme awareness and phoneme synthesis did not. After accounting for these skills, vocabulary knowledge, short term memory span, and visual discrimination did not explain any additional significant variance.

Discussion

The aim of this study was to examine the cognitive and reading-related skills that underpin early word reading when children are taught to read with synthetic phonics, and to see if these differ from the results of previous studies where children were taught with other methods. By carrying out a cognitive analysis of the synthetic phonics method of reading instruction, it was possible to make hypotheses regarding the skills that children may rely upon when learning to read by this approach. As predicted, letter sound knowledge, phoneme awareness (particularly phoneme synthesis), and verbal short term memory span underpinned early word reading skill (as measured by a standardised reading assessment). These results contrast with previous findings suggesting that verbal short term memory is relatively unimportant for early word reading in comparison to letter knowledge and phonological abilities.

In accordance with previous studies (Muter et al., 1998; Scanlon & Vellutino, 1996; Schatschneider et al., 2004), letter sound knowledge was an important determinant of children's word reading development, accounting for up to 43% of the variance in early reading performance. Consistent with McGeown, Johnston, and Medford (2012), children's knowledge of letter sounds prior to school entry predicted their later word reading ability. In addition, children's letter sound knowledge after 18 weeks of instruction explained variance in their word reading skill both concurrently and one year later, even after accounting for previous reading skill. This is unsurprising, as synthetic phonics teaches children to utilise their knowledge of letter-sound correspondences in order to aid word reading. Children with a good knowledge of letter sounds will be better equipped to read unfamiliar words by forming connections between the letters in the spellings of words and the sounds in the pronunciations of words. In synthetic

phonics, children are taught letter sounds very rapidly; this is illustrated by the significant gain in letter sound knowledge at 18 weeks of instruction compared to at school entry.

In addition to letter knowledge, children's phonological awareness also played an important role in their early word reading. A combination of letter sound knowledge and phonological abilities accounted for up to 59% of the variance in children's word reading skill. However, as predicted, children's phoneme awareness was more important for their word reading development than rhyme awareness. Whilst children's phoneme analysis and phoneme synthesis skills were closely associated with their reading ability, rhyme awareness showed only weak associations. In addition, whilst children's phoneme skills explained independent variance in their concurrent and later word reading ability, their rhyme awareness did not. This is consistent with previous findings suggesting that phoneme awareness is more important than rhyme awareness for early word reading development (Blaiklock, 2004; Castles & Coltheart, 2004; Foy & Mann, 2006; Hulme et al., 2002; Muter et al., 2004; Muter, et al., 1998; Muter & Snowling, 1998; Savage & Carless, 2005).

However, Bryant et al. (1990) found that rhyme awareness had a direct connection with children's reading skill that appeared to be independent of phoneme awareness. One explanation for mixed findings regarding the importance of rhyme awareness for early word reading may concern the method of reading instruction received by children. Indeed, consistent with the current study, McGeown, Johnston, and Medford (2012) found that whilst rhyme awareness did not predict early word reading for those taught to read with synthetic phonics, it did predict word reading ability for those taught to read with an eclectic method of instruction that taught many different strategies for word

reading. Conversely, whereas phoneme awareness predicted early word reading for the synthetic phonics group, it did not predict word reading for the eclectic group. These results highlight the important influence of method of reading instruction in shaping the phonological skills that support early word reading development. Rhyme awareness is likely to be less important for word reading when children are taught to read with synthetic phonics because children are taught solely to sound and blend grapheme - phoneme correspondences.

Whilst the results of this study highlight the importance of phoneme awareness for early word reading, they further suggest that phoneme synthesis may be more important than phoneme analysis when children are taught to read with synthetic phonics. Phoneme synthesis ability assessed after 18 weeks of reading instruction accounted for higher levels of variance in both concurrent and later word reading skill than phoneme analysis ability (except for longer length regular word reading). In addition, whilst phoneme synthesis explained additional variance in later reading skill after accounting for previous reading skill, phoneme analysis did not. Therefore, it appears that phoneme synthesis skills were more important for the development of early word reading. It is likely that phoneme synthesis is more important than phoneme analysis when children are taught to read with synthetic phonics because they are taught to read words specifically by blending phonemes. It may be that the reverse pattern would be found if children were taught to read by analytic phonics; a method in which children segment spoken words into sounds. However, phoneme analysis and phoneme synthesis abilities were both closely correlated with word reading and both explained independent variance in word reading skill, suggesting that both elements may play a significant role.

The current results suggest that phonological awareness may follow a developmental pattern beginning at early awareness of rhymes and progressing to awareness of phonemes. Whilst children had some rhyme awareness prior to formal reading instruction, they performed at floor on measures of phoneme awareness and phoneme blending, indicating that they had no measureable sensitively to phonemes at this stage. However, these skills had significantly improved when assessed after 18 weeks of reading instruction. This is consistent with Carroll, Snowling, Hulme, and Stevenson (2003), who also found that young children developed syllable and rime awareness before phoneme awareness. In addition, a number of other studies indicate that children's phonological awareness tends to follow a developmental pattern beginning at early awareness of larger phonological units to awareness of smaller units, or from global to segmental phonological representations (Anthony & Lonigan, 2004; Anthony et al., 2002; Bryant et al., 1990).

The current results are also consistent with research suggesting that whereas rhyme awareness may often develop prior to reading instruction, phoneme awareness is unlikely to arise until children have received some exposure to formal instruction (see Castles & Coltheart, 2004). For example, cross-sectional research by Mann and Wimmer (2002) compared the reading development of American children to that of German children, who are taught literacy skills later on than their American counterparts. Results showed that the American children developed phoneme awareness skills before the German children, suggesting that phoneme awareness develops primarily as a product of literacy exposure. Indeed, it may be the process of learning to read that first alerts the beginning reader to the relevant smaller phonological segments in a language. The results from this study suggest that children can develop phoneme awareness indirectly as a product of their reading instruction, as children received no

explicit phoneme awareness training but rather learnt about phonemes in the context of printed words. These phoneme awareness skills consequently allowed progress in early reading skill. The current findings are consistent with Wagner et al. (1994), whose results support the view that the relationship between phonological processing abilities and reading acquisition is bi-directional. However, as Castles and Coltheart (2004) note, it is also possible that a third, unknown factor may be mediating the relationship between phoneme awareness and early word reading.

Interestingly, both rhyme awareness and phoneme awareness showed differing associations with regular and irregular word reading. Rhyme awareness showed closer and more consistent associations with the reading of regular than irregular words. In addition, whilst rhyme awareness prior to instruction explained independent variance in later regular word reading, it did not explain variance in irregular word reading. This is unsurprising, as whilst regular words contain rhyming spelling units, irregular words do not follow consistent letter-sound correspondence rules. Therefore, awareness of rhyming spelling sequences will not be beneficial for reading irregular words. Interestingly, whilst rhyme awareness prior to instruction predicted variance in regular short word reading, it did not predict variance in regular long word reading. It may be that short words are more transparent in terms of the rhyme, i.e. children may find it easier to identify the rhyming unit in shorter length words. However, children's rhyme awareness after 18 weeks of instruction did not explain unique variance in either irregular or short or longer length regular word reading ability. This suggests that the strategies children used to read both regular and irregular words were not drawing upon their knowledge of rhyme, but rather their knowledge of phonemes.

Phoneme analysis and phoneme synthesis ability were closely associated with both regular and irregular word reading. Therefore, it appears that children were using a phonological recoding strategy for reading all words, consistent with the synthetic phonics approach. This is consistent with research showing that method of reading instruction has a significant influence on the way in which children process print (Connelly et al., 2009; Johnston & Thompson, 1989) and on the strategies that they use to read words (Deavers et al., 2000; Sowden & Stevenson, 1994; Walton & Walton, 2002). However, whereas phoneme synthesis ability significantly predicted variance in children's irregular word reading, phoneme analysis ability did not. This is similar to Nilsen and Bourassa (2008), who also found that children's phoneme analysis ability did not explain unique variance in the reading of irregular words. Conversely, Hulme et al. (2007) found that phoneme analysis skills were important for the reading of some irregular words. The reason for these previous mixed findings is unclear. However, for the present study, it is argued that phoneme analysis skills were less important than phoneme synthesis skills because children were taught to read words with a strategy focused on phoneme blending (i.e., synthesising the sequences of phonemes).

Interestingly, whilst children's phoneme analysis skill explained independent variance in their ability to read longer length regular words, it did not explain variance in their ability to read shorter length regular words. It may be that phoneme analysis skill becomes more important with increasing word length and/or number of phonemes, as children are required to segment longer words into smaller consecutive elements, therefore drawing on their analysis skills. Indeed, it may be that sufficient phoneme analysis skills are necessary before blending can take place. This is consistent with the fact that whilst phoneme blending explained variance in children's short regular word

reading (this was almost significant), it did not explain variance in their longer length word reading.

Consistent with previous research (Alloway et al., 2005; Brunswick et al., 2012; Ellis & Large, 1987; Johnston et al., 1987; Lonigan et al., 2009; Rapala & Brady, 1990), children's verbal short term memory both prior to instruction and after 18 weeks of instruction was closely associated with their later word reading skill. Furthermore, short term memory span explained significant additional variance in later standardised word reading even after accounting for letter sound knowledge and phonological awareness, and was important for reading both short and longer length words. However, children's short term memory was not a significant predictor of their irregular word reading skill after accounting for letter knowledge and phonological skills. As a whole, these results contradict previous research suggesting that short term memory span is relatively unimportant for early word reading after accounting for or when compared to phonological skills (de Jong & van der Leij, 1999; Parilla et al., 2004; Rohl & Pratt, 1995).

One explanation for the results of the present study may concern the method of reading instruction that children received. Indeed, consistent with the current study, McGeown et al. (2012) found that whilst verbal short term memory span predicted early word reading for those taught to read with synthetic phonics, it did not predict reading for those taught with an eclectic method of instruction. It is likely that verbal short term memory is particularly important for a synthetic phonics method of instruction due to the strategy children are taught to read words; to sequentially blend grapheme phoneme correspondences. This strategy will require the retention of the series of letter-sound correspondences in memory before blending. It may be that short term memory was

more important for regular than irregular word reading because children were unable to carry out the complete blending of grapheme-phoneme correspondences in irregular words due to the inconsistent letter-sound correspondences. Instead, children may have looked for the parts of irregular words that do follow letter-sound correspondence rules (as they were taught to do) rather than attempting to decode the full sequence of letter-sound correspondences, which may have relied less on short term memory span.

Martinez Perez et al. (2012) found that whilst children's order short term memory (remembering the order of the items) had an independent effect on reading skill, the effect of item short term memory (remembering the items) could be accounted for by phonological abilities. Although the distinction between these elements of verbal short term memory was not made in the current study, it is likely that it is order short term memory which is particularly important for word reading with synthetic phonics due to the sequential recoding process. However, future research using a comparative task to assess other aspects of short term memory would be necessary to fully investigate this.

In accordance with hypotheses, children's vocabulary knowledge prior to instruction showed weak associations with later word reading skill, and did not predict significant variance in later word reading after accounting for letter knowledge and phonological awareness. Furthermore, after 18 weeks of instruction, children's vocabulary knowledge did not predict additional significant variance in their concurrent or later word reading. These results contradict Nation and Snowling (2004), who found that oral language skills contributed to children's word recognition skill even after accounting for decoding and phonological ability (although this study was with much older children). However, the current findings are consistent with Lonigan et al. (2009), who found contrasting results; oral language skills did not contribute unique variance to early

reading skills after accounting for phonological skills. In addition, the current findings are consistent with Muter et al. (2004), who found that vocabulary knowledge was less important than phoneme awareness for word reading ability. As the children in the current study were taught to read all words using a phonological recoding strategy, with no teaching of words within context (which may rely on vocabulary knowledge), it is unsurprising that vocabulary knowledge did not have a strong influence on children's word reading skill. Consistent with McGeown et al. (2012), this highlights the potential role of method of reading instruction in shaping children's reliance on vocabulary knowledge for early word reading.   McGeown et al. (2012), found that whilst vocabulary knowledge predicted word reading for those taught to read by an eclectic approach (which included sight word learning and recognising words within books), it did not predict word reading for those taught to read with synthetic phonics, suggesting that children taught to read with a greater emphasis on phonics may rely less on vocabulary knowledge for early word-level reading.

It was hypothesised that if vocabulary knowledge was found to play a role in determining children's early word reading skill, it would specifically influence the reading of irregular words. However, the current study showed contrasting results. Whilst children's vocabulary knowledge was associated with their regular word reading, it was not associated with irregular word reading. This contradicts Ricketts et al. (2007), who found that oral vocabulary skills predicted children's reading of irregular but not regular words. It is possible that vocabulary knowledge was less important for irregular word reading in this study because children were taught to read irregular words using a phonological approach, with less reliance on vocabulary. However, it is unclear as to why vocabulary knowledge showed closer associations with regular word reading.

Nilsen and Bourassa (2008) suggest that at the early stages of word reading, when children's orthographic-phonological decoding abilities are inefficient, vocabulary knowledge may have the potential to support the learning of both irregular and regular words. It is possible that in this study, vocabulary knowledge was more important for regular than irregular word reading because the children were able to access known pronunciations of regular words more easily due to the more efficient/quicker process of decoding regular words. However, another explanation for the current findings may concern the low distribution of scores on the irregular word reading task. Indeed, correlations with irregular word reading may have been stronger if the distribution of scores had been greater. Nevertheless, although correlated with regular word reading, vocabulary knowledge did not explain significant variance in either irregular or regular word reading after accounting for letter sound knowledge and phonological awareness, suggesting that the influence of vocabulary knowledge on regular word reading may only be minor.

Interestingly, children's visual discrimination ability prior to instruction did predict significant additional variance in their later word reading skill after accounting for letter knowledge and phonological awareness. This is consistent with Brunswick et al. (2012), who found that the ability to distinguish between letter-like forms was correlated with subsequent reading skill. As visual discrimination abilities are associated with letter identification skills (Woodrome & Johnson, 2009), it is likely that early visual discrimination abilities are important for synthetic phonics word reading due to the rapid letter learning process in synthetic phonics. As such, visual discrimination skills may be necessary in order to distinguish between lots of different letter shapes very early on.

It may be that the type of reading instruction received by children influences the extent to which they rely on visual discrimination abilities for early word reading. If children are taught letters at a slower pace than in synthetic phonics, it may be that early visual discrimination abilities are less important. However, in the current study, visual discrimination assessed after 18 weeks of instruction no longer explained additional significant variance in children's concurrent or later word reading skill, suggesting that the early influence of visual discrimination on word reading may become surpassed by the greater influence of other abilities such as phoneme awareness as children progress in their reading development. In addition, the current results contrast to those of McGeown et al. (2012), who found that visual discrimination ability prior to instruction did not explain significant variance in children's early word reading when children were taught by synthetic phonics.

In summary, the cognitive and reading-related skills supporting word reading when children are taught to read with synthetic phonics are generally consistent with their method of instruction. However, in some cases, these skills differ from what has previously been found in the literature (where children were taught to read by other types of instruction). In particular, verbal short term memory span appeared to exert a greater influence on early word reading than is generally reported in the literature. It has been argued that this is probably due to the sequential method of sounding and blending taught by synthetic phonics. In addition, whilst phoneme analysis skills did have an influence on word reading, phoneme synthesis skills were generally more important; although for longer words which may require segmentation, analysis skills were more important. Finally, early visual discrimination skills were also important for later word reading skill, possibly because these aided in the rapid learning and differentiation of letters. The current findings are consistent with the suggestion that

method of reading instruction plays an important role in shaping the cognitive and reading-related skills that underpin early word reading development (McGeown et al., 2012).

Implications

The current findings suggest important implications for future research, theory, and educational practice. Perhaps the most important implication of this research is that it demonstrates the need for researchers to take into account the type of reading instruction that children receive when examining the skills that underpin their early word reading. This study has illustrated that it is possible to systematically analyse methods of reading instruction and from this, make predictions as to the skills that children will draw upon when learning to read. In addition, the present study, and previous research (McGeown et al., 2012), suggests that predictions made based on method of reading instruction can also be quite accurate.

If teachers are aware of the skills supporting children's early reading, it may be possible to screen children for early impairments in these skills in order to identify those children at risk of early reading difficulties. In addition, it is possible that providing focused training and support in the skills known to underpin early word reading may help to alleviate some potential reading problems before they start. Importantly, the current study highlights the significance of taking method of reading instruction into account when considering the cognitive and reading-related skills that educators should use as screening criteria or training targets. For example, the current results suggest that focusing on improving a child's vocabulary knowledge would not be particularly beneficial for early word recognition if children were being taught by a synthetic

phonics approach. Alternatively, if the method of reading instruction teaches children to use vocabulary knowledge and oral skills to help decode unfamiliar words, training in these abilities may produce more positive results. The current study suggests that for those taught to read with synthetic phonics, training and supporting children to improve their letter sound knowledge, phoneme blending skills, and verbal short term memory capacity may produce the most beneficial effects. However, further research with a larger sample size is necessary to examine these suggestions.

Limitations and suggestions for future research

Some limitations of this study should be noted. Firstly, the current study assessed children taught by only one method of reading instruction: synthetic phonics. Unfortunately, at the time of this study, as synthetic phonics was the advised method of reading instruction in the U.K, a comparison group of children taught by a different method of instruction was not available. Therefore, differences between the skills supporting reading when children are taught by different methods could not be experimentally compared. However, the current study provides a thorough examination of the skills supporting word reading when children are taught to read with synthetic phonics, which is a little-studied area of research. In addition, the current study provides evidence suggesting that these skills differ from those generally proposed to support word reading in previous literature, and highlights the importance of taking method of reading instruction into account. In order to directly compare influence of reading instruction, further research could assess children from different countries in which different methods of reading instruction are taught. Further research could also examine

children's cognitive and reading-related skills over a longer period of time, to see if the current findings show enduring effects throughout primary school.

The present study assessed children in a single school; therefore, further work is necessary to see if the findings can be generalised. In addition, the school involved in the current study was from an area of low socioeconomic status (SES). Therefore, further work is necessary to see if these findings can be generalised to children from areas of higher SES. However, including children from a low SES area is advantageous in some respects. Children from low SES areas typically show more delayed acquisition of literacy skills from a very young age (Duncan & Seymour, 2000); therefore, it is important to examine the skills that support reading acquisition for children who may need the most support in the early years of school. In addition, it should be borne in mind that these children started school with very poor reading readiness skills. Therefore parent teaching at home of literacy skills was arguably minimal or non-existent. It may be the case that such clear cut results would not emerge in schools where parents are more involved in their child's early literacy development, as parents involvement may alter the skills supporting children's reading (if children are then receiving mixed strategies).

A further limitation concerns some of the assessments used in the current study. Some measures (e.g. irregular word reading) showed little distribution of scores, with scores skewed towards the lower end of the scale. It may be that the children in this study did not have the ability to read many irregular words at this stage. Alternatively, it may be that the measure used wasn't sensitive enough to assess these skills. If score distributions had been greater for this assessment, the relationships between irregular word reading and cognitive/reading-related skills may have been stronger. Further

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research could use word lists including a greater number of items, which may produce more robust findings for the relationships between reading-related skills and irregular word reading abilities. In addition, another limitation may concern the phoneme awareness tests used in the current study. At school entry, on average, children performed at floor on these assessments. It is likely that the children hadn't developed phoneme awareness skills at this stage; however, it is possible that the assessments used weren't sensitive enough to capture these early abilities. Further research could include a more age appropriate measure of phoneme analysis and phoneme synthesis skills.

Conclusion

The current study highlights the important influence of method of reading instruction in shaping the cognitive and reading-related skills that support children's early word reading development. Findings suggest that the main skills underpinning children's early word reading when taught to read with synthetic phonics are letter sound knowledge, phoneme awareness (particularly phoneme synthesis), and verbal short term memory. The results highlight the need for researchers to take into account the role of reading instruction when examining the skills supporting children's initial reading development.

CHAPTER 5: EXAMINING THE INFLUENCE OF CLASSROOM BEHAVIOUR ON EARLY READING DEVELOPMENT

Abstract

Research suggests there are associations between children's classroom behaviour and their early reading development. However, few studies have examined the influence of early behaviour on the development of emergent-reading related skills, or assessed whether behaviour can predict early reading skill after accounting for these abilities. The current study examined the extent to which children's early reading ability and emergent reading-related skills were predicted by their classroom behaviours. Eighty eight new school entrants were assessed on emergent reading-related skills and reading ability at three time points: school entry (T1), after 18 weeks of instruction (T2), and one year later (T3). In addition, at T2 and T3 class teachers completed questionnaires measuring five categories of behaviour: hyperactivity/inattention, conduct problems, emotional problems, peer relationship problems, and pro-social behaviour, for each child. It was found that children's hyperactivity/inattention in particular was significantly and closely associated with emergent reading-related abilities and reading skill. However, behavioural factors did not explain significant variance in children's reading skill after accounting for reading-related and cognitive skills. The implications of including behavioural targets in early reading interventions are discussed.

Introduction

A significant body of research has examined the cognitive and reading-related skills supporting children's reading acquisition (see Chapter 4 for a review). However, this research has often been at the expense of understanding the influence of non-cognitive factors, such as classroom behaviour, and how this may influence early reading ability. The current study examined the associations between children's negative and positive behaviours at school and the development of their early reading skill. More specifically, the current study examined whether behavioural factors could explain variance in children's reading development after accounting for cognitive and reading-related abilities. Furthermore, the influence of behaviour on the development of pre-reading skills was examined.

The association between behavioural/emotional problems and reading

As reading is a taught skill and something which children take time to develop, it is feasible that early problem behaviours may interfere with children's ability to acquire reading skills and/or the cognitive skills that support early reading acquisition (e.g., letter knowledge, phonological awareness). Indeed, as outlined in Chapter 2, research suggests that there is a close relationship between behavioural or emotional problems and literacy difficulties in childhood (Adams et al., 1999; Carroll et al., 2005; Dahle et al., 2011; Maughan & Carroll, 2006). For example, children with reading difficulties have been found to score more highly than controls on a range of behavioural/emotional problems such as anxiety, somatic complaints, social problems, aggression and inattention (Dahle et al., 2011). In addition, behavioural and emotional problems have been found to explain significant variance in children's reading skill (Adams et al.,

1999), suggesting that these factors may play a role in shaping children's reading progress in school. Furthermore, these relationships have been found to be present even for very young children, suggesting that the influence of these factors should be considered during initial reading instruction. For example, Lonigan, Bloomfield, Anthony et al. (1999) found that preschooler's problem behaviours were significantly related to a number of emergent literacy skills. In addition, Bulotsky-Shearer, Fernandez, Dominguez, and Kouse (2011) found that children's problem behaviour at 4 years of age had a negative effect on their reading outcomes over the course of a year, suggesting that the relationships between negative behaviour and reading ability emerge very early on in a child's life.

However, relatively little research has examined the behavioural factors that influence children's reading progress during the initial stages of formal reading instruction. The current study examined the influence of behavioural and emotional problems on children's early reading development, focusing on four main categories of negative behaviour: hyperactivity/inattention, conduct problems, emotional problems, and peer relationship problems. In addition, the positive influence of pro-social behaviour on reading skill was examined.

Hyperactivity/inattention and reading

Research suggests that inattentive behaviour is closely associated with children's reading development in the early years of school (Alexander, Entwistle & Pauber, 1993; Duncan, Dowsett, Claessens et al., 2007; Grimm, Steele, Mashburn et al., 2010; Rabiner, Cole, Bierman et al., 2000; Rabiner, Malone et al., 2004; Romano, Babchiskin, Pagani, & Kohen, 2010; Rowe & Rowe, 1992). For example, attention skills assessed in

kindergarten or at school entry have been found to have moderate predictive power for later reading achievement (Duncan et al., 2007, Romano et al., 2010). Furthermore, early attention problems have been found to have a greater effect than other negative behaviours in predicting changes in children's reading skill (Grimm et al., 2010), and have been found to account for variance in early reading ability even after controlling for prior achievement, other behavioural difficulties, socio-economic status, and gender (Rabiner et al., 2000; Rabiner et al., 2004; Rowe & Rowe, 1992). Inattentive behaviours in the classroom include being easily distracted, making careless mistakes, and being unable to listen to or carry out instructions. It is likely that children demonstrating high levels of these behaviours are disadvantaged during early reading instruction as they will find it more difficult to engage in learning activities that require them to focus on and attend to details for periods of time (however, see chapter 7 for a review of other possible causal directions).

Similarly, hyperactive behaviour, such as fidgeting, being unable to sit still, and excessive physical movement and talking, has also been linked to children's reading ability (e.g. McGee, Prior, Williams et al., 2002). However, evidence suggests that hyperactive behaviour may have a lesser influence than other negative behaviours on early reading skill. For example, a number of studies indicate that inattention is more closely associated with children's reading ability than hyperactivity (e.g. Merrell & Tymms, 2001; Willcutt, Betjemann, Wadsworth et al., 2007; see Chapter 7 for a more in-depth review). In addition, hyperactivity has been found to be unimportant for early reading skill after taking inattention into account (Giannopulu et al., 2008), suggesting that inattentive behaviours may play a more dominant role in determining early reading progress.

Conduct problems and reading

Another behavioural factor associated with children's reading attainment is conduct behaviour problems, such as anti-social, aggressive, defiant, and rule-breaking behaviour. For example, research shows that children with reading difficulties often show more conduct problems than typical readers (Terras, Thompson & Minnis, 2009). In addition, conduct problems have been found to be negatively associated with children's reading ability, even after controlling for intelligence (Adams et al., 1999), suggesting that conduct problems may have some influence in shaping children's reading skill.

However, findings regarding the relationship between conduct problems and early reading skill are mixed. Fergusson and Lynskey (1997) found that children with reading difficulties at 8 years had higher rates of conduct problems at 6 years than typical readers, suggesting that the relationships between conduct problems and reading may be established at a young age. However, other studies suggest that the association between conduct problems and early reading development may only be weak in strength (Cornwall & Bawden, 1992; Hooper, Roberts, Sideris et al., 2010). In addition, some studies suggest that there may be age effects in the relationship between conduct problems and reading ability. For example, Miles and Stipek (2006) found that whilst aggressive behaviour was associated with literacy achievement in 3rd and 5th grades, it was not associated with literacy skill in kindergarten or 1st grade, suggesting that the relationship between conduct problems and reading may increase as children progress through school. Similarly, Arnold (1997) found that whilst the relationship between externalising behaviour (aggressive, non-compliant behaviour) and academic

difficulties was evident in the early years, the association increased in strength with age, suggesting that the relationship may be stronger for older children.

Regarding the causal nature of the relationship between conduct problems and reading ability, findings are also mixed. For example, a review by Cornwall and Bawden (1992) concluded that whilst there was some evidence to suggest that behavioural difficulties are a precursor to reading difficulties, there was no evidence to suggest that reading difficulties are a precursor to behavioural problems. It is possible that some children with conduct problems are disadvantaged in learning to read because they spend less time actively engaging in learning activities due to their defiant classroom behaviour. In addition, children with high levels of conduct problems are likely to spend a greater proportion of time being disciplined by class teachers, rather than participating in reading instruction. However, a recent study by Halonen, Aunola, Ahonen and Nurmi (2006) found that problems in learning to read predicted an increase in externalising problem behaviour (anti-social behaviour and problematic relations with peers) during the first two years of school. In addition, Morgan, Farkas, Tufis, and Sperling (2008) found that whilst reading levels elevated a child's odds of engaging in problem behaviours (e.g. arguing, fighting), early problem behaviours did not elevate a child's odds of becoming a poor reader. These findings suggest that a child's experience of reading failure may have a negative influence on the development of conduct problems. Indeed, it may be that difficulty in learning to read leads to frustration or low academic self-esteem, which may then cause a child to engage in disruptive classroom behaviour and avoid participation in reading activities. However, it is possible that the relationship between conduct problems and reading development is bi-directional, with each having some casual influence on the other (e.g. Arnold, 1997; Maughan & Carroll, 2006). In addition, some findings suggest that the relationship between conduct problems and

reading ability may be mediated by other factors, such as attentional difficulties (Maughan & Carroll, 2006; Maughan, Pickles, Hagell et al., 1996; Rapport, Scanlon, & Denny, 1999; Willcutt & Pennington, 2000).

Emotional problems and reading

Research suggests that emotional problems are also associated with children's reading ability (Adams et al., 1999; Boetsch, Green, & Pennington, 1996; Dahle et al., 2011; Siperstein, Wiley, & Forness, 2011; Willcutt & Pennington, 2000). For example, children with reading difficulties have been found to show higher levels of emotional problems than typical readers, such as anxiety, depression, and somatic complaints (Dahle et al., 2011; Terras et al., 2009).

However, research examining the association between emotional problems and early reading development is mixed. Some studies suggest that the relationship is evident even for young children (Halonen et al., 2006; Hooper et al., 2010; Ialongo, Edelsohn, & Kellam, 2001; Lim & Kim, 2011; Massetti, Lahey, Pelham et al., 2008). For example, Massetti et al. (2008) followed young children over a period of 8 years and found that those with high rates of emotional problems had consistently lower reading scores. In addition, emotional problems have been found to explain significant variance in early reading ability (Halonen et al., 2006) and to cause slower growth in early reading skills (Lim & Kim, 2011). Conversely, other studies show contrasting results. For example, some findings suggest that early emotional problems and reading development share only a weak association (Grimm et al., 2010; Hooper et al., 2010). In addition, some studies have failed to find a significant relationship between emotional problems and early reading skill (Kempe, Gustafson, & Samuelsson, 2011; Miller,

Hynd, & Miller, 2005). For example, Kempe et al. (2011) found that young children with reading problems did not have higher levels of emotional problems than normal ability readers. Furthermore, other studies suggest that there may be age effects in the association between emotional problems and reading skill. For example, Ackerman, Izard, Kobak et al. (2007) found that whilst emotional distress was associated with children's reading problems in 5th grade, it was not associated with reading difficulties in 3rd grade, suggesting that emotional problems may become more closely associated with reading ability as children progress through school.

Regarding the causal nature of the relationship between emotional problems and reading skill, there are several possible explanations. Firstly, it may be that emotional problems have a negative influence on children's reading development; for example, by causing children to put less effort or attention into reading instruction and learning activities due to other, emotional, pre-occupations (e.g. Jalongo & Hirsh, 2010). Alternatively, it may be that emotional problems arise as a consequence of reading difficulties, rather than being a cause of reading failure (Maughan & Carroll, 2006; Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003). For example, Maughan et al. (2003) found evidence of strong relationships between reading problems and increased risk for depressed mood. It was suggested that a lowered sense of emotional well being and academic self-esteem may arise if children become aware of their reading difficulties or if they are observed to struggle with reading publicly. Indeed, other findings also suggest that reading problems drive negative emotions, rather than vice versa (e.g. Ackerman et al., 2007). However, it is also possible that emotional problems and reading share a reciprocal relationship. For example, Halonen et al. (2006) found that the relationship between early emotional problems and reading ability was bi-directional, with each factor having some causal influence on the other. Indeed, it is possible that emotional problems have a

detrimental effect on children's reading progress, which as a consequence, may then cause children to develop further negative emotions.

Peer relationship problems and reading

Another category of behaviours associated with children's early academic achievement are peer relationship problems (Benner, Beaudoin, Kinder, & Mooney, 2005; Gadeyne, Ghesquière, & Onghena, 2004; Kempe et al., 2011; O'neil, Welsh, Parke et al., 1997). For example, Benner et al. (2005) found a close relationship between children's early reading ability and their level of social adjustment, suggesting that social skills are strongly associated with early literacy performance. Similarly, Kempe et al. (2011) found that young children with reading problems at the beginning of school had higher levels of social problems than typical readers, suggesting that peer relationship problems may have an influence on reading development very early on. However, findings are mixed, with some studies failing to find evidence of a significant relationship between children's social competency and their emergent literacy ability or later reading achievement (Duncan et al., 2007; Lonigan et al., 1999).

It is possible that some children with peer relationship problems are disadvantaged in learning to read; for example, because they have a lower level of support from peers due to having a restricted social network (Kempe et al., 2011). Indeed, it may be that some children require support and encouragement from their peers during some aspects of reading instruction, particularly those which operate within socially mediated learning activities or whole class teaching. In addition, it may be that the behaviours that children bring to peer interactions also cross over to interactions with class teachers. As such, it is possible that deficient social skills also lead to relationship problems with

teachers, which may further act to hinder the learning process. These causal hypotheses are supported by findings suggesting that peer relationship problems have a causal influence on children's reading development, rather than being a consequence of reading skill (Kempe et al., 2011). However, some findings present contrasting conclusions regarding the causal direction of the association. For example, Welsh, Parke, Widaman, and O'neil (2001) found that young children's academic competency led to social competency over time. It was suggested that children with deficient academic skills may become frustrated with the learning process, and as a consequence, engage in inappropriate or disruptive social behaviour, leading to peer rejection. However, in this study, a bidirectional influence also emerged, suggesting that the relationship may be reciprocal, with each factor having some causal influence on the other.

It is also possible that the association between peer relationship problems and reading development is mediated by other factors, such as self-esteem or other negative classroom behaviours. For example, Flook, Repetti, and Ullman (2005) found that children's academic self-concept and emotional problems helped to mediate an association between children's peer relations in the classroom and academic performance. It was suggested that peer relationship problems may affect children's academic self-concept, emotional well-being, and consequently, performance at school. Indeed, a child experiencing social rejection may put less effort into learning activities due to other emotional pre-occupations regarding peer relations. In addition, it is also possible that the relationship is mediated by other negative or positive classroom behaviours. For example, O'neil et al. (1997) found that young children's level of peer rejection was more systematically related to problematic classroom behaviour than to actual reading outcomes. It was suggested that the behaviours children bring to social

interactions are also likely to influence classroom learning experiences. For example, if a child is uncooperative in a social interaction, they are also likely to be uncooperative during reading instruction activities.

Pro-social behaviour and reading

The majority of research examining the relationships between behavioural factors and reading has focused mainly on the influence of negative classroom behaviours. However, it is also important to examine the positive behaviours that may influence early reading skill, as these may potentially be useful intervention targets. One category of positive classroom behaviour that has been linked to children's reading achievement is pro-social behaviour (e.g. Adams et al., 1999; Romano et al., 2010). Pro-social behaviour is voluntary behaviour that is intended to benefit another person or a group as a whole; in the classroom, this may take the form of helping other children, sharing, and co-operating with others. Adams et al. (1999) found that pro-social behaviour explained significant variance in children's reading ability even after controlling for intelligence, suggesting that pro-social behaviour may have an influence on shaping children's reading progress in school.

The relationship between pro-social behaviour and reading ability appears to be present even for young children. For example, Romano et al. (2010) found that greater levels of pro-social behaviour in kindergarten predicted better reading performance. Furthermore, research suggests that pro-social behaviour may be particularly important during the early years. For example, Miles and Stipek (2006) found that whilst children with higher levels of pro-social behaviour had better literacy achievement in kindergarten and first grade, pro-social skills were no longer significantly related to literacy

performance in third and fifth grades. This is consistent with Carroll et al. (2005) who found no significant association between the presence of literacy difficulties and level of pro-social behaviour for children aged 9 to 15 years. It may be that pro-social behaviour influences early reading development because pro-social skills are beneficial during co-operative learning interactions with peers and teachers. Furthermore, children with higher levels of pro-social behaviour may receive more help from teachers and peers, and thus progress faster in reading skill (e.g. Miles & Stipek, 2006). Alternatively, it may be that pro-social behaviour is associated with early reading development due to its relationship with other behaviours that directly facilitate learning, such as compliance and conscientiousness (e.g. Wentzel, 1993).

Behaviour and pre-reading/emergent literacy skills

As discussed, a number of studies indicate that there are associations between behavioural factors and reading ability in childhood. However, few studies have examined the influence of behavioural factors on the development of pre-reading skills such as letter sound knowledge and phonological awareness. Indeed, it is possible that the relationships between behavioural factors and early reading development are mediated by the influence of behaviour on the development of pre-reading or emergent literacy skills.

For example, as briefly outlined in Chapter 2, some studies have examined the influence of inattention on the development of emergent literacy skills. Giannopulu et al. (2008) found that for children aged 5 to 7 years, inattention was associated with lower scores on reading-related and cognitive tasks such as phonological awareness, vocabulary, letter recognition, and verbal short term memory. In addition, a study by Dally (2006)

found that inattentive behaviour in kindergarten disrupted the acquisition of phonological analysis abilities. Similarly, Walcott, Scheemaker, and Bielski (2010) found that attention problems in preschool negatively predicted phonemic awareness and letter naming scores one year later, even after controlling for initial language ability and preschool performance on these tasks. These findings suggest that early attention problems may interfere with the acquisition of some pre-reading skills.

However, other findings present contrasting conclusions. For example, Velting and Whitehurst (1997) found that whilst early inattention-hyperactivity was significantly related to early reading achievement, it was not significantly related to the development of pre-reading abilities. However, as noted by Spira and Fischel (2005), this finding may be due to the measure of behaviour used in Velting and Whitehurst's study. As inattention is generally more closely associated with children's reading skill than hyperactivity, a measure of inattention alone may be necessary in order to find a significant relationship with emergent literacy abilities. In a review of the literature, Spira and Fischel (2005) conclude that whilst research findings do not decisively support the hypothesis of pre-reading skills as mediator of the relationship between early behaviour problems and reading achievement, they also do not reject this model.

Aims and Hypotheses

As discussed, there is quite a significant literature to suggest that there are associations between children's classroom behaviour and their early reading development. However, few studies have examined the longitudinal influence of behaviour on the development of reading ability during the initial stages of reading instruction. In addition, very few studies have examined whether behavioural factors can explain variance in early

reading ability after accounting for reading-related and cognitive skills. Therefore, the current study examined whether children's behaviours could explain additional variance in early reading development after accounting for the cognitive and reading-related skills that are known to underpin children's reading acquisition. In addition, few studies have examined the influence of behavioural factors on the skills that underpin children's early reading development. Therefore, an additional aim was to examine the associations between children's behaviours and the development of pre-reading/emergent literacy skills.

It was expected that children's negative classroom behaviour would explain significant variance in their early reading ability after accounting for cognitive and reading-related skills. In addition, it was expected that negative behaviour would be associated with children's emergent literacy abilities, such as letter knowledge and phoneme awareness. However, in accordance with Grimm et al. (2010), of all the behavioural categories, hyperactivity/inattention was expected to be most closely associated with children's early reading skills. Finally, it was expected that children's pro-social behaviour would also show significant associations with their early reading performance.

The present study examined the influence of behavioural factors on the reading development of a sample of typically developing school children, where behavioural problems are often mild. It is likely that children with formal diagnoses of behavioural or emotional disorders will experience the greatest detriments to their reading progress; however it is important to examine whether children without behavioural diagnoses are still at risk of negative reading outcomes. In addition, rather than use cut-off points for behavioural or emotional problems, the current study investigated behavioural factors as continuous variables. Children were assessed on a range of cognitive and reading-

related skills at two time points: first, at school entry (T1) and second, after 18 weeks of reading instruction (T2). Children's word reading ability was also assessed at T1 and T2, and again one year later (T3). In addition to this, children's behaviours were assessed by their class teachers at both T2 and T3.

Method

Participants

The participants in this study were exactly the same as in Chapter 4. Consent from the head teacher and class teachers were obtained prior to testing.

Materials

Cognitive and reading-related skills

At T1 and T2, children were assessed on exactly the same measures as in Chapter 4. At T3, children were assessed only on standardised word reading ability, using the same assessment as in Chapter 4 (see Chapter 4 for details of the assessments used).

Behaviour

Children's behaviour was assessed using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) at both T2 and T3. The SDQ is a behavioural screening tool used with children aged 3 to 16 years, and was completed by class teachers for each child. Twenty five items are used to assess children's psychological attributes/behaviours. These are divided into four negative behaviour scales: emotional symptoms (5 items), conduct problems (5 items), hyperactivity/inattention (5 items), peer relationship problems (5 items), and one positive behaviour scale: pro-social behaviour (5 items).

Each item in the questionnaire consists of a behavioural statement (e.g. 'Restless,

overactive, cannot stay still for long'), with three possible Likert-type responses: 'not true', 'somewhat true', and 'certainly true'. The teacher (or other informant) is required to select the most appropriate response based on the child's behaviour over the previous six months. 'Not true' responses are assigned a score of zero, 'somewhat true' responses are assigned a score of one, and 'certainly true' responses are assigned a score of two. The questionnaire is comprised of some negatively worded items (as in the example above), and some positively worded items (e.g. 'Sees tasks through to the end, good attention span'); therefore, scores for the positive items are reversed. The raw scores are summed for each sub-scale to give an indication of the child's level of each behaviour. The four negative behaviour scales can also be summed in order to give an indication of the child's total level of negative behaviour.

The SDQ is a widely used tool in developmental research, and has been found to compare well to other childhood behavioural questionnaires (Goodman, 1997; Goodman & Scott, 1999). In addition, it has proved to be an effective tool in predicting referrals to childhood mental health centres (Goodman, Renfrew, & Mullick, 2000), indicating high levels of validity. In the current study, using Cronbach's alpha values, the SDQ sub-scales showed high levels of internal consistency: all alpha values at both T2 and T3 were above $\alpha = .72$.

However, it should be noted that some research suggests that the five SDQ sub-scales should be used cautiously with low-risk samples (Goodman, Lamping, & Ploubidis, 2010). Goodman et al. (2010) suggest that it may be more appropriate and valid to use an alternative three-subscale division of the SDQ for general population samples, consisting of 'internalising problems' (combining emotional and peer relationship problems scales, 10 items), 'externalising problems' (conduct problems and

hyperactivity/inattention, 10 items), and the pro-social scale (5 items). Therefore, the current study included the three-subscale division measures as well as the original five subscales. In this study, using Cronbach's alpha values, the internalising and externalizing scales showed high levels of internal consistency: all alpha values at both T2 and T3 were above $\alpha = .82$.

Procedure

The cognitive and reading-related tasks were administered in exactly the same way as in Chapter 4. Class teachers completed and returned the SDQs for each child within a month of the child completing the reading assessments. Ethical approval was sought and granted from the Department of Psychology Ethics Committee at the University of Hull.

Results

The results are divided into four sections: 1) SDQ sub-scale distributions, and correlations between SDQ scores at T2 and T3, 2) Correlations between behaviour, reading, and reading-related/cognitive skills, 3) Predicting emergent reading skills using behaviour, 4) Predicting reading ability using reading-related/cognitive skills and behaviour.

1) SDQ distributions and correlations between T2 and T3 scores.

Skewness and kurtosis are illustrated for each SDQ scale (see Table 5.1). Regarding the five sub-scales, at both T2 and T3, the following sub-scales had skewed score distributions that were significantly different from the norm ($p < .05$), with scores skewed towards the lower end of the scale: emotional problems, conduct problems, and peer relationship problems. In addition, at T2, the emotional problems and conduct problems sub-scales had significant levels of kurtosis ($p < .05$), indicating a pointy distribution of scores. At T3, the following distributions had significant levels of kurtosis ($p < .05$): conduct problems, hyperactivity/inattention, and pro-social behaviour.

Regarding total negative behaviours, the total difficulties scale showed significant levels of skewness and kurtosis at both T2 and T3 ($p < .05$), with scores skewed towards the lower end of the scale. Finally, regarding the internalising-externalising dimensions, both scales also showed significant levels of skewness and kurtosis at both T2 and T3 ($p < .05$), with scores skewed towards the lower end of the scale. The skewed distributions

in the current study are not ideal; however, they are to be expected when assessing a typically developing sample of children, with mild levels of negative behaviour.

Table 5.1. Descriptive statistics for the SDQ sub-scales

Assessment	Mean	S.D.	Skewness	Kurtosis
T2				
Total Difficulties	7.20	5.69	1.10	1.42
Hyperactivity/Inattention	3.21	2.66	.45	-.26
Conduct problems	.92	1.71	2.37	6.18
Emotional problems	1.41	2.01	1.63	2.22
Peer relationship problems	1.66	1.89	1.11	.77
Pro-social behaviour	7.70	2.61	-.74	-.71
Internalising behaviour	3.07	3.40	1.34	1.18
Externalising behaviour	4.13	3.84	1.01	.87
T3				
Total Difficulties	10.83	8.18	.73	-.30
Hyperactivity/Inattention	4.26	3.40	.19	-1.26
Conduct problems	1.99	2.78	1.56	1.35
Emotional problems	2.67	2.33	.74	.15
Peer relationship problems	1.92	2.03	1.12	.69
Pro-social behaviour	6.86	3.01	-.42	-1.14
Internalising behaviour	4.58	3.83	1.00	1.10
Externalising behaviour	6.25	5.76	.80	-.42

A number of children in this study had a different class teacher at T3 than at T2. Therefore, correlations were carried out to examine the associations between SDQ scores at T2 and T3, in order to assess whether SDQ scores were consistent across informants and over time (Table 5.2).

Table 5.2. Correlations between T2 and T3 SDQ scores

	T3 HI	T3 CP	T3 EP	T3 PR	T3 PS	T3 TD	T3 IB	T3 EB
T2 Hyp./Inattention	.73**							
T2 Conduct		.40**						
T2 Emotional			.32**					
T2 Peer				.60**				
T2 Pro-social					.45**			
T2 Total difficulties						.53**		
T2 Internalising							.45**	
T2 Externalising								.65**

Note: HI = Hyperactivity/Inattention, CP = Conduct problems, EP = Emotional problems, PR = Peer relationship problems, PS = Pro-social behaviour, TD = Total Difficulties, IB = Internalising behaviour, EB = Externalising behaviour; * = p < .05, ** = p < .01.

Regarding the five SDQ sub-scales, scores on all sub-scales at T2 were significantly correlated with scores at T3. The most consistent SDQ ratings across informant and over time were for hyperactivity/inattention and peer relationship problems, and the least consistent ratings were for emotional problems and conduct problems. Regarding total negative behaviours, total difficulties scores at T2 were significantly and closely

correlated with scores at T3. Finally, regarding the internalising-externalising dimensions, whilst scores at T2 were significantly correlated with scores at T3 for both scales, the closest association over time was for externalising behaviour.

2) Correlations between behaviour, reading, and reading-related/cognitive skills.

Correlations were carried out to examine the concurrent relationships between children's SDQ scores and their reading-related/cognitive skills at T2 (Table 5.3).

Table 5.3. Correlations between T2 SDQ scores and T2 reading-related / cognitive skills.

	HI	CP	EP	PR	PS	TD	IB	EB
Letter knowledge	-.35**	-.00	-.00	-.00	.20	-.16	-.00	-.24*
Rhyme awareness	-.10	.30**	-.01	.03	-.14	.05	.01	-.06
Phoneme Analysis	-.26*	-.05	-.08	.01	.14	-.16	-.04	-.20
Phoneme Synthesis	-.45**	-.02	-.03	-.24*	.18	-.31**	-.15	-.32**
Vocabulary	-.10	.17	-.02	.07	-.10	.02	.03	.01
Short term memory	-.34**	-.21*	.01	-.21*	.22*	-.29**	-.12	-.33**
Visual Disc.	-.04	-.04	-.06	-.04	-.02	-.06	-.06	-.04

Note: HI = Hyperactivity/Inattention, CP = Conduct problems, EP = Emotional problems, PR = Peer relationship problems, PS = Pro-social behaviour, TD = Total difficulties, IB = Internalising behaviour, EB = Externalising behaviour; * $p < .05$, ** $p < .01$.

Regarding the five sub-scales, children's level of hyperactivity/inattention showed the strongest and most consistent associations with their concurrent cognitive and reading-

related skills. In particular, hyperactivity/inattention was associated with children's letter sound knowledge, phoneme analysis, phoneme synthesis, and verbal short term memory; the closest association was with phoneme blending ability. In addition, pro-social behaviour showed a positive relationship with verbal short term memory span, but was not significantly related with any other skill. Peer relationship problems were associated with children's phoneme blending ability and verbal short term memory span, but not with any other cognitive or reading-related skill. Whilst conduct problems were negatively associated with children's short term memory, they were positively associated with rhyme awareness. Finally, emotional problems were not significantly associated with children's ability on any cognitive or reading-related task.

Regarding children's total negative behaviour, the total difficulties score was associated with phoneme blending ability and verbal short term memory, but not with any other skill. Finally, regarding the internalising-externalising dimensions, whilst externalising behaviour was negatively associated with letter knowledge, phoneme synthesis, and verbal short term memory, internalising behaviour was not associated with any cognitive or reading-related skill. Of all the cognitive abilities, the SDQ scores correlated most with short term memory, followed by phoneme synthesis, followed by letter sound knowledge.

Correlations were then carried out to examine the associations between children's behaviours and their concurrent and later reading ability, with separate analyses conducted for T2 and T3 SDQ scores (Table 5.4).

Table 5.4. Correlations between T2 or T3 SDQ scores and T2 or T3 reading ability

T2 SDQ scores								
	HI	CP	EP	PR	PS	TD	IB	EB
T2 reading	-.32**	.02	-.15	-.10	.07	-.23*	-.14	-.22*
T3 reading	-.51**	-.19	-.15	-.18	.22	-.43**	-.19	-.44**
T3 SDQ scores								
	HI	CP	EP	PR	PS	TD	IB	EB
T3 reading	-.53**	-.28*	-.14	-.24*	.27*	-.42**	-.22	-.45**

Note: HI = Hyperactivity/Inattention, CP = Conduct problems, EP = Emotional problems, PR = Peer relationship problems, PS = Pro-social behaviour, TD = Total difficulties, IB = Internalising behaviour, EB = Externalising behaviour; * $p < .05$, ** $p < .01$.

Regarding the five SDQ sub-scales, children's hyperactivity/inattention at T2 was associated with both their concurrent and later word reading ability; the closest relationship was with T3 reading skill. However, none of the other four sub-scales at T2 were significantly associated with concurrent or later reading ability. Regarding total negative behaviour, total difficulties scores at T2 were significantly associated with children's concurrent and later word reading skill; the closest association was with T3 reading ability. Finally, regarding the internalising-externalising dimensions, whilst children's externalising behaviour at T2 was significantly associated with both concurrent and later word reading, their internalising behaviour was not.

Regarding children's behaviour at T3, children's conduct problems, hyperactivity/inattention, peer relationship problems, and pro-social behaviour were all significantly correlated with their concurrent reading ability. However, the closest

association was with hyperactivity/inattention. Regarding total negative behaviour, the total difficulties score was also closely associated with children's concurrent reading skill. Finally, regarding the internalising-externalising dimensions, whilst children's externalising behaviour was significantly associated with their concurrent reading ability at T3, their internalising behaviour was not.

3) Predicting emergent reading skills using behaviour

Hierarchical regression analyses were carried out to examine whether children's behaviour at T2 could explain variance in their concurrent reading-related skills after accounting for previous abilities at T1. However, as children showed floor effects at T1 on measures of phoneme analysis and phoneme synthesis (see Chapter 4), these were not included in the analyses. In addition, in the correlational analyses (Tables 5.3 and 5.4), the five SDQ subscales, particularly hyperactivity/ inattention, showed closer relationships with reading-related/cognitive skills and reading ability than the total difficulties score or the internalising-externalising dimensions. Therefore, in all following analyses, the five sub-scales were used to predict reading-related skills/reading ability rather than the internalising-externalising dimensions or total difficulties score.

Table 5.5. Predicting T2 letter sound knowledge using T1 letter sound knowledge and T2 behaviour

Criterion variable: T2 letter sound knowledge			
Enter	R²	Finalβ	P
1. T1 Letter knowledge	.15	.39	.00
2. T2 Hyp/Inattention		-.37	.01
T2 Conduct		.16	.25
T2 Emotional		-.10	.42
T2 Peer		.10	.47
T2 Pro-Social	.28	.12	.39

After accounting for previous letter sound knowledge at T1, children's level of hyperactivity/inattention explained significant additional variance in their concurrent letter sound knowledge at T2 (Table 5.5). However, none of the other four SDQ sub-scales explained additional variance.

Table 5.6. Predicting T2 rhyme awareness using T1 rhyme awareness and T2 behaviour

Criterion variable: T2 rhyme awareness			
Enter	R²	Finalβ	P
1. T1 Rhyme awareness	.24	.49	.00
2. T2 Hyp/Inattention		-.23	.09
T2 Conduct		.35	.01
T2 Emotional		-03	.78
T2 Peer		-.11	.40
T2 Pro-Social	.32	-.05	.74

After accounting for previous rhyme awareness at T1, children's level of conduct problems explained significant additional variance in their concurrent rhyme awareness at T2 (Table 5.6). However, none of the other four SDQ sub-scales explained additional variance.

4) Predicting reading ability using reading-related / cognitive skills and behaviour.

Regression analyses were carried out to examine whether children's behaviour could explain variance in their T3 reading ability after accounting for previous reading skill, with separate analyses conducted for T2 and T3 SDQ scores (Tables 5.7 & 5.8).

Table 5.7. Predicting T3 word reading skill using T2 reading skill and T2 behaviour

Criterion variable: T3 word reading			
Enter	R²	Finalβ	P
1. T2 Word reading	.48	.69	.00
2. T2 Hyp/Inattention		-.36	.00
T2 Conduct		-.02	.83
T2 Emotional		-.14	.16
T2 Peer		.05	.60
T2 Pro-Social	.57	-.04	.75

After accounting for previous reading ability at T2, children's level of hyperactivity/inattention explained significant additional variance in their later reading skill at T3. However, none of the other four SDQ sub-scales explained significant additional variance.

Table 5.8. Predicting T3 word reading skill using T2 reading skill and T3 behaviour

Criterion variable: T3 word reading			
Enter	R²	Finalβ	P
1. T2 Word reading	.47	.69	.00
2. T3 Hyp/Inattention		-.44	.00
T3 Conduct		.04	.79
T3 Emotional		.01	.91
T3 Peer		-.04	.70
T3 Pro-Social	.58	-.12	.37

After accounting for previous reading ability at T2, children's level of hyperactivity/inattention explained significant additional variance in their concurrent reading ability at T3. However, none of the other four SDQ sub-scales explained significant additional variance.

Hierarchical regression analyses were then carried out to examine whether children's classroom behaviour at T2 could explain variance in their concurrent or later (T3) reading skill after accounting for T2 cognitive and reading-related abilities. The cognitive and reading-related skills were entered into the analyses in the same order as in Chapter 4. Due to the sample size, only one measure of phoneme awareness was entered into the analyses in order to maintain statistical power (as a limited number of predictors could be used). As phoneme synthesis was found to show more consistent/closer associations with children's word reading skill in Chapter 4, phoneme synthesis was entered as a measure of phoneme awareness, rather than phoneme

analysis. In addition, each behavioural factor was entered in separate analyses in order to maintain statistical power.

Table 5.9. Predicting T2 word reading skill using T2 reading-related/cognitive skills and behaviour

Criterion variable: T2 word reading			
Enter	R²	Finalβ	P
1. T2 Letter knowledge	.37	.61	.00
2. T2 Rhyme awareness		.07	.44
T2 Phoneme synthesis	.52	.42	.00
3. T2 Vocabulary		.04	.68
T2 Short term memory		.23	.01
T2 Visual discrimination	.57	.09	.32
4. T2 Hyp/Inattention	.57	.02	.80
4. T2 Conduct	.57	.09	.32
4. T2 Emotional	.58	-.14	.07
4. T2 Peer	.57	.04	.65
4. T2 Pro-Social	.58	-.11	.18

After accounting for children's cognitive and reading-related skills, none of the five SDQ sub-scales explained significant additional variance in children's concurrent reading ability at T2 (Table 5.9).

Table 5.10. Predicting T3 word reading skill using T2 reading-related/cognitive skills and behaviour

Criterion variable: T3 word reading

Enter	R²	Finalβ	P
1. T2 Letter knowledge	.43	.66	.00
2. T2 Rhyme awareness		-.03	.74
T2 Phoneme synthesis	.55	.43	.00
3. T2 Vocabulary		.08	.38
T2 Short term memory		.27	.01
T2 Visual discrimination	.61	.05	.56
4. T2 Hyp/Inattention	.63	-.17	.07
4. T2 Conduct	.50	-.16	.07
4. T2 Emotional	.48	-.03	.70
4. T2 Peer	.48	-.08	.35
4. T2 Pro-Social	.50	.15	.08

After accounting for children's cognitive and reading-related skills, none of the five SDQ subscales explained significant additional variance in children's later reading ability (Table 5.10).

Discussion

The aim of this study was to examine the associations between children's classroom behaviour and the development of their early reading skill. More specifically, the study examined whether behavioural factors would predict children's early reading ability after accounting for cognitive and reading-related skills. An additional aim was to examine the relationships between children's behaviour and the development of their emergent reading-related abilities. Results showed that of all the behavioural categories assessed, hyperactive/inattentive behaviour showed the closest and most consistent associations with children's emergent reading-related skills and early reading ability. Furthermore, children's hyperactivity/inattention explained significant variance in their reading ability even after accounting for previous reading skill. However, after accounting for the reading-related and cognitive skills known to underpin reading acquisition, behavioural factors did not explain any significant additional variance in children's early reading performance.

The current study assessed children's behaviour using both the five sub-scale (i.e. hyperactivity/inattention, conduct problems, emotional problems, peer relationship problems, pro-social behaviour) and three sub-scale (i.e. internalising behaviour, externalising behaviour, pro-social behaviour) compositions of the SDQ (Goodman, 1997; Goodman et al., 2010). Regarding the internalising-externalising dimensions, whilst children's externalising behaviour was negatively associated with some emergent reading-related skills and with early reading ability, children's internalising behaviour was not. However, a pattern emerged in the results suggesting that hyperactivity/inattention showed closer associations with early reading skills than a composite measure of both hyperactivity/inattention and conduct problems (i.e.

externalising behaviour). Therefore, the current study focused mainly on the influence of the five separate sub-scale behaviours of the SDQ, rather than on the internalising-externalising dimensions. This afforded a more focused examination of the specific behaviours relating to early reading development than a composite measure would allow.

As stated, the hyperactivity/inattention scale showed the closest and most consistent associations with children's early reading skill. In addition, hyperactivity/inattention was the only behavioural category to explain significant additional variance in children's reading skill after accounting for previous reading ability. These findings are consistent with previous studies indicating a close relationship between inattentive behaviour and children's reading development in the early years of school (Alexander et al., 1993; Duncan et al., 2007; Grimm et al., 2010; Rabiner et al., 2000; Rabiner et al., 2004; Romano et al., 2010; Rowe & Rowe, 1992). Furthermore, the current results are consistent with research suggesting that attention problems are more influential than other negative behaviours in predicting changes in early reading ability (Grimm et al., 2010).

It is likely that children demonstrating inattentive or hyperactive behaviour are disadvantaged during early reading instruction as they will struggle to engage in and concentrate on learning activities for periods of time. However, in the current study, hyperactivity/inattention did not explain additional variance in children's reading skill after accounting for emergent reading-related and cognitive abilities. This suggests that the relationship between hyperactivity/inattention and early reading skill may be mediated in some way by the influence of hyperactive/inattentive behaviour on the development of emergent reading-related skills. Indeed, in the current study, children's

level of hyperactivity/inattention showed close associations with a number of emergent reading-related abilities. Specifically, hyperactive/inattentive behaviour was negatively related to children's letter sound knowledge, phoneme analysis ability, phoneme synthesis ability, and verbal short term memory; the closest association was with phoneme blending skill. Furthermore, hyperactivity/inattention explained significant additional variance in children's letter sound knowledge after 18 weeks of instruction even after accounting for letter sound knowledge at school entry. These findings are consistent with previous results suggesting that inattentive behaviour has a negative influence on the development of some emergent reading-related skills, such as letter recognition and phonological awareness (e.g. Dally, 2006; Giannopulu et al., 2008; Walcott et al., 2010). Indeed, it may be that hyperactive/inattentive behaviour has a detrimental influence on the development of some emergent reading-related skills, which may consequentially cause slower reading progress.

Interestingly, hyperactive/inattentive behaviour was most closely associated with the emergent reading-related and cognitive skills that the children were taught to use for early word reading. In this study, children were taught to read with synthetic phonics, a method of reading instruction that teaches children to read using sounding and blending techniques. In an analysis of the skills that underpin early word reading when children are taught to read with this approach, letter sound knowledge, phoneme awareness (particularly phoneme synthesis), and verbal short term memory were most closely associated with early word reading skill (see Chapter 4). Therefore, the current findings illustrate that hyperactive/inattentive behaviour has the greatest detrimental effect on the emergent reading-related skills that children are currently developing most (see Table 4.1, Chapter 4) and which children are relying upon most for early word reading. Indeed, it may be that the children demonstrating hyperactive/inattentive behaviour in

this study struggled to concentrate or engage in learning activities that taught them letter sounds or how to blend grapheme-phoneme correspondences to read. Alternatively, if children were being taught to read using rhyme-analogy strategies or to recognise words from context, rhyme awareness and vocabulary skills may be developing at a greater rate, and therefore hyperactive/inattentive behaviour may be a stronger predictor of the development of these skills. However, further research is necessary to examine these possibilities.

Regarding the influence of conduct problems on children's early reading development, this behavioural category showed less consistent relationships with children's reading skill. Whilst children's conduct problems assessed at T3 did show a significant association with their concurrent reading ability, this association was weak in strength. In addition, children's conduct problems assessed after 18 weeks of instruction (T2) were not significantly associated with either concurrent or later reading performance. Finally, conduct problems did not explain variance in children's early reading skill after accounting for previous reading ability or emergent reading-related skills. These findings are consistent with previous research suggesting only a weak association between conduct problems and early reading skill (Cornwall & Bawden, 1992; Hooper et al., 2010).

Previous research suggests that the association between conduct problems and reading ability may strengthen over time (Arnold, 1997; Miles & Stipek, 2006). For example, Miles and Stipek (2006) found that whilst aggressive behaviour was not associated with children's literacy skill in kindergarten or 1st grade, it was associated with literacy achievement in 3rd and 5th grades. As the relationship between conduct problems and reading skill only became apparent at the final stage of testing in the current study

(when the children were in Year 1), the current results also suggest that there may be age effects in the relationship between conduct problems and reading. One possible explanation for this finding may be that children become more aware of their reading difficulties with age, leading to frustration and engagement in acting-out behaviour as a consequence. Further research could pursue this suggestion.

Regarding the relationship between conduct problems and emergent reading-related skills, some surprising findings emerged. Whilst children's conduct problems were negatively associated with verbal short term memory span, they were positively associated with rhyme awareness. Furthermore, children's conduct problems explained significant additional variance in their rhyme awareness after 18 weeks of instruction even after accounting for rhyme awareness skill at school entry. It is presently unclear as to why conduct problems were positively associated with children's early rhyme awareness; therefore, further research needs to examine these associations further.

Children's emotional problems did not show any significant associations with their early reading ability or emergent reading-related skills. This contrasts to previous research indicating the presence of a relationship between emotional problems and reading performance during the early years of school (Halonen et al., 2006; Hooper et al., 2010; Ialongo et al., 2001; Lim & Kim, 2011; Massetti et al., 2008). However, the current findings are consistent with studies suggesting that the association is only weak in strength (Grimm et al., 2010; Hooper et al., 2010) or that there is no significant association between emotional problems and early reading ability (Kempe et al., 2011; Miller et al., 2005).

It may be that the relationship between emotional problems and reading skill only emerges as children progress further through school. For example, Ackerman et al. (2007) found that whilst children's emotional distress was not associated with their reading problems in 3rd grade, it was associated with reading difficulties in 5th grade. Ackerman et al. (2007) suggest that emotional problems may be particularly related to the reading skill of older children because reading difficulties become more pronounced with age and because children develop more mature concepts of their reading ability as they progress through school. Therefore, as a consequence of recognised reading difficulties or failure, children may develop negative emotions during the later stages of primary school.

Peer relationship problems also showed weak associations with children's early reading skill. Whilst children's peer relationship problems at T3 were significantly associated with their concurrent reading skill, the association was weak. In addition, children's peer relationship problems after 18 weeks of instruction were not associated with their concurrent or later reading ability. Finally, peer relationship problems did not explain significant additional variance in children's reading skill after accounting for previous reading ability or emergent reading-related skills. These findings contrast to previous studies indicating that early social problems are closely related to children's early reading performance (e.g. Benner et al., 2005; Kempe et al., 2011). However, they are more in accordance with previous findings suggesting no significant evidence of a relationship between social competency and emergent literacy ability or later reading achievement (Duncan et al., 2007; Lonigan et al., 1999).

In the current study, the relationship between peer relationship problems and reading skill only emerged during the final stage of testing (when the children were in Year 1).

Therefore, this suggests that there may be age effects in the relationship between peer relationship problems and reading achievement, with the association appearing to strengthen with age. Indeed, it is possible that these factors become more closely associated as children progress through school and develop more mature concepts of their social status and quality of peer relationships in comparison to others. Indeed, if a child is experiencing peer relationship problems, this may have a detrimental effect on their emotional wellbeing and confidence, and consequently result in less concentration during learning activities due to other, emotional, pre-occupations (e.g. Flook et al., 2005). However, further research needs to examine whether there are age effects in the association between peer relationship problems and reading skill.

Regarding associations with emergent reading-related skills, children's peer relationship problems were negatively, albeit weakly, associated with their phoneme synthesis ability and verbal short term memory span. Interestingly, similar to the associations between emergent reading-related skills and hyperactivity/inattention, these are the skills that children were taught to utilise for early word reading in this study. Therefore, it is possible that peer relationship problems may be particularly detrimental for the development of the reading-related skills that children are taught to use during early reading instruction. For example, as the systematic phonics method was delivered on a whole class basis in the current study, some children may have benefited from peer encouragement during instruction on sounding and blending techniques. A child with peer relationship problems may have received less support from peers due to having a restricted social network (e.g. Kempe et al., 2011), and consequently progressed more slowly. Further research could examine the influence of peer relationship problems on emergent reading skills as children learn to read by methods of instruction which rely to varying degrees on peer co-operation and collaboration.

Regarding the influence of pro-social behaviour on early reading development, this category of positive behaviour was only weakly associated with children's early reading skills. Whilst pro-social behaviour was positively associated with children's concurrent reading skill at T3, the association was weak. In addition, children's pro-social behaviour after 18 weeks of instruction was not significantly related to either concurrent or later reading ability, and did not explain variance in children's reading skill after accounting for previous ability or emergent reading-related skills. Regarding associations with emergent reading-related abilities, pro-social behaviour only showed a significant, albeit weak, association with verbal short term memory span. These findings contrast with previous research indicating that pro-social behaviour predicts early reading performance (Miles & Stipek, 2006; Romano et al., 2010).

As some children had a different class teacher for each SDQ assessment, consistency of SDQ ratings across informant and over time was assessed. Results showed that scores on all five sub-scales assessed after 18 weeks of instruction were significantly associated with SDQ ratings one year later. This indicates that the SDQ ratings were consistent across the stages of the study. However, interestingly, the most consistent scores appeared to be for hyperactivity/inattention and peer relationship problems. It may be that children's levels of these behaviours were the most consistent over time, and underwent the least amount of change. Alternatively, it may be that these types of behaviours are more obvious to class teachers, and easier to rate than behaviours such as emotional problems, which may be less obvious or disruptive in the classroom.

Educational implications

The current results suggest a number of educational implications. Firstly, as hyperactive/inattentive behaviour appears to be closely associated with children's early reading development, it may be possible to use behavioural assessments in order to identify children who may be less focused during initial reading instruction, and therefore potentially at greater risk for early underachievement in reading. This may enable the possible remediation of attentional difficulties before they have a strong detrimental effect on early reading progress. In addition, the current results suggest that it may be beneficial for early reading interventions to focus on remediating young children's hyperactive/inattentive behaviour as well as on developing the reading-related skills that are important for early reading acquisition. Indeed, as hyperactive/inattentive behaviour appears to be closely associated with early reading abilities, interventions targeting only reading-related skills, without simultaneously attending to a child's behaviour problems, may prove less effective. However, there is currently a shortage of studies comparing reading only interventions with reading interventions plus behavioural supports (Rivera, Al-Otaiba, & Koorland, 2006). Therefore, it is currently unclear whether reading interventions are more effective when combined with strategies to reduce hyperactivity/inattention. However, there is some evidence to suggest that early attention problems can be remediated or reduced. For example, Rabiner, Murray, Skinner, and Malone (2010) found that computerised attention training and computer assisted instruction produced a decline in teacher rated attention problems for inattentive first graders. Future research needs to examine the effectiveness of behavioural interventions for improving early reading progress.

Limitations and suggestions for future research

Some limitations of the current study should be noted. Firstly, there are some limitations regarding the measures used to assess children's early classroom behaviour. Several of the SDQ sub-scales in this study showed significant levels of skewness and kurtosis. Whilst this is common when assessing the behavioural characteristics of a typically developing sample of children, it is not ideal. If some of the scale distributions had shown greater levels of variance, the associations between behaviour and reading skills may have been stronger. In addition, it is possible that the hyperactivity/inattention scale showed closer associations with early reading ability because it was not significantly skewed, and therefore had greater variance. It is also possible that the behavioural assessment used in the current study may not have been sensitive enough to capture variation among typically developing children. Indeed, as previously stated, Goodman et al. (2010) suggest that the SDQ sub-scales should be used cautiously with low-risk samples. The development of more sensitive behavioural assessments which can be used with typically developing children would therefore be advantageous to study the influence of typical classroom behaviours on children's reading development and learning in education.

Although the measure of hyperactivity/inattention was closely related to children's early reading abilities, it is possible that using a measure of inattention alone may have produced stronger associations. For example, previous studies indicate that inattention is more closely associated with children's reading ability than hyperactivity (e.g. Merrell & Tymms, 2001; Giannopulu et al., 2008; Willcutt et al., 2007; see Chapter 7 for a more in-depth review). Therefore, it is possible that a measure of inattention alone may have predicted variance in children's reading ability even after accounting for

reading-related and cognitive skills. Further research is necessary to examine this possibility.

Another limitation concerns the use of informant-based measures of behaviour. As noted by Adams and Snowling (2001), it is difficult to rule out the presence of a 'halo effect' when using informant-based ratings. For example, teachers may view the behaviour of children who underperform academically more negatively than the behaviour of high achievers, whose negative behaviour may be overlooked. In order to eliminate this possibility, future research could use direct measures of behavioural data, rather than informant based ratings.

As stated in Chapter 4, the current study assessed children in a single school; therefore, further work is necessary to see if the current findings can be generalised. In addition, the school involved in the current study was from an area of low socioeconomic status (SES). Therefore, further work is necessary to see if the current findings can be generalised to children from areas of higher SES. However, as stated in Chapter 4, including children from a low SES area is advantageous in some respects. Children from low SES areas typically show more delayed acquisition of literacy skills from a very young age (Duncan & Seymour, 2000); therefore, it is important to examine the influence of behaviour on early reading skill for those who may already need the most support during the early years of school. However, interestingly, research suggests that there may be SES effects on the influence of behavioural problems on children's reading development. Lonigan et al. (1999) found that the association between inattention and other problem behaviours with emergent literacy skills was generally stronger for middle income children than low income children. Therefore, it is possible that the relationships between behaviour and early reading ability may have been

stronger if the children were from a higher SES area. Finally, children in the present study received phonics instruction largely on a whole class basis, with very little individual or small group teaching (although small group teaching was used more often in Year 1). However it may be the case that hyperactivity/inattention has a greater influence in large class settings than in smaller group settings, where children receive more individual support and greater attention. Further research is necessary to examine the extent to which learning environment influences the relationship between behaviour and early reading acquisition.

Conclusion

The current study highlights the influence of early classroom behaviour on the development of children's emergent reading-related skills and reading ability. In particular, findings suggest that hyperactive/inattentive behaviour may have a detrimental effect on early reading skill, possibly through its influence on the development of emergent reading-related skills such as letter sound knowledge and phoneme awareness. The results suggest that it may be beneficial to incorporate strategies to reduce children's hyperactivity/inattention in early reading interventions.

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CHAPTER 6: COGNITIVE AND MOTIVATIONAL INFLUENCES ON READING: THE NEED FOR A DOMAIN SPECIFIC APPROACH
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Abstract

This study examined the importance of both cognitive and motivational factors for children's reading attainment. Furthermore, the extent to which motivation needs to be studied from a domain specific perspective was examined: whether reading motivation (domain specific) or school motivation (general) contributes to children's reading. One hundred and five children (44 boys, aged 8 - 9) completed assessments of reading skill, cognitive ability (verbal IQ, phonological decoding and memory) and questionnaires examining their motivation and competency beliefs for reading (domain specific) and school (general). It was found that both cognitive and motivational factors contributed unique variance to children's reading attainment; however only children's intrinsic reading motivation and reading competency beliefs explained variance in their reading skills; extrinsic reading motivation, school motivation and school competency beliefs did not. The importance of considering both cognitive and specific motivational factors for reading instruction and intervention are discussed.

Introduction

The following two experimental chapters examine the cognitive and non-cognitive factors that may influence children's later reading skills, specifically reading comprehension. As the main goal of reading is to understand and gain information from text (rather than to recognise individual words), it is important for research to examine the factors that influence children's reading comprehension, in addition to word reading skill.

As highlighted in previous chapters, a significant body of research has focused on the cognitive skills that support children's reading attainment (e.g. Kendeous et al., 2009; Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007; Share, 1995). However, as previously stated, this focus on cognitive ability has often being at the expense of understanding the role of non-cognitive influences, such as reading motivation. Researchers are become increasingly interested in the influence of motivation on children's reading skill, and studies show that children's motivation to read (Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004) is consistently associated with their reading performance. However, few studies have examined the relative influences of children's domain specific reading motivation and their motivation for schoolwork in general. In addition, few studies have examined the relative importance of cognitive and motivational factors for children's reading attainment. The current study therefore examined the influence of children's reading and school motivation after accounting for the cognitive skills most commonly associated with reading comprehension.

Reading comprehension and cognitive skills.

As outlined in Chapter 1, it is often argued that reading comprehension is underpinned by two main cognitive components: decoding skill and verbal ability. This idea stems from the simple view of reading (Hoover & Gough, 1990) where it is argued that in order to understand a text, a child must be able to read the individual words (phonological decoding skill) and understand the meaning (verbal ability). This model is often cited and studies have consistently shown that both skills are crucial for children's reading comprehension. For example, Kendeous et al. (2009) found that both oral language skills and decoding skills each independently predicted children's reading comprehension, illustrating that both were important contributors. Similarly, many other studies have shown that decoding skill (Nation & Snowling, 2004; Share, 1995) and verbal abilities (Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007) support children's reading comprehension.

However, as stated in Chapter 1, the simple view of reading has been criticised for being overly simplistic and in addition to decoding and verbal ability, working memory has been found to explain additional variance in reading comprehension after controlling for these cognitive skills (Cain et al., 2004). In addition, children with reading comprehension deficiencies have been found to perform poorly on verbal working memory tasks (Swanson & Berninger, 1995). Within school, working memory skills have been found to predict subsequent learning outcomes (Alloway & Alloway, 2010), and are related to children's attainment in core curriculum subjects such as English and Mathematics (e.g. Gathercole, Pickering, Knight, & Stegmann, 2004; St. Clair-Thompson & Gathercole, 2006). Whilst not exhaustive, it is generally

considered that these three abilities (decoding, verbal IQ and working memory) are the main cognitive skills that support children's reading comprehension.

Motivation

Increasingly however, researchers are examining the influence that motivation may have on children's reading and academic success. Motivation is generally considered to be a multi-dimensional construct that determines the extent to which an individual will choose to engage or persevere with a given activity. As outlined in Chapter 2, there are many different conceptualisations of motivation; however the theory which is most commonly used within reading research (e.g. Wang & Guthrie, 2004; Wigfield & Guthrie, 1997), and which will be focused on in the following studies is that of intrinsic and extrinsic motivation (Ryan & Deci, 2000). According to this theory, an individual is intrinsically motivated when they choose to engage in an activity because it is inherently interesting or enjoyable, and extrinsically motivated when they choose to engage in an activity because it leads to a separable outcome, such as gaining a reward or avoiding a punishment. Ryan and Deci (2000) suggest therefore that these dimensions of motivation provide different explanations as to why an individual will choose to engage in or avoid specific activities. It is suggested that intrinsically motivated individuals typically show greater persistence at a task than those who are extrinsically motivated who may be engaging in a task with disinterest or though coercion (Ryan & Deci, 2000). Interestingly, research shows that whilst intrinsic motivation is generally positively associated with academic achievement, extrinsic motivation is generally negatively associated with academic achievement (Lepper, Henderlong-Corpus, & Iyengar, 2005). These dimensions of intrinsic and extrinsic motivation can be further divided into more specific dimensions of motivation, based on

more precise reasons as to why an individual will to choose to engage in or persist with an activity. The current study will focus on the intrinsic-extrinsic model of reading motivation proposed by Wang and Guthrie (2004), in which three dimensions of intrinsic motivation (curiosity, involvement and challenge) and five dimensions of extrinsic motivation (recognition, grades, competition, social and compliance) are examined. These dimensions take into account children's achievement goals, performance goals and social reasons for reading, and have a strong theoretical basis as well as empirical support (Baker & Wigfield, 1999; Guthrie et al., 1999; Wang & Guthrie, 2004; Wigfield & Guthrie, 1997).

Motivation: Domain specificity

Researchers have argued that a domain specific approach to motivation is crucial as children's motivation across domains will vary (Wigfield, 1997). Indeed, there is research to suggest that children's academic motivation is school subject-specific, with children reporting distinct levels of motivation for different school subjects (Guay, Chanel, Ratelle, et al., 2010). For example, a child who enjoys reading may be motivated during class reading activities but they may not necessarily be motivated during maths lessons. Further support for between-subject differentiation of motivation comes from correlational data showing that children's motivation towards a specific school discipline (e.g. reading) is more closely associated with other motivational constructs (e.g. self-concept) corresponding to the same discipline than to other disciplines (Gottfried, 1985; Guay et al., 2010). Furthermore, Gottfried (1985) found that children's subject-specific intrinsic motivation is more closely associated with other corresponding subject-specific measures of motivation than with a measure of general academic motivation. In addition, subject-specific measures of motivation have been

found to be more strongly related to measures of children's class participation and educational aspirations within the same subject area than within different subject areas (Green, Martin, & Marsh, 2007). This suggests that it is important to consider children's motivation towards specific school subjects or disciplines when investigating the influences of motivation on educational attainment.

The majority of studies that have examined the relationship between reading motivation and reading attainment have focused on children's reading motivation specifically, rather than general school or academic motivation. However, Gottfried (1985) examined the relationships between reading motivation, general academic motivation and reading attainment. Results showed that both reading motivation and general academic motivation were associated with reading attainment, with general academic motivation showing slightly more consistent links with reading achievement across three studies. Similarly, Logan and Medford (2011) found that children's intrinsic school motivation was slightly more closely correlated with their reading attainment than their intrinsic reading motivation. As academic motivation has been found to be domain specific (Gottfried, 1985; Guay et al., 2010) it may be predicted that motivation relating to a particular domain would best predict attainment in that domain. However, with conflicting results in this area, there is a need for further research to examine this.

Reading motivation and reading attainment

As outlined in Chapter 2, many studies have investigated the association between children's reading motivation and reading attainment and have consistently found that these are significantly associated (Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004). Regarding intrinsic-extrinsic dimensions of motivation, Wang

and Guthrie (2004) found that whilst children's intrinsic reading motivation was positively correlated with their reading skill, their extrinsic reading motivation was negatively correlated with their reading skill. It was suggested that extrinsically motivated readers, who may be reading with disinterest or through coercion, use more surface level reading strategies for reading comprehension, such as guessing or memorisation of the text, rather than more deeper level strategies that result in better understanding of the text. Other studies have also highlighted the positive relationship between intrinsic reading motivation and reading attainment and the negative relationship between extrinsic reading motivation and reading (Becker et al., 2010; Mucherah & Yoder, 2008). Nevertheless, the relationship between intrinsic and extrinsic motivation is arguably complex: whilst these dimensions have been considered by some to relate to opposite ends of a single continuum, more recently it is acknowledged that children can be motivated to read for numerous reasons, both intrinsic and extrinsic. Indeed it may be that extrinsic motivation is not necessarily detrimental if coupled with high levels of intrinsic motivation. For example, as cited in Chapter 2, Park (2011) found that extrinsic motivation was negative for reading performance if the student also had low levels of intrinsic motivation; however, extrinsic motivation was positive for reading performance if levels of intrinsic reading motivation were moderate. In addition, McGeown, Norgate and Warhurst (2012) found that among very good readers with high intrinsic reading motivation, being extrinsically motivated to read was associated with even better reading attainment. Nevertheless, both studies highlighted the initial importance of high levels of intrinsic reading motivation for reading skill.

Reading and competency beliefs

As outlined briefly in Chapter 2, in addition to motivation, children's competency beliefs have also been found to be closely associated with their reading attainment (Aunola et al., 2002; Chapman & Tunmer, 1995; 1997; Katzir et al., 2009; Logan & Johnston, 2009; Logan & Medford, 2011). Competency beliefs refer to children's beliefs or self-estimates about how competent they are at a given activity, and have been found to be evident in children of even a very young age (Chapman, Tunmer, & Prochnow, 2000). Children's competency beliefs are subject-specific, with children reporting distinct competency beliefs in different school domains (Eccles, Wigfield, Harold, & Blumenfeld, 1993). In addition, the relationship between competency beliefs and reading attainment also appears to be domain specific, as children's competency beliefs in reading have been found to be more closely associated with their reading skill than their competency beliefs in school (Logan & Medford, 2011).

Children's reading self-concept has been found to predict variance in their reading comprehension skill after controlling for word reading and verbal ability (Katzir et al., 2009), suggesting an important role for this factor after accounting for cognitive skills. In addition, students' competency beliefs in reading have been found to be associated with their reading attainment even after controlling for other dimensions of intrinsic motivation (Bouffard et al., 2003). Interestingly, Chapman et al. (2000) found that young children who were poorer readers had more negative self-concepts of their general academic ability, suggesting that self-concepts of skills such as reading may influence the development of more general academic competency beliefs.

Recently there have been several studies that have examined the relative importance of both cognitive and motivational factors in children's reading. For example, Taboada, Tonks, Wigfield, and Guthrie (2009) found that both cognitive factors (background knowledge and student questioning) and intrinsic motivation explained independent variance in children's reading comprehension skill and reading growth, suggesting that both were important contributors. Taboada et al. (2009) suggested that rather than acting separately from cognitive skills, intrinsic motivation acts as an energiser that enables students to engage their cognitive resources and strategies, leading to improved reading comprehension performance. Unfortunately Taboada et al. (2009) did not include the cognitive skills typically found to support reading comprehension (verbal IQ, decoding and working memory); however the inclusion of both cognitive and motivational variables illustrated that both were important. Similarly, Anmarkrud and Braten (2009) found that reading task value (measuring the usefulness, importance and intrinsic interestingness of reading comprehension) predicted reading comprehension ability after variance explained by gender, reading achievement, topic knowledge and strategy use were controlled for. In addition, as stated earlier, Katzir et al. (2009) found that children's reading self-concept explained additional variance in reading comprehension after controlling for word reading skills and verbal ability.

However, research suggests that there may be individual differences in the importance of children's reading motivation for their reading comprehension skills. Logan, Medford, and Hughes (2011) found that after controlling for verbal IQ and decoding skill, intrinsic reading motivation did not explain additional variance in the reading comprehension skill of all readers. However, when children were identified as either

high or low ability readers, it was found that motivation predicted significant variance in reading performance and growth in reading skills in the low ability group (after controlling for cognitive ability). It was suggested that poor readers have a more difficult task when presented with the same reading assessment as their more able peers. Poor readers will be challenged more by the texts which will be slower and harder to read which may lead to greater levels of disengagement. It was suggested therefore that motivation may be particularly important for these children, as they will need to persevere more with difficult reading material.

Aims and Hypotheses

As highlighted, studies have begun to consider the role of both cognitive and motivational factors for children's reading development; albeit using different measures of cognitive ability and motivation. In the current study, the cognitive skills commonly associated with reading comprehension (verbal IQ, decoding and memory) were examined, in addition to children's motivation and competency beliefs (in both reading and school). As stated, previous studies have often included cognitive skills less commonly associated with reading (e.g., Anmarkrud & Braten, 2009; Taboada et al., 2009), therefore the current study included those skills which have been shown to explain the most variance in children's reading. If children's motivation or competency beliefs were found to predict additional variance in their reading after accounting for these skills, it would provide stronger evidence that these were important factors contributing to children's reading skill. Therefore, the first aim of the current study was to examine whether children's motivation or competency beliefs would predict additional variance in their reading skill after accounting for the cognitive skills commonly associated with reading.

In addition, previous studies which have investigated the associations between reading skill, motivation and competency beliefs have generally focused on subject specific motivation and competency beliefs (Chapman & Tunmer, 1997; Wang & Guthrie, 2004). Previous research studies have not considered how children's reading skill may relate to their motivation and competency beliefs towards schoolwork in general. Therefore a further aim of the study was to examine whether general levels of school motivation contribute to children's reading skill or whether reading motivation better explains variation in children's reading.

It was expected that children's motivation and competency beliefs would explain additional variance in their reading comprehension ability after accounting for the cognitive skills commonly associated with reading. However, it was expected that children's domain specific reading motivation and competency beliefs would be more closely associated with their reading skill than their motivation and competency beliefs regarding schoolwork in general.

Method

Participants

One hundred and five children (44 boys, 61 girls), with an average age of 8 years and 8 months (.28 SD) took part in this study. The children came from two cohorts of Year 4 classes within one large school (there were two classes in each cohort). All children included in the study had English as their first language. Percentage of free school meals was taken as an index of social deprivation: 47.4% of children were entitled to free school meals (national average was approximately 18%). The children came from a low achieving school as in the most recent review at the time of testing (2009), only 65% of children were achieving a Key Stage 2 Assessment Level of 4 or above (the national average that year was 80%). Consent from the head teacher and class teachers were obtained prior to testing.

Materials

Reading Comprehension

All children completed a group administered test measuring reading comprehension ability (Group Reading Test II, Macmillan Test Unit, 2000). Reading comprehension was measured using a 45 item sentence completion task, which requires children to select appropriate words to complete sentences with missing words (e.g., "The _____ was filled with hay", options: play, idea, barn, horse, table). Forms C and D of the test were given to children alternately based on where they were seated to prevent copying. The examiner read through the practice items with the children beforehand to ensure they understood the test. The assessment was completed in approximately 25 minutes,

although no time restriction was imposed for completion. Children's standardised scores were used for the purposes of analysis.

Verbal IQ

Verbal ability was assessed using the British Ability Scales II (Elliot et al., 1996) verbal similarities and word definition tests, a combination of which provides a measure of a child's verbal IQ. For the verbal similarities task, the child is required to state how three things are similar (e.g. peas, cabbage and carrots are all vegetables), and for the word definitions task, the child is required to explain the meanings of individual words (e.g. an assistant is someone who helps or works for someone else). These assessments were administered in accordance with manual guidelines and standardised scores were used for purposes of analysis.

Phonological decoding

Phonological decoding ability was assessed using a nonword reading task, which requires children to use phonics rules (i.e., application of letter-sound correspondences) in order to read nonsense words. The list of nonwords used in the assessment were: hast, kisp, mosp, drant, prab, sted, gromp, trolb, snid, twesk, tegwop, balras, molsmit, nolcrid, twamket, stansert, hinshink, chamgalp, kipthirm, sloskon, hognelkrag, bisgakdip, joklentos, shodrinmert, lomcrenkin, yimterbesfich, ronbikculgan, foyminlantos, basrelwathrin, wosraltsenbith. The first twenty nonwords were taken from Snowling, Stothard, and McLean (1996) Graded Nonword reading Test and a further ten words were added to remove the chance of ceiling effects. The children read five practice nonwords beforehand and were informed of any mispronunciations by the examiner. The percentage of nonwords read correctly was used for purposes of analysis.

Memory span

Children's memory span was assessed using the British Ability Scales II (Elliot et al., 1996) recall of digits forward and recall of digits backward tasks. The recall of digits forward task is an assessment of children's short term memory span, and requires the child to repeat sequences of digits of increasing length presented orally by the examiner. The recall of digits backward task is a measure of children's working memory span, and requires the child to repeat sequences of digits presented orally in reverse order. Children's scores on both tasks were converted to standardised scores and summed to form a composite measure of memory span. These tasks were administered in accordance with manual guidelines and standardised scores are shown below in the analysis.

Reading and School Motivation Questionnaire

All children completed a group administered 40 item questionnaire measuring motivation and competency beliefs for reading and school (see Appendix 3). Children's motivation was measured using a multi-dimensional approach, with dimensions proposed by Wang and Guthrie (2004). This questionnaire identifies three dimensions of intrinsic motivation: challenge (desire to work with/master complex materials), curiosity (desire to learn more/new things) and involvement (child's level of engagement/involvement) and five dimensions of extrinsic motivation: competition (desire to outperform others), recognition (desire for achievements to be recognised by others), grades (desire to achieve good marks), compliance (conformity to an external requirement) and social (social interactions involving books/school). These dimensions have a strong theoretical basis as well as empirical support (Wang & Guthrie, 2004; Wigfield & Guthrie, 1997). The motivation items were created so that they referred to either reading (16 items) or school (16 items). Competency beliefs were measured by

asking children to report their perceived level of reading skill (4 items for reading) or general academic ability (4 items for school). Children answered each statement using a 4 point Likert scale (definitely disagree, probably disagree, probably agree, and definitely agree). Half of the items were positively worded and half were negatively worded in order to prevent children from circling the same option without considering the question. In addition, three practice questions were given beforehand to ensure children understood the nature of the assessment. This questionnaire had been used in a previous study with a larger sample of pupils (Logan & Medford, 2011) and has shown high internal consistency using Cronbach's alpha: competency beliefs for reading (four items, $\alpha = 0.69$), competency beliefs for school (four items, $\alpha = 0.73$), motivation for reading (16 items, $\alpha = 0.79$) and motivation for school (16 items, $\alpha = 0.74$).

Procedure

Assessments were carried out in the third month of the children's fifth school year. All children completed the questionnaire and reading comprehension assessment within their classroom. This took approximately one hour. Following this, all children completed individual assessments (verbal IQ, phonological decoding and memory span) in a quiet room close to their classroom. Each individual assessment session lasted approximately 30 minutes. Ethical approval was sought and granted from the Department of Psychology Ethics Committee at the University of Hull.

Results

The results are separated into four sections: 1) Descriptive statistics for each measure, 2) Correlations between reading skill, cognitive abilities and reading and school motivation, 3) Predicting reading skill using cognitive skills and reading motivation, and 4) Predicting reading skill using cognitive skills and school motivation.

1) Descriptive statistics

Skewness and kurtosis values are illustrated for each assessment (see Table 6.1). Regarding the cognitive and reading assessments, none of the measures showed significant levels of skewness. However, the memory span composite and the non-word reading task showed significant levels of kurtosis ($p < .05$), indicating a pointy distribution of scores. Regarding the motivation and competency beliefs assessments, the following sub-scales showed significant levels of skewness ($p < .05$): intrinsic reading, intrinsic school, extrinsic reading, extrinsic school, with scores skewed towards the higher end of the scales. However, only one of these sub-scales showed a significant level of kurtosis ($p < .05$): extrinsic reading. Therefore, as a whole, the data were considered as suitable for further analysis.

Table 6.1. Descriptive statistics for each assessment

Assessment	Mean	S.D.	Skewness	Kurtosis
Reading comprehension (SS)	91.20	11.73	.36	.10
Verbal IQ (SS)	84.71	10.80	.34	.74
Memory (SS)	94.88	12.27	-.05	0.93
Nonword reading (%)	53.56	27.35	-.23	-1.02
Total motivation reading (raw)	45.93	7.59	-55	.00
Total motivation school (raw)	47.59	6.07	-.38	-.20
Intrinsic motivation reading (raw)	18.63	4.32	-.84	.42
Intrinsic motivation school (raw)	24.37	4.09	-.53	-.15
Extrinsic motivation reading (raw)	30.08	4.61	-.74	2.09
Extrinsic motivation school (raw)	23.21	3.54	-.74	-.02
Competency beliefs reading (raw)	11.98	2.60	.20	-.56
Competency beliefs school (raw)	11.07	2.71	.16	-.46

2) Correlations between reading skill, cognitive abilities and reading and school motivation

Correlations were carried out to examine the strength of association between reading attainment, cognitive skills (verbal IQ, decoding, memory) and motivational factors for reading and school (motivation (intrinsic/extrinsic), competency beliefs).

Table 6.2. Associations between reading skill, cognitive and motivational factors

	1	2	3	4	5	6	7	8	9	10	11
Reading	.56**	.60**	.52**	.21	.27*	.10	.27*	.30**	.14	.47**	.20

Note: 1 = Verbal IQ, 2 = Decoding skill, 3 = Memory, 4 = Motivation Reading (composite), 5 = Motivation Reading (Intrinsic), 6 = Motivation Reading (Extrinsic), 7 = Motivation School (Composite), 8 = Motivation School (Intrinsic), 9 = Motivation School (Extrinsic), 10 = Competency Beliefs (Reading), 11 = Competency Beliefs (School). * $p < .05$, ** $p < .001$.

Children's cognitive skills correlated significantly and closely with their reading attainment (see Table 6.2). Whilst children's school motivation correlated significantly with their reading attainment, their reading motivation did not (however, this difference was not large). When examining intrinsic and extrinsic motivation, children's intrinsic motivation (for both reading and school) correlated significantly with their reading skill, whilst their extrinsic motivation did not. In addition, children's reading competency beliefs correlated significantly with their reading skill, whilst their school competency beliefs did not. Generally, children's cognitive abilities correlated more closely with their reading attainment than their motivation and competency beliefs.

3) Predicting reading skill using cognitive skills and reading motivation

Hierarchical regression analyses were carried out to examine the variance in reading comprehension skill explained by cognitive abilities and motivation, with separate analyses conducted for motivation (composite, intrinsic, extrinsic) and competency beliefs.

Table 6.3. Predicting reading skill using cognitive abilities and reading motivation (composite measure of intrinsic and extrinsic motivation)

Criterion variable: Reading skill				
Enter	Variable Added	R^2	Final β	p
1	Verbal IQ	.30	.38	.00
2	Decoding	.42	.27	.01
3	Memory	.50	.26	.01
4	Reading Motivation (composite)	.52	.18	.03

Table 6.4. Predicting reading skill using cognitive abilities and reading motivation (intrinsic)

Criterion variable: Reading skill				
Enter	Variable Added	R^2	Final β	p
1	Verbal IQ	.29	.35	.00
2	Decoding	.43	.31	.00
3	Memory	.48	.22	.01
4	Reading Motivation (intrinsic)	.52	.21	.01

Table 6.5. Predicting reading skill using cognitive abilities and reading motivation (extrinsic)

Criterion variable: Reading skill

Enter	Variable Added	R²	Final β	p
1	Verbal IQ	.31	.37	.00
2	Decoding	.43	.27	.01
3	Memory	.51	.29	.00
4	Reading Motivation (extrinsic)	.52	.12	.17

Table 6.6. Predicting reading skill using cognitive abilities and reading competency beliefs

Criterion variable: Reading skill

Enter	Variable Added	R²	Final β	p
1	Verbal IQ	.31	.33	.00
2	Decoding	.45	.28	.00
3	Memory	.50	.18	.03
4	Reading Competency Beliefs	.57	.29	.00

Children's reading competency beliefs and motivation (composite measure) both made significant and independent contributions to their reading attainment after controlling for verbal IQ, decoding skill and memory. When dimensions of motivation were analysed separately, only intrinsic motivation explained additional variance in

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children's reading skill, extrinsic motivation did not. In addition, each of the cognitive abilities made a significant and independent contribution to children's performance on the reading assessment. In general, children's reading competency beliefs explained more variance than their reading motivation.

4) Predicting reading skill using cognitive skills and school motivation

Finally, hierarchical regression analyses were carried out to examine the variance in reading comprehension skill explained by cognitive abilities and school motivation.

Table 6.7. Predicting reading skill using cognitive abilities and school motivation (composite measure of intrinsic and extrinsic motivation)

Criterion variable: Reading skill				
Enter	Variable Added	R^2	Final β	p
1	Verbal IQ	.34	.34	.00
2	Decoding	.45	.30	.00
3	Memory	.51	.24	.01
4	School Motivation (composite)	.53	.15	.09

Table 6.8. Predicting reading skill using cognitive abilities and school motivation (intrinsic)

Criterion variable: Reading skill				
Enter	Variable Added	R^2	Final β	p
1	Verbal IQ	.31	.32	.00
2	Decoding	.43	.31	.00
3	Memory	.49	.24	.01
4	School Motivation (intrinsic)	.50	.14	.13

Table 6.9. Predicting reading skill using cognitive abilities and school motivation (extrinsic)

Criterion variable: Reading skill				
Enter	Variable Added	R^2	Final β	p
1	Verbal IQ	.34	.36	.00
2	Decoding	.46	.33	.00
3	Memory	.51	.25	.01
4	School Motivation (extrinsic)	.53	.13	.13

Table 6.10. Predicting reading skill using cognitive abilities and school competency beliefs

Criterion variable: Reading skill				
Enter	Variable Added	R²	Final β	p
1	Verbal IQ	.31	.34	.00
2	Decoding	.43	.29	.00
3	Memory	.49	.26	.01
4	School Competency Beliefs	.50	.09	.26

In contrast to reading motivation and competency beliefs, children's school motivation and competency beliefs did not make independent contributions to their reading attainment after controlling for verbal IQ, decoding skill and memory. In addition, when analysed separately, neither intrinsic nor extrinsic motivation explained significant variance.

Discussion

The aim of this study was to examine whether children's motivation and competency beliefs for reading or school would predict variance in their reading skills after accounting for the cognitive abilities commonly associated with reading comprehension (verbal IQ, decoding and memory). It was found that children's reading motivation and competency beliefs did explain significant variance in their reading comprehension after accounting for these cognitive skills. However, when intrinsic and extrinsic dimensions of reading motivation were analyzed separately, only intrinsic reading motivation explained additional variance, extrinsic did not. Finally, children's school motivation and competency beliefs did not explain additional variance in reading comprehension skill after accounting for cognitive skills. By including the cognitive skills known to be the best predictors of children's reading, this study provided a thorough test of whether motivation is an important factor contributing to children's reading attainment. The results suggest that it is and highlight the importance of considering both cognitive and motivational factors for children's reading; but also emphasize that some aspects of motivation may be more important than others.

As stated earlier, in contrast to the wealth of research examining solely the cognitive skills supporting reading, there is little research that has examined the contribution of both cognitive and motivational factors in children's reading. Those that have, have often used cognitive skills less commonly associated with reading comprehension skill (e.g., background knowledge and student questioning, Taboada et al., 2009). With regard to cognitive abilities, in accordance with previous research (Hoover & Gough, 1990; Kendeous et al., 2009; Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007; Share, 1995) both verbal ability and decoding skill explained independent and

significant variance in children's reading skill. Indeed these two cognitive abilities explained the largest amount of variance in children's reading attainment. This is unsurprising, as in order to understand a text, a child must be able to both decode (to read unfamiliar words) and understand the meanings of the words and sentences within the text. However, children's memory capacity explained additional variance in reading comprehension ability after accounting for these skills, suggesting that the simple view of reading (Hoover & Gough, 1990) is too restrictive.

In this study, children's reading motivation and competency beliefs explained additional variance in reading comprehension skill after accounting for the variance explained by verbal ability, decoding skill, and memory capacity. These findings are consistent with previous research which has demonstrated the importance of both cognitive and motivational factors in reading (Anmarkrud & Braten, 2009; Katzir et al., 2009; Taboada et al., 2009) and are also in accordance with other studies which suggest that reading motivation and competency beliefs are related to reading skill (Aunola et al., 2002; Baker & Wigfield, 1999; Chapman & Tunmer, 1995; 1997, Katzir et al., 2009; Logan & Medford, 2011; Morgan & Fuchs, 2007; Wang & Guthrie, 2004). However, the results of this study can be further understood in terms of a multi-dimensional approach to motivation. Whilst children's intrinsic reading motivation explained additional variance, their extrinsic reading motivation did not. Similarly, it was only children's reading motivation that predicted variance in their reading skill; their general school motivation did not. These differences in the relationship between intrinsic and extrinsic motivation and ability have been previously highlighted and the results regarding intrinsic motivation are consistent with previous research (Becker et al., 2010; Logan & Medford, 2011; Mucherah & Yoder, 2008; Wang & Guthrie, 2004). However, in this study, extrinsic motivation was not associated with reading attainment.

This is consistent with Logan and Medford (2011), who also found no relationship between extrinsic motivation and reading attainment, but inconsistent with other studies (e.g. Becker et al., 2010; Lepper et al., 2005), which have suggested a negative association between the two. Indeed, research examining the association between extrinsic motivation and attainment is often mixed (e.g., McGeown, Norgate, and Warhurst, 2012; Park, 2011). Therefore further research should be carried out to better understand the role of extrinsic motivation in children's attainment.

In terms of interpreting the results of this study, it may be that children who are more motivated to read and have higher reading competency beliefs put more cognitive effort into understanding texts, decoding unfamiliar words, and may process information more deeply. Indeed, motivation and competency beliefs may exert their effect on reading attainment by acting as energisers (Taboada et al., 2009) that enable children to engage their cognitive abilities during reading, leading to improved reading attainment. Although conclusions regarding causality cannot be warranted based on the correlational nature of this study, it is likely that reading motivation and reading competency beliefs share a reciprocal relationship with reading attainment. Indeed, in a review of studies examining the relationship between reading motivation and attainment, it was suggested that this relationship is bi-directional (Morgan & Fuchs, 2007). Children who are more motivated to read and believe that they are more competent readers are likely to engage in reading activities more, and put more effort into reading activities, which in turn will develop their reading comprehension abilities. Conversely, children who are less motivated to read and who believe they are incompetent readers are less likely to engage in reading activities and put effort into reading, and thus their reading abilities are less likely to improve. Therefore, whilst it is clear that motivation is important, it is currently not as clear why motivation is

important; whether it improves children's engagement and perseverance in reading activities leading to higher levels of attainment or whether motivation leads to greater levels of reading frequency which therefore develops children's reading skills. It is therefore important that future research consider whether motivation directly influences reading attainment or influences reading attainment via a mediating factor (e.g., reading frequency).

Children's motivation and competency beliefs regarding school work in general did not predict significant additional variance in reading comprehension ability after accounting for the variance explained by cognitive skills. This suggests that motivation should be studied at the domain specific level (Wigfield, 1997). However, it is important to note that close associations were found between children's intrinsic school motivation, school competency beliefs and reading attainment. Due to the importance of reading for academic attainment, children's reading skills are likely to be closely correlated with their overall academic ability. It may be that as children progress through school, their reading skill increasingly affects their perceptions of their overall academic ability and motivation towards school because of positive or negative academic experiences. For example, if a child increasingly has difficulty with reading which consistently affects their performance at school, they may begin to develop a negative self-concept of their overall ability in school. Interestingly, research has shown that the strength of association between reading skill and competency beliefs grows stronger with age (Chapman & Tunmer, 1997; Logan & Medford, 2011) and a similar pattern has also been found in the association between reading skill and motivation (Logan & Medford, 2011), suggesting that motivation may become more important as children get older. This is in spite of the fact that longitudinal and cross-sectional research studies illustrate that children's motivation generally decreases with age. For example, Lepper et al.

(2005) found that students' general intrinsic motivation (but not extrinsic motivation) significantly decreased with age. Similarly, Unrau and Schlackman (2006) illustrated that both intrinsic and extrinsic reading motivation decreased with age (although decreases were greater in intrinsic motivation than extrinsic motivation).

Educational implications

The results of this study have some important educational implications. Firstly, the results highlight that children's reading motivation and beliefs in reading skills may be important contributors to their reading attainment. Therefore reading instruction in school should focus on developing cognitive abilities (e.g., phonics and language skills), but also instil an enjoyment of reading so that children have the desire to read and engage with reading activities. This is consistent with previous suggestions (Guthrie, McKae, & Klauda, 2007). A reading curriculum focused on developing both cognitive skills and motivational factors should arguably be in place from the earliest stages of reading instruction and continue throughout children's primary school education. Furthermore, as the importance of motivation and competency beliefs appear to be domain specific, reading instruction should focus on fostering greater levels of reading motivation (rather than general motivation) to be most effective. In addition, fostering greater levels of intrinsic reading motivation may be particularly important. Intrinsic reading motivation may be fostered by providing children with access to reading materials that are interesting and engaging for them and allowing them time throughout the school day to read books of their choice. Alternatively, methods fostering extrinsic motivation are more likely to involve using a grade or level system within school for children to chart their reading progress or providing recognition for reading skills. However, increasing children's beliefs or confidence in their ability can

be promoted by praising children for their efforts rather than their abilities. It is not necessarily the case that praise for ability is important to foster greater motivation, rather praise for effort has been found to lead to greater learning opportunities (Mueller & Dweck, 1998).

The focus on fostering greater levels of intrinsic motivation rather than extrinsic motivation is consistent with Souvignier and Moklesgerami (2006) who found that framing young adolescent's learning around intrinsic goals resulted in better understanding of learning material than framing their learning around extrinsic goals. Similarly, Guthrie, Wigfield, Humenick et al. (2006) found that intrinsic reading motivation and reading comprehension performance could be increased by fostering children's situational interest in texts by using stimulating tasks related to the topic of interest. It is crucial that teachers are aware of the importance of motivation in children's education and have the knowledge and resources available to identify ways to improve children's motivation within the classroom. Indeed, reading intervention research by Guthrie, Wigfield, Barbosa et al. (2004) found that children who received reading instruction combining both cognitive strategy instruction and motivational support had better reading comprehension ability than children who were only taught cognitive strategy instruction or who were taught with a traditional approach that placed little emphasis on reading motivation. Nevertheless, whilst teachers often receive information and training about developing cognitive skills within the classroom (e.g., reading, phonics, language etc), there are very few resources available for teachers to develop children's motivation and interest. It may be beneficial to provide more resources for teachers that enable their ability to do this.

Limitations and suggestions for future research

Firstly, a single age group was included in this study, therefore further research is necessary to examine the importance of both reading and school motivation as children progress through school. As stated earlier, there is evidence that the association between motivation and attainment becomes stronger with age, but that children's level of motivation generally decreases with age, therefore future research should examine the role of both cognitive and motivational factors among different age groups. An understanding of this would allow teachers to identify at which stages they should focus more on motivational factors for reading. In addition, the school in which this data was collected was a relatively low attaining school; therefore the sample is not necessarily representative of the typical school population. Furthermore, as Logan et al. (2011) found that motivation was particularly important for poor readers' reading skills, it may be the case that among higher attaining schools, different results are found. However, knowledge of the factors that contribute to reading skills in low attaining schools is particularly important as there is considerable interest and focus on helping children from less privileged backgrounds improve their reading skills (Duncan & Seymour, 2000). Nevertheless, additional research in a number of different schools with different attainment levels would test whether these results can be generalised.

In the current study, the assessment used to measure reading comprehension was a group administered test (which is similar to the group administered tests that are given in schools as part of national assessments). However, group assessments rely on children completing the task themselves, with no encouragement from someone to continue when it gets difficult. This is in contrast to individually administered assessments where children might be encouraged by the assessor to continue, or feel

under greater pressure to continue based on the assessor's presence. Future research should consider the extent to which motivation is important for reading skill in individually versus group administered tests. Given the use of group administered assessments within national tests, an understanding of this is clearly important. Finally, it would be interesting to investigate whether the domain specific link between children's motivation and competency beliefs regarding reading and reading attainment is also found across other academic subjects (e.g., mathematics).

Conclusions

To conclude, this study provided a thorough test of the importance of motivation for reading by including the cognitive skills most commonly associated with reading. The results highlight the importance of considering both cognitive and motivational factors in reading instruction and when identifying ways to improve children's reading skills. However, rather than fostering greater levels of academic motivation, a focus on increasing reading motivation is likely to provide the greatest gains for children's reading skills.

CHAPER 7: THE INFLUENCE OF COGNITION, MOTIVATION, AND BEHAVIOUR ON CHILDREN'S READING

Abstract

This study examined the extent to which behavioural, motivational, and cognitive factors could explain variance in children's reading comprehension skill and national curriculum reading level. Furthermore, the strength of association between children's negative classroom behaviours, reading motivation, and cognitive skills were examined. One hundred and thirty three children (71 boys, aged 10 - 11) completed assessments of reading comprehension, word reading skill, verbal IQ, and memory, and questionnaires examining their motivation and competency beliefs for reading. In addition, class teachers completed a behavioural scale for each child assessing ADHD (Attention Deficit Hyperactivity Disorder)-type behaviours, hyperactivity, and oppositional behaviour. It was found that children's negative behaviours (particularly ADHD-type behaviours) and reading competency beliefs were significantly associated with their reading comprehension, whereas reading motivation was not. In addition, motivational factors for reading were not significantly associated with children's negative classroom behaviours. The importance of considering cognitive, motivational, and behavioural factors for reading instruction and intervention are discussed.

Introduction

As stated in previous chapters, whilst not exhaustive, it is generally considered that decoding skill, verbal IQ, and working memory are the main cognitive skills that support children's reading comprehension (see Chapter 6 for a more in-depth review and supporting findings). However, as highlighted in Chapters 5 and 6, researchers are becoming increasingly interested in the influence of non-cognitive factors on children's reading skill, such as motivation and classroom behaviour. Indeed, studies show that children's reading motivation (Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004) and negative classroom behaviours (e.g. Breslau, Breslau, Peterson et al., 2010; Fergusson, Lynskey, & Horwood, 1997; McGee et al., 2002; Rabiner et al., 2000; Smart, Sanson, & Prior, 1996) are consistently associated with their reading performance. However, few studies have examined the links between cognitive, motivational, and behavioural factors. The current study explores the relative importance of these contributors, and examines the potential relationships between them.

Reading, Motivation, and Self-Concept

As outlined previously, children's reading motivation is consistently associated with their reading attainment (Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004). Furthermore, studies have found that children's motivation to read can predict their reading skill even after accounting for cognitive ability (Anmarkrud & Braten, 2009; Taboada et al., 2009), suggesting that both are important contributors. In addition, research shows that interventions focusing on improving both reading skills and reading motivation produce greater improvements in children's reading attainment

(Guthrie et al., 2007), highlighting the importance of incorporating motivational targets into reading interventions. As outlined in Chapter 6, rather than acting separately from cognitive skills, reading motivation is thought to act as an energiser than enables students to engage their cognitive resources and strategies, leading to improved reading performance (Taboada et al., 2009). As a result, children's motivation to read may determine whether or not they will reach their full reading potential based on their cognitive skills.

As highlighted in previous chapters, the relationship between reading skill and motivation is thought to be reciprocal (Morgan & Fuchs, 2007), with each having a causal influence on the other. A child who is unmotivated to read is less likely to engage in reading activities and thus their level of reading skill is less likely to improve (e.g. Guthrie et al., 1999; Wigfield & Guthrie, 1997). Similarly, a child who struggles with reading is less likely to be motivated to engage in reading tasks than a child who experiences success with reading tasks. This causal pathway is related to reading self-concept; an individual's self-estimates about how competent they are at reading. Consistent with the self-efficacy theory of motivation (e.g. Seifert, 2004), a child with a high perception of their reading abilities is likely to be more motivated to read and persevere more with challenging reading tasks than a child with a low perception of their abilities. Indeed, as highlighted in Chapter 2, some researchers consider reading competency beliefs to be one of the main determinants of children's motivation to read (Gambrell et al., 1996). Children's competency beliefs regarding reading have been found to be related to their reading enjoyment and motivation (Baker & Wigfield, 1999; Chapman & Tunmer, 2003; Retelsdorf, Köller, & Möller, 2011), and are consistently and closely related to their reading attainment (Chapman & Tunmer, 1995; 1997; Logan & Medford, 2011). Furthermore, reading competency beliefs have been found to be

associated with reading attainment even after controlling for other dimensions of intrinsic motivation (Bouffard et al., 2003), suggesting that competency beliefs make an independent contribution to children's reading skill.

Reading and Behaviour

In addition to motivation, children's classroom behaviour is also associated with their reading skill. Although there are a wide range of behaviours that may affect reading performance, the main focus of the current study is on the influence of negative behaviours that are associated with Attention Deficit Hyperactivity Disorder (ADHD). ADHD is a psychological disorder characterised by inattentive, hyperactive, and impulsive behaviour, and is usually estimated to have a prevalence rate of 3%-9% in children and young people (NICE, 2008). Inattentive behaviours in the classroom involve making careless mistakes in schoolwork, not listening to or following instructions properly, and being distracted easily. Hyperactive behaviours include fidgeting, being unable to stay sitting down quietly, and talking excessively. Finally, impulsive behaviours include interrupting others, being unable to take turns during activities or to wait in queues, and answering questions before they have been fully asked. Children with ADHD are often impaired academically as well as behaviourally (Mayes & Calhoun, 2006), and it is well established that children with ADHD generally perform more poorly on measures of reading ability than their typical peers (Barbaresi, Katusic, Colligan et al., 2007; Clark, Prior, & Kinsella, 2002; Frazier, Youngstrom, Glutting, & Watkins, 2007). Indeed, a meta-analytic study by Frazier et al. (2007) found that reading measures produced the largest effect sizes for the discrepancy in academic achievement between children with ADHD and typical controls, indicating that children

with ADHD may be particularly impaired in the domain of reading or may often have co-morbid reading difficulties.

However, research suggests that the relationship between negative classroom behaviours and reading attainment is not restricted to children with a behavioural diagnosis. Arnold, Goldston, Walsh et al. (2005) found that after accounting for ADHD diagnoses, adolescent poor readers had higher levels of inattention than good readers, indicating that attention problems may also have an influence on the reading performance of those without a diagnosis. In addition, findings show an association between attention and dyslexia or learning difficulties for children without ADHD (Heiervang, Stevenson, Lund, & Hugdahl, 2001; Mayes, Calhoun & Crowell, 2000), highlighting the fact that behavioural problems occur on a continuum and are not simply present or absent (Mayes et al., 2000). Similarly, Merrell and Tymms (2001) found that children with high levels of negative behaviours, but without a diagnosis of ADHD, had lower reading attainment than those with zero scores on ADHD-type behaviours. This illustrates the fact that children without a behavioural diagnosis may still be at risk of negative academic outcomes as a consequence of their behaviour.

Behaviour and cognitive ability

Clark et al. (2002) suggest that children with behavioural problems experience reading difficulties due to fewer opportunities for active engagement in reading instruction as a consequence of their overactive, inattentive behaviour. For example, a child who is inattentive or hyperactive in the classroom may not listen to instructions properly, and may spend more time engaging in negative, off-task classroom behaviours, such as fidgeting or talking, and less time actively engaging in reading. This may cause their

reading progress to be slower than expected. However, it is possible that the reading difficulties of children with behavioural problems are a consequence of associated cognitive impairments rather than behavioural symptoms. Regarding ADHD, children with this diagnosis often show deficits in executive function (e.g. Lambek, Tannock, Dalsgaard et al., 2011), such as impaired working memory capacity. Therefore, it is possible that the reported reading difficulties are mainly a product of such impairments rather than a consequence of hyperactive or inattentive behaviour. However, a study by Barry, Lyman and Klinger (2002) found that whilst behavioural symptoms predicted underachievement in reading over and above performance on measures of executive function, executive function did not predict underachievement after accounting for behaviour. This suggests that behavioural symptoms show a robust relationship with reading skill even after accounting for cognitive ability. Another study, by McConaughy, Volpe, Anshel et al. (2011) found that although cognitive skills accounted for the most variance in children's academic performance, the presence of ADHD behaviours explained additional variance, indicating that both factors are important. Other research indicates that behavioural symptoms and cognitive skills may interact to predict reading achievement. For example, Rogers, Hwang, Toplak et al. (2011) found that behavioural inattention significantly predicted children's working memory capacity, which in turn was strongly associated with reading achievement, providing support for a mediation model. Alternatively, Gathercole, Alloway, Kirkwood et al. (2008) suggest that working memory difficulties may lead to inattentive behaviour, as children with impaired working memory capacity may fail to keep up with the storage and processing demands of learning activities, leading to loss of crucial task information and demonstrations of non-goal directed, inattentive behaviour. Therefore, it is possible that for some children, one way to improve classroom

behaviour (and indirectly, reading attainment) may be to focus on improving their working memory capacity.

Hyperactivity-impulsivity versus inattention

Research suggests that some of the negative behaviours associated with ADHD may be more detrimental for children's reading performance than others. Regarding the influence of hyperactivity on children's reading attainment, the evidence appears to be mixed. Some findings suggest that hyperactivity shows long-term effects on children's reading performance. For example, a longitudinal study by McGee et al. (2002) found that hyperactivity showed persistent effects on children's academic performance and literacy skills, even after accounting for family background factors and early literacy performance. However, it was noted that the inattention component of hyperactive behaviour may be particularly important. Similarly, Smart et al. (1996) found that hyperactivity played a causal role in the pathway from behavioural problems to reading impairment. However, other research indicates that hyperactive behaviour may be more detrimental for some aspects of reading than for others. Chadwick, Taylor, Taylor et al. (1999) found that whilst children with high levels of hyperactivity at school entry did not show poorer reading accuracy at follow up, they did show poorer reading comprehension, suggesting that hyperactivity may have a greater influence on some components of reading. Interestingly, Tymms & Merrell (2011) found that some of the negative behaviours associated with hyperactivity-impulsivity may not always be detrimental for children's reading performance. In this study, teacher-rated impulsivity was actually associated with advantages in children's reading attainment. It was suggested that children who become excited and more cognitively engaged during

learning activities (and thus learn more), may express this excitement through behaviours that may be considered impulsive, such as blurting out answers in class.

However, despite the associations between hyperactivity-impulsivity and reading, a number of studies have shown that inattentiveness appears to exert a stronger influence than hyperactivity on academic and reading performance (Greven, Rijsdijk, Asherson, & Plomin, 2011; Massetti et al., 2008; Merrell & Tymms, 2001; Tymms & Merrell, 2011; Willcutt & Pennington, 2000). For example, Greven et al. (2011) found that whilst inattentiveness and hyperactive-impulsive symptoms of ADHD both contributed to the prediction of reading, inattentiveness was a significantly stronger predictor. Similarly, Willcutt and Pennington (2000) found that the association between reading difficulties and ADHD was stronger for symptoms of inattention than for symptoms of hyperactivity-impulsivity. Other studies have found that children with the predominantly inattentive subtype of ADHD have poorer academic and reading skills than those who with the predominantly hyperactive-impulsive subtype (Massetti et al., 2008; Merrell & Tymms, 2001), suggesting that inattention is the most influential behavioural factor. Furthermore, inattention has been found to mediate the relationship between other problem behaviours, such as delinquent behaviour, and academic achievement (Barriga, Doran, Newell et al., 2002).

Inattention shows a consistent, strong and negative relationship with reading ability (Pham, Fine, & Semrud-Clikeman, 2011; Tymms & Merrell, 2011), even after accounting for SES, age, gender, and other behavioural difficulties (Rabiner et al., 2000; Rowe & Rowe, 1992). Furthermore, longitudinal studies show that inattention can predict reading achievement even after controlling for prior reading achievement and IQ (Breslau et al., 2010; Fergusson et al., 1997; Rabiner et al., 2000), suggesting that

inattention may exert a long-term influence on reading achievement that is independent of IQ and cognitive ability. This evidence has led some researchers to advocate the screening of young children for attention problems in order to help those at risk of reading difficulties (Rabiner et al., 2000).

The causal pathway between behaviour and reading

Although the negative relationship between behaviour problems and reading performance is well established, the causal nature of this relationship is yet to be fully understood. As outlined briefly in Chapter 5, one interpretation may be that difficulties in learning to read lead to behaviour problems in the classroom, as children who struggle with reading may become discouraged and lose motivation to read, resulting in inattentive, distractible behaviour. This is consistent with Imai, Anderson, Wilkinson, and Xi (1992), who found that children's attention during reading lessons showed a sharp decline following oral reading errors as children appeared to become discouraged with reading. Furthermore, a study by Halonen et al. (2006) found that difficulties in learning to read predicted increases in externalising problem behaviours during the first two years of school, indicating that reading difficulties may have a causal influence on negative classroom behaviour. However, alternatively, it may be that poor reading achievement is a consequence of problem behaviours, as hyperactive or inattentive children are likely to experience fewer on-task learning opportunities. This is in accordance with Greven et al. (2011), who found that whilst ADHD symptoms and reading ability significantly predicted each other over time, ADHD behaviours were a significantly stronger predictor of reading than vice versa. Similarly, Fergusson and Horwood (1992) found that whilst children's level of attention deficit influenced their reading abilities, there was no evidence to suggest that inattentiveness was a

consequence of reading difficulties. Other findings also suggest that behavioural problems precede or exacerbate reading difficulties, rather than vice versa (Smart et al., 1996). However, it may be that the relationship between reading difficulties and behavioural problems is bi-directional, with each having some causal influence on the other. For example, a longitudinal study by McGee et al. (2002) found evidence of reciprocal pathways between inattention and literacy skills. Similarly, Rowe and Rowe (1992) found strong bi-directional effects between reading achievement and attentiveness in the classroom.

Behaviour and motivation

Very few studies have examined the relationships between children's motivation to read and their classroom behaviour. However, it is likely that these two factors are related. As previously discussed, children who struggle with reading tasks are likely to become discouraged and de-motivated with reading. As suggested by Imai et al. (1992), reading failure and discouragement may lead to a decline in levels of attention during a classroom reading task. This may cause children to show decreased engagement in on-task, goal-directed behaviour and increased engagement in distractible classroom behaviour. In this way, it is possible that children's levels of reading motivation are related to their frequency or severity of negative classroom behaviours. Alternatively, it is possible that negatively behaved children may be less motivated to engage in reading activities because of their preference to engage in other activities that conform to their behavioural preferences and tendencies. Furthermore, negatively behaved children are likely to spend less time engaged in reading activities, and more time engaged in off-task activities, such as being disciplined by their class teacher. As a consequence, their reading performance and levels of reading motivation are unlikely to improve. This is in

accordance with Rowe and Rowe (1992) who found that levels of inattentiveness had strong negative effects on children's attitudes towards reading and levels of reading activity at home.

Regarding ADHD, research indicates that children with ADHD show lower rates of academic motivation than their typical peers. Junrod, DuPaul, Jitendra et al. (2006) conducted behavioural observations of academic engagement during reading instruction, with results showing that children with ADHD had lower rates of engagement (although this difference was small), suggesting that children with ADHD may have lower motivation to read. In addition, research shows that children with ADHD show less persistence in the face of academic failure (Hoza, Pelham, Waschbusch et al., 2001; Olivier & Steenkamp, 2004), indicating that children with ADHD may be less academically motivated than their typical peers. It may be that children with behavioural difficulties, and associated academic impairments, choose to give up on difficult classroom tasks in order to avoid failure and to protect their self-esteem. Another study, by Oehler-Stinnet and Boykin (2001) correlated teacher ratings of ADHD with ratings of academic motivation, with results showing that academic motivation was positively related to good attentional skills. It was suggested that it may be beneficial to target motivational factors for some behavioural intervention purposes.

Other studies have examined whether academic motivation may play a mediating role in the relationship between behaviour and academic achievement or reading skill. Volpe, DuPaul, DiPerna et al. (2006) investigated whether a measure of academic enablers (consisting of academic motivation, engagement, study skills, interpersonal skills) was related to teacher ratings of ADHD and academic achievement. Results showed that correlations between ADHD and academic enablers were high. Furthermore, the

relationships between ADHD symptoms and academic achievement were mediated through the effects of ADHD on academic enablers, particularly study skills and academic motivation. A similar study, by Demaray and Jenkins (2011) focused on children that had high levels of ADHD symptoms, but without a formal diagnosis. Results showed that children with high inattention/hyperactivity had lower scores on the academic enablers than typical controls. Furthermore, academic motivation was found to fully mediate the relationship between behaviour and reading attainment, suggesting that motivation may play an important mediating role in the link between behaviour and reading.

Behaviour and Self-Concept

In addition to motivation, it is likely that children's negative classroom behaviours are related to their competency beliefs regarding academic ability and reading. A child with low reading competency beliefs may avoid reading tasks in order to prevent expected reading failure. This may cause them to spend less time actively engaged in learning activities, and more time engaged in distractible, negative classroom behaviour. Indeed, Pisecco, Wristers, Swank et al. (2001) found that negative academic self-concept contributed to the later manifestation of negative behaviours in adolescence, particularly anti-social behaviour. It was suggested that some children with low perceptions of their abilities may engage in negative or delinquent classroom behaviours in order to enhance their self-image or to gain acceptance or approval from a subsample of their peers. Other findings indicate that some children with ADHD have lower self-perceptions of their abilities than their typical peers (e.g. Treuting & Hinshaw, 2001). However, evidence is mixed, as some studies report that children with ADHD symptoms often show a positive illusory bias regarding their scholastic competence (Owens & Hoza,

2003). It is suggested that this may be either be a consequence of cognitive immaturity or to serve a self-protective purpose (see Owens & Hoza, 2003, for a discussion).

Aims and Hypotheses

The current study examined the extent to which behavioural, motivational, and cognitive factors could explain variance in children's reading skill. Furthermore, the current study examined the strength of association between children's negative classroom behaviours, motivation, cognitive skills, and reading attainment. Few studies have investigated the relationships between these factors, as most previous research has focused solely on one or two of these elements. However, incorporating constructs from differing casual models of reading achievement may provide us with more knowledge about the relationships between behaviour, motivation, and achievement, and may provide better clues as to how to remediate children's reading difficulties.

One of the aims of the current study was to examine whether children's negative classroom behaviour could explain variance in their reading attainment after accounting for cognitive abilities. Previous research suggests that negative behaviours do explain additional variance after accounting for IQ and cognitive ability (e.g. Barry et al., 2002; McConaughy et al., 2011; Rabiner et al., 2000). However, such research has not examined the cognitive and reading skills that are most closely associated with children's reading comprehension performance (i.e. word reading skill, verbal ability, working memory). If children's negative classroom behaviour could explain variance in children's reading attainment after accounting for these skills, it would provide further evidence for the influence of negative classroom behaviour on children's reading skill.

In addition, the current study examined the relationship between children's oppositional-defiant behaviour and their reading skill. Whilst the relationship between ADHD-type behaviours and reading is well established, less research has focused on the influence on other negative classroom behaviours. Oppositional-defiant behaviour (e.g. being defiant to class teachers, being easily annoyed or angered) is one of the most common co-morbid problems of ADHD (e.g. Rommelese, Altink, Fliers et al., 2009), and it is likely that this type of problem behaviour also affects children's reading performance. For example, an oppositional-defiant child is likely to spend more time being disciplined by class teachers and less time engaging in classroom learning activities, which may result in slower reading progress.

In addition, less research has examined the influence of non-ADHD children's negative classroom behaviours on their reading attainment. However, school professionals are often confronted with children who demonstrate ADHD-type behaviours but who do not meet the criteria for a behavioural diagnosis. Therefore, the current study conceptualised classroom behaviour as being on a continuum, including children with a range of frequency and severity of negative behaviours in order to assess the relationship between behaviour, attainment, and motivation for a typical sample of school children.

A second aim of the study was to examine whether children's motivation to read could predict their reading skill after accounting for cognitive abilities (see also Chapter 6). Previous studies that examined this have included cognitive abilities that are less commonly associated with reading comprehension (e.g. background knowledge and student questioning; Taboada et al., 2009). Therefore, the current study examined whether children's reading motivation or reading competency beliefs could explain

variance in their reading skill after accounting for the skills that are most commonly associated with reading comprehension (i.e. word reading skill and verbal ability). If motivation or competency beliefs could explain additional variance, it would provide further evidence for the importance of motivational factors for children's reading attainment. In addition, the current study examined whether children's reading motivation or competency beliefs explained more variance in their standardised reading performance or in their teacher-rated reading grade.

A final aim of the study was to examine the strength of association between negative classroom behaviours and reading motivation. Previous research suggests that academic motivation is related to classroom behaviour (e.g. Oehler-Stinnet & Boykin, 2001), and that academic motivation may mediate the relationship between behaviour and reading (Demaray and Jenkins, 2011). However, such research has focused on general academic motivation rather than domain specific reading motivation. In addition, very few studies have considered the relationship between negative classroom behaviour and domain specific reading competency beliefs. Therefore, the current study examined the relationships between children's negative classroom behaviour, reading motivation, and reading self-concept.

It was expected that children's reading motivation and negative classroom behaviours would explain additional variance in their reading comprehension skill after accounting for decoding ability, verbal IQ, and working memory. In addition, it was expected that children's negative classroom behaviours would show significant associations with their reading competency beliefs and motivation to read.

Method

Participants

Sixty four Year 5 children (33 boys, 31 girls) with an average age of 10 years and 4 months (.29 SD) and sixty nine Year 6 children (38 boys, 31 girls) with an average age of 11 years and 5 months (.33SD) took part in this study. The children were attending two different primary schools in the U.K. The final two years of primary school were selected because research indicates that children's self-perceptions become more accurate with age (Chapman & Tunmer, 1997). Thus, assessments in the final years of primary school are likely to give the most accurate reflections of the relationships between children's self-reported reading motivation and competency beliefs, reading ability, and teacher ratings of behavioural symptoms.

The first school to take part was a low achieving school, as in the most recent review (2010), the proportion of children achieving a Key Stage 2 Assessment Level of 4 and above was lower than the national average. The second school was a higher achieving school, as the proportion of children achieving expected Key Stage 2 Assessment Levels was slightly higher than the national average. Using proportion of free school meals as an index of social deprivation, both schools were in areas of average socio-economic status, as the proportion of children that were entitled to free school meals in each school was close to the national average. Consent from the head teacher and class teachers were obtained prior to testing.

Materials

Reading Comprehension

Reading Comprehension was assessed using two standardised tests: a group administered assessment (Group Reading Test II, GRT II, Macmillan Test Unit, 2000), and an individually administered assessment (York Assessment of Reading for Comprehension, YARC, Snowling, Stothard, Clarke et al., 2009).

Group Reading Test II (GRT II)

This assessment measures reading comprehension ability via sentence completion, (see Chapter 6, page 147, for details). The assessment was completed in approximately 25 minutes, although no time restriction was imposed for completion. Children's standardised scores were used for the purposes of analysis.

York Assessment of Reading Comprehension (YARC)

This assessment measures children's text comprehension. Children are required to read graded passages (both fiction and non-fiction) aloud to the experimenter. Following each passage, the child is asked a set of 8 comprehension questions that tap both literal and inferential comprehension skills. The assessment took approximately 10-15 minutes to administer, and standardised scores were used for the purposes of analysis.

National Curriculum Reading Level

Class teachers provided each child's national curriculum reading level, rated in accordance with national curriculum guidelines. National curriculum levels range from level 1 (the lowest level) to level 8 (the highest level), and each level has three sub-levels: a (high), b (medium), and c (low).The children in this study were achieving

reading levels within the range of level 2c to level 5a. For purposes of analysis, each reading level was assigned a numerical score using the following code: 2c: 65, 2b: 70, 2a: 75, 3c: 80, 3b: 85, 3a: 90, 4c: 95, 4b: 100, 4a: 105, 5c: 110, 5b: 115, 5a: 120. These numerical scores were chosen in order to most closely represent a standardised distribution. At the end of primary school, children are expected to attain a level 4 in reading; levels above this are considered to be higher than average, and levels below this are considered to be below average.

Word reading skill

Word reading skill was assessed using two measures: YARC reading accuracy, and the Single Word Reading Test (Foster, 2007).

i)YARC word reading skill

This assessment was a separate component of the YARC comprehension test. As children read aloud their assigned passages, the experimenter noted down any word reading errors. These scores were converted into standardised scores for the purposes of analysis.

ii)Single Word Reading Test

This assessment requires the child to read individual words of increasing length and difficulty presented on a card. If the child was unsure of a word, they were encouraged to sound the word out and have a go, but if they did not do this or were incorrect, they skipped to the next word. In this way, children were given the opportunity to read every word presented to them. This assessment took approximately 5 - 10 minutes to administer and standardised scores were used for the purposes of analysis.

Verbal Ability

Children's vocabulary knowledge was used as an index of verbal ability. Receptive vocabulary was assessed using the English Picture Vocabulary Test II (Brimer & Dunn, 1968). For this assessment, the child is required to select a picture from a series of four that most closely matches the target word read by the experimenter. This assessment took approximately 10 minutes to administer on a group basis and standardised scores were used for the purposes of analysis.

Working Memory

Working memory was assessed using the British Ability Scales II (BAS II) Backwards Digit Span task (Elliot et al., 1996). For this assessment, the child is required to repeat in reverse order sequences of digits presented orally by the examiner. This assessment took approximately 5 minutes to administer and standardised scores were used for the purposes of analysis.

Reading Motivation

Children completed a group administered 45 item questionnaire measuring motivation for reading (the Motivation for Reading Questionnaire (MRQ) – Revised Version, Wang & Guthrie, 2004). The MRQ – Revised measures reading motivation using a multi-dimensional approach which identifies three dimensions of intrinsic motivation: challenge (desire to work with/master complex materials; 5 items), curiosity (desire to learn more/new things; 7 items) and involvement (child's level of engagement/involvement; 7 items) and five dimensions of extrinsic motivation: competition (desire to outperform others; 6 items), recognition (desire for achievements to be recognised by others; 5 items), grades (desire to achieve good marks; 4 items), compliance (conformity to an external requirement; 4 items) and social (social

interactions involving books/school; 7 items). These dimensions have a strong theoretical basis as well as empirical support (Wang & Guthrie, 2004; Wigfield & Guthrie, 1997). Questions were read aloud to the children, who answered each statement using a 4 point Likert scale (very different from me, a little different from me, a little like me, a lot like me). The most positive responses were assigned 4 points and the least positive responses were assigned 1 point. In addition, two practice questions ('I like to read about animals'; 'I read a lot of books at home') were given beforehand to ensure children understood the nature of the assessment. Scores were summed to give an indication of the child's overall level of intrinsic and extrinsic motivation. In addition a total reading motivation score was calculated by summing the scores for intrinsic and extrinsic motivation. The questionnaire took approximately 15-20 minutes to administer. Cronbach's alpha values were used as measure of reliability for the intrinsic-extrinsic dimensions: internal consistency for both dimensions was high (intrinsic, $\alpha = .86$; extrinsic, $\alpha = .86$).

Reading Competency Beliefs

Children completed a group administered 10 item questionnaire measuring competency beliefs for reading (Motivation to Read Profile – Competency Beliefs Subscale, Gambrell et al., 1996). This scale measures children's self-perceived competence in reading and self-perceived competence relative to their peers. Questions were read aloud to the children, who responded using a 4 – point Likert – type scale. Half of the response items were positively ordered and half were negatively ordered in order to prevent children from responding without fully considering the questions. One practice item was administered beforehand ('Maths is... very easy for me, kind of easy for me, kind of hard for me, very hard for me') to ensure that the children knew the nature of the assessment. The most positive responses were assigned 4 points and the least

positive responses were assigned 1 point. Scores for all responses were summed to give an indication of the child's overall competency beliefs in reading, and percentage scores were used for the purposes of analysis. The questionnaire took approximately 5 – 10 minutes to administer. Cronbach's alpha was used a measure of reliability for this questionnaire and internal consistency was high ($\alpha = .75$).

Behaviour

Class teachers completed the Conners' Teacher Rating Scale - Revised Short Version (Conners, 1997), for each child. This standardised scale assesses the severity of children's ADHD behavioural symptoms and other problem behaviours. Three of the subscales were used in the current study: Oppositional behaviour (5 items), Hyperactivity (7 items), and the ADHD index (12 items). However, the fourth subscale, Cognitive Problems/Inattention, was excluded, as some of the questions in this subscale refer specifically to cognitive or academic difficulties at school, e.g. 'poor at reading', rather than to a measure of pure 'inattention'. Therefore, any associations between this subscale and reading attainment or motivation may have reflected the 'cognitive problems' element of the subscale rather than the 'inattention component'. Unfortunately, standardised scores are not available for the inattention component alone, so could not be used in the current study. The oppositional scale assesses behaviours including rule breaking, problems with authority, and being easily annoyed or angered. The hyperactivity scale assesses behaviours such as being restless, impulsive, and always on the go. Finally, the ADHD index combines both hyperactive-impulsive and inattentive behaviours, and assesses the extent to which children are 'at risk' for ADHD. Teachers were asked to rate each item of the scale according to how much of a problem the behaviour had been in the last month. Each statement was answered using a 4 – point Likert Scale (not true at all, just a little true, pretty much

true, very much true). 'Not at all true' scored 0 points, and 'Very much true' scored 3 points. Scores were summed for each behaviour category and converted into standardised scores for the purposes of analysis.

Procedure

Assessments were carried out in the sixth or seventh month of the children's fifth or sixth school year. Children first completed the group assessments in their classrooms in the following order: reading motivation questionnaire, reading competency beliefs questionnaire, vocabulary test, group reading test. This took approximately one hour. Prior to completing each questionnaire, children were informed that the questionnaire was not a test, that there were no right or wrong answers, and that they should be as honest as possible in their responses. Following the group assessments, children completed the individual assessments in the following order: working memory test, single word reading test, YARC reading assessment. Class teachers completed and returned the behaviour rating scales within one week of testing. Ethical approval was sought and granted from the Department of Psychology Ethics Committee at the University of Hull.

Results

The results are separated into three sections: 1) Descriptive statistics for each assessment, 2) Correlations between reading comprehension, reading level, word reading skill, cognitive skills, motivational factors for reading, and behaviour, 3) Predicting reading skill using word reading skill, cognitive abilities, motivational factors, and behaviour.

1) Descriptive statistics

The distribution of scores for each assessment was examined and the z scores for skewness and kurtosis were calculated. For national curriculum reading level, total reading motivation, and extrinsic reading motivation, skewness differed significantly from the normal distribution ($p < .05$), with more scores towards the higher end of the scales. However, kurtosis for these assessments was not significant, illustrating that the scores did not cluster towards the top end of the distribution. However, for oppositional and hyperactive behaviour, and for the ADHD index, both skewness and kurtosis were significantly different from the normal distribution. This illustrates that scores for these measures were more frequent and clustered at the lower end of the scales.

Table 7.1. Descriptive statistics for each assessment

Assessment	Mean	S. D.	Skewness	Kurtosis
YARC reading comprehension (SS)	103.38	9.47	.04	.11
GRT reading comprehension (SS)	96.69	10.18	-.06	.04
Reading Level (converted score)	100.00	10.57	-0.76	.60
YARC word reading skill (SS)	98.44	11.26	.41	-.26
Single Word Reading Test (SS)	102.02	12.63	-.18	-.59
Vocabulary (SS)	89.06	12.56	-.23	-.18
Working memory (SS)	99.23	13.36	.00	-.39
Reading competency beliefs (%)	70.54	10.27	-.08	-71
Total reading motivation (raw)	125.74	21.63	-.6	.11
Intrinsic reading motivation (raw)	54.20	10.34	-.41	-.28
Extrinsic reading motivation (raw)	71.58	12.59	-.53	.94
Oppositional behaviour (SS)	98.65	11.90	3.53	13.00
Hyperactivity (SS)	94.79	9.38	4.33	20.99
ADHD index (SS)	94.45	11.08	3.14	11.64

2) Correlations

Correlations were carried out to examine the strength of association between reading attainment (reading comprehension, reading level), cognitive/reading skills (word reading skill, vocabulary, memory), motivational factors for reading (intrinsic/extrinsic motivation, competency beliefs), and behaviour (oppositional, hyperactive, ADHD index).

Table 7.2. Associations between reading comprehension ability, reading level, word reading skill, cognitive abilities, motivation, and behaviour.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	---												
2	.39**	---											
3	.52**	.68**	---										
4	.46**	.65**	.47**	---									
5	.39**	.67**	.56**	.84**	---								
6	.32**	.37**	.38**	.29**	.25*	---							
7	.32**	.25*	.34**	.51**	.39**	.33**	---						
8	.33**	.42**	.50**	.31**	.36**	.37**	.27**	---					
9	.17	.16	.11	.02	-.05	.17	.23*	.50**	---				
10	.16	.12	.10	.00	-.09	.05	.18	.42**	.93**	---			
11	.14	.17	.11	.03	-.02	.23**	.22*	.50**	.96**	.77**	---		
12	.01	-.08	.01	-.14	-.10	.06	-.01	.05	.06	.02	.07	---	
13	-.15	-.14	-.10	-.24*	-.21*	-.06	-.04	-.02	.09	.08	.08	.50**	---
14	-.23*	-.26**	-.23**	-.33**	-.31**	-.06	-.15	-.04	.05	.06	.04	.66**	.89**

Note. 1 = YARC reading comprehension, 2 = Group Reading Test comprehension, 3 = Reading Level, 4 = YARC word reading skill, 5 = Single Word Reading Test, 6 = Vocabulary, 7 = Working Memory, 8 = Reading Competency Beliefs, 9 = Total Reading Motivation, 10 = Intrinsic Reading Motivation, 11 = Extrinsic Reading Motivation, 12 = Oppositional Behaviour, 13 = Hyperactivity, 14 = ADHD index; * = p<.05, ** = p<.01.

Children's word reading skill, vocabulary knowledge, and working memory all correlated significantly and closely with reading comprehension and national

curriculum reading level (see table 7.2). Regarding reading motivation, children's total reading motivation (combining intrinsic and extrinsic motivation) was not significantly correlated with their reading attainment. Furthermore, neither intrinsic nor extrinsic motivation were significantly associated with reading performance. However, reading competency beliefs were significantly and closely correlated with reading comprehension and reading level. In addition, children's reading competency beliefs were significantly correlated with their reading motivation. Regarding behaviour, whilst children's oppositional and hyperactive behaviour were not significantly correlated with their reading comprehension or reading level, their severity of ADHD behaviours (ADHD index) was. However, none of the behaviour categories were significantly related to children's competency beliefs regarding reading, or to their intrinsic or extrinsic reading motivation. Whilst hyperactivity and ADHD index were associated with children's word reading skill, they were not significantly correlated with children's vocabulary or working memory capacity. Finally, oppositional behaviour was not significantly correlated with any of the measured cognitive skills.

3) Predicting reading comprehension and reading level using word reading ability, cognitive skills, motivational factors for reading, and behaviour.

Hierarchical regression analyses were carried out to examine the variance in reading comprehension skill and national curriculum reading level explained by word reading ability, cognitive skills, motivational factors, and behaviour. Separate analyses were conducted in order to predict reading comprehension and national curriculum reading level using the separate motivational factors (intrinsic, extrinsic, competency beliefs) and the separate behavioural categories (oppositional, hyperactivity, ADHD index) after accounting for cognitive skills and word reading ability. For the dependent variable of

'reading comprehension', a combined measure was used by summing the standardized scores for the YARC and GRT comprehension assessments and halving the total. Similarly, a combined measure of word reading skill was used as a predictor, by summing the standardized scores for the YARC word reading skill and the SWRT assessments and halving the total.

Table 7.3. Predicting reading comprehension using word reading skill, cognitive abilities, and motivational factors.

Criterion: Reading comprehension				
Enter	Variable Added	R^2	Final β	p
1	Word reading skill		.62	.00
	Vocabulary	.50	.22	.00
2	Working Memory	.50	-.02	.82
3	Intrinsic Reading Motivation	.54	.21	.01
1	Word reading skill		.61	.00
	Vocabulary	.50	.23	.00
2	Working Memory	.50	-.02	.86
3	Extrinsic Reading Motivation	.52	.15	.05
1	Word reading skill		.62	.00
	Vocabulary	.51	.23	.00
2	Working Memory	.51	-.02	.82
3	Reading Competency Beliefs	.54	.19	.01

Table 7.4. Predicting reading level using word reading skill, cognitive abilities, and motivational factors

Criterion: National curriculum reading level

Enter	Variable Added	R²	Final β	p
1	Word reading skill	.34	.44	.00
	Vocabulary		.29	.00
2	Working Memory	.34	.10	.32
3	Intrinsic Reading Motivation	.37	.15	.08
1	Word reading skill		.44	.00
	Vocabulary	.33	.27	.00
2	Working Memory	.34	.08	.42
3	Extrinsic Reading Motivation	.35	.10	.27
1	Word reading skill		.44	.00
	Vocabulary	.34	.28	.00
2	Working Memory	.35	.09	.37
3	Reading Competency Beliefs	.43	.32	.00

Children's word reading skill and vocabulary knowledge each explained significant independent variance in their reading comprehension performance and national curriculum reading level, with word reading skill explaining the most variance in each. However, after accounting for word reading skill and vocabulary, children's working memory capacity did not explain additional significant variance. After accounting for cognitive abilities and word reading skill, children's intrinsic and extrinsic reading motivation, and reading competency beliefs, explained significant additional variance in their reading comprehension. However, the amount of additional variance explained by

each motivational factor was small. Finally, whilst children's reading competency beliefs explained significant additional variance in their reading level after accounting for cognitive abilities and word reading skill, their intrinsic and extrinsic reading motivation did not explain additional variance.

Table 7.5. Predicting reading comprehension using word reading skill, cognitive abilities, and behaviour

Criterion variable: Reading comprehension				
Enter	Variable Added	R²	Final β	p
1	Word reading skill		.62	.00
	Vocabulary	.51	.23	.00
2	Working Memory	.51	-.02	.82
3	ADHD index	.52	-.13	.10
1	Word reading skill		.62	.00
	Vocabulary	.51	.23	.00
2	Working Memory	.51	-.02	.82
3	Hyperactivity	.51	-.03	.71
1	Word reading skill		.62	.00
	Vocabulary	.51	.23	.00
2	Working Memory	.51	-.02	.82
3	Oppositional	.51	.02	.74

Table 7.6. Predicting reading level using word reading skill, cognitive abilities, and behavioural factors

Criterion variable: National curriculum reading level

Enter	Variable Added	R²	Final β	p
1	Word reading skill		.44	.00
	Vocabulary	.34	.28	.00
2	Working Memory	.35	.09	.37
3	ADHD index	.35	-.09	.30
1	Word reading skill		.44	.00
	Vocabulary	.34	.28	.00
2	Working Memory	.35	.09	.37
3	Hyperactivity	.35	.05	.57
1	Word reading skill		.44	.00
	Vocabulary	.34	.28	.00
2	Working Memory	.35	.09	.37
3	Oppositional	.36	.10	.34

After accounting for word reading skill and cognitive abilities, none of the behavioural categories explained significant additional variance in reading comprehension or reading level.

Discussion

The aim of this study was to examine the relative contribution of children's word reading skill, cognitive skills, motivational factors for reading, and negative classroom behaviours, to their reading comprehension performance and national curriculum reading level. In addition, the strength of association between children's word reading skill, cognitive skills, motivation, behaviour, and reading attainment was examined. As stated earlier, few studies have investigated the relationships between these factors, as most previous research has focused solely on one or two of these elements. However, examining the associations between different influences on reading attainment may provide us with better clues as to how to remediate children's reading difficulties. It was found that whilst children's combined ADHD-type behaviours were associated with their reading comprehension and word reading attainment, their severity of hyperactive and oppositional behaviours were not. However, after accounting for word reading skill and cognitive abilities, severity of ADHD behaviour did not significantly predict children's reading comprehension performance. Regarding motivational factors, whilst children's reading competency beliefs were associated with their reading comprehension skill, their reading motivation was not. However, reading motivation did predict variance in children's reading comprehension skill after accounting for word reading skill and cognitive factors. Finally, motivational factors for reading were not significantly associated with children's negative classroom behaviour.

Regarding cognitive abilities, in accordance with previous research (Hoover & Gough, 1990; Kendeous et al., 2009; Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007; Share, 1995) both verbal ability and word reading skill were closely related to children's reading attainment. This is unsurprising, as in order to understand a text, a

child must be able to read the individual words (word reading skill) and understand the meanings (verbal ability). Furthermore, consistent with previous research (e.g. Kendeous et al., 2009), children's word reading skill and vocabulary knowledge each explained independent variance in their reading comprehension/reading level, illustrating that both elements are uniquely important. However, although children's working memory capacity was associated with their reading comprehension, it did not explain additional variance in their reading comprehension skill after accounting for word reading ability and vocabulary. This contradicts previous research (Cain et al., 2004) and the results of Chapter 6, which found that working memory capacity explained significant additional variance in reading comprehension after accounting for these factors. It is possible that this discrepancy is a result of methodological differences, as different measures of reading comprehension, word reading skill, and verbal ability were used in each study.   In addition, Chapter 6 used a composite score from short term and working memory, whereas the present study used only a working memory score. Therefore, as evidence concerning the role of working memory is mixed, further research needs to assess the role that working memory plays in children's reading performance.

With regard to motivation, some surprising results emerged. In contrast to previous research (Anmarkrud & Braten, 2009; Baker & Wigfield, 1999; Becker et al., 2010; Morgan & Fuchs, 2007; Mucherah & Yoder, 2008; Retelsdorf et al., 2011; Taboada et al., 2009; Park, 2011; Wang & Guthrie, 2004), reading motivation was not significantly related to children's reading attainment. In addition, when examining motivation from a multi-dimensional approach, neither intrinsic nor extrinsic reading motivation were associated with reading skill. Furthermore, although reading motivation explained additional (but small) amounts of variance in children's reading comprehension after

accounting for word reading and cognitive skills (consistent with Anmarkrud & Braten, 2009; Taboada et al., 2009), it did not explain additional variance in children's national curriculum reading level.

It is particularly surprising that intrinsic motivation was not significantly associated with children's reading ability, as intrinsic reading motivation has previously shown consistent positive relationships with reading attainment (Becker et al., 2010; Mucherah & Yoder, 2008; Park, 2011; Retelsdorf et al., 2011; Taboada et al., 2009; Wang & Guthrie, 2004). Due to the wealth of evidence supporting an association between intrinsic motivation and reading skill, the current results are very unusual. However, research indicates that the association between reading skill and reading motivation can vary considerably. For example, Morgan and Fuchs (2007) examined fifteen peer-reviewed, published studies investigating the link between reading motivation and attainment and found that although children's reading skills and motivation were consistently correlated, the reported magnitude of the correlations varied substantially. In this review, the correlation coefficient between reading and motivation varied from a low of .11 to a high of .65, or from 1% to 42% of explained variance. This suggests that reading motivation may be only weakly associated with reading skill for some children. In addition, it may be that the absence of published studies showing no relationship between motivation and attainment reflects a publication bias for results that are consistent with the previous literature.

Regarding extrinsic motivation, the results are a little less surprising. Whilst some studies suggest that extrinsic motivation is negatively associated with reading skill (Becker et al., 2010; Wang & Guthrie, 2004), other research shows contrasting results. The current results are consistent with Logan and Medford (2011) who also found no

relationship between extrinsic motivation and reading attainment. As stated in previous chapters, it may be that the relationship between extrinsic reading motivation and reading attainment is more complex than previous research suggests (e.g. McGeown, Norgate, & Warhurst, 2012; Park, 2011). Due to mixed evidence, further research should be carried out to better understand the role of extrinsic motivation for children's reading attainment.

With regard to reading self-concept, the present results are consistent with other studies showing a close relationship between competency beliefs and reading attainment (Chapman & Tunmer, 1995; 1997; Logan & Medford, 2011). Furthermore, the results suggest that it may be children's self-perceptions of their reading abilities, rather than their reading motivation, that is particularly associated with their reading skill. Consistent with previous findings (Katzir et al., 2009), reading competency beliefs explained significant additional (although relatively little) variance in children's reading comprehension after accounting for word reading skill and cognitive abilities. Furthermore, reading competency beliefs was the only motivational factor that explained additional variance in children's national curriculum reading level after accounting for word reading and cognitive skills. It may be that children's reading competency beliefs are more closely associated with their reading level than their intrinsic/extrinsic motivation because children base their beliefs about their reading abilities on their reading grades. Whilst children's reading grades are often communicated to them, less feedback is usually given about their performance on standardised reading tests. Therefore, children's beliefs about their reading abilities are likely to be closely tied to their reading levels. In the current study, competency beliefs explained slightly more variance in children's reading grades than in their standardised comprehension performance. This is in accordance with Helmke and van Aken (1995),

who found a tendency towards a stronger impact of maths grades on children's competency beliefs regarding maths compared to their test performance. It was suggested that this may be because communicated grades can be used for social comparison in the classroom, whereas standardised test scores may not be conveyed or understood.

Although direction of causality cannot be determined in this study due to the correlational design, as stated in previous chapters, it is likely that the relationship between competency beliefs and reading is reciprocal (Morgan & Fuchs, 2007). As proposed earlier, in accordance with the self-efficacy theory of motivation (e.g. Seifert, 2004) a child with high competency beliefs is likely to persevere more with challenging reading tasks than a child with low perceptions of their abilities, and thus their reading ability is more likely to improve. However, research suggests that reading competency beliefs mainly develop as a consequence of children's reading abilities and experiences with reading (Aunola et al., 2002; Chapman & Tunmer, 1997; Chapman et al., 2000). Good readers are likely to develop high self-estimates of their reading abilities whereas poor readers are likely to develop negative reading competency beliefs.

Regarding classroom behaviours, the current results are consistent with previous studies showing a negative relationship between ADHD-type behaviours and children's reading attainment (Barbaresi et al., 2007; Clark et al., 2002; Frazier et al., 2007). Furthermore, these results provide further support for the relationship between ADHD-type behaviours and reading attainment for typical school children without a behavioural diagnosis (e.g. Arnold et al., 2005; Fergusson et al., 1997; Heiervang et al., 2001). However, the association between ADHD behaviours and reading attainment in this study was weak, suggesting that ADHD behaviours may only be weakly related to

reading performance. In addition, contrasting previous findings (e.g. Barry et al., 2002; McConaughy et al., 2011), after accounting for word reading skill and cognitive abilities, negative classroom behaviour did not explain significant variance in reading comprehension performance. This may be due to the cognitive skills assessed in the current study. As stated, word reading skill and verbal ability are considered to be the most important factors for children's reading comprehension (e.g. Hoover & Gough, 1990). Therefore, it may be that after accounting for these skills, behaviour does not exert an influence on children's reading ability. However, the weak association between behaviour and reading in the current study may also reflect the behavioural measure used. In this study, teachers rated children's behaviour according to their general negative behaviour displayed in school. However, it is possible that if teachers rated children on their behaviour during reading activities and instruction (i.e., a domain specific measure of behaviour), the relationship between behaviour and reading attainment would be stronger. Indeed, other non-cognitive factors have shown a closer relationship with reading when measured in a domain specific context. For example, the results from Chapter 6 illustrated that reading motivation and reading competency beliefs were more closely associated with reading attainment than motivation for school in general or competency beliefs for school. Similarly, Logan and Medford (2011) also found that children's competency beliefs in reading were more closely associated with their reading skill than their general school competency beliefs.

The current results suggest that combined ADHD behaviour (both inattentive and hyperactive-impulsive), rather than hyperactivity alone, is detrimental for children's reading skill. This is inconsistent with previous studies showing the negative influence of hyperactivity on children's reading performance (McGee et al., 2002; Smart et al. ,1996). However, these results are consistent with research suggesting that combined

ADHD behaviours are a better predictor of reading attainment than hyperactivity alone. For example, Merrell and Tymms (2001) found that whilst high scores on the combined (both hyperactive-impulsive and inattentive symptoms) and predominantly inattentive subtypes of ADHD were negatively related to academic progress, the achievement of those with predominantly hyperactive-impulsive behaviours did not differ as greatly from those with zero scores. However, the influence of hyperactive-impulsive behaviours on academic progress did grow with age. It was suggested that this may have been because young children are typically more active and impulsive than older children, but this may not necessarily mean that they are not learning. Nevertheless, in the current study, hyperactivity failed to show significant relationships with reading attainment during the final years of primary school. Further research should be carried out to examine the ages at which hyperactive behaviour is most influential on children's academic progress.

Although a measure of solely inattentive behaviour was not included in this study, as combined ADHD behaviours, rather than hyperactivity alone, was related to reading skill, the results further illustrate the influence of inattention on reading. This is consistent with previous studies showing that inattention plays the greatest role in children's reading attainment (Greven et al., 2011; Merrell & Tymms, 2001; Massetti et al., 2008; Willcutt & Pennington, 2000). In addition, the current findings suggest that combined ADHD behaviour is more detrimental for children's reading attainment than oppositional behaviour. However, as children typically become more oppositional with age, it may be that oppositional classroom behaviour exerts a greater influence on the academic performance of older children. During primary school, it is likely that children with attentional difficulties develop poorer reading skills as a consequence of fewer active learning experiences and engagement in reading tasks due to higher engagement

in inattentive, distractible behaviour. However, this cannot be confirmed in the current study due to the correlational design, and as stated earlier, it is possible that negative classroom behaviours are a consequence of reading deficits (e.g. Halonen et al., 2006), or that the relationship is reciprocal (McGee et al., 2002; Rowe & Rowe, 1992).

Regarding the relationship between negative behaviour and the cognitive skills associated with reading comprehension, whilst ADHD behaviours were associated with children's word reading skill, they were not significantly related to children's vocabulary knowledge or working memory capacity. This contradicts previous findings suggesting that behavioural inattention is associated with working memory (Gathercole et al., 2008; Rogers et al., 2011). However, this may be because the current study used a combined measure of ADHD behaviours, rather than a separate measure of behavioural inattention. It may be that a measure of behavioural inattention alone would produce stronger relationships with working memory. In addition, the present study used only one measure of working memory: the backwards digit span task. It may be that a more in-depth or thorough assessment of working memory span may have produced stronger associations with inattention. However, the task used in the current study enabled a relatively quick, standardised assessment of working memory span, which was necessary due to time constraints within school. The results of this study also suggest that negative classroom behaviour does not influence children's vocabulary knowledge. This may be because vocabulary is learnt automatically through conversations as well as in classroom learning tasks that require good, attentive behaviour.

With regard to the relationship between negative classroom behaviour and reading motivation, negative behaviours were not significantly associated with children's reading motivation or reading competency beliefs. This contradicts previous research

showing that teacher ratings of ADHD are correlated with academic motivation (Oehler-Stinnet & Boykin, 2001). In addition, the current findings contrast with previous results suggesting that academic motivation plays a mediating role in the relationship between behaviour and reading performance (Demaray & Jenkins, 2011; Volpe et al., 2006). However, previous studies have examined children's general academic motivation rather than domain specific reading motivation. It is possible that a measure of domain-specific negative behaviour during reading activities and instruction would be more closely related with reading motivation. Further research could examine this possibility. In addition, it may be that a separate measure of behavioural inattention, rather than a combined measure of ADHD behaviours, would produce stronger relationships with reading motivation or reading competency beliefs. Furthermore, the results of this study may be influenced by the positive skews shown by the behaviour measures as the majority of children in this study were rated as having minimal levels of negative classroom behaviour. Therefore, it is possible that the weak associations between behaviour and reading attainment/reading motivation reflect the relatively poor distribution of scores. Including a behavioural measure which is more sensitive to variation in behaviours among typically developing children would be advantageous.

Educational implications

The results of this study have some educational implications. Firstly, the results have implications for the use of motivational strategies during reading interventions. Previous research suggests that focusing on improving both reading skills and reading motivation produces the greatest improvements in children's reading attainment (Guthrie et al., 2007). In addition, in Chapter 6, it was recommended that due to the association between reading motivation and reading skill, reading interventions should

focus on raising children's motivation to read as well as their cognitive abilities. However, the current study casts some doubt on the consistency of the association between reading motivation and attainment as the correlational analyses indicate that the relationship between the two can be weak. Nevertheless, the regression analyses do provide some evidence of the importance of reading motivation for reading attainment. As stated previously, there is a lot of empirical support for the relationship between reading motivation and reading skill, with much of this research coming from large scale well designed research studies (e.g. Anmarkrud & Braten, 2009; Baker & Wigfield, 1999; Becker et al., 2010; McGeown et al., 2012; Morgan & Fuchs, 2007; Mucherah & Yoder, 2008; Park, 2011; Retelsdorf et al., 2011; Taboada et al., 2009;; Wang & Guthrie, 2004). Furthermore, theoretically it would make sense for there to be a relationship between reading motivation and reading skill. Therefore, it may be worthwhile to continue to focus on raising children's motivation to read, based on the assumption that it may incur some benefits on reading skill. Consistent with Chapter 6, the present study suggests that focusing on improving children's reading competency beliefs may also be beneficial for children's reading attainment. Interventions to improve reading competency beliefs may include using attribution re-training techniques (Chapman & Tunmer, 2003), or include giving children reading activities of appropriate difficulty so that they have the opportunity to experience success (Linnenbrink & Pintrich, 2003).

This study also examined negative classroom behaviours to identify the influence it may have on children's reading. In terms of educational implications, the results of this study suggest that there would be greater benefits to children's reading skill if teachers focused more on developing reading motivation and reading competency beliefs rather than on reducing negative classroom behaviours. This suggestion is based on the fact

that motivation to read (and reading competency beliefs) rather than behaviour predicted variation in reading comprehension skill and national curriculum reading levels. However, ADHD-type behaviours were associated with reading skill and cognitive abilities, therefore teachers and other school professionals should be aware of the negative impact that ADHD-type behaviours may have on the reading performance of typical school children, and put some focus on remediating behavioural difficulties. Possible ways in which to improve children's negative classroom behaviour include whole school positive behaviour support (Luiselli, Putnam, Handler, & Feinberg, 2005) and computerised attention training (Rabiner et al., 2010).

Limitations and suggestions for future research

Firstly, as previously stated, it would be beneficial to include a separate measure of behavioural inattention, rather than including inattention within a combined score of ADHD-type behaviours. This would allow a more thorough examination of the relationships between different types of negative classroom behaviours, motivation, and reading attainment. Furthermore, the influence of other measures of inattention on children's reading skill and motivation could be examined, such as continuous performance measures rather than teacher-rated attention. In addition, as previously discussed, it would be beneficial for further research to include a measure of domain-specific behaviour during reading activities and instruction. This would enable an examination of the domain-specific relationships between reading attainment, motivation, and behaviour. Further research could also examine the relationships between negative classroom behaviours and other motivational factors, such as attitudes towards reading. For example, Rowe and Rowe (1992) found that inattentiveness had strong negative effects on children's attitudes toward reading. Finally, it is important to

note that a single age group was included in this study; therefore further research is necessary to examine the importance of behaviour and motivation as children progress through school. An understanding of this would allow teachers to identify at which stages they should focus more on behavioural or motivational factors for reading. In addition, a longitudinal design would help to establish causal relationships between negative classroom behaviour, motivation and attainment.

Conclusions

To conclude, this study examined the relationship between children's negative classroom behaviours, reading motivation, cognitive abilities, and reading attainment. The results highlight the importance of considering both cognitive and non-cognitive factors when identifying ways to improve children's reading skills. The current results suggest that fostering children's reading-related cognitive skills and reading competency beliefs may positively influence their reading attainment. However, regarding reading motivation, there were some discrepancies regarding the significance of the relationship with reading skill. Contrary to previous research, it was found that reading motivation was not significantly associated with children's reading skill (although it did explain significant variance in reading), suggesting that the association between reading motivation and reading attainment may be inconsistent. In general, the results suggest that focusing on improving children's reading competency beliefs may be more beneficial for their reading attainment than focusing on reducing their negative classroom behaviours or on increasing their intrinsic or extrinsic reading motivation.

CHAPTER 8: PREDICTING CHILDREN'S MOTIVATION TO READ

Abstract

Research suggests that children's motivation to read is influenced by their level of reading skill and reading self-concept. However, it is possible that characteristics unrelated to reading, such as underlying personality characteristics, also influence children's motivation to read. The current study examined the extent to which children's reading motivation was predicted by their reading skill, reading self-concept, and personality characteristics. Two hundred and ninety five children (aged 10 – 11) completed questionnaires measuring reading motivation, reading self-concept, personality characteristics, and also completed a reading assessment. It was found that personality explained significant variance in reading motivation after accounting for reading skill and reading self-concept. Furthermore, personality factors accounted for similar amounts of variance in intrinsic reading motivation as reading self-concept and skill. The implications for improving children's motivation to read are discussed, in addition to the importance of tailoring educational and motivational strategies to individuals.

Introduction

As outlined in previous chapters, a number of studies have highlighted the importance of children's reading motivation for their reading attainment (Anmarkrud & Braten, 2009; Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Taboada et al., 2009). As a result, there is a significant emphasis on making reading programs and interventions engaging and enjoyable, to boost children's enjoyment of reading and motivation to read, in addition to developing their reading skills. However, in order to do this, it is important to understand the factors that may influence children's levels of reading motivation. Previous research suggests that children's reading motivation relates closely with their reading abilities and experiences with reading (Baker & Wigfield, 1999; Wang & Guthrie, 2004) and that reading skill may have an influence on children's motivation to read (Morgan & Fuchs, 2007). However, it is possible that other internal factors, such as personality characteristics, also influence children's levels of reading motivation. The current study examines the extent to which reading skill, reading competency beliefs, and underlying personality characteristics predict motivation to read.

The importance of reading motivation

As outlined previously, research examining the predictors of children's reading attainment has typically focused on the cognitive skills that support children's reading ability, such as verbal abilities (Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007) and decoding skill (Nation & Snowling, 2004; Share, 2005). However, interest in children's reading motivation is increasing, as more research identifies quite consistent associations between motivation to read and reading attainment (Baker &

Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004). Furthermore, studies have found that children's motivation to read can explain variance in their reading attainment even after accounting for cognitive ability (Anmarkrud & Braten, 2009; Taboada et al., 2009), suggesting that both are important contributors.

Consequently, there is currently a large amount of emphasis in reading programs and interventions on improving children's motivation to read, as well as on improving cognitive and reading-related skills (e.g. Guthrie et al, 2004; Guthrie et al., 2007). However, as stated in Chapter 6, it is currently unclear about the best ways to foster children's reading motivation. Guthrie et al. (2006) found that intrinsic reading motivation and reading comprehension performance could be increased by fostering children's situational interest in texts by using stimulating tasks related to the topic of interest. Other ways of improving reading motivation may be to provide children with access to reading materials that are interesting and engaging for them and by allowing them to read books of their choice during the school day. However, it could be argued that in order to gain a fuller understanding of how to improve children's reading motivation, it is important to understand the factors that underlie children's motivation to read. According to previous research, individual differences in children's levels of reading motivation are significantly associated with individual differences in reading abilities and experiences with reading (Baker & Wigfield, 1999; Morgan & Fuchs, 2007; Wang & Guthrie, 2004). Therefore the best to way to increase levels of reading motivation may be to focus primarily on remediating children's skill deficits. However, it may be that children's motivation to read is also a product of other underlying factors such as personality traits. If so, it may be beneficial to place less emphasis on developing cognitive skills, and more emphasis on motivational techniques that aim to improve children's levels of reading motivation, taking into account individual

differences in personality characteristics. Previous research examining the influence of reading abilities, experiences with reading, and underlying personality characteristics on children's motivation to read is outlined in the following subsections.

The influence of reading skill on motivation to read

The relationship between reading motivation and reading ability is thought to be bi-directional, with each factor exerting causal influences on the other (Morgan & Fuchs, 2007). It is likely that children who are more motivated to read put more effort into learning to read, and thus become better readers. Similarly, it is likely that better readers are more motivated to read because they find reading activities to be easier and are thus more likely to enjoy reading. As such, it is probable that children's motivation to read largely stems from their reading abilities and experiences with reading. If a child experiences repeated episodes of difficulty or failure during reading tasks, they are likely to become discouraged with reading and associate reading tasks with feelings of failure. Over time, reading tasks will become increasingly associated with negative emotions, and consequentially motivation to read will decline. Alternatively, if a child experiences a high success rate with reading tasks in school, they may begin to associate positive feelings of success with reading activities, they will enjoy reading more, and their intrinsic motivation to read may increase. As such, children's reading skill is likely to play an important role in shaping their motivation to read.

Reading self-concept

As stated in Chapter 2, reading self-concept, an individual's self-estimates or beliefs about how competent they are at reading, is considered by some researchers to be one of

the main indicators or components of children's motivation to read (Gambrell et al., 1996; Morgan & Fuchs, 2007). Children's self-perceptions of their reading abilities have been found to be positively related to their reading motivation (Baker & Wigfield, 1999; Bouffard et al., 2003) as children with higher reading self-concept are likely to be more motivated to engage in reading tasks compared to children with low reading self-concept.

Regarding the causal nature of the relationship between motivation and competency beliefs, Gottfried (1990) argued that intrinsic motivation is positively related to children's competency beliefs because children with higher levels of intrinsic motivation should persist more with challenging learning tasks, be more successful, and thus have higher perceptions of their competency. However, it is probable that children's competency beliefs also exert a causal effect on their levels of reading motivation. Children with higher reading competency beliefs are likely to enjoy reading more and be more motivated to engage in reading tasks whilst children with negative self-competency beliefs are likely to be discouraged with reading, enjoy reading less, and be less motivated to engage in reading. Indeed, Chapman and Tunmer (2003) suggest that declines in reading competency beliefs should precede declines in children's levels of reading motivation. This is consistent with the self-efficacy theory of motivation (Seifert, 2004), which suggests that children who have high perceptions of their abilities will persevere more with challenging tasks than children who have low perceptions of their abilities, who typically avoid tasks, leading to lack of engagement. Self-efficacy beliefs are conceptually very similar to competency beliefs, but refer to more specific and situational judgments that individuals make about their abilities rather than more general judgments (Linnenbrink & Pintrich, 2003). An example of a self-efficacy belief may be 'I am good at reading difficult words in reading comprehension

tasks at school', whereas an example of a competency belief may be 'I am a good reader'. As with competency beliefs, research indicates that children's efficacy beliefs have an effect on their levels of motivation (Boggiano, Main, & Katz, 1988; Sewall & St-George, 2000; Smith, Smith, Gilmore, & Jameson, 2012). Boggiano et al. (1988) found that children with higher efficacy beliefs reported more intrinsic interest in school-related activities and a preference for more challenging activities. Similarly, Baker and Wigfield (1999) found that reading efficacy beliefs were closely correlated with measures of intrinsic and extrinsic reading motivation.

As stated in previous chapters, it is likely that reading competency beliefs develop mainly as a consequence of children's reading abilities and experiences with reading (Aunola et al., 2002; Chapman & Tunmer, 1997; Chapman et al., 2000). Good readers, who experience a high success rate with reading tasks, are likely to develop high self-estimates of their reading abilities, whereas poor readers, who struggle with reading tasks and experience higher rates of failure, are likely to develop negative reading competency beliefs. Indeed, reading self-concept has been found to be associated with reading enjoyment and interest (Retelsdorf et al., 2011), attitudes towards reading (Logan & Johnston, 2009), and reading skill (Aunola et al., 2002; Chapman & Tunmer, 1995; 1997; Chapman et al., 2000; Logan & Medford, 2011).

It is therefore likely that children with low motivation to read are largely under-motivated because of experiences of failure in acquiring reading skill. In the current study, competency beliefs are examined separately from reading motivation, in order to investigate the extent to which beliefs in reading ability and reading skill predict children's motivation to read. If children's competency beliefs do have a causal influence on their motivation to read, it would suggest that the more effective way to

increase levels of reading motivation would be to focus primarily on remediating children's reading skill deficits and self-concept of themselves as readers. This is consistent with Chapman and Tunmer (2003), who suggested that reading interventions should focus on two key elements: strategies for improving the cognitive skills that support reading, and strategies for ameliorating children's negative self-perceptions of their reading ability. However, it may be that children's reading motivation is not solely a product of children's reading abilities and experiences, but that it is also influenced by other underlying factors such as personality characteristics. If so, it may be important to consider the effects that personality traits have on levels of reading motivation when designing interventions to improve children's motivation to read.

Personality, attainment, and motivation

Personality refers to the set of underlying traits that determine how an individual typically behaves, thinks, and feels. Personality characteristics are generally thought to be stable, and determine consistent ways in which an individual interacts with their environment. A meta-analysis by Roberts and DelVecchio (2000) found that personality traits were relatively consistent across the life course; although most consistent in adulthood and least consistent in infancy, suggesting that personality characteristics become more stable with age. There are several different conceptualisations of personality; however the most widely accepted framework, and the framework which will be focused on in the current study, is the five-dimensional ('Big 5') framework (Goldberg, 1990). The Big 5 framework identifies five main personality factors to explain an individual's personality: agreeableness, extraversion, neuroticism, openness to experiences, and conscientiousness. Each individual has varying levels of each of these factors; a combination of which explains their personality. The five broad factors

consist of several sub-traits that characterise each. Agreeableness includes traits such as trustworthiness, straightforwardness, altruism, compliance, modesty and tender-mindedness. Extraversion includes warmth, gregariousness, assertiveness, excitement-seeking, and positive emotions such as optimism. Neuroticism (emotional regulation) includes anxiety, angry-hostility, depression, self-consciousness, impulsiveness and vulnerability. Openness to experiences includes imagination, interest in aesthetics, intellectual curiosity, and openness to feelings, actions, and other values. Finally, conscientiousness includes sensibleness, organisation, moral obligation, achievement striving, self-discipline and carefulness.

Currently, there is a lack of studies examining the relationship between children's personality traits and motivation. However, a number of studies have shown that personality traits are related to children's general academic performance (Barbaranelli, Caprara, Rabasca, & Pastorelli, 2001; Bratko, Chamorro-Premuzic, & Saks, 2006; Hair & Graziano, 2003; Heaven, Ciarrochi, & Vialle, 2007; Laidra, Pullmann, & Allik, 2007; Poropat, 2009), even after accounting for intelligence (Poropat, 2009; Spinath, Freudenthaler, & Neubauer, 2010). Of all the personality factors, conscientiousness shows the most robust relationship with academic performance (Bratko et al., 2006; Heaven et al., 2007; Laidra et al., 2007), followed by openness to experiences (Barbaranelli et al., 2001; Gilles & Bailleux, 2001; Laidra et al., 2007), with higher levels of openness to experiences and conscientiousness being associated with higher levels of academic achievement. Agreeableness has also been found to be positively related to children's academic performance, although this association appears to decrease with age (Laidra et al., 2007). The relationships between neuroticism, extraversion, and academic performance, appear to be less consistent. Neuroticism has been found to be negatively related to children's academic performance, although this

relationship becomes weaker after controlling for other personality variables (Laidra et al., 2007). Similarly, extraversion has been found to be less important for school achievement than openness to experiences and conscientiousness (Barabaranelli et al., 2001).

Despite the associations between children's personality characteristics and their academic performance, it is currently unclear as to why this relationship exists. It may be that personality is directly related to children's academic attainment because of positive traits that naturally promote academic learning. For example, positive traits related to conscientiousness, such as organisational skills and self-discipline, by their very nature, are likely to foster better school performance. However, it may be that personality characteristics influence children's academic achievement via other, mediating factors. For example, some studies have found that student's learning goals or approaches to learning may mediate the associations between personality factors and achievement (Duff, Boyle, Dunleavy, & Ferguson, 2004; Steinmayr, Bipp, & Spinath, 2011; Zhang, 2003). Alternatively, it is possible that the relationship is mediated by children's motivation, or willingness to perform (Poropat, 2009). For example, conscientious children are typically more achievement orientated and are thus likely to be more self-motivated than less conscientious children. This in turn, is likely to influence academic achievement. Nevertheless, research into the relationships between personality factors and academic motivation is limited, and studies that have examined these associations have generally used restricted participant groups of undergraduate students.

Research with undergraduate participants has found evidence of strong relationships between student's personality factors and academic motivation. Busato, Prins, Elshout,

and Hamaker (2000), found that student's achievement motivation was positively correlated with levels of extraversion, conscientiousness, agreeableness and openness to experiences. Similarly, Komarraju and Karau (2005) found that higher levels of openness to experiences were strongly related to higher levels of student's academic motivation and engagement, suggesting that differences in student motivation may be related to basic differences in student's personality characteristics. Richardson and Abraham (2009) found that achievement motivation fully mediated the impact of conscientiousness on student's academic performance, suggesting that personality exerts its influence on academic attainment through its effects on motivation. Other studies have examined the relationships between personality characteristics and student's levels of intrinsic and extrinsic motivation. Komarraju, Karau, and Schmeck (2009), found that 17% of the variance in student's intrinsic academic motivation could be explained by their conscientiousness and openness to experiences, whilst 13% of the variance in extrinsic academic motivation could be explained by levels of neuroticism, conscientiousness, and extraversion. Conscientiousness was also found to be a significant partial mediator of the relationship between intrinsic motivation and academic achievement. It was suggested that conscientiousness and openness to experiences were particularly important for intrinsic motivation because conscientious students tend to be more achievement oriented, whilst high openness to experiences indicates a strong intellectual curiosity; traits that are synonymous with intrinsic motivation. Other research has examined the links between student's personality characteristics and sub-components of intrinsic motivation. Clark and Schroth (2010) found that students who were intrinsically motivated to gain knowledge and accomplish things tended to be agreeable and conscientious, whereas students who were intrinsically motivated to experience stimulation were open to new experiences,

suggesting that personality characteristics may relate differently to intrinsic motivation depending on individual sub-facets.

Whilst there is currently a lack of studies investigating the relationships between children's personality characteristics and their academic motivation, it is possible that the relationships found between university student's personality traits and academic motivation hold true for school children also. If so, it may be beneficial to consider the potential influences of personality characteristics when examining the origins of children's academic motivation and when developing interventions to improve children's motivation in school.

Aims and Hypotheses

As research indicates that children's motivation to read has a significant influence on their reading attainment, it is important to identify ways to improve children's reading motivation, by developing a more comprehensive understanding of the factors influencing motivation to read. The current study examined the extent to which children's reading abilities, reading competency beliefs, and general personality characteristics could explain variance in their levels of intrinsic and extrinsic reading motivation. If children's personality characteristics were found to predict additional variance in their reading motivation after accounting for their reading ability and reading competency beliefs, it would suggest that reading motivation does not result solely from children's reading abilities and experiences, but that it is also influenced by other, more stable characteristics. Therefore, the first aim of the current study was to examine whether children's personality characteristics would predict additional variance in their reading motivation after accounting for reading ability and reading

competency beliefs. As research with undergraduate students suggests that personality characteristics may relate differently to different sub-facets of motivation (Clark & Schroth, 2010), a second aim of the study was to examine whether personality characteristics are differentially related to the sub-components of intrinsic-extrinsic reading motivation.

The personality factors that were focused on in the current study were conscientiousness, openness to experiences, and agreeableness, as these factors have been found to be positively associated with children's academic performance (e.g. Laidra et al., 2007), and were hypothesised to be the most important for children's levels of reading motivation. Conscientiousness is associated with university student's academic motivation (Busato et al., 2000; Komarraju et al., 2009; Richardson and Abraham, 2009) and was thought to be important for children's reading motivation because conscientious children are typically more achievement-oriented and self-disciplined, and are therefore also more likely to be self-motivated to engage in reading tasks. Openness to experiences has also been found to be associated with university student's academic motivation (Busato et al., 2000; Komarraju and Karau, 2005; Komarraju et al., 2009) and was thought to be important for children's reading motivation because children who have higher levels of openness to experiences are more intellectually curious, and are therefore more likely to have a desire to learn through reading. Finally, agreeableness has been linked to university student's academic motivation (Busato et al., 2000) and was thought to be important for children's levels of reading motivation because agreeable children are typically more compliant, and as a result may also demonstrate higher levels of reading motivation in school.

It was expected that children's personality characteristics would predict additional variance in their reading motivation after accounting for reading ability and reading competency beliefs. However, it was expected that the personality characteristics examined may be differentially related to different components of intrinsic and extrinsic reading motivation.

Method

Participants

In total, two hundred and ninety five children took part in this study. One hundred and thirty five children were in Year 5 (63 boys, 72 girls) with an average age of 10 years and 1 month (.30 SD) and one hundred and sixty children were in Year 6 (80 boys, 80 girls) with an average age of 11 years and 1 month (.28SD). The children were attending four different primary schools in the U.K. The final two years of primary school were selected because research indicates that children's self-perceptions become more accurate with age (Chapman & Tunmer, 1997), and that personality trait stability increases with age (Roberts & DelVecchio, 2000). Thus, assessments in the final years of primary school are likely to give the most accurate reflections of the relationships between children's self-reported personality characteristics, competency beliefs, and reading motivation.

Three of the schools that took part in this study were low achieving schools, as in the most recent review (2009), these schools had a lower than national average proportion of children achieving a Key Stage 2 Assessment Level of 4 or above. Using proportion of free school meals as an index of social deprivation, these schools were also from areas of social disadvantage, as in the most recent Ofsted reports (2008-2010), a much higher than national average proportion of children were entitled to free school meals. The fourth school was a high achieving school in an area of social advantage, as a higher than national average proportion of children were achieving expected Key Stage 2 Assessment Levels, and a lower than average proportion of children were entitled to

free school meals. Consent from the head teachers and class teachers were obtained prior to testing.

Materials

Reading Comprehension

Reading comprehension was assessed using a group administered, 45 item, sentence completion task (Group Reading Test II, Macmillan Test Unit, 2000). See Chapter 6 page 147, for more details. Children's standardised scores were used for the purposes of analysis.

Personality Questionnaire

Children completed a group administered, standardised questionnaire measuring the Big 5 personality dispositions (Five – Factor Personality Inventory – Children (FFPI-C), McGhee, Ehrler, & Buckhalt, 2007). The FFPI-C consists of five subscales that correspond to the Big 5 personality factors: agreeableness, extraversion, openness to experiences, conscientiousness, and neuroticism/emotional regulation. As stated earlier, in the present study only three of the sub-scales were used: agreeableness, openness to experiences, and conscientiousness, as these factors have been found to be most closely associated with children's academic performance (e.g. Laidra et al., 2007). The questionnaire consisted of 45 items; 15 items for each subscale. Each item consisted of a target statement and two opposing anchor statements (e.g. 'I like to read poetry', 'I don't like to read poetry'), which were read aloud by the experimenter. The children were required to choose the anchor statement that mostly closely represented their opinion, and then to make a qualitative decision about the degree of support for their choice by filling in one of five circles between the two anchor statements. The

questionnaire took approximately 25 minutes to administer and scores were summed and converted to standardised scores for the purposes of analysis. Using the current data set, Cronbach's alpha was used to evaluate internal consistency for the three personality dimensions. Internal consistency values for conscientiousness (α = .79), openness to experiences (α = .70), and agreeableness (α = .78) were regarded as suitable for analysis. The FFPI-C is considered a reliable and valid measure of personality; further information regarding the reliability and validity can be found in the examiner's manual (McGhee et al., 2007).

Reading Self-Concept

Children completed a group administered 10 item questionnaire measuring reading self-concept (Motivation to Read Profile – Competency Beliefs Subscale, Gambrell et al., 1996). See Chapter 7, page 186, for details. The questionnaire took approximately 5 – 10 minutes for children to complete. Cronbach's alpha was used to evaluate internal consistency and was found to be high (α = .77).

Reading Motivation Questionnaire

Children completed a group administered 45 item questionnaire measuring motivation for reading (the Motivation for Reading Questionnaire (MRQ) – Revised Version, Wang & Guthrie, 2004). See Chapter 7, page 185, for details. Scores were summed to give an indication of the child's overall level of intrinsic and extrinsic reading motivation. The questionnaire took approximately 15-20 minutes to administer. Cronbach's alpha was used to evaluate internal consistency for the dimensions of intrinsic and extrinsic reading motivation and their sub-components. Internal consistency was high for intrinsic motivation (α = .85), extrinsic motivation (α = .87), curiosity (α = .74), involvement (α = .68), challenge (α = .66), recognition (α = .79),

grades (α = .64), social (α = .71), and competition (α = .77). However, for the sub-component of compliance, internal consistency was a low (α = .30).

Procedure

Assessments were carried out in the fourth or fifth month of the children's fifth or sixth school year. All children completed the questionnaires and reading assessment in their classrooms in the following order: reading motivation questionnaire, reading competency beliefs questionnaire, reading comprehension assessment, personality questionnaire. This took approximately one hour. Ethical approval was sought and granted from the Department of Psychology Ethics Committee at the University of Hull.

Results

The results are separated into three sections: 1) Descriptive statistics for each assessment, 2) Correlations between reading skill, reading competency beliefs, personality and reading motivation, 3) Predicting reading motivation (intrinsic-extrinsic) using reading skill, reading competency beliefs, and personality.

1) Descriptive statistics

Descriptive statistics were calculated for each assessment (see Table 8.1). Skew values for all dimensions of intrinsic motivation differed significantly from the normal distribution ($p < .05$), with more scores high in the distribution. However, kurtosis values were not significant for these variables. Regarding extrinsic motivation, scores were significantly skewed for recognition and grades ($p < .05$), with more scores at the higher end of the scales; however, these sub-scales did show significant levels of kurtosis. Social and competition showed significant levels of kurtosis ($p < .05$), but were not significantly skewed. All other skew and kurtosis values indicated a normal distribution. Therefore the score distributions were regarded as suitable for further analysis.

Table 8.1. Descriptive statistics for each assessment

Assessment	Mean	S. D.	Skewness	Kurtosis
Reading skill (SS)	94.36	12.55	1.68	-1.34
Competency Beliefs (%)	28.44	4.74	.042	-1.12
Total intrinsic motivation (raw)	54.92	10.50	-2.90	-.08
Involvement (raw)	20.28	4.42	-2.31	-1.45
Challenge (raw)	14.57	3.49	-3.96	-.04
Curiosity (raw)	19.95	4.47	-2.56	-1.52
Total extrinsic motivation (raw)	71.93	13.85	-.05	-.50
Recognition (raw)	15.08	3.74	-.51	-.56
Grades (raw)	12.25	2.75	-.58	-.16
Social (raw)	17.05	5.01	.12	-.73
Competition (raw)	16.60	4.63	-.05	-.82
Compliance (raw)	10.92	2.35	-.20	.12
Conscientiousness (SS)	100.79	13.12	1.03	1.06
Openness to experiences (SS)	98.76	16.62	-1.26	1.60
Agreeableness (SS)	99.83	14.31	1.33	.03

2) Correlations

Correlations were carried out to examine the strength of association between reading skill, reading competency beliefs, reading motivation (intrinsic-extrinsic) and personality factors (agreeableness, conscientiousness, openness to experiences).

Table 8.2. Associations between reading skill, reading competency beliefs, reading motivation, and personality

	1	2	3	4	5	6	7
1	---						
2	.37**	---					
3	.21**	.46**	---				
4	.00	.49**	.65**	---			
5	-.06	.02	.28**	.20**	---		
6	.10	.28**	.57**	.45**	.34**	---	
7	.10	.40**	.41**	.38**	.44**	.53**	---

Note: 1 = Reading Attainment, 2 = Reading Competency Beliefs, 3 = Intrinsic Reading Motivation, 4 = Extrinsic Reading Motivation, 5 = Agreeableness, 6 = Openness to Experience, 7 = Conscientiousness * p < .05, ** p < .01.

Whilst children's intrinsic reading motivation was significantly correlated with their reading attainment, their extrinsic reading motivation was not (see Table 8.2). When examining personality, none of the personality factors correlated significantly with reading attainment. However, children's openness to experiences and conscientiousness correlated closely and significantly with both their intrinsic and extrinsic reading motivation. Agreeableness also significantly correlated with children's intrinsic and extrinsic reading motivation, albeit less closely. In addition, openness to experiences and conscientiousness correlated with children's reading competency beliefs, whilst agreeableness did not. Children's reading competency beliefs were significantly related to their reading attainment, intrinsic reading motivation and extrinsic reading motivation. Finally, children's personality factors were significantly correlated with one another.

3) Predicting reading motivation (intrinsic-extrinsic) using reading competency beliefs, reading skill and personality.

Regression analyses are separated into two sections: i) examining the predictors of intrinsic and extrinsic reading motivation; ii) examining the predictors of the sub-components of intrinsic and extrinsic motivation.

i) Predicting intrinsic and extrinsic dimensions of reading motivation.

Hierarchical regression analyses were carried out to examine the variance in children's reading motivation explained by their reading skill, reading competency beliefs and personality, with separate analyses conducted for intrinsic and extrinsic reading motivation.

Table 8.3. Predicting intrinsic and extrinsic reading motivation using reading ability, reading competency beliefs, and personality factors

	Model 1:	Model 2:	Model 3:
Enter 1:1	1	1	
Enter 2:	2	2	
Enter 3:			3; 4; 5
Criterion variable: Intrinsic reading motivation			
1. Reading skill	.21**	.21**	.21**
2. Competency beliefs		.45**	.45**
3. Agreeableness			.13*
4. Openness to experiences			.44**
5. Conscientiousness			-.01
R^2	0.05	0.22	.44
Criterion variable: Extrinsic reading motivation			
1. Reading skill	0.00	0.00	-.02
2. Competency beliefs		.58**	.58**
3. Agreeableness			.07
4. Openness to experiences			.30**
5. Conscientiousness			.01
R^2	0.00	0.28	.40

Note: Values presented in table are Finalβ values, with the exception of the final row which are R^2 values. * = $p < .05$; ** = $p < .01$. The order in which variables were entered into the hierarchical regression analyses can be observed using the model summaries at the top of the table. 1= Reading Ability, 2 = Reading Competency Beliefs, 3 = Agreeableness, 4 = Openness to Experiences, 5 = Conscientiousness.

After controlling for children's reading attainment and reading competency beliefs, personality factors explained significant additional variance in both intrinsic and extrinsic reading motivation. Furthermore, a regression model using reading attainment, competency beliefs, and personality factors as predictors (model 3; see table 8.3) explained 22% more variance in intrinsic motivation, and 12% more variance in extrinsic motivation, than a regression model including only reading attainment and reading competency beliefs (model 2). Children's openness to experiences and agreeableness both made significant and independent contributions to their intrinsic reading motivation after accounting for reading attainment and competency beliefs, with openness to experiences explaining the largest amount of variance. However, children's openness to experiences was the only personality factor that made a significant additional contribution to levels of extrinsic reading motivation.

Children's competency beliefs regarding reading explained significant independent variance in both intrinsic and extrinsic reading motivation after accounting for reading attainment. Furthermore, a regression model including both reading attainment and competency beliefs (Model 2) explained 17% more variance in intrinsic motivation and 28% more variance in extrinsic motivation than a regression model using only reading attainment as a predictor (Model 1). Finally, whilst reading attainment explained significant variance in children's intrinsic reading motivation, it did not explain significant variance in children's extrinsic reading motivation.

ii) Examining the predictors of the sub-components of intrinsic and extrinsic reading motivation.

Further hierarchical regression analyses were carried out to examine whether children's reading attainment, competency beliefs, and personality factors contributed differently to the different sub-facets of intrinsic (curiosity, involvement, preference for challenge) and extrinsic (recognition, grades, social, compliance, competition) reading motivation.

Table 8.4. Predicting the sub-components of intrinsic reading motivation using reading ability, competency beliefs, and personality factors

	Model 1:	Model 2:	Model 3:
	Enter 1:1	1	1
	Enter 2:	2	2
	Enter 3:		3; 4; 5
Criterion variable: Curiosity			
1. Reading skill	.06	.06	.06
2. Competency beliefs		.37**	.39**
3. Agreeableness			.19**
4. Openness to experiences			.40**
5. Conscientiousness			-.00
R^2	.00	.12	.37
Criterion variable: Involvement			
1. Reading skill	.23**	.22**	.22**
2. Competency beliefs		.32**	.32**

3. Agreeableness			.08
4. Openness to experiences			.44**
5. Conscientiousness			-.06
R²	.05	.14	.32

Criterion variable: Challenge

1. Reading skill	.30**	.30**	.30**
2. Competency beliefs		.43**	.43**
3. Agreeableness			.04
4. Openness to experiences			.28**
5. Conscientiousness			.04
R²	0.09	.25	.34

Note: Values presented in table are Finalβ values, with the exception of the final row which are R^2 values.

$*$ = $p < .05$; $**$ = $p < .01$. 1= Reading Ability, 2 = Reading Competency Beliefs, 3 = Agreeableness, 4 = Openness to Experiences, 5 = Conscientiousness.

After controlling for children's reading attainment and reading competency beliefs, personality factors explained significant additional variance in all of the intrinsic reading motivation sub-components (see table 8.4). A regression model using reading attainment, competency beliefs, and personality factors as predictors accounted for 25% more variance in children's curiosity and 18% more variance in children's involvement than a model using only reading attainment and competency beliefs (model 2). However, personality factors only accounted for an additional 9% of the variance in children's preference for challenge. Children's reading competency beliefs accounted for significant variance in each sub-component of intrinsic reading motivation after accounting for reading attainment; however, competency beliefs explained the most variance in children's preference for challenge.

Children's openness to experiences and agreeableness both made significant and independent contributions to their reading curiosity after accounting for reading attainment and competency beliefs, with openness to experiences explaining the largest amount of variance (see model 3). However, children's openness to experiences was the only personality factor that made a significant additional contribution to levels of involvement and preference for challenge. Finally, whilst reading attainment explained significant variance in children's involvement in reading and their preference for challenge, it did not explain significant variance in their levels of curiosity for reading.

Table 8.5. Predicting sub-components of extrinsic reading motivation using reading ability, competency beliefs, and personality factors

	Model 1:	Model 2:	Model 3:
	Enter 1:1	1	1
	Enter 2:	2	2
	Enter 3:		3; 4; 5
Criterion variable: Recognition			
1. Reading skill	.07	.07	.06
2. Competency beliefs		.50**	.50**
3. Agreeableness			.10
4. Openness to experiences			.31**
5. Conscientiousness			-.16*
R²	.01	.22	.31
Criterion variable: Competition			
1. Reading skill	.08	.08	.09
2. Competency beliefs		.43**	.46**
3. Agreeableness			-.19**
4. Openness to experiences			.17**
5. Conscientiousness			.09
R²	.01	.17	.24
Criterion variable: Compliance			
1. Reading skill	-.08	-.08	-.10
2. Competency beliefs		.34**	.35**
3. Agreeableness			.06

4. Openness to experiences			.05
5. Conscientiousness			.22**
R²	.01	.12	.19

Criterion variable: Social

1. Reading skill	.09	-.09	-.09
2. Competency beliefs		.44**	.44**
3. Agreeableness			.22**
4. Openness to experiences			.29**
5. Conscientiousness			-.10
R²	.01	.18	.30

Criterion variable: Grades

1. Reading skill	.03	.03	-.01
2. Competency beliefs		.41**	.43**
3. Agreeableness			.10
4. Openness to experiences			.18**
5. Conscientiousness			.13
R²	.00	.15	.29

Note: Values presented in table are Finalβ values, with the exception of the final row which are R² values.

* = p < .05; ** = p < .01. 1= Reading Ability, 2 = Reading Competency Beliefs, 3 = Agreeableness, 4 = Openness to Experiences, 5 = Conscientiousness.

After controlling for children's reading attainment and reading competency beliefs, personality factors explained significant additional variance in all of the extrinsic reading motivation sub-components (see table 8.5). However, a regression model using reading attainment, competency beliefs, and personality factors as predictors (model 3) explained relatively small amounts of additional variance in each subcomponent when compared to a model using only reading ability and competency beliefs (model 2).

Personality factors explained most variance in children's social reasons for reading and in their motivation to read in order to receive good grades. Children's reading competency beliefs explained significant additional variance in all sub-components of extrinsic reading motivation after accounting for reading attainment. However, competency beliefs explained the most variance in children's motivation to read in order to gain recognition, motivation to read for competitive reasons, and motivation to read for social reasons.

Children's openness to experiences and agreeableness explained significant additional variance in reading for competition and reading for social reasons after accounting for reading attainment and competency beliefs; however, conscientiousness did not. Regarding children's motivation to read in order to be compliant, whilst children's conscientiousness explained additional variance after accounting for reading attainment and competency beliefs, openness to experiences and agreeableness did not. For the reading for recognition sub-component, openness to experiences and conscientiousness explained additional variance, whereas agreeableness did not. For the reading for grades sub-component, openness to experiences was the only personality factor that accounted for significant additional variance. Finally, children's reading attainment did not explain significant variance in any of the sub-components of extrinsic reading motivation.

Discussion

The aim of this study was to examine whether children's personality characteristics would predict variance in their reading motivation after accounting for reading skill and reading competency beliefs. It was found that children's personality traits did explain significant additional variance in levels of both intrinsic and extrinsic reading motivation after accounting for these factors. This highlights the importance of considering reading abilities, competency beliefs and underlying personality characteristics to understand children's reading motivation.

As stated earlier, there is currently a lack of research examining the influence of children's personality characteristics on their motivation, specifically reading motivation; previous studies typically focus on the relationship between children's reading abilities and competency beliefs in reading and how this relates to their reading motivation. In accordance with previous studies (Becker et al., 2010; Mucherah & Yoder, 2008; Wang & Guthrie, 2004), children's intrinsic reading motivation was positively associated with their reading attainment. As previously stated, although the direction of this relationship cannot be causally determined, it is likely that the relationship is bidirectional, with each exerting causal effects on the other (Morgan & Fuchs, 2007). Children who are more intrinsically motivated to read are likely to put more effort into reading tasks and thus become better readers, whereas children who are less intrinsically motivated to read are likely to put less effort into learning to read, and thus reading skill is less likely to improve. Similarly, good readers, who find reading tasks to be easier, are likely to enjoy reading more, and thus be more intrinsically motivated to read, whereas poor readers, who struggle with reading tasks, are likely to enjoy reading less and be less intrinsically motivated to read. As such, children's

intrinsic reading motivation is likely to stem in part from children's reading abilities and experiences with reading. The results of the current study support this suggestion, as children's reading attainment was found to explain significant independent variance in their levels of intrinsic reading motivation. However, the amount of variance in intrinsic motivation explained by children's reading skill was relatively small, suggesting that other factors may be more important. Furthermore, in this study, children's reading skill was not associated with their extrinsic motivation, and did not explain significant variance in their extrinsic motivation to read. This is inconsistent with previous studies that have found a negative relationship between children's extrinsic reading motivation and their reading attainment (Mucherah & Yoder, 2008; Wang & Guthrie, 2004), but consistent with Logan and Medford (2011), who also found no relationship between extrinsic motivation and reading skill. Research examining the associations between extrinsic motivation and attainment is often mixed (e.g., Park, 2011). Therefore, as stated in previous chapters, further research should be carried out to better understand the relationship between children's extrinsic reading motivation and their reading skill.

Consistent with previous studies (Chapman & Tunmer, 1995; 1997; Logan & Medford, 2011), children's competency beliefs regarding reading were closely associated with their reading performance. Research suggests that this relationship is also likely to be bi-directional (Morgan & Fuchs, 2007), with each exerting a casual effect on the other. As such, it is likely that children's reading competency beliefs develop mainly as a consequence of their reading abilities and experiences with reading (Aunola et al., 2002; Chapman & Tunmer, 1997; Chapman et al., 2000). Good readers, who are successful at reading tasks, are likely to develop high self-estimates of their reading abilities, whereas poor readers, who experience higher rates of failure with reading tasks, are likely to develop negative reading competency beliefs.

The current study found that reading competency beliefs were also closely associated with children's intrinsic and extrinsic reading motivation. Furthermore, competency beliefs explained additional variance in both intrinsic and extrinsic reading motivation after accounting for reading skill, illustrating that reading competency beliefs explain variation in children's motivation to read. This is consistent with previous studies showing a relationship between children's competency beliefs and academic motivation (Boggiano et al., 1988; Sewall & St-George, 2000; Smith et al., 2012), and between their reading competency beliefs and motivation to read (Baker & Wigfield, 1999; Retelsdorf et al., 2011). It is likely that children with higher reading competency beliefs are more motivated to read because they believe they will succeed at reading tasks, and will consequentially enjoy reading more. Alternatively, children with negative competency beliefs are likely to become de-motivated and discouraged with reading as they believe they will fail at reading tasks. This is consistent with Chapman and Tunmer (2003), who suggested that declines in reading competency beliefs should precede declines in children's levels of reading motivation. Furthermore, this is consistent with the self-efficacy theory of motivation (Seifert, 2004), which suggests that children who have positive competency beliefs persevere more with challenging tasks than children who have low perceptions of their abilities, who typically avoid tasks, leading to lack of engagement. Interestingly, children's reading competency beliefs explained a much larger proportion of the variance in their reading motivation than their reading skill did; as children's reading competency beliefs may shape their reading motivation, further research could also consider the factors that predict children's self-perceptions of their reading skills.

With regard to personality characteristics, none of the personality factors assessed were significantly associated with children's reading performance. This contradicts previous

findings showing a relationship between children's personality factors and their general academic performance (Barbaranelli et al., 2001; Bratko et al., 2006; Hair & Graziano, 2003; Heaven et al., 2007; Laidra et al., 2007; Poropat, 2009). However, it may be that the association between personality and performance does not emerge when assessing children's performance on a domain specific skill such as reading ability. It may be that personality and performance are only related when considering children's general academic performance, or when combining scores on a range of ability assessments. Further research needs to examine these possibilities. However, the results of this study are consistent with the suggestion that personality characteristics exert their effects mainly through children's motivation, or willingness to perform (Poropat, 2009). In accordance with previous studies showing an association between university student's personality characteristics and academic motivation (Busato et al., 2000; Komarraju and Karau, 2005; Komarraju et al., 2009; Richardson and Abraham, 2009), children's personality characteristics were closely associated with their motivation to read. In addition, children's personality factors explained additional unique variance in their reading motivation after accounting for their reading attainment and competency beliefs. This suggests that reading motivation cannot solely be explained by children's reading abilities and experiences, but that it is also predicted by children's underlying personality characteristics. Furthermore, personality characteristics explained similar levels of variance in intrinsic reading motivation as children's reading ability and competency beliefs, suggesting that personality characteristics may be equally important. This is particularly interesting, as given that three of the factors investigated were domain specific (reading skill, reading competency beliefs, reading motivation), it is surprising that a non-domain specific trait unrelated to reading is such a good predictor of children's reading motivation after accounting for their reading ability and competency beliefs.

When examining the predictors of extrinsic and intrinsic reading motivation, personality factors explained an additional 22% of the variance in intrinsic motivation and an additional 12% of the variance in extrinsic motivation. This suggests that children's personality characteristics may have a greater influence on their intrinsic motivation to read. Of all the personality factors, children's openness to experiences was most closely associated with and accounted for the most additional variance in both intrinsic and extrinsic reading motivation. Openness to experiences is likely to influence children's reading motivation because children with high levels of openness to experiences are more intellectually curious, and are thus more likely to be self-motivated to engage in reading tasks in order to learn through reading. However, agreeableness and conscientiousness were also closely correlated with both intrinsic and extrinsic reading motivation. This suggests that these factors also play a part, albeit a relatively smaller part, in shaping children's motivation to read. It is likely that agreeable children are more motivated to read because they are more likely to comply with the expectations of their class teachers. Conscientiousness is likely to be important for children's reading motivation because conscientious children are more achievement oriented and self-disciplined, characteristics that are likely to promote self-motivation. However, agreeableness and conscientiousness were relatively weak predictors of children's motivation to read when compared to openness to experiences, suggesting that openness to experiences may be the key personality characteristic that influences children's levels of reading motivation.

When examining the predictors of the different sub-components of reading motivation, some interesting results emerged. With regards to intrinsic reading motivation, personality traits explained more variance in curiosity and involvement than reading skill and competency beliefs did, whilst reading skill and competency beliefs explained

more variance in challenge than personality traits did. Of the personality traits, openness to experiences was the most important personality factor for all sub-components of intrinsic motivation. It is likely that children's openness to experiences was particularly important for their curiosity and involvement in reading because children who have high levels of openness to experiences are more intellectually curious, and are thus more likely to read to learn new information and become involved in the texts they are reading. Conversely, reading skill and competency beliefs explained most variance in children's preference for challenge. A child with good reading skills and positive competency beliefs is likely to read challenging materials because they believe that they will succeed, whereas a child with weaker reading skills and less confidence in their reading skills is likely to avoid challenging materials because they believe that they will fail. This is consistent with Boggiano et al. (1988), who found that children with higher perceptions of their academic competence reported a greater preference for challenging learning activities.

With regards to extrinsic reading motivation, more variance in each dimension was predicted by competency beliefs rather than personality traits or reading skill. Indeed, personality traits explained a relatively small amount of additional variance in each sub-component of extrinsic motivation compared to intrinsic motivation. With regards to the personality characteristics that were most important for each sub-component of extrinsic reading motivation, a varying pattern emerged, although openness to experiences was typically the strongest predictor. A notable exception was the motivational trait of compliance, which can be defined as conforming to an external requirement. Children with higher levels of conscientiousness rather than openness to experiences were more likely to be compliant. As conscientiousness is associated with characteristics such as sensibleness, moral obligation, achievement striving and self-discipline, it is perhaps

unsurprising that these children would be more likely to be compliant within a classroom setting.

To summarise, the results of this study suggest that children's personality characteristics are important predictors of their motivation to read, and may be equally important in shaping children's reading motivation as their reading abilities and competency beliefs.

Educational implications

Research shows that reading interventions focusing on developing reading and reading related skills (e.g. phonics and language skills) and on improving children's motivation to read produce the greatest gains in reading skill (Guthrie et al., 2004; Guthrie et al., 2007). Furthermore, research indicates that focusing on improving children's intrinsic rather than extrinsic reading motivation is likely to be particularly beneficial (Logan et al., 2011; Souvignier and Moklesgerami, 2006; Wang & Guthrie, 2004). The results of this study also highlight the association between intrinsic motivation and reading attainment, suggesting that it is important for reading programs to include techniques that aim to improve children's intrinsic motivation to read. However, the results of this study also have some important implications regarding possible ways in which to improve children's reading motivation.

Firstly, the results suggest that personality factors may play an important part in shaping children's intrinsic reading motivation. The influence of personality factors on children's reading motivation could be interpreted in a negative way. As personality traits are relatively stable and consistent (Roberts & DelVecchio, 2000), this could be somewhat problematic for interventions that aim to improve children's levels of reading

motivation. If reading motivation depends partly on children's underlying, stable personality characteristics, it may be that levels of reading motivation can only be changed to a certain extent. However, it may be possible to use knowledge about the relationship between children's personality characteristics and their levels of reading motivation for positive purposes. Although personality traits are generally stable, it may be possible to encourage children to develop or make better use of the personality characteristics that are most beneficial for levels of reading motivation. For instance, as openness to experiences appears to be the most important personality factor for children's reading motivation, it may be possible to develop children's intellectual curiosity, a personality trait associated with openness to experiences, by designing lesson activities that encourage this trait. For example, children could do reading activities in which they have to find out as many things as possible about a topic of their choice or about a topic that they are interested in. This may encourage children's curiosity, and may consequentially cause intrinsic motivation to read to increase. In addition, children could be rewarded for demonstrating behaviours associated with positive personality traits, such as being more open or more conscientious. Further research should examine these possibilities.

It may also be beneficial to tailor teaching methods and interventions to different personalities. Komarraju and Karau (2005) suggested that university students may be more motivated by academic environments that provide a good fit with their personality characteristics. Similarly, a review by Eysenck (1996) proposed that children learn better with teaching methods that suit their personality traits. It was suggested that it may be beneficial for teachers to give children personality assessments in order to understand their personalities and to develop the most appropriate teaching methods for their pupils. As such, it may be possible to enhance children's motivation to read by

providing learning activities that fit well with their personalities, or by providing learning activities that match children's motivational preferences based on their personality characteristics. For example, a child who has high levels of openness to experiences may be more motivated by reading tasks that encourage intellectual curiosity, whilst a conscientious child may be more motivated by reading tasks that are more achievement - focused or that involve using organisational skills. Further research should investigate these possibilities. In addition, it may also be beneficial to use knowledge about the predictors of the different sub-components of intrinsic-extrinsic reading motivation when designing interventions to improve children's motivation to read. For example, of all the intrinsic motivation sub-components, the current study found that children's curiosity and involvement in reading depended most on children's underlying personality characteristics, particularly openness to experiences. Thus, for children with high levels of openness to experiences, it may be particularly beneficial to focus on reading motivation interventions that aim to promote children's curiosity and involvement in reading, which should come more naturally to children with high levels of openness to experiences, and may produce the greatest gains in motivation for these children. However, it should be noted that matching learning activities to children's individual personality characteristics may realistically be an almost impossible task, especially when teaching large class sizes. Therefore these suggestions should be considered within the context of what is realistic within a classroom setting.

The current results also have some implications regarding the extent to which children's reading motivation can be improved by developing their reading skill. Previous research indicates that children's motivation to read is closely and reciprocally related to their reading abilities (Morgan & Fuchs, 2007). If so, then an effective way to improve children's motivation to read would arguably be to primarily focus on improving

children's reading skills. However, the current results suggest that it may be children's competency beliefs regarding reading, rather than their actual reading abilities, that mainly predict levels of reading motivation. Thus, it may be beneficial for reading motivation interventions to focus on improving children's reading competency beliefs. However, the current results suggest that children's reading competency beliefs may be more important for some sub-components of their reading motivation than for others. Therefore, a focus on improving children's competency beliefs regarding reading may only be beneficial for certain aspects of children's motivation to read. For instance, the current study found that children's competency beliefs regarding reading were particularly important for their preference to engage in challenging reading activities. Therefore, if a child is avoiding challenging reading tasks, it may be possible to motivate the child to engage in such activities by focusing on improving their reading competency beliefs. However, improving reading competency beliefs for other sub-components of motivation, such as curiosity and involvement, may increase levels of reading motivation to a lesser extent. Therefore, it may be beneficial for teachers to assess the particular motivational deficits of their children before considering strategies to improve their motivation to read.

As reading competency beliefs generally stem from children's reading skills (Aunola et al., 2002; Chapman et al., 2000; Chapman & Tunmer, 1997), one way to improve children's reading competency beliefs may be to focus on improving their cognitive abilities and reading skills. Alternatively, another way to improve children's competency beliefs may be to use attribution retraining techniques that aim to change children's beliefs about their reading failure from being caused by a lack of ability to being caused by inappropriate strategy use or inadequate effort (Chapman & Tunmer, 2003). In addition, it may be beneficial to give children tasks that are challenging but

not too difficult, as they are likely to develop more positive competency beliefs as they experience success (Linnenbrink & Pintrich, 2003). Furthermore, teachers should foster the beliefs that reading skill is changeable and controllable (Linnenbrink & Pintrich, 2003).

Limitations and suggestions for future research

Some limitations of the current study should be noted. Firstly, the current study included only three of the Big 5 personality factors: agreeableness, openness to experiences, and conscientiousness. However, it is likely that children's reading motivation is also influenced by their levels of extraversion or neuroticism. For example, extraverted children may be more extrinsically motivated to read due to the sub-traits associated with extraversion, such as warmth and a tendency to prefer social interaction. Further research could do a more in-depth analysis of the personality factors associated with children's intrinsic and extrinsic motivation to read, in order to gain a full understanding of how personality affects the different dimensions of motivation. In addition, due to the correlational nature of this study, causal relationships cannot be determined. Further research could examine the relationships between personality factors, reading motivation, reading ability, and competency beliefs longitudinally in order to acquire a full understanding of the factors that underlie children's reading motivation. Furthermore, only a single age group was included in this study; thus a longitudinal design would enable an examination of the importance of personality characteristics for children's reading motivation as they progress through school.

The current study used self-rating scales to measure children's competency beliefs, reading motivation, and personality. However, it is well known that self-ratings may be

affected by social desirability, as individuals may attempt to represent themselves in a positive light (e.g. Holden, 2007). Further research could examine the influence of children's personality characteristics as rated by others such as peers, parents, or teachers. In addition, the extrinsic motivation sub-scale of compliance used in this study had low internal consistency, suggesting that the items in this sub-scale may not be a highly accurate measure of children's motivation to read in order to comply with external expectations. However, the Motivation for Reading Questionnaire – Revised (Wang & Guthrie, 2004) has received previous empirical support and validation (Wang & Guthrie, 2004; Wigfield & Guthrie, 1997), suggesting that the questionnaire is a valid and reliable measure of children's motivation to read. Nevertheless, it may be interesting to investigate the associations between children's personality characteristics and more behavioural measures of reading motivation, such as a child's persistence at a reading task. In addition, it would be interesting to examine the influence of children's personality characteristics on other aspects of motivation, such as children's attitudes toward reading. For example, Heaven, Mak, Barry, and Ciarrochi (2002), found that conscientiousness was a powerful predictor of children's general attitudes to school. It may be that children's personality characteristics are also related to children's domain specific attitudes to reading. Furthermore, future research could examine whether personality characteristics influence children's reading frequency and amount of reading. Schutte and Malouff (2004) found that personality characteristics, in particular openness to experiences and conscientiousness, predicted student's amount of recreational and non-recreational reading. Previous research indicates that children's motivation to read influences their reading frequency (Baker & Wigfield, 1999). Therefore, it would be interesting to examine the relationships between children's reading motivation, personality characteristics and their frequency of engagement in reading activities.

Finally, it could be argued that a better understanding of the influence of children's personality traits on their general academic learning and attainment would be useful. Indeed, a recent meta-analysis exploring the relationship between personality and attainment found only eight out of one hundred and thirty five studies included children in primary school education (Poropat, 2009). Therefore the study of personality traits and how they relate to primary school children's academic learning and attainment is arguably still in its infancy, with many possibilities for future research.

Conclusions

To conclude, this study provided an examination of the extent to which children's motivation to read could be explained by their reading skill, reading competency beliefs, and general personality characteristics. By doing so, the current study investigated whether children's motivation to read is best explained by their reading experiences or whether reading motivation can also be explained by personality traits. The results highlight the importance of considering children's personality characteristics to better understand variation in reading motivation, and emphasise the importance of tailoring educational and motivational strategies to individuals.

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CHAPTER 9: GENERAL DISCUSSION
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The research carried out in this thesis examined both cognitive and non-cognitive factors that may influence children's reading skill and development. More specifically, the research aimed to develop a better understanding of the role that cognitive, motivational, and behavioural factors play in shaping reading skill, to understand how method of reading instruction may influence the cognitive skills that support reading acquisition, and to better understand the factors that predict children's motivation to read.

In this final discussion, the main results from all the studies will initially be summarised and discussed in three main sections: 1) cognitive skills, 2) behavioural factors, 3) motivational factors. Within these main sections, the relationships between the cognitive, motivational, and behavioural factors for reading will also be summarised. In addition, the influence of method of reading instruction and the predictors of children's motivation to read will be summarised and discussed. These areas will then be integrated together for a discussion on the potential implications of this research for educational practice, theory, and research. Following this, directions for future research will be suggested and discussed, and final conclusions will be drawn.

Cognitive skills

Chapter 4 examined the cognitive and reading-related skills that underpin children's early reading acquisition. It was found that children's word reading skill was largely supported by their letter sound knowledge, phoneme awareness (particularly phoneme

synthesis), and verbal short term memory span. Furthermore, short term memory span explained significant additional variance in children's word reading skill after accounting for letter knowledge and phonological awareness. In addition, visual discrimination skill was significantly associated with early reading ability. However, children's rhyme awareness and vocabulary knowledge showed only weak associations with their early word reading skill.

In Chapters 6 and 7 the skills supporting children's later reading comprehension ability were examined. It was found that reading comprehension skill was largely underpinned by children's verbal ability and decoding skill; the influence of memory span on reading comprehension was inconsistent. In Chapter 6, children's memory span (composite of short term memory and working memory) explained significant additional variance in their reading comprehension after accounting for verbal ability and decoding skill. However, in Chapter 7, working memory did not explain significant variance in reading comprehension after accounting for these abilities.

Regarding children's early reading acquisition, the current findings show some consistencies with previous research. Firstly, they are in accordance with studies suggesting that letter knowledge and phonological awareness are closely associated with children's early word reading skill (Muter et al., 1998; Lonigan et al., 2009; Lonigan et al., 2000; Scanlon & Vellutino, 1996; Schatschneider et al., 2004). In addition, they are consistent with findings suggesting that phoneme awareness is more important than rhyme awareness for children's word reading development (Blaiklock, 2004; Castles & Coltheart, 2004; Foy & Mann, 2006; Hulme et al., 2002; Muter et al., 2004; Muter et al., 1998; Muter & Snowling, 1998; Savage & Carless, 2005). Letter sound knowledge and phoneme awareness are thought to determine the extent to which

children can make use of the alphabetic principle for word reading (e.g. Ehri, 2005; Share, 1995). In other words, children with higher levels of these skills will be better equipped to decode new words using the letter-sound (grapheme-phoneme) correspondences in words.

However, the results were also inconsistent with previous research. In particular, verbal short term memory span was found to exert a greater influence on children's early reading skill than is typically reported in the literature. For example, previous studies suggest that short term memory is relatively unimportant for early word reading after accounting for or when compared to phonological skills (de Jong & van der Leij, 1999; Parilla et al., 2004; Rohl & Pratt, 1995). However, in the current study, children's verbal short term memory explained significant additional variance in their early word reading after accounting for letter sound knowledge and phonological awareness.

It is argued that this inconsistency may be accountable to the type of reading instruction that children had received. In this study, children were taught to read with a synthetic phonics approach, which teaches children to decode words by sequentially sounding and blending the series of grapheme-phoneme correspondences. It is proposed that verbal short term memory may be particularly important when children are taught with this approach, as the sequence of letters and their corresponding sounds need to be stored in memory before a pronunciation can be formed. In addition to short term memory, the additional skills supporting early word reading in this study were also consistent with the method of instruction. For example, it is proposed that phoneme awareness was found to be more important than rhyme awareness in this study as children were taught to sound and blend at the level of the phoneme and were not taught to use rhyme-analogy strategies for word reading. Furthermore, it is proposed that

phoneme synthesis was particularly important because synthetic phonics teaches children to blend (i.e., synthesise) grapheme-phoneme correspondences from the earliest stages of instruction. Regarding visual discrimination skill, it is argued that this ability was related to early word reading because children are taught letters very rapidly in synthetic phonics, and will therefore require the visual skills to differentiate between several different letter shapes very early on. Conversely, it is proposed that vocabulary knowledge was unimportant for early reading acquisition as children were taught to read all words with a phonological decoding approach, which is likely to rely less on vocabulary knowledge compared to other word reading strategies (e.g. using context cues).

The current findings are consistent with McGeown, Johnston, & Medford (2012), who found that the cognitive skills supporting children's early word reading development were influenced by their method of reading instruction. Indeed, results from both McGeown et al. and from the current study suggest that the type of reading instruction that children receive plays an important role in shaping the skills that support their early reading development. It is therefore proposed that method of reading instruction should be considered when examining the cognitive skills underpinning children's early reading skills and when determining training and intervention targets to improve children's early reading progress.

Regarding children's later reading comprehension ability, the current results are consistent with previous findings suggesting that verbal ability and decoding skill are essential for successful reading comprehension (Hoover & Gough, 1990; Kendeous et al., 2009; Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007; Share, 1995). Indeed, these skills are necessary for children to be able to decode unfamiliar

words in a text and understand the meaning. However, regarding the influence of memory span on children's reading comprehension; the current findings show some inconsistencies. As previously stated, in Chapter 6 children's memory span explained additional variance in their reading comprehension after accounting for verbal ability and decoding skill. This is consistent with Cain et al. (2004), who also found that working memory explained variance in reading comprehension after accounting for these skills. However, in Chapter 7, children's working memory did not explain additional variance in their reading comprehension skill after accounting for these abilities. It is suggested that this inconsistency may be a consequence of methodological differences between the studies in Chapters 6 and 7; for example, different measures of reading skill, verbal ability, decoding skill, and memory span were used in each study. However, in both studies, memory span was significantly associated with children's reading comprehension skill. Nevertheless, further research is necessary to assess the robustness of the relationship between working memory and reading. Theoretically, working memory is argued to be important for reading comprehension as it allows children to store and process text they are reading and integrate it into the context of the rest of the text. Therefore, the measure of working memory used in this study (backward digit span) is arguably not appropriate or sensitive enough to capture this element of working memory. Further research should therefore include a more appropriate working memory task. In addition, it is possible that using an alternative method of task administration may have altered the relationship between children's memory span and their reading comprehension performance. For example, St. Clair-Thompson (2012) compared the predictive ability of working memory tasks when set sizes are administered in ascending order (e.g. as in the digit span tasks used in the current research) to when they are administered in a randomised order. It was found that only children's scores on the randomised tasks were significantly related to their

cognitive ability (as assessed using the Raven's progressive matrices). Therefore, it is possible that using a similar randomised memory task would create a more robust relationship between memory and children's reading attainment.

Behavioural factors

Chapter 5 examined the influence of children's classroom behaviours on their early reading development (focusing on hyperactivity/inattention, conduct problems, emotional problems, peer relationship problems, and pro-social behaviour), and Chapter 7 examined the influence of behaviour on children's later reading skill (focusing on ADHD-type behaviours, hyperactivity, and oppositional behaviour). More specifically, these studies examined whether behavioural factors could explain additional variance in children's reading skill after accounting for the cognitive and reading-related skills known to underpin reading. Results for both studies showed that of all the behavioural categories assessed, hyperactivity/inattention (termed ADHD-type behaviour in Chapter 7) showed the closest and most consistent associations with children's reading skills. However, in both studies, after accounting for the reading-related and cognitive skills known to underpin reading, behavioural factors did not explain any significant additional variance in children's reading ability.

Chapter 5 also examined the relationships between children's negative classroom behaviours and their emergent reading-related skills. It was found that behavioural factors (particularly hyperactivity/inattention) were significantly associated with some pre-reading skills (particularly letter knowledge, phoneme awareness, and verbal short term memory). Finally, Chapter 7 examined the relationships between behavioural factors and children's motivation to read. However, it was found that children's

negative classroom behaviour did not show significant associations with their reading competency beliefs or reading motivation.

These findings are consistent with previous research suggesting that there is a significant association between hyperactive/inattentive behaviour and reading attainment in childhood (Alexander et al., 1993; Barbaresi et al., 2007; Clark et al., 2002; Duncan et al., 2007; Frazier et al., 2007; Grimm et al., 2010; Rabiner et al., 2000; Rabiner et al., 2004; Romano et al., 2010; Rowe & Rowe, 1992). Furthermore, they are consistent with studies indicating that attention problems are more influential than other negative behaviours in predicting changes in children's reading skill (Grimm et al., 2010; Greven et al., 2011; Merrell & Tymms, 2001; Massetti et al., 2008; Willcutt & Pennington, 2000). Importantly, these findings provide further support for the relationship between hyperactivity/inattention and reading attainment for typical school children without a behavioural diagnosis (e.g. Arnold et al., 2005; Fergusson et al., 1997; Heiervang et al., 2001).

Interestingly, regarding the influence of behaviour on children's early reading development, hyperactivity/inattention was only slightly less closely associated with children's reading skill than cognitive/reading-related abilities were (the correlation between T2 hyperactivity/inattention and T3 word reading was -.51, whilst the correlations for letter sound knowledge, phoneme synthesis, and verbal short term memory with reading skill were .66, .66, and .54 respectively; see Chapters 4 and 5). This suggests that children's hyperactive/inattentive behaviour is as closely related to their early word reading skill as their cognitive/reading-related abilities. Indeed, it may be that children with high levels of hyperactivity/inattention in the classroom benefit less from early reading instruction as they are likely to spend less time actively

engaging in learning activities. However, regarding the influence of behaviour on children's later reading skills (Chapter 7), ADHD-type behaviours were only weakly associated with children's reading skill, and were less closely associated with reading than cognitive/reading-related skills were. Therefore, it is possible that children's negative classroom behaviour has a greater detrimental effect on the development of early word reading skills (when children are involved in more direct reading instruction) than on later reading comprehension abilities. However, these differences could also be due to methodological differences between the two studies; for example, different behavioural rating scales were used in each study.

As stated, in both Chapters 5 and 7, behavioural factors did not explain significant additional variance in children's reading skills after accounting for the cognitive/reading-related skills known to underpin reading. However, regarding early reading development, it is proposed that the relationship between hyperactivity/inattention and early word reading skill may be mediated by the influence of hyperactive/inattentive behaviour on children's emergent reading-related abilities. For example, in Chapter 5, hyperactivity/inattention showed close associations with important pre-reading skills such as letter sound knowledge and phoneme awareness. This is consistent with previous research suggesting that inattentive behaviour has a negative influence on the development of some emergent literacy skills (e.g. Dally, 2006; Giannopulu et al., 2008; Walcott et al., 2010). Therefore, it is suggested that children's hyperactive/inattentive behaviour in the classroom may influence their early word reading skill indirectly through its association with emergent pre-reading abilities. However, further longitudinal research is necessary with a larger sample size to provide evidence for this proposed mediation model.

Motivational factors

Another possible mediating/moderating factor for the relationship between negative classroom behaviour and reading attainment is children's motivation to read (e.g. Demaray & Jenkins, 2011; Volpe et al., 2006). Indeed, children who behave negatively in the classroom may demonstrate negative behaviours as a consequence of low motivation during reading instruction, which may cause them to engage more in distractible behaviour. However, the current findings (Chapter 7) suggest that children's negative classroom behaviour is not significantly associated with their reading motivation or reading competency beliefs. This contradicts previous research suggesting that ADHD-type behaviours are associated with academic motivation (Oehler-Stinnet & Boykin, 2001), and that academic motivation may play a mediating role in the relationship between behaviour and attainment (Demaray & Jenkins, 2011; Volpe et al., 2006). However, it is suggested that children's domain specific hyperactivity/inattention during reading activities and instruction (which was not measured in the current study) may be more closely associated with their reading motivation than their general negative behaviour in school. Further research is necessary to examine this.

Chapter 6 examined the nature of motivation that contributes to children's reading attainment: whether domain specific (reading motivation) or general (school motivation). In addition, this study examined whether children's motivation or competency beliefs could explain variance in their reading comprehension after accounting for the cognitive skills known to underpin reading. It was found that whereas children's reading motivation and reading competency beliefs explained significant variance in their reading comprehension skill after accounting for cognitive abilities, school motivation and school competency beliefs did not. However, when

considering a multi-dimensional approach to motivation, only children's intrinsic reading motivation explained variance in their reading skills; extrinsic reading motivation did not.

The associations between reading motivation and reading attainment were also examined in Chapters 7 and 8. Consistent with Chapter 6, in Chapter 8 it was found that whereas children's intrinsic reading motivation and reading competency beliefs were significantly associated with their reading skill; extrinsic motivation was not. However, in Chapter 7 it was found that neither intrinsic nor extrinsic reading motivation were significantly associated with children's reading skill (although both intrinsic and extrinsic motivation did explain a small amount of variance in reading skill after accounting for cognitive abilities). However, consistent with Chapters 6 and 8, children's reading competency beliefs were closely associated with their reading skill, and furthermore, they explained significant variance in children's reading skill after accounting for cognitive abilities.

Finally, given the relationship between reading motivation and attainment, Chapter 8 examined the predictors of children's motivation to read. It was found that children's reading skill, reading competency beliefs, and personality characteristics were all significantly associated with their reading motivation. However, reading competency beliefs explained a much larger proportion of the variance in children's motivation to read than reading ability. In addition, personality characteristics (particularly openness to experiences) explained additional variance in children's reading motivation after accounting for reading skill and competency beliefs. Furthermore, personality characteristics explained similar amounts of variance in intrinsic reading motivation as

reading skill and competency beliefs, suggesting that personality characteristics may be equally important for children's intrinsic motivation to read.

Consistent with Wigfield (1997), the results from Chapter 6 support the suggestion that the relationship between motivation and reading attainment should be studied at the domain specific level. However, the results from the present studies also indicate that certain aspects of reading motivation are more important than others for children's reading development. Although there are some inconsistencies in the results, the findings generally suggest that intrinsic motivation is typically positively associated with children's reading attainment, whilst extrinsic motivation is not related with children's reading skill. Furthermore, the current findings indicate that children's intrinsic motivation to read can explain additional variance in children's reading skill after accounting for the cognitive/reading-related skills that are known to support reading. This is consistent with previous studies showing that intrinsic reading motivation is related to reading skill (Becker et al., 2010; Mucherah & Yoder, 2008; Wang & Guthrie, 2004), and with studies demonstrating the importance of both cognitive and motivational factors in reading (Anmarkrud & Braten, 2009; Katzir et al., 2009; Taboada et al., 2009). Furthermore, as the current research included the cognitive skills that are most closely associated with children's reading attainment, the findings provide quite strong evidence of the influence of reading motivation on reading skill.

However, the results in Chapter 7 also suggest that the relationship between intrinsic reading motivation and reading skill may not be as consistent as previously thought (e.g. Becker et al., 2010; Mucherah & Yoder, 2008; Park, 2011; Retelsdorf et al., 2011; Taboada et al., 2009; Wang & Guthrie, 2004). This inconsistency in the relationship between intrinsic motivation and attainment is unusual and suggests that the

relationship between the two may not be as robust as is presented in the literature. However, research does indicate that the strength of the association between reading skill and reading motivation can vary considerably (Morgan & Fuchs, 2007). Regarding extrinsic reading motivation, this motivational factor was found to be consistently unrelated with children's reading skill. These findings contradict previous studies indicating a negative relationship between extrinsic motivation and reading attainment (Mucherah & Yoder, 2008; Wang & Guthrie, 2004). However, they are consistent with Logan and Medford (2011), who also found no relationship between extrinsic motivation and reading skill. As research examining the associations between extrinsic motivation and attainment is often mixed (e.g., McGeown, Norgate, & Warhurst, 2012; Park, 2011), further research is necessary to better understand the role of extrinsic reading motivation in children's reading development.

Regarding the influence of reading competency beliefs, these were found to be consistently associated with children's reading skill across all studies (Chapter 6, 7, and 8). These findings are consistent with previous research (Chapman & Tunmer, 1995; 1997; Katzir et al., 2009; Logan & Medford, 2011), and research highlighting a reciprocal relationship between reading competency beliefs and reading skill (Morgan & Fuchs, 2007). Indeed, a child with more positive reading competency beliefs is likely to engage more in reading activities and develop their reading skills. On the other hand, a child with good reading skills is more likely to have higher reading competency beliefs.

Regarding the predictors of children's motivation to read, the results suggest that children's reading skill, competency beliefs and personality characteristics are all associated their levels of reading motivation. These findings are consistent with

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previous studies indicating a relationship between children's competency beliefs and academic motivation (Boggiano et al., 1988; Sewall & St-George, 2000; Smith et al., 2012), and between their reading competency beliefs and motivation to read (Baker & Wigfield, 1999; Retelsdorf et al., 2011). Furthermore, as reading competency beliefs were found to explain a much larger proportion of the variance in children's reading motivation than reading skill, it is suggested that children's perceptions of their reading skills may be a better predictor of their reading motivation than their actual reading attainment. Indeed, some researchers also consider reading competency beliefs to be a dimension of reading motivation (e.g., Wigfield & Guthrie, 1997). The findings are also consistent with previous studies showing significant associations between university student's personality characteristics and academic motivation (Busato et al., 2000; Komarraju & Karau, 2005; Komarraju et al., 2009; Richardson & Abraham, 2009), and with the suggestion that personality characteristics exert their effects on academic attainment mainly through pupils' motivation, or willingness to perform (Poropat, 2009). Interestingly, personality characteristics were found to explain similar amounts of variance in children's reading motivation as reading abilities and competency beliefs. This suggests that children's motivation to read may be largely determined by internal traits within the child, as well as by their experiences with reading and reading skills.

Implications

The results of the research carried out within this thesis have some important implications for educational practice, theory and future research. Firstly, and perhaps most importantly, the results emphasise the importance of considering both cognitive and non-cognitive factors when examining the influences on children's reading skill and development. Previous research has often focused solely on the cognitive skills that

support children's reading skill (e.g. Kendeous et al., 2009; Nation & Snowling, 2004; Ouellette, 2006; Ricketts et al., 2007; Share, 1995). On the other hand, those researchers studying reading motivation often neglect to include cognitive factors within their research (e.g., Wang & Guthrie, 2004; Wigfield & Guthrie, 1997). The research carried out within this thesis suggests that both cognitive and non-cognitive factors, particularly reading motivation rather than classroom behaviour, play an important role in shaping children's reading skills.

As a result it may be beneficial for school professionals to consider the impact of both cognitive and non-cognitive influences on children's reading progress. Indeed, it may be that incorporating both cognitive and non-cognitive targets (i.e. motivational or behavioural targets) into reading interventions and instruction may produce the greatest gains in children's reading skill. Providing teachers with resources and guidance aimed at increasing reading motivation in addition to cognitive skills will enable them to do this. Similarly, it may be beneficial for educators to use both cognitive and non-cognitive screening criteria in order to identify children who are at risk of reading difficulties.

It is important that attempts to boost reading motivation are focused on those aspects of motivation that will be most likely to improve children's reading skill. The results of this thesis suggest that to improve reading skill, reading instruction should focus on fostering greater levels of reading motivation (rather than general school motivation) to be most effective. Furthermore, fostering greater levels of intrinsic reading motivation is likely to incur greater benefits on reading skill rather than fostering greater extrinsic reading motivation. The results of this study suggest that boosting intrinsic reading motivation may be quite difficult, as personality traits strongly predict children's

intrinsic motivation to read. Alternative routes to increasing intrinsic reading motivation may be to focus on the more malleable trait of reading competency beliefs, which were also found to be a strong predictor of their motivation to read. Interventions to improve reading competency beliefs include using attribution re-training techniques (Chapman & Tunmer, 2003), or include giving children reading activities of appropriate difficulty so that they have the opportunity to experience success (Linnenbrink & Pintrich, 2003).

Regarding behavioural factors, behavioural interventions focusing particularly on reducing children's hyperactive/inattentive behaviour are likely to be most beneficial to reading. This may have an indirect effect on raising children's reading attainment, as children spend an increased amount of time actively engaging in reading activities and instruction. As the research within this thesis included typical school children without a behavioural diagnosis, this suggests that such interventions may indirectly benefit reading attainment even for children without severe levels of negative behaviour. It may also be beneficial to screen new school entrants for hyperactive/inattentive behaviour in order to identify children who may be less focused during reading instruction, and therefore potentially at greater risk for underachievement in reading (and underachievement in other areas of academic learning). This may enable the possible remediation of attentional difficulties before they have a detrimental effect on children's reading and academic progress. Possible ways in which to improve children's negative classroom behaviour include whole school positive behaviour support (Luiselli et al., 2005) and computerised attention training (Rabiner et al., 2010).

In addition to educational implications regarding non-cognitive factors, the current research also presents some implications regarding the cognitive skills supporting

reading development. In Chapter 4 it was found that the cognitive skills supporting children's reading acquisition were influenced by their method of reading instruction. Therefore, reading researchers should take method of reading instruction into account when examining the cognitive skills supporting children's reading progress. Furthermore, it may also be beneficial to incorporate method of reading instruction into cognitive models of children's reading acquisition and development. Regarding the practical implications of this research, it is suggested that during reading interventions and instruction it may be beneficial to consider method of reading instruction when selecting the skills that should be focused upon as training targets. For example, if children are taught by synthetic phonics, the current results suggest that focusing on improving children's letter sound knowledge, phoneme awareness (particularly phoneme synthesis), and verbal short term memory span may be most beneficial. Similarly, using these skills as screening criteria is likely to be most accurate in identifying the children who may be at risk of reading difficulties when taught by this approach. However, if taught by a different method of reading instruction, these training targets and screening criteria may be less effective. Therefore, further research is necessary to identify the cognitive and reading-related skills that support reading development when children are taught with different instructional approaches.

Future research directions

The results of this thesis lead to a number of potentially interesting avenues to direct future research. Firstly, the studies provide relatively small scale cross-sectional examinations of the influence of cognitive, motivational and behavioural factors on children's reading skill. The results suggest that it would be worthwhile to carry out larger longitudinal research studies examining the relative importance of cognitive and

motivational influences on children's reading skill and development. In addition, focusing on attention and also behaviour within the context of literacy is likely to yield a better understanding of the influence of behaviour on children's reading acquisition and development. Longitudinal studies would enable an examination of whether these factors have an enduring effect on children's reading development throughout primary school. In addition, they would allow a greater understanding of the ages at which cognitive skills, motivation and behaviour are important influences on children's reading attainment. Furthermore, whilst the focus of this thesis was on children's reading development, the development of other academic skills is also likely to be dependent, to varying extents, on both cognitive and motivational factors. Therefore the concept of motivated cognition could be applied to a variety of academic domains in order to develop a better understanding of the factors influencing children's academic learning and development.

Future research could also investigate whether method of reading instruction has an enduring effect on the skills that support reading children's skill and development. Research by Connelly et al. (2009) suggests that reading instruction influences children's and adults' reading strategies, creating a 'cognitive footprint' which has a long lasting effect on the way in which they process words. However, there currently exists no research which examines whether later reading strategies are supported by different cognitive skills. It is likely however that as children's word recognition skills develop and they automatically recognise most words on sight, method of early instruction is likely to exert less influence on the skills children's draw upon. Nevertheless, future research could make use of variation in teaching practices in different countries (e.g., a common methodology adopted by Connelly et al., 2009) to

study the influence of method of reading instruction on the later cognitive skills supporting reading.

A further avenue to pursue future research would be to carry out reading intervention studies, examining the efficacy of different approaches to boost reading skill. This would enable an examination of the benefits of incorporating cognitive, motivational, and behavioural factors into reading interventions and training targets. Currently very few studies exist that have examined whether reading interventions or instruction is more effective when strategies to improve cognitive/reading-related skills are combined with strategies to improve children's motivation to read (Guthrie et al., 2004) or to reduce negative classroom behaviour (Rivera et al., 2006). Furthermore, there exists no research examining the effectiveness of reading instruction/interventions which focus on boosting intrinsic reading motivation (e.g., by developing children's curiosity to learn more through reading) versus extrinsic reading motivation (e.g., by directing children to focus on improving their reading grades). Future research comparing reading instruction plus supplementary intrinsic or extrinsic motivational direction would be of interest. In addition, identifying the extent to which children respond to different types of instruction/interventions based on their reading skills, personality characteristics and other variables would also be of interest. Whilst intrinsic reading motivation is generally more closely associated with children's reading skill, it may be that some children are more likely to respond to reading instruction/interventions which focus on extrinsic motivators rather than intrinsic motivators.

Another potential avenue for future intervention research is to investigate ways in which to improve children's motivation to read. As stated, Guthrie et al. (2006) found that one way to improve children's intrinsic reading motivation may be to foster children's

situational interest in texts by using stimulating tasks related to the topic of interest. However, the current research suggests that children's reading motivation is predicted by their reading competency beliefs and personality characteristics. Therefore, future research studies could examine a range of techniques to improve children's reading motivation, based on a more developed understanding of the factors that predict it.

It would also be interesting for future research studies to investigate whether there are specific circumstances under which reading motivation is particularly important. For example, previous research has examined individual differences (e.g., differences reflecting sex or ability) in the importance of motivation for children's reading attainment. For example, Logan and Medford (2011) found that boys' reading competency beliefs and intrinsic reading motivation were significantly more closely associated with their level of reading skill compared to girls. Previous research by Oakhill and Petrides (2007) and Logan and Johnston (2009) similarly found that boys' reading attitudes and interest in reading were more closely associated with their reading attainment. Other studies suggest that there may also be ability differences in the strength of this relationship. For example, Logan et al. (2011) found that whilst intrinsic motivation explained significant variance in growth in reading comprehension skills for low ability readers, it did not explain significant variance for high ability readers. However, these previous studies examined individual differences in the importance of reading motivation. It may be the case that differences in reading material also influences the importance of reading motivation. For example, motivation to read may predict more variance in reading performance when children are reading more complex texts compared to easier texts, given that they will need to persevere more with a more challenging text. Alternatively, reading motivation may be more important when children are required to read a text that they are not particularly interested in, compared

to a text that is interesting to them. Therefore examining the relative importance of cognitive and motivational factors as children engage in different reading activities would also be of interest.

The current thesis assessed children's motivation to read using a multi-dimensional approach that focused on intrinsic-extrinsic motivation (e.g. Ryan & Deci, 2000; Wang & Guthrie, 2004) as this theory of motivation is the most commonly used in reading motivation research (e.g. Baker & Wigfield, 1999; Guthrie et al., 1999; Wang & Guthrie, 2004; Wigfield & Guthrie, 1997). However, as discussed in Chapter 1, reading motivation is a very complex concept that is thought to consist of a number of different constructs (e.g. Eccles & Wigfield, 2002; Murphy & Alexander, 2000; Wigfield & Guthrie, 1997). Indeed, compared to the study of cognitive factors, which are typically clearly defined with appropriate standardised measures, the study of motivational factors creates difficulties as researchers often rely upon different conceptualisations of motivation. It may therefore be interesting for future research to examine the relationships between reading attainment and other motivational constructs, such as goal theory and reading attitudes. By examining a wider range of motivational constructs, further research may direct reading instruction and interventions towards developing different aspects of reading motivation to most effectively boost reading attainment.

Conclusions

The results of this thesis provide strong support to the influence of cognitive and non-cognitive factors for children's reading skill and development. The results further suggest that motivation should be studied at a domain specific level. In addition, some aspects of reading motivation may be more important for reading development than

others; specifically intrinsic reading motivation rather than extrinsic reading motivation. However, different dimensions of children's reading motivation are differentially predicted by reading skill, competency beliefs and personality characteristics. With regard to behaviour, hyperactivity/inattention was found to have the greatest influence on children's early word reading and later reading comprehension skill. Finally, the results highlight the important influence of method of reading instruction in shaping the cognitive and reading-related skills that support early reading acquisition.

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APPENDICES

Appendix 1.

Regularity task items for Chapter 4

Appendix 2.

Longer length regular words for Chapter 4

Appendix 3.

Reading and school motivation questionnaire for Chapter 6

Appendix 1.

Regularity Task

Regular 3 phoneme words		Irregular 3 phoneme words	
Word	Frequency per million	Word	Frequency per million
fog	19	axe	16
gap	14	lamb	3
hoot	14	doubt	14
dash	16	knife	11
thorn	3	hymn	3
chap	8	dove	3
keen	11	bass	8
moth	8	warn	19
pass	3	sewn	3
shin	5	pear	19

Average word length (no. letters):

 3.9

Average word length (no. letters):

 4.1

Average frequency per million:

10.1

Average frequency per million:

9.9

Appendix 2.

Longer length regular words

Regular 5-6 phoneme words

Word	Frequency per million
admit	11
arctic	19
fatter	11
impish	3
anthem	5
fabric	8
kidnap	8
nesting	14
object	11
crispy	8

Average word length (no. letters): 6

Average frequency per million   : 9.8

Appendix 3.

Questionnaire assessing motivation/competency beliefs for reading and

motivation/competency beliefs for schoolwork in general.

*Note: (R) = negatively worded item: the Likert Scale score is reversed.

Competency Beliefs Reading

I find it difficult to understand the stories we read in class. (R)

I make a lot of mistakes when I'm reading. (R)

I am good at working out hard words myself.

I am a good reader.

Competency Beliefs School

I am good at doing school work.

I find school work easy.

The work I do in class is often too hard for me. (R)

I make lots of mistakes in my school work. (R)

Intrinsic School Motivation

Challenge

I like it when the teacher gives us hard, challenging work.

If something is difficult, I just give up. (R)

Curiosity

If the teacher discusses something interesting, I like to find out more.

I am not interested in learning about new things. (R)

Involvement

I often get really involved in the work I am doing in class.

I don't like to be involved in group and class discussions. (R)

Extrinsic School Motivation

Recognition

It is important to me that my parents notice when I do good work.

I don't care whether the teacher notices when I do good work. (R)

Grades

I don't care what my final grade is at the end of the year. (R)

I work hard in class to get a good grade.

Compliance

I finish my work on time so that I don't get into trouble. (R)

I don't listen to the teacher when I'm told to get on with my work.

Social

I don't talk about school with my family. (R)

I help my friends with their school work.

Competition

I try to get more answers right than my friends.

I don't care if my friends get better grades than me. (R)

Intrinsic Reading Motivation

Challenge

I don't like it when I have to work out difficult words in stories. (R)

I like it when the teacher gives us a hard, challenging book to read.

Curiosity

I think reading is a good way to learn more about things.

I am not interested in learning new things from books. (R)

Involvement

I often imagine how things would look in the stories I read.

I am never very interested in the stories I read. (R)

Extrinsic Reading Motivation

Recognition

I don't care about getting compliments for my reading. (R)

I like it when the teacher says I have read well.

Grades

I read to improve my grades.

I don't think it is important to get a good reading grade. (R)

Compliance

I read in class so that I won't get into trouble.

I don't listen to the teacher when I'm told to do my reading. (R)

Social

I talk about books with my friends.

I never read at home with my family. (R)

Competition

I don't care if my friends are better readers than me. (R)

I like to finish my reading before everyone else in the class.