Cognitive, linguistic, and literacy development in young children learning English as an Additional Language

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Abstract

Extensive research with monolingual children has established the importance of early code-related skills, memory, and oral language for children's future literacy attainment, but less is known about the development of these skills in children who learn English as an Additional Language (EAL) in school. As there has been a particular lack of longitudinal research with this population spanning development during preschool and into early education, the aim of this thesis was to examine the performance and development of EAL children on measures of phonological awareness, letter-sound knowledge, rapid automatized naming, verbal memory, and oral language during this time frame. Additionally, once EAL children reached school age, their skills on these measures were compared to those of their monolingual peers, and the role of these cognitive and linguistic abilities in explaining individual differences in literacy skills (reading accuracy, fluency, comprehension, and spelling) was compared across groups. EAL children from diverse linguistic backgrounds (N=96) were first recruited in Nursery (3;7 years), and were reassessed in Reception, Year 1, and Year 2. Monolingual children (N=53) from the same schools were recruited and assessed in Years 1 and 2. Comparisons to both norms and the monolingual groups suggested that although EAL children's cognitive and linguistic skills in English were very limited during Nursery, these skills showed accelerated development during Nursery to Reception, and their code-related and memory skills were very similar to those of monolingual children by the time they reached Reception or Year 1. However, oral language remained an area of weakness for these children, even at the final testing point. Finally, there were group differences in the contributions of cognitive and linguistic predictors to explaining differences in literacy outcomes. The relevance of these findings for our understanding of bilingual literacy development and the practical implications of this work are discussed.

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Presentations and Invited Talks

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"*Oral language and literacy development in young children learning English is an Additional Language."*

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"Language and literacy development in children with English as an Additional Language: a longitudinal study of early education."

2014 **EuroSLA Annual Conference– Accepted poster presentation**
"*A longitudinal study of early language and literacy development in young children learning English as an Additional Language*."

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"Language and literacy development in preschool children learning English as an Additional Language."

2013 **Department of Human Communication Sciences PGR Conference – Paper**
"Language and literacy development in children with English as an Additional Language: a longitudinal study of early education."

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List of Abbreviations

BPVS – British Picture Vocabulary Test
CCC-S – Children's communication checklist - short
CELF – Clinical Evaluation of Language Fundamentals
DfE – Department for Education
DTWRP – Diagnostic Test of Word Reading Processes
EAL – English as an additional language
ELL – English language learner
EV – Expressive vocabulary
IMD – Index of Multiple Deprivation
L1 – First/primary language
L2 – Second/additional language
LK – Letter knowledge
LNK – Letter name knowledge
LSK – Letter sound knowledge
NVIQ – Nonverbal intelligence quotient
OECD – Organization for Economic Co-operation and Development
OL – Oral language
PA – Phonological awareness
PCA – Principle components analyses
PhAB – Phonological Assessment Battery
PP – Phonological processing
RAN – Rapid automatized naming
RAPT – Renfrew Action Picture Test
RM – Repeated measures
SDQ – Strengths and difficulties questionnaire
SES – Socioeconomic status
SS – Sentence structure
STM – Short-term memory
SVR – Simple view of reading
TOWRE – Test of Word Reading Efficiency
VM – Verbal memory
WM – Working memory
WPPSI - Wechsler Preschool and Primary Scale of Intelligence
WS – Word Structure
YARC – York Assessment of Reading Comprehension

Introduction

Over the past decades, countries across the world have seen a steady increase in the number of children for whom the language of instruction in school is different from their home language (Organization for Economic Co-operation and Development [OECD], 2010; Batalova & McHugh, 2010). England is no exception to this trend, and the number of children between 5- to 16-years-old learning English as an additional language (EAL) has increased from 7.6% in 1997 to 16.2% in 2013 (Strand, Malmberg, & Hall, 2015). When considering specifically children in primary school this figure increases from 7.8% in 1997 to 18.1% in 2013, and 20.1% in 2016 (DfE, 2016). These children attend the same schools and are subject to the same educational expectations as their monolingual peers, but bring with them a different set of linguistic skills and experiences to the processes of learning to read and write. For this reason, a growing body of research has considered to what extent literacy learning in a first language (L1) or in an additional language (L2) is qualitatively different (August & Shanahan, 2006).

Research with monolingual populations has established that children's early literacy skills are foundational for their later literacy skills, and early reading and spelling attainment predicts children's future literacy and academic success (National Early Literacy Panel (NELP), 2008). For this reason, there has been considerable interest in identifying the specific cognitive and linguistic skills and processes that predict individual differences in children's early literacy achievement (Bowey, 2005). There is strong evidence to suggest that many of the core skills that underpin literacy development begin to develop in preschool, and children who begin formal education with stronger skills in these areas are often found to be more successful in learning to read and write (Scarborough, 1998; NELP, 2008). Among these core predictors of literacy are phonological awareness (PA), letter knowledge (LK), rapid automatized naming (RAN), verbal memory (VM), and oral language (OL) skills including vocabulary, grammatical knowledge, and listening comprehension (Foulin, 2005; NELP, 2008; Norton & Wolf, 2011; Oakhill & Cain, 2012; Hulme, Nash, Gooch, Lervåg, & Snowling, 2015).

However, learning to read and write in an L2 is likely to present a different set of challenges to learning in an L1, as many of these children are faced with the task of gaining OL proficiency simultaneously with developing the same word- and text-level literacy skills that are the subject of classroom teaching. Despite the importance of understanding the development and predictive significance of cognitive and linguistic skills for bilingual children's learning, there have been relatively few longitudinal studies that have explored early literacy development in this group of children (Farnia & Geva, 2013; Zadeh, Farnia, & Geva, 2012; Lesaux, Rupp, & Siegel, 2007; Swanson, Sáez, & Gerber, 2006; Manis, Lindsey, & Bailey, 2004). Even fewer have included a monolingual comparison group, making direct comparisons of literacy development across mono- and bilingual populations difficult. Finally, only a very limited number of studies have examined the development and predictive significance of preschool skills for later literacy attainment in children learning in an L2, and this type of study would be key to evaluating whether similar preschool skills underpin future reading and spelling development in L1 and L2 learners.

For this reason, the current study used a longitudinal design to follow the development of a group of EAL children in England over three years from Nursery (t1, t2) through Reception (t3), Year 1 (t4), and Year 2 (t5). The study included an extensive battery of cognitive and linguistic predictor measures including code-related skills (PA, LK, and RAN), along with VM, and vocabulary, grammar, and listening comprehension, as well as reading and spelling outcome measures. In Year 1 and Year 2, bilingual children's performance and development on predictor and literacy measures was compared to a group of monolingual children from the same schools and classrooms, making it possible to identify similarities and differences in the predictors and literacy skills of children from these two language backgrounds. Finally, the relative contributions of the cognitive and linguistic predictors to explaining individual differences in literacy skills was evaluated and compared across groups.

Within this thesis, Chapters 1 and 2 provide literature reviews on which the current work was based. Chapter 1 discusses theories of literacy development, and considers evidence of the role of the individual cognitive and linguistic skills in predicting children's reading and spelling success in both mono- and bilingual children. Chapter 2 reviews the available research that has directly compared children learning in an L1 or L2 on literacy outcome measures, including reading accuracy, reading fluency, reading comprehension, and spelling, and concludes with research aims and questions. The methods used in the current work are set out in Chapter 3, while Chapters 4 to 6 present results and discussions of the findings. Specifically, Chapter 4 considers the performance and development of cognitive and linguistic predictors in EAL children and their monolingual peers, while Chapter 5 presents similar results but for literacy outcomes. In Chapter 6, correlational and hierarchical multiple regression analyses are used to examine the relationships between cognitive and linguistic skills as well as their role in explaining individual differences in literacy outcomes for both mono- and bilingual children. Finally, Chapter 8 brings together and discusses the findings from all three results chapters and concludes with the limitations, practical implications, and overarching conclusions from this work.

Chapter 1 – Cognitive and linguistic skills and their role in literacy development in monolingual and bilingual children

The study of literacy development has an extensive history and a rich and energetic research tradition (Huey, 1908; Morphett & Washburne, 1931; Resnick & Resnick,1977). Today's studies of how children learn to read and write build upon a solid foundation of existent knowledge, and the current work is no exception. This chapter will provide a necessarily brief introduction to some theoretical approaches to literacy development that were relevant to the conceptualisation of the current study, and will also review research on the contributions of individual cognitive and linguistic skills to children's literacy development. This latter section will be presented in terms of what is known about the role of these predictors for monolingual children, followed by the available evidence for bilingual children.

At this point it is also useful to clarify the use of the term bilingual throughout this thesis. The literature has been inconsistent with regards to the terms used to describe children learning more than one language in childhood (Hammer, Hoff, Uchikoshi, Gillanders, Castro, & Sandilos, 2014), and so this thesis did not apply any strict criteria to the use of this term. As such, the term bilingual is used to denote any child exposed to and learning more than one language at any point in childhood. The term L2 learner is used in instances when bilingual children's skills in their additional language are the specific topic of focus, and similarly, the terms monolingual child and L1 learner are used interchangeably to reference children learning in their native and only language. Finally, the sample in the current study were referred to as having EAL, as this is the specific term used in English educational settings to denote bilingual learners of English (DfES, 2006). This term could not be used throughout as not all of the literature reviewed included learners of English, and so the term EAL was primarily reserved for the discussion of the current sample.

1.1 Theoretical approaches to literacy development

Theoretical accounts of literacy development abound, and the aim of the current thesis is not to evaluate the empirical value of any specific theoretical model. However, in order to frame the research into the individual cognitive and linguistic skills that are believed to be important contributors to children's literacy learning, the predictions of the simple view of reading (SVR; Gough & Tunmer, 1986) will be presented. Following on from this, accounts of the development of word reading (decoding) and comprehension will be considered.

1.1.1 The simple view of reading

One of the most successful and influential frameworks for considering reading and its components is the SVR as proposed by Gough and Tunmer (1986). The framework was published during the time when the whole language movement was championed in the US and Canada, and there were polarised opinions on the role of phonic decoding strategies and language skills in learning to read (Kirby & Savage, 2008). The framework represented the authors' attempt to clarify and unify the oppositional conceptions of the relative contribution of these two important underlying skills in the process of learning to read (Gough & Tunmer, 1986).

The framework suggests that reading, and more specifically reading comprehension (R), is the product of decoding skill (D) and language, or listening, comprehension (C), and can be expressed as R = D x C. In their original paper, the authors defined decoding as the ability to "read isolated words quickly, accurately, and silently" (Gough & Tunmer, 1986, p.7). The authors made explicit their conviction of the importance of the reader's abilities to understand and apply grapheme-phoneme correspondence rules when learning an alphabetic script, and as such chose the term decoding rather than word recognition to describe this aspect of reading. They also asserted that the truest measure of this skill was the ability to pronounce nonwords. In terms of the language comprehension component, this was conceptualised as all the processes and abilities that underpin the interpretation of discourse.

The central claim of the framework is that both components, decoding and language comprehension, are necessary but not sufficient for reading to be successful. This is captured in the multiplicative nature of the framework, as if either component is valued at 0, then the reading product will also be 0. Following on from this, it should be the case that there are situations when language comprehension occurs in the absence of decoding skill (i.e., young children who have yet to learn to read), and decoding in the absence of language comprehension (i.e., the ability to read nonwords or foreign but easily consistent scripts; Gough, Hoover, & Peterson, 1996). It was also suggested that the relationship between the components and reading comprehension may change over time, with decoding being the stronger predictor in younger children still mastering the mechanics of reading, while language comprehension is likely to play a greater predictive role once a child has become an accurate and fluent reader.

While this was indeed a simple conceptualisation of reading, the authors made explicit that this was not a claim that reading was simple. Instead, they argued that despite reading being a complex task, fundamentally decoding and language comprehension were the two related but dissociable proximal causes that would explain an individual's reading success. Furthermore, their goal was to create an empirically testable hypothesis that could be used to examine successful reading, and to identify and explain the specific areas of weaknesses for struggling readers.

This framework has been widely debated and tested, and has received an enormous amount of support from various areas of research. The SVR's contention that decoding and language comprehension are dissociable skills has found support from two areas. First, there is a large and growing body of evidence suggesting that some children do experience specific difficulties with decoding, but have intact language comprehension skills, a profile most often referred to as dyslexia (Catts, Hogan, & Fey, 2003; Spooner, Baddeley, & Gathercole, 2004). Other children experience the reverse pattern of difficulties and show sufficient decoding but limited reading and language comprehension abilities, and these children are now often referred to as poor comprehenders (Nation & Norbury, 2005). Secondly, statistical modelling of reading components consistently differentiates decoding and comprehension, and the predictors of these skills also appear to be different (Muter, Hulme, Snowling, & Stevenson, 2004; Catts, Hogan, & Fey, 2003; Wagner, Herrera, Spencer, & Quinn, 2015). While this has most often been considered in terms of the cognitive predictors of reading, there is emerging evidence that there are also distinct genetic and environmental influences for decoding and language comprehension (Keenan, Betjemann, Wadsworth, Defries, & Olson, 2007).

Furthermore, measures of decoding and language comprehension together have been demonstrated to account for between 45-85% of the variance in reading comprehension (Adolf, Catts, & Little, 2006; Tilstra, McMaster, Van de Broek, Kendeou, & Rapp, 2009), and there are strong relationships between children's skills in both decoding and language comprehension, and their reading comprehension skills (Hoover & Gough, 1990; Nation & Snowling, 1997, Vellutino, Tunmer, Jaccard, & Chen, 2007). As the framework suggested, there is also evidence that the relationships between the subcomponents and reading comprehension change over time, with decoding being the stronger predictor of reading comprehension in younger readers, while language comprehension becomes more predictive in older children (García & Cain, 2014; Adlof, Catts, & Little, 2006).

However, the framework is not universally accepted, and is considered by some to be incomplete or too reductionist to fully capture the complexities of learning to read (Kirby & Savage, 2008). Some of the most prominent issues that have been debated recently include the role of fluency in the framework (Kershaw & Schatschneider, 2012; Kirby & Savage, 2008; Joshi & Aaron, 2000) and how well the SVR explains learning to read in more consistent orthographies (Florit & Cain, 2011). Orthographic consistency refers to the consistency of the pronunciation of letters within words. In consistent orthographies, such as Finnish or Greek, letters almost always represent the same sound. Conversely, in inconsistent orthographies, such as English and Danish, there are numerous ways to pronounce the same letter, making decoding a more complex task (Ziegler, et al., 2010; Seymour, Aro, & Erskine, 2003).

As a growing body of evidence suggests that reading fluency is related to reading comprehension (Pikulski & Chard, 2005), it is unclear exactly what role this aspect of reading proficiency was considered to have in the SVR in its original form. However, the definition of decoding did make reference to the importance of speed and accuracy together, albeit only at the word-level. As such, researchers have examined to what extent the predictive power of the framework is improved through the addition of a fluency component. The evidence to date is mixed, with some suggesting that fluency is indeed an additional and dissociable component that explains unique variation in reading comprehension (Tilstra et al., 2009; Aaron, Joshi, & Williams, 1999; Joshi & Aaron, 2000; Johnston & Kirby, 2006; Kershaw & Schatschneider, 2012; Meyer & Felton, 1999), while others found no unique contribution of fluency over and above accuracy (Adlof et al., 2006; Georgiou, Das, & Hayward, 2009). As such, the issue of the explanatory role of reading fluency in reading comprehension within the context of the SVR continues to be debated.

Given that the majority of research examining the validity of the SVR has considered learners of English, and given that English can to some extent be considered unique in terms of its orthographic characteristics (Seymour, Aro, & Erskine, 2003), a legitimate question is whether the framework is applicable to other languages. A recent meta-analysis examining the contributing roles of decoding and linguistic comprehension to reading in different orthographies suggested that in more consistent languages where it is known that readers reach levels of decoding proficiency more quickly, linguistic comprehension played a greater predictive role than decoding even in young readers (Florit & Cain, 2011). As such, the SVR's posited shift from dependence on decoding to greater involvement of language skills may be most applicable in inconsistent orthographies where learning to decode is a protracted process. However, although the role of decoding may be smaller and more time-limited in consistent orthographies, there is evidence that it is still an important and significant predictor of reading comprehension (Tobia & Bonifacci, 2015).

Given these issues, it is worth considering to what extent the SVR is a useful simplification of the processes underpinning reading, or whether the framework is too reductionist to appropriately explore reading development and all its intricacies. Indeed, the SVR posits nothing of the more distal contributors to reading development, and challenges others to take up the task of more carefully delineating the components of the two broad contributors to reading. This thesis aims to examine more closely these predictors of both word reading and reading comprehension in children who are monolingual and bilingual. Furthermore, given the controversy around the role of fluency in reading proficiency, measures of both word- and text-level fluency were included in this study. Finally, while the SVR does not address the role of memory in literacy development, there is evidence to suggest that this general cognitive ability also plays a part in learning to read and spell (NELP, 2008), and as such children's short-term and working memory will also be examined in the current work.

1.1.2 The development of decoding and word reading

The use of the term decoding in the SVR could perhaps be considered misleading, for as previously noted, the definition provided in Gough and Tunmer's (1986) original paper emphasised the importance of being able to read words accurately and fluently. This conceptualisation of decoding is consistent with the what others have referred to as sight word reading, which is attained when a reader is able to activate the pronunciation and meaning of both individual words and words in text relatively automatically (Ehri, 2005). The importance of automaticity lies in that effortful decoding requires resources that are important for constructing meaning from text. Therefore more fluent word reading skills allow the reader to focus their attention on the ultimate goal of reading, namely comprehension (Perfetti, 1985).

Extensive research has considered the nature of children's sight word reading development, and numerous theoretical accounts have been proposed to explain how children transition from non-readers to skilled readers. Ehri (2005) provided an overview of the similarities across many of the most prominent theoretical accounts of sight word reading development in children. These models attempt to describe the changes in children's behaviour as they develop competencies in word reading, and often consider these changes in terms of stages or phases. Stages suggest that each aspect of the developmental progression must be mastered before a child progresses to the following stage. Phases are considered more flexible and do not presume the same degree of mastery before progression to more advanced reading processes, and indeed this conceptualisation is more reflective of children's behaviour (Stuart, Stainthorp, & Snowling, 2008; Ehri, 2005).

Fundamentally, the central claim of all recent developmental theories of word reading is that children must learn the alphabetic principle; that words consist of letters (graphemes), and letters correspond to sounds (phonemes; Stuart et al., 2008; Snowling & Hulme, 2007). Some theories go beyond description of the characteristics of reading for children in different phases to posit potential internal and external causes for children's development. Internal causes include those components that the learner brings to the process of learning to read, such as cognitive, linguistic, and memory capabilities, as well as motivation. Additionally, there are external factors, such as instruction and reading practice, which are governed by the environment and a child's experiences (Ehri, 2005; Bowey, 2005).

One of the most widely cited models of literacy acquisition is Ehri's phase model (1992, 1995, 2005). This model suggests that there are four phases in children's word reading development, and that the predominant approach children use in word reading is the defining feature of each phase. Ehri (2005) also argued that the relevance of identifying what phase of reading development a child is in is that it can support educators in identifying the most appropriate approach to teaching for the child's literacy level. Moreover, there is good evidence from children learning to read in English to support the differentiation of the different phases (Ehri, 2005), and therefore the different phases will be briefly outlined.

Children in the *pre-alphabetic phase* have not yet grasped the alphabetic principle, and rely instead on visual and contextual cues to help them to recognise words. These may include salient characteristics of the word itself (such as relating the "*oo*" in *look* to eyes), or familiar features of the environment that specific words are typically found in (such as the shape and colour of environmental print like restaurant signage; Ehri, 2005; Harn, Stoolmiller, & Chard, 2008). Once children begin to develop letter-knowledge, they transition to the *partial alphabetic phase*. At this point, children are able to use their understanding of the correspondence between letters and sounds to identify and remember some aspects of novel words, often the initial and final letters. During this phase, the application of letter-knowledge to reading is incomplete, and children may confuse words with the same boundary letters, and may still rely on contextual cues to support reading.

However, once children have fully acquired the alphabetic principle and are able to apply this consistently to their word reading attempts (i.e., they have become successful decoders), they transition to the *full alphabetic phase*. At this point, children can read even novel words using their reading strategy. Their ability to link all the letters in the word with their corresponding sounds creates a full representation of the word in memory, and this representation is robust and decreases the chances of confusing words with similar spellings. Children are able to learn and remember new words after very few encounters. However, in English, using only a decoding approach will not always lead to successful reading given the number of irregular words, and as such others have emphasised the importance of also teaching children the whole-word approach during this stage (Ehri, 2005).

Finally, through practice and experience, children come to the *consolidated alphabetic phase*. At this point, children have encountered the same words and words with identical letter sequences frequently enough to recognise these grapho-phonemic combinations and remember them as a consolidated unit. This process of moving away from a dependency on individual letter-sound correspondences towards recognition of increasingly larger units of words (such as syllables and morphemes) allows children to become more automatic and fluent in their word recognition, and is key to ensuring sufficient resources for reading comprehension (Ehri, 2005; Harn et al., 2008).

As with previous accounts of literacy acquisition, Ehri's (2005) phase model and the evidence cited in support of this account comes primarily from children learning to read in English.

Work from Seymour and colleagues (Seymour, 1990, 1997, 1999; Seymour & Duncan, 2001) has proposed the importance of considering cross-linguistic variation in literacy development, something not addressed by Ehri's work. In their dual-foundation framework, Seymour and Duncan (2001) proposed that learning to read could be considered the product of the interaction between the orthographic system, responsible for decoding and encoding text, and the linguistic awareness system, based on children's knowledge of spoken language. In this account, language-specific characteristics were considered to have an impact on both of these components of literacy development.

One impact of the specific linguistic features of a language on the development of children's literacy is through the phonological representations children develop while learning the spoken language. Seymour (2005, p.302) defined phonological representations as "linguistically defined sublexical segments of speech," and children's awareness of and ability to discriminate the sounds in language (i.e., PA) is a known predictor of literacy acquisition (see section 1.2.1). Differences in the linguistic complexity of languages in terms of such features as the saliency and complexity of syllables and onsets, and the influence of vowel and consonant harmony have been shown to impact on the development on PA (Anthony & Francis, 2005; Seymour, 2005). Indeed, cross-linguistic evidence suggests that children learning different languages have different PA skills, and that these skills are related to the specific linguistic features of their native language (Bruck, Genesee & Caravolas, 1997; Caravolas & Bruck, 1993).

The relevance of this for considering EAL children is that these children are often learning to read in a language in which they have limited spoken language competency. As such, while it is believed that the phonological representations and early PA skills children have developed prior to the introduction of literacy instruction form the basis for literacy acquisition (Seymour, 2005), it is unclear what this means for children who are learning to read in a non-native language. While some evidence does suggest that aspects of PA can transfer across languages (Dickinson, McCabe, Clark-Chiarelli, & Wolf, 2004), there is still uncertainty about what the added complexity of cross-linguistic differences means for children learning to read in an additional language, and this will be considered further in section 1.2.2 .

1.1.3 The development of comprehension

While decoding and sight word reading are relatively well-delineated and specific skills, comprehending both spoken and written language is enormously complex and protracted in its development. As such, to consider all of the contributing factors and their individual and interacting trajectories is well beyond the scope of the current work. Instead, the fundamental underpinnings of comprehension (both spoken and written) will be briefly outlined.

At their core, listening and reading comprehension are the same in that they concern the listener's or reader's ability to construct meaning from communication (Duke & Carlisle, 2011). It has been suggested that comprehension is not a passive receipt of information, but rather a process requiring the comprehender to apply their own knowledge and skills to actively build an understanding of the message being communicated, something that has been referred to as forming a mental model (Kintsch, 1998; Perfetti, 2007). Both external factors, such as the content, language, structure, and context of the message, as well as internal factors, such as the background knowledge and linguistic skills of the listener/reader, come into play in determining the success with which someone understands what they hear or read (Duke & Carlisle, 2011).

It is thought that comprehension is built on different levels of processing of the stimulus. Firstly, the comprehender must understand the words and then the sentences within a message to build local coherence, and this draws on vocabulary and grammatical knowledge. Beyond this, the comprehender must use their background knowledge and long-term memory to build upon local coherence to form global coherence. This process is supported by an individual's skills in comprehension monitoring, and their understanding of story structure and inferencing (Cain & Oakhill, 2007; Duke & Carlisle, 2011). What is clear is that comprehension is a complex process requiring the interaction of numerous subsidiary factors, making quantifying what comprehension is and how to measure its development a challenging prospect. Furthermore, any of the aforementioned factors could contribute to a breakdown in comprehension, something that is important to consider when attempting to identify the source of comprehension difficulties for children who struggle to understand spoken or written language.

Furthermore, while listening and reading comprehension share many similarities, there are also important differences to note. Reading comprehension requires the interpretation of 'decontextualized' language, without the contextual support often available during listening comprehension. The linguistic, and particularly syntactic, structures used in written text may be more advanced than those children typically experience in spoken language, and may thereby require greater competencies in vocabulary and grammar knowledge. Additionally, the parsing strategies associated with comprehension in the different modalities are clearly different; while written text allows the reader the opportunity to look back at what they read, listening may provide the chance to ask questions or receive clarification directly from the speaker (Perfetti, Landi, & Oakhill, 2005; Cain & Oakhill, 2007). As such, it is not unreasonable to consider that the qualitative differences between comprehension when listening as opposed to reading may have an influence on the development and predictors (or relative strength of relevant predictors) of these cognitive abilities. However, in their discussion of the SVR, Gough and colleagues (1996) argued that there were more similarities than differences between listening and reading comprehension, and asserted that it is therefore useful to consider them as being underpinned by the same processes.

In terms of the predictors of comprehension development, it is clear that the quality and quantity of language exposure children receive in their early childhood has a significant influence on their linguistic growth (Hart & Risley, 1995; Duke & Carlisle, 2011). Furthermore, there may be some differences in when components of comprehension emerge; while vocabulary and grammatical knowledge begin to develop from birth, some have argued that comprehension monitoring may be the product of greater linguistic aptitude, or may even be linked to the process of learning to read (Cain & Oakhill, 2007). There is some evidence that the nature of the types of inferences that children make changes over time, and that this change is independent of children's growing world knowledge (Barnes, Dennis, & Haefele-Kalvaitis, 1996). Also, children's exposure to reading experience (e.g. through shared reading in childhood) is likely to impact on their understanding of story structure (Perfetti, 1994), which in turn influences their understanding of narratives (Oakhill & Cain, 2008). These, and many other contributing factors, work in tandem to determine the development of the individual skills that underpin both children's listening and reading comprehension. The following section will consider the role of cognitive and linguistic skills in determining children's reading comprehension, along with other aspects of literacy skill.

1.2 Predictors of literacy in monolingual and bilingual children

A particular strength of the SVR is that it addresses the changing nature of reading proficiency. Literacy is often differentiated into word- and text-level skills; word-level skills being relatively lower level and earlier in their development, while text-level skills are more advanced and dependent on adequate mastery of word-level skills (Lesaux & Geva, 2006). What this means more concretely is that becoming proficient in decoding and sight word reading leads on to reading fluency, and the ability to read both accurately and automatically is a core contributing aspect of developing reading comprehension skills. Indeed, the idea that word-level reading forms the basis for text reading success is in line with the core idea of the SVR that decoding is a prerequisite for successful reading comprehension (see section 1.1.1). Within the current thesis, the term word-level skills refers to reading accuracy, fluency, and spelling of individual words, while text-level skills refers to accuracy, fluency, and comprehension of connected text.

As literacy skills evolve and change, so too do the predictors of individual differences in literacy success. An enormous amount of research has focused on identifying the cognitive predictors of literacy development in monolingual children, and there is general consensus within the field that PA, LK, and RAN are among the core predictors of early literacy development (Manis, Doi, & Bhadha, 2000; Foulin, 2005). OL skills (vocabulary, grammar, and listening comprehension) and VM have also been shown to be important, especially for the development of higher-level and text related skills (Storch & Whitehurst, 2002; Oakhill & Cain, 2008; Melby-Lervåg et al., 2012). While learning to read and write is also likely to be influenced by factors such as children's self-perception and motivation, research has tended to focus on internal cognitive processes, as these are more likely to be causally related to changes in children's literacy abilities (Kirby, Desrochers, Roth, & Lai, 2008)

While research into individual differences in monolingual children's literacy development has been extensive and has benefitted from numerous large-scale, longitudinal studies (Wagner, Torgesen & Rashotte, 1994; Lonigan, Burgess, & Anthony, 2000; Sénéchal, & LeFevre, 2002; Muter et al., 2004), research with bilingual populations is still in its early stages. It is likely that learning to read and write in an L1 or L2 may be qualitatively different, and some have argued that literacy development in a non-native language is likely to be a more challenging experience for children (Lesaux et al., 2007). For these reasons it is relevant to consider whether the same cognitive processes are important for literacy development in mono- and bilingual children. While there is evidence that literacy learning in an L1 or L2 is likely to be underpinned by similar cognitive processes (August & Shanahan, 2006), whether the relative strength of the contributions of individual skills is different for children from different language backgrounds is still unclear.

The following section will consider what is known about the role and importance of PA, LK, RAN, VM, vocabulary, grammar, and listening comprehension for the development of both word- and text-level literacy skills (reading accuracy, fluency, and comprehension, as well as spelling) in mono- and bilingual children. These specific cognitive and linguistic skills were chosen as the literature on monolingual children has highlighted these as core predictors of literacy. For bilingual children, the role of L1 skills and cross-linguistic transfer will also be discussed, with an aim to evaluating the state of knowledge with regards to the similarities and differences in the development and influence of known predictors of literacy development in an L1 vs. an L2.

1.2.1 Phonological awareness in monolingual children

Metalingusitic awareness is a broad concept most basically defined as a capacity to think about and reflect on language in an abstract way, including its forms and structures (Adesope, Lavin, Thompson, & Ungerleider, 2010). This overarching term includes the ability to identify and manipulate the phonological structure of words as separate from their meaning, also known as PA (Melby-Lervåg, Lyster, & Hulme, 2012). The role of PA in literacy development has been studied extensively, and PA has been demonstrated to be one of the strongest predictors of children's reading and spelling skills in a wide range of languages (Lerner & Lonigan, 2016; Caravolas, et al., 2012).

In measuring PA skills, distinctions are made between the size of the linguistic unit being assessed, as well as the explicitness of the task used to measure the skill (Anthony & Francis, 2005; Ziegler & Goswami, 2005). Linguistic units are typically categorised as large (words, syllables), intermediate (onset-rime), or small (phonemes; Melby-Lervåg et al., 2012), and at the intermediate level, the onset can be defined within syllables as the initial consonant or consonant cluster preceding the vowel (which is present in many but not all syllables in English), while the vowel and consonant following this together make up the rime (Anthony & Francis, 2005). So, in the example "CAT", "C" is the onset and "AT" is the rime, although it is also possible for this rime to exist without the onset. Variations in the explicitness of the task refer to the degree to which there is a need for conscious manipulation of the phonological information, and task difficulty progresses from relatively easier tasks such as identification, through segmentation, blending, and finally manipulation (Fricke, Szczerbinski, Fox-Boyer, & Stackhouse, 2016). The combination of these two dimensions creates a range of tasks that increase in difficulty from implicit identification of large units, to conscious manipulation of small units (McBride-Chang, 2004).

Evidence from a range of different languages supports the idea that children's PA skills develop along both of these dimensions such that they become aware of larger linguistic units before smaller units, and they are able to perform implicit awareness tasks before explicit ones (Anthony & Francis, 2005; Ziegler & Goswami, 2005). One contentious issue within the study of the development of PA has been the role of literacy instruction in the emergence of phoneme awareness. While some researchers have suggested that phoneme awareness may be a product rather than a predictor of learning to read (Castles & Coltheart, 2004; Ziegler & Goswami, 2005; Goswami & Bryant, 1990), others have asserted that phoneme awareness plays a particularly privileged role in children's literacy development (Hulme, 2002; Perfetti, Beck, Bell, & Hughes, 1987). There is evidence that children show some awareness of phonemes even before they identify their name or sound, and before they experience formal literacy teaching (Hulme, Caravolas, Malkova, & Brigstocke, 2005; Anthony et al., 2002). Furthermore, a meta-analysis addressing the contribution of VM, rime awareness, and phoneme awareness to children's reading ability demonstrated that after controlling for the other two predictors, only phoneme awareness showed a uniquely predictive role in children's reading skills (Melby-Lervåg et al., 2012). While these results provide strong evidence of the importance of PA, and particularly phoneme awareness, for the development of literacy skills, there is also general agreement that the relationship between PA and literacy is reciprocal, and that the process of learning to read changes the way children process language (Wagner et al., 1994; Castles & Coltheart, 2004).

While the developmental sequence of PA skills seems relatively stable across languages, it seems that the features of the language children are learning will impact upon the rate at which they become aware of different linguistic units (Caravolas & Bruck, 1993; Ziegler & Goswami, 2005). Aspects of linguistic complexity, such as articulatory factors, phoneme position, and the saliency and complexity of word structures, have all been found to influence the development of PA in children (Anthony & Francis, 2005). In a canonical study in this area, Caravolas and Bruck (1993) examined the phoneme awareness of Czech- and English-speaking children, and found that Czech children showed more advanced abilities to identify phonemes in onsets with consonant clusters as compared to English-Canadian children. This advantage for Czech-speaking children is consistent with the idea that the syllabic structure of children's language can impact on their PA skills, as the Czech language has a much larger number of permissible cluster onsets than English. As such, one interpretation of this result is that the higher frequency with which Czech children experienced cluster onsets prompted the development of this more advanced PA skill in these children. More recently, Duncan, Colé, Seymour, and Magnan (2006) provided further support for the influence of language structure on PA in their study showing differences in the syllable awareness of young English- and French-speaking children that were consistent with the rhythmic properties and syllable structures of these two languages.

There is now extensive research evidence demonstrating the central role of PA in the development of reading and spelling in both alphabetic and non-alphabetic languages (Bus & IJzendoorn, 1999; Byrne, Fielding-Barnsley, & Ashley, 2000; Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Hulme, Bowyer-Crane, Carroll, Duff, & Snowling, 2012). The intense research interest in this area has meant that there are currently several meta-analyses examining both correlational evidence (Melby-Lervåg et al., 2012; Swanson, Trainin, Neceoechea, & Hammill, 2003; NELP, 2008), as well as evidence from training studies (Bus & IJzendoorn, 1999; Ehri et al., 2001; NELP, 2008). The NELP's meta-analysis (2008) found that PA measured in children aged 0- to 5-years-old showed average correlations with later word reading, comprehension, and spelling between .40 -.44, demonstrating consistent relationships between early measures of this cognitive skill and later literacy outcomes. Ehri et al. (2001) found that PA training had a moderate and statistically significant impact on both word reading and reading comprehension, providing further evidence of the causal role of PA in literacy development. However, the relationships between PA and literacy outcomes may vary depending upon the literacy skill being considered, and while PA seems to show a direct influence on word-level reading and spelling skills, its relationship with reading comprehension may be indirect and through its impact on word reading (Vellutino et al., 2007; Muter et al., 2004).

1.2.2 Phonological awareness in bilingual children

There has long existed the idea that bilingualism may foster children's metalinguistic awareness, as having experience of two or more languages at an early age may accelerate children's understanding of the structural and systematic features of their languages (Vygotsky, 1962; Bialystok, 2001). It is plausible that exposure to two or more sound systems from an early age may make PA development qualitatively different in mono- and bilingual children. As Bialystok, Majumder, and Martin (2003) noted, if bilingualism does confer an advantage for the development of PA, this could have important implications for the literacy skills of these children.

Comparisons of PA skills in monolingual and bilingual children have returned mixed results, with evidence of weaker (Verhoeven, 2000; Lesaux & Siegel, 2003), equal (Chiappe & Siegel, 1997; Chiappe, Siegel, & Wade-Woolley, 2002; Jongejan, Verhoeven, & Siegel, 2007; Harrison, Goegan, Jalbert, McManus, Sinclair, & Spurling, 2016), and superior (Bruck & Genesee, 1995; Campbell & Sais, 1995; Bialystok et al., 2003; Marinova-Todd, Zhao, & Bernhardt, 2010) PA in bilingual children. The explanations for these contradictory findings are likely to be manifold, and one line of research has considered how transfer effects between children's languages may explain these discrepancies. The available evidence suggests that PA does show significant cross-linguistic relationships. However, the strength of these relationships is dependent on numerous factors including; (1) the characteristics of the tasks being used, (2) the linguistic features of the respective languages, (3) the child's age and cognitive level at the time of testing, (4) their proficiency in and experience of the language(s) of testing, (4) the characteristics of the educational experience they receive (Branum-Martin, Tao, Garnaat, Bunta, & Francis, 2012). Recent meta-analytic results also suggest strong relationships between the same PA skills measured in L1 and L2 (r = .60), as well as moderate relationships between L1 PA and L2 decoding (r = .44; Melby-Lervåg & Lervåg, 2011). This is an issue of particular importance for children who do not experience sustained contact with the language of instruction until they enter formal education, and these results suggest that L1 PA can support L2 literacy development. However, the extent to which children can benefit from PA skills in one language when using their other is far from straightforward, and these numerous influences are likely to have interacting effects (Melby-Lervåg & Lervåg, 2011).

These issues of transfer aside, it is generally believed that PA skills follow a similar developmental order in a child's L1 and L2, progressing from awareness of larger to smaller units and from more implicit to more explicit knowledge (Jongejan et al., 2007). Kieffer and Vukovic (2013) examined the growth trajectories of literacy-related skills for linguistically diverse bilingual children and their monolingual English-speaking peers from low SES backgrounds growing up in the US. Children were followed from Grades 1-4 at three time points (initial age 6;11 years), and the results suggested that the groups showed almost identical development in PA (measured using a sound deletion task), both in terms of their levels of achievement and the trajectory of their growth. Furthermore, both groups performed very similarly to national norms for the test measure. Although this study only examined bilingual children's PA in their L2, this does provide good evidence that mono- and bilingual children are very similar in their PA development, and that the children's relatively deprived backgrounds did not result in poorer performance. Furthermore, this study also established that PA skills, even when assessed early in children's L2 development, were a good predictor of later literacy difficulties, and the predictive relationship appeared similar across language groups.

Several authors have argued that because bilingual children are likely to have less advanced language skills as compared to monolingual children, they may need to rely on lower-level skills, such as PA, for longer during literacy development (Jongejan et al, 2007; Geva & Zadeh, 2006). Jongejan and colleagues (2007) based this argument on their finding that while PA and RAN were significant unique predictors of spelling in bilingual Canadian 8- to 9-year-old children (from diverse linguistic backgrounds), syntactic awareness and VM uniquely predicted this skill in monolingual children. However, recent evidence from Harrison and colleagues (2016) showed that PA was an important predictor of spelling for both mono- and mixed-language bilingual Canadian children of a similar age to those in the previous study, drawing into doubt the special role of PA for bilingual children. What seems clear is that PA skills are at least as important for the development of word-level reading and spelling skills for children learning in their L2, and show a strong predictive relationship with these skills, especially in young children (Muter & Diethelm, 2001; Lesaux & Siegel, 2003; Chiappe, Glaeser, & Ferko, 2007; Lesaux et al., 2007; Nakamoto, Lindsey, & Manis, 2007). While PA is likely to play a proximal role in predicting lower-level literacy skills, its relationship with fluency and comprehension may be more distal. Zadeh and colleagues (2012) found that for their large sample (N=308) of Canadian bilingual children from linguistically diverse backgrounds, the relationship between PA in Grade 1 and reading comprehension in Grade 3 was fully mediated by children's word reading skills in Grade 2. This adds support to the idea that for bilingual children, as for their monolingual peers, PA plays a very central role in the development of accurate and fluent word reading, but once this is established children's OL skills become the deciding factor in their more advanced reading abilities including text fluency and comprehension.

1.2.3 Letter knowledge in monolingual children

LK, sometimes referred to as alphabet knowledge, encompasses children's understanding of the forms and names of letters, along with their corresponding sounds (Piasta & Wagner, 2010). Within research of LK, distinctions have been drawn between letter-name knowledge (LNK) and letter-sound knowledge (LSK), with some suggestion that these two facets of alphabet knowledge show different patterns of development and prediction to reading skills (McBride-Chang, 1999; Lerner & Lonigan, 2016). Despite these distinctions, both LNK and LSK have consistently been found to be strong preschool predictors of later literacy skills in children learning alphabetic scripts, and often they are assessed together in a combined measure (Bond & Dykstra, 1967; Bruck et al., 1997; Muter, Hulme, Snowling, & Taylor, 1997; Seymour et al., 2003; Foulin, 2005).

LK (including LNK and LSK) has been shown to be most influential for children's word reading and spelling skills, while its role in reading comprehension is likely to be primarily through the development of decoding (although see Leppänen, Aunola, Niemi, & Nurmi, 2008). Scarborough's (1998) meta-analysis found kindergarten LK knowledge to be the strongest predictor of word reading as measured in Grade 1, and a more recent meta-analysis examined 52 studies and found moderate to large average correlations between LK and decoding (.50), spelling (.54), and reading comprehension (.48; NELP, 2008). Schatschneider and colleagues (2004) demonstrated that both LNK and LSK knowledge measured at the beginning of kindergarten explained unique variance in reading accuracy, reading fluency, and comprehension measured at the end of Grades 1 and 2, but that by the end of kindergarten ceiling effects in LNK meant this was no longer a useful predictor. As such, the facets of LK may show different time-limited influences in predicting literacy, as LNK may be a stronger predictor in younger children until they reach ceiling in this skill, at which point LSK may be more predictive (Foulin, 2005). Even LSK tends to reach ceiling within the first year of formal education for most children (Seymour et al, 2003), although development of this skill is likely to be very affected by cultural and educational practices (Caravolas, 2004; Ellefson, Treiman, & Kessler, 2009).

Although correlational studies have provided strong evidence of a predictive relationship between LK and literacy skills, results from training studies have been less conclusive (Adams, 1990; Piasta & Wagner, 2010). Advances in LK are generally not found to translate to improvements in literacy skills, leading to the suggestion that LK may be mediated by other variables, or may even be a proxy for other influential variables such as exposure to book reading and informal literacy instruction (Bowey, 2005; Adams, 1990). Nonetheless, it is clear that having knowledge of letters and the role they play in alphabetic writing is a key component in the development of children's understanding of the alphabetic principle. Understanding the alphabetic principle is also closely linked to children's PA skills, as an ability to identify the individual sounds within spoken words is fundamental to identifying their consistency across spoken words, and then the consistency with which they are represented by letters (Bowey, 2005).

This leads to the argument that LK and PA together play an interacting role in literacy development, and that the relationship between these two skills may be reciprocal. Indeed, Byrne and Fielding-Barnsley (1989) found that only those children who demonstrated both phonemic awareness and LK skills together showed a more generalised understanding of the alphabetic principle, suggesting both skills are necessary but insufficient for the acquisition of this fundamental concept. Burgess and Lonigan (1998) examined the relationships between these variables more closely in English-speaking children in the US, and found PA (of phonemes) measured when children were 5-years-old showed significant and unique prediction of their LK when children were 6-years-old, even when initial levels of PA and vocabulary were controlled, and the same was also true for the predictive relationship from LK at 5-years-old to PA at 6-years-old. Given that some have claimed that phoneme-level PA may only develop as a consequence of learning LK (Castles & Coltheart, 2004), Lerner and Lonigan (2016) examined the relationship between LK and PA of larger linguistic units (words, syllables, and phonemes). Once again, significant bidirectional relationships were found revealing that initial levels of PA and LK were predictive of growth in the other skill over the course of one year in preschool. The combined prediction of these two skills was recently examined by Hulme and colleagues (2012), who used mediation analyses to establish that increases in PA and LK together fully explained the improvement in word reading skills of the British children who had received a phonology and reading intervention, providing strong evidence of the causal role of LK (with PA) in children's literacy skill development. As such, it is perhaps most useful to consider LK and PA as co-determinants of literacy skills, especially in alphabetic languages (Bowey, 2005).

1.2.4 Letter knowledge in bilingual children

Alternative ideas have been suggested with regards to whether learning more than one language in early childhood is likely to help or hinder the development of children's LK. Verhoeven (2000) argued that children being educated in their L2 may have poorer auditory discrimination of sounds in their additional language, and as such would find it more difficult to develop consistent mappings between phonemes and graphemes. This may lead to a more protracted development of this skill for at least some bilingual children. Indeed, Páez, Tabors, and Lopez (2007) examined the LK of 4-year-old Spanish-English bilingual children attending Head Start programs (comprehensive early education programs targeted at low-income families) in the US, and found that while their English LK was just within one SD of the monolingual norm, the children did not make age gains over the year, and their LK standard scores in their L1 (Spanish) decreased during this period. Muter and Diethelm (2001) found that for children attending English language schools in Switzerland (mean age 5;2 years), monolingual children had better LK as compared to bilingual children from diverse linguistic backgrounds, and group differences on this measure remained one year later at retesting.

However, others have suggested that exposure to literacy materials in more than one language may foster an understanding of the symbolic nature of print, especially in cases when children learn languages with different scripts or alphabets (Bialystok, 2001). Bialystok (1997) found no difference between French-English and Chinese-English 4- to 5-year-old bilingual children and their monolingual peers on a measure of LK, but the bilingual children showed a more advanced understanding of the invariance of print labels. Similar findings of comparable performance on LK measures in mono- and bilingual children have also been reported for children from lower SES backgrounds and with less equal language exposure to their two languages (Chiappe, Siegel, & Gottardo, 2002; Lesaux et al., 2007), suggesting that at least in terms of LK skills, the Bialystok (1997) results were not due to the more linguistically balanced backgrounds of the children in her study.

There are numerous potential explanatory factors in the discrepancy between the aforementioned studies, but it is generally thought that LK is developed primarily as a consequence of informal and formal teaching (Anthony, et al., 2009). As such, it is relevant to consider the extent to which LK shows transfer across children's languages, as this would suggest that even in instances where children were learning a different home language to their language of education, they may be able to build on their L1 LK knowledge during literacy development in their L2. Evidence suggests that LK does show some cross-linguistic relationships (Lindsey, Manis, & Bailey, 2003), and also that LK in children's L1 is predictive of literacy outcomes in children's L2 (Manis et al., 2004). With regards to the influence of formal education, in at least some of the studies that showed equivalent performance on LK measures across language groups, children were attending schools with a dedicated focus on teaching emergent literacy skills, including LK (Chiappe, Siegel, & Gottardo, 2002). As such, although some bilingual children may show weaknesses in this important foundational literacy skill early on, it is likely that the same types of home support (in the L1 and/or L2) and educational practices that have been demonstrated to be important for LK development in monolingual research will also be useful for bilingual children (Foulin, 2005).

LK knowledge is also an important early literacy predictor for children learning in their L2, and numerous studies have now shown that the relationships between LK and reading accuracy, reading comprehension, and spelling are similar for mono- and bilingual children (Muter & Diethelm, 2001; Verhoeven, 2000; Erdos, Genesee, Savage, & Haigh, 2014; Goodrich, Farrington, & Lonigan, 2016). In their large scale study of mono- and bilingual children from diverse linguistic backgrounds growing up in Canada, Lesaux et al. (2007) assessed LK in kindergarten (average age 5;4 years), and found it to be a significant predictor of Grade 4 word reading accuracy and comprehension. Furthermore, LK was also the best predictor of both initial skill and growth in word reading for children from both language backgrounds. Results from a similar cohort revealed that LK measured in kindergarten is also a good predictor of children at risk for later literacy difficulty, and showed similar patterns of prediction of spelling for mono- and bilingual children (Chiappe, Siegel, & Gottardo, 2002).

Less research has considered the reciprocal nature of LK and PA for bilingual children, although some evidence has shown that LK skills are not a unique predictor of PA in bilingual 3- and 4-year-old children (Anthony et al., 2009) Despite these results, it is likely that an important relationship between PA and LK also exists for bilingual learners, and that together these skills underpin the development of the alphabetic principle in children learning to read and write in their L2.

1.2.5 Rapid automatized naming in monolingual children

RAN is a measure of the speed with which a child can accurately name an array of overly familiar stimuli, the most common of which include colours, objects, letters, and numbers (Denckla & Rudel, 1976). Despite the ease with which many children are able to complete this task, the underlying processes associated with RAN are likely to be complex. Wolf and Denckla (2005) suggested that RAN involves "(a) attentional processes to the stimulus; (b) bihemispheric visual processes responsible for initial feature detection, visual discrimination, and pattern identification; (c) integration of visual features and pattern information with stored orthographic representations; (d) integration of visual and orthographic information with stored phonological representations; (e) access and retrieval of phonological labels; (f) activation and integration of semantic and conceptual information with all other input; and (g) motoric activation leading to articulation" (p. 2). Indeed, Wolf and colleagues have argued that the relationship between RAN and literacy skills is because both processes are reliant on the automatic functioning of linguistic and perceptual processes, as well as the integration of these types of information, in order to complete a visually presented serial task (Norton & Wolf, 2011).

However, others have put forward alternative accounts of RAN, including that the relationship between RAN and literacy lies in their shared dependence on the development of a global processing speed construct (Kail & Hall, 1994; Kail, Hall, & Caskey, 1999; Catts, Gillispie, Leonard, Kail, & Miller, 2002). A different account purports that RAN shares with literacy the need for speeded retrieval of phonological information (Bowey, 2005; Wagner & Torgesen, 1987). Still others have suggested that the relationship between reading and RAN lies in that the neural circuitry associated with object identification and naming (as required in RAN) underpins the development of children's visual word recognition system, and RAN provides a measure of the quality of connections in the brain regions that will go on to support this aspect of literacy (Lervåg & Hulme, 2009).

While controversy remains as to what RAN is believed to measure, what is clear is that this task has consistently been shown to be one of the strongest predictors of young children's literacy development in both consistent and inconsistent orthographies (Landerl & Wimmer, 2008; Babayiğit & Stainthorp, 2010; Manis et al., 2000). Studies differ in the stimuli used to measure RAN, and higher correlations with literacy outcomes are generally found when measures of alphanumeric, as opposed to non-alphanumberic, RAN are used (Meyer, Wood, Hart, & Felton, 1998; Vaessen & Blomert 2010; Shanahan & Lonigan, 2010). However, given the importance of the over-learned status of the stimuli in RAN tasks, it is unlikely that RAN for letters and digits would be appropriate for use with preschool children (Bowey, 2005). In these instances, measures of colour and object RAN are likely to be more reliable, and longitudinal evidence has shown that non-alphanumeric RAN measured in pre-literate children is predictive of later reading skills (Kirby, Parrila, & Pfeiffer, 2003, de Jong & van der Leij, 1999). Furthermore, earlier measures of non-alphabetic RAN show a strong relationship with later measures of alphanumeric RAN, suggesting that these tasks are supported by similar cognitive processes, and that the most appropriate RAN stimuli may change over time (Lervåg & Hulme, 2009).

Differing results have also been reported with regards to the developmental association between RAN and literacy skills, with some accounts suggesting a reduction, and others an increase, in the relationship over time. Torgesen, Wagner, Rashotte, Burgess, and Hecht (1997) showed that, for US English-speaking children, RAN assessed in Grades 2 and 3 did show relationships with literacy outcomes. However, it was not a unique predictor of reading outcomes in Grades 4 and 5 once the literacy skill autoregressor had been controlled. Landerl and Wimmer (2008) reported somewhat different results, and found that an early measure of RAN (Grade 1) was still a strong predictor of reading fluency measured in Grade 8 for German children. Similarly, Vaessen et al. (2010) demonstrated that for monolingual children learning three languages varying in consistency (Hungarian, Dutch, and Portuguese), the relationship between RAN and reading fluency increased from Grades 1 to 4, and the orthographic properties of the language children were learning did not impact on the nature of this developmental progression. As such, whether RAN remains a consistent predictor of literacy skills across development remains unclear.

RAN has also been shown to vary in its predictive significance depending on the literacy outcome in question. There is evidence that this cognitive measure is related to reading accuracy (Manis et al., 2000; Georgiou, Parrila, Kirby, & Stephenson, 2008) and spelling (Scarborough, 1998; Caravolas, et al., 2012; Landerl & Wimmer, 2008), and to some extent reading comprehension (Manis, Seidenberg, & Doi, 1999). However, it seems that the speeded nature of RAN makes it a particularly strong predictor of reading fluency, in a range of languages and for an extended period of development (Wolf, Bowers, & Biddle, 2000; Savage & Frederickson, 2005; Babayiğit & Stainthorp, 2010; Schatschneider et al., 2004).

A recent meta-analysis by Araújo, Reis, Petersson, and Faisca (2012) sought to address some of the inconsistencies in the literature on RAN. Overall, the study found average effect sizes of *r*

=.45 for word and text reading, and *r* =.39 for reading comprehension. Furthermore, moderator analyses revealed stronger relationships for RAN and reading assessments that measured fluency over accuracy, higher correlations for assessments of alphanumeric RAN, and stronger relationships between RAN and literacy measures in children with impaired reading. The impact of children's age on the correlation between RAN and literacy was complicated, with some suggestion that the relationship between RAN and reading accuracy (but not fluency) decreased over time. Furthermore, although for children learning inconsistent orthographies the influence of RAN decreased after Grade 1 or 2, it remained stable in children learning consistent orthographies.

A final important point is that despite the controversy in what RAN measures, there is some evidence that it is the specific phonological components of RAN that makes it a good predictor of literacy skill. For example, Chiappe, Stringer, Siegel, and Stanovich (2002) found that of the variance in reading explained by RAN, 75% of it was shared with PA and only 25% was unique, and this has been argued to be evidence that although RAN and PA do not always correlate very strongly, it is their shared reliance on phonological skills that is the key determining factor in their predictive significance for literacy development (Vaessen, Gerretsen, & Blomert, 2009; Ziegler, et al., 2010).

1.2.6 Rapid automatized naming in bilingual children

As RAN is dependent upon the automaticity of retrieval of phonological information and has been shown to be related to language exposure (Compton, 2003), it is possible that levels of RAN proficiency or the relationship between RAN and literacy outcomes may be different for bilingual as compared to monolingual children (Jongejan et al., 2007). With regards to bilingual children's performance on RAN tasks, there is now relatively good evidence to suggest that, where group differences in favour of monolingual children do exist, they occur in young children in the first years of education, and they are small and short-lived (Chiappe, Siegel, & Wade-Woolley, 2002; Chiappe, Siegel, & Gottardo, 2002). Several studies have even reported superior RAN performance in bilingual children (Lesaux & Siegel, 2003; Geva & Zadeh, 2006; Jongejan et al., 2007; Geva & Farnia, 2012), although the cause of this bilingual advantage is still unclear. Geva and Zadeh (2006) ruled out differences in educational or socioeconomic characteristics or general cognitive ability as potential explanatory factors for the mono- and bilingual group difference in their study of Canadian children. They noted that the nature of bilingualism could afford children a cognitive advantage on this task, although at that point the evidence base for this argument was weak. More recent considerations have indeed demonstrated cognitive advantages for bilingualism, although it should be noted that these advantages are contingent on a number of different factors, including language proficiency in both or all languages (Adescope, Lavin, Thompson, & Ungerleider, 2010). As such, it is still unclear if this is a satisfactory explanation for the superior performance of the bilingual children in the previously cited studies, given many of them had relatively weak L2 language skills. An alternative suggestion is that the processes associated with developing efficient mappings between visual and verbal information may develop relatively language-independently, and requirements of bilingual language development may foster this process in some way (Yeong & Liow, 2010). However, Yeong and Liow (2011) did not find evidence to support this conclusion in their study of Mandarin-English bilingual 5- to 6-year-old children, and other studies have also found low cross-linguistic correlations between measures of both RAN objects and letters (Swanson, Saez, Gerber, & Leafstedt, 2004). Consequently, this is an area that would benefit from additional research, as it remains unclear why in some instances bilingual children show an advantage on measures of RAN.

Despite these suggestions of differences in RAN attainment, RAN seems to play a similar predictive role in the development of reading accuracy and spelling for mono- and bilingual children (Chiappe, Siegel, & Gottardo, 2002; Swanson et al., 2004). Jongejan et al. (2007) examined the language and literacy skills of mono- and bilingual children (from diverse linguistic backgrounds) in Grades 1, 2, 3, and 4 (ages 6-10 years) growing up in Canada. Results suggested that for both language groups, RAN of objects was the only unique predictor of word reading accuracy after PA in Grades 1 and 2. Furthermore, for bilingual children only, RAN continued to be predictive of reading accuracy in Grades 3 and 4, and was also a predictor of spelling at these time points. The authors argued that this could be evidence that RAN plays a particularly important role in the literacy development of children learning to read in their additional language, as it may serve to compensate in some way for their more limited linguistic skills. Yeong and Liow (2011) also found RAN to be a significant predictor of spelling for children growing up in Singapore who spoke predominantly Mandarin at home, but not for children who spoke primarily English, the language of instruction, adding credence to the importance of RAN for literacy development in children learning in their L2. Nakamoto and colleagues (2007) examined literacy development longitudinally in Spanish-English bilingual children (initial age approximately 5;8 years), and found that RAN skills were related to growth in literacy over time. Specifically, low levels of both RAN and PA were associated with faster growth in the short term, but predicted deceleration in word decoding development in older children. Furthermore, children with lower levels of RAN skill at the beginning of the study showed poorer reading accuracy, and continued to show weaker skills in this literacy outcome later in their development, suggesting that RAN in children's L2 can be an early indicator of bilingual children who will go on to show persistent literacy weaknesses.

There is also evidence of an association between RAN and reading fluency and comprehension in bilingual children (Nakamoto et al., 2007; Manis et al., 2004; Geva & Farnia, 2012; Grant, Gottardo, & Geva, 2012). Geva and Farnia (2012) found a significant concurrent relationship between RAN and reading comprehension for bilingual Canadian children that was not present in their monolingual peers. In a similar sample of Canadian children, Zadeh, Farnia and Geva (2012) examined the extent to which the relationship between RAN measured in Grade 1 and higher-level reading skills measured in Grade 3 (i.e., reading comprehension and word- and text-level fluency) was mediated through Grade 2 word reading accuracy. Results suggested that RAN's influence on reading comprehension was indeed indirect through its role in the development of efficient word reading accuracy, but it also played a direct role in children's reading fluency at both the word- and text-level. These results mirror those reported for monolingual children, suggesting that RAN plays a particularly prominent role in predicting the fluency with which children can read, and thereby an indirect role in predicting how well children can understand what they read. As such, results generally converge to suggest that this cognitive skill shows similar relationships to literacy outcomes for children learning in their L1 or L2.

1.2.7 Verbal memory in monolingual children

In the current work, the term VM is used to define a broad concept that includes both short-term memory (STM) and working memory (WM) components. STM is used when information needs to be held in memory passively and temporarily, while WM is considered a limited-capacity system that allows for information to be both held and actively processed (Cain & Oakhill, 2008; Baddeley & Hitch, 1974). In their canonical work on memory, Baddeley and Hitch (1974) proposed modality specific stores in memory, so that visual information is stored and processed (in the visuo-spatial sketchpad) separately from spoken and written language information (in the phonological loop). The phonological loop therefore deals with phonological STM, and this latter term is used here to describe STM for specifically linguistic information.

Both STM and WM are likely to play a role in literacy acquisition, both directly and indirectly through their contribution to other important literacy skills (Gathercole, Tiffany, Briscoe, & Thorn, 2005; Savage, Lavers, & Pillay, 2007). In terms of the direct contribution of STM and WM, during encoding and decoding children need to hold sounds and letters in mind in order to build a complete representation of a word. This process is mirrored at the text-level by the need to remember what was read to build understanding that integrates novel information with background knowledge (Gathercole, 1995; Melby-Lervåg et al., 2012; Cain & Oakhill, 2008). In addition to these direct contributions, memory processes have also been suggested to contribute to other core literacy predictors such as LK and PA. Some have argued that the development of LK relies upon STM, as children's ability to maintain robust phonological representations may be important for learning letter-sound correspondences (Gathercole & Baddeley, 1993). Relatedly, many of the more advanced PA measures, such as phoneme deletion, require both holding and manipulating phonological representations in mind in order to complete the task, making it likely that these measures reflect WM capacity in addition to phonological knowledge (Tunmer & Hoover, 1992). What these processes have in common is the need for adequate phonological representations in long-term memory. Indeed, some researchers have argued that VM plays no unique role in predicting literacy skills, and that the relationship between reading and spelling outcomes and memory is simply a product of the ability of memory measures to assess the quality of a child's phonological representations (McDougall, Hulme, Ellis, & Monk, 1994).

In accordance with this view, there are contradictory findings in terms of the contribution of STM in predicting literacy skills in monolingual children. Meta-analytic results have suggested that average correlations between measures of STM taken in preschool or kindergarten and decoding are weak (r =.26), and moderate for reading comprehension (r =.39) and spelling (r =.31; NELP, 2008). While some studies have found measures of STM to uniquely predict reading skills after controlling for PA and RAN abilities (McCallum, Bell, Wood, Below, Choate, & McCane, 2006), others have not (Caravolas, et al., 2012). Based on their study of French-speaking preschool children (5- to 6-year-olds), Nithart, et al. (2011) suggested that while PA and phonological STM may be almost indistinguishable in young children, they quickly become separable and contribute differently to reading acquisition. They found that STM of serial information (measured using immediate recall of nonwords) was particularly important for decoding and also word recognition, suggesting that this cognitive ability is involved in matching short-term with long-term phonological representations.

It is more widely accepted that WM plays a predictive role in reading comprehension. Research has generally suggested that because comprehension is an active process requiring both maintenance and manipulation of the information, WM measures are more predictive than STM measures in reading comprehension (Cain & Oakhill, 2008). There is also agreement that children who struggle with reading comprehension tend to show WM weaknesses (Carretti, Borella, Cornoldi, & De Beni, 2009). Carretti and colleagues (2009) concluded that group differences (good vs. poor comprehenders) were most evident on measures that used verbal (rather than visual) information, and on measures that required greater attentional control. Predictive studies have demonstrated that WM measured at 8-years-old is a unique predictor of reading comprehension at 9-years-old, even after controlling for vocabulary, decoding, and the autoregressive effects of comprehension (Seigneuric & Ehrlich, 2005). Cain and colleagues have investigated the specific contribution of WM to reading comprehension over and above its influence on other higher-level text comprehension skills (i.e. comprehension monitoring, integration and inference, story structure knowledge), and found that WM does contribute uniquely to concurrent predictions of reading comprehension in children aged 8- to 11-years-old (Cain, Oakhill, & Bryant, 2004). A recent large-scale study of adolescents provides further evidence that WM and attentional control play a sustained role in reading comprehension (Arrington, Kulesz, Francis, Fletcher & Marcia, 2014). However, Oakhill and Cain (2012) did not find WM to uniquely predict reading comprehension. They argued that while their findings could not rule out the possibility that WM underpins the development of comprehension-related skills, it did suggest that processing abilities alone were not sufficient to explain the link between these aspects of memory and literacy. Both the work of Carretti et al. (2009) and Arrington et al. (2014) highlighted the role of attentional control in the relationship between WM and reading comprehension. These findings suggest that it may be important to consider the specific demands of a WM measure (and especially its reliance on attentional resources) in order to explain when significant relationships between WM and reading comprehension occur.

As such, it seems that while STM and to some extent WM skills may be involved in the development of lower-level literacy abilities (i.e., decoding, word recognition, spelling), WM and attention are important for children's reading comprehension abilities.

1.2.8 Verbal memory in bilingual children

It has been suggested the VM may be particularly important in learning a new language (Baddeley, Gathercole, & Papagno, 1998). Research based on monolingual populations has found a relationship between phonological STM and vocabulary learning, such that children with better phonological STM demonstrate higher levels of vocabulary knowledge (Gathercole, Willis, Emslie, & Baddeley, 1992). This reasoning has also been applied to bilingual populations, and there is evidence that children's STM in both their L1 and L2 is important for L2 vocabulary acquisition (Thorn & Gathercole, 1999). While some have argued that STM is language-specific (Thorn & Gathercole, 1999; Swanson et al., 2004), numerous studies have found significant cross-linguistic relationships on measures of both STM and WM in bilingual children (Abu-Rabia & Siegel, 2002; Da Fontoura & Siegel, 1995; Mumtaz & Humphreys, 2001). However, the linguistic demands of the tasks used to assess memory skills are likely to have an impact on the performance of bilingual children. For example, studies that have used measures of WM that place heavy demands on language knowledge, such as the sentence span task, have tended to suggest that bilingual children have weaker L2 memory capacities as compared to monolingual children (Lesaux & Siegel, 2003; Jongejan et al., 2007; Lesaux et al., 2007). This is likely to be more reflective of their underdeveloped L2 knowledge as opposed to a true memory weakness in these children. Support for this argument comes from studies that have used measures that require less advanced vocabulary and grammar knowledge (e.g., digit span tasks), which have reported equal or better memory skills in bilingual children (Harrison et al., 2016; Kieffer & Vukovic, 2013; Morales, Calvo, & Bialstok, 2013; Adesope et al., 2010).

Research by Swanson and colleagues has examined more closely the roles of L1 and L2 STM and WM in the literacy development of bilingual children. In a study of 5- to 6-year-old Spanish-English children (N=101) growing up in the US, Swanson and colleagues (2004) assessed children's STM (using digit span) and WM (using complex verbal span tasks), as well as word recognition and decoding in Spanish and English. The results suggested that L2 (English) reading was predicted by a WM composite comprised of both Spanish and English span tasks, as well as by L1 (Spanish) STM. The authors interpreted these results as evidence that while the predictive elements of WM are present when measured in either of children's languages, STM skills in children's L1 play a particularly important role in L2 literacy development. Swanson and colleagues (2006) then followed up this sample in the following two school years, when children were 6- to 8-years-old. The authors were particularly interested in examining the development of predictors of reading difficulty in bilingual children, and the results revealed that children considered at risk for later reading difficulties based on their Grade 1 reading scores (age 5- to 6-years-old) showed less growth in both L1 STM and both L1 and L2 WM over the two years studied. Other work has also found memory weakness to differentiate good and poor readers in bilingual populations (Da Fontoura & Siegel, 1995). The implications of these findings are that assessment of children's L1 memory skills could be useful in the early identification of reading difficulties, although this is likely to be difficult in populations such as those seen in the UK, where children come from a large number of different language backgrounds (Strand et al., 2015).

The predictive relationship between measures of memory and literacy outcomes is also similar for typically developing mono- and bilingual children. STM and WM have been linked to reading accuracy (Lesaux et al., 2007; Geva, 2006), spelling (Harrison, et al., 2016; Jongejan et al., 2007; Yeong & Liow, 2011) and reading comprehension (Lesaux et al., 2007; Farnia & Geva, 2013), with direct comparisons of mono- and bilingual populations suggesting that the strength and nature of these relationships are similar across language groups (Lesaux, Lipka, & Siegel, 2006). While it may be the case that L1 memory skills have a particularly important influence on word reading, it seems that memory measures in children's L2 still contribute in important ways to literacy development in bilingual children. Moreover, when these measures do not overly tax children's more limited L2 OL, differences between bilingual and monolingual children are unlikely.

1.2.9 Oral language skills as predictors of literacy

While the consideration of the predictors of literacy has tended to focus on cognitive skills more closely associated with code-related skills (i.e., PA, RAN, LK), there is growing acceptance of the important role of OL skills in children's literacy development. The following sections will consider the research that children's vocabulary, grammar, and listening comprehension are predictive of reading and spelling skills, and the term OL will be used broadly to refer to any or all of these various components of language.

1.2.9.1 Vocabulary in monolingual children

Of the subcomponents of OL, the relationship between vocabulary and reading accuracy and comprehension has received the most attention. The impact of vocabulary knowledge on children's reading accuracy has been debated, with suggestions that the nature of the relationship may be either indirect or direct (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003). One indirect role of vocabulary in literacy development is suggested by the lexical restructuring hypothesis, which proposes that vocabulary knowledge influences reading through its critical role in the development of pre-reading skills, most specifically PA (Metsala & Walley, 1998). This hypothesis is based on the argument that children first represent words holistically, but the growing acquisition of new lexical items prompts the development of recognition of words in increasingly smaller units (syllables and eventually phonemes). In this way vocabulary knowledge drives the fine-tuning of phonological representations, and thereby supports the development of better reading accuracy skills. Sénéchal, Ouellette, and Rodney (2006) found evidence that Canadian English-speaking children's vocabulary skills in kindergarten uniquely predicted 4% of variance in PA skills measured in Grade 1, even after parent literacy levels, alphabet knowledge, invented spelling, and listening comprehension skills were controlled. Similar results of the predictive relationship between vocabulary and PA have also been reported in other studies (Storch & Whitehurst, 2002; Lonigan et al., 1998, Vellutino & Scanlon, 2001).

An alternative suggestion is that vocabulary knowledge plays a more direct role in literacy development through the benefit of having well-defined phonological and semantic representations of words (Wise, Sevcik, Morris, Lovett, & Wolf, 2007). Share's (1995) self-teaching hypothesis suggests that having a stored phonological representation of a word (i.e. vocabulary knowledge) should support children in their decoding attempts. However, in inconsistent orthographies such as English that have many irregular words, semantic knowledge may play an additional role in word reading through contextual support for word identification. This idea is congruent with the connectionist triangle model of reading (Harm & Seidenberg, 2004; Plaut, McClelland, Seidenberg, & Patterson, 1996). While some studies have demonstrated positive relationships between vocabulary knowledge and broader measures of reading accuracy (Sénéchal & LeFevre, 2002; Lee, 2011; Duff, Reen, Plunkett, & Nation, 2015; Dickinson et al., 2003), as well as specifically irregular word reading (Nation & Snowling, 2004; Ricketts, Nation, & Bishop, 2007) others have not found evidence of this relationship (Metsala, 1997; Muter et al., 2004).

More consistent results have been found for the relationship between vocabulary knowledge and reading comprehension. Recent evidence has shown that even very early measures of children's vocabulary are related to later comprehension skills. Duff and colleagues (2015) used structural equation modelling to predict both reading accuracy and comprehension in

British children aged 4;5 to 9;5 years from parent report measures of their vocabulary skills at 16 to 24 months, controlling for the effects of age. Results suggested that even when measured at this early stage, vocabulary knowledge accounted for 11% and 18% of variance in reading accuracy and reading comprehension respectively, and these results mirror those previously reported by Lee (2011). Also within the UK context, Muter and colleagues (2004) demonstrated that vocabulary measured at school entry (average age of 4;9 years) was predictive of reading comprehension measures during the first two years of education, even after influences of word recognition, PA, and LK skills were controlled. As suggested by the SVR it is likely that OL skills (including vocabulary), become increasingly important as children become more proficient in their reading skills and the texts they encounter become more linguistically challenging (Storch & Whitehurst, 2002; Oakhill & Cain, 2008; Roth, Speece, & Cooper, 2002; Muter et al., 2004; de Jong & van der Leij, 2002).

For sufficiently proficient readers, text is also an important source of new vocabulary knowledge (Nagy & Scott, 2000). As such, it is also likely that reading development and vocabulary knowledge have a reciprocal relationship (de Jong & van der Leij, 2002). Some have even suggested that there may be a stronger relationship from reading comprehension to vocabulary knowledge than vice versa (Eldredge, Quinn, & Butterfield, 1990). Seigneuric and Ehrlich (2005) demonstrated that for French-speaking children, vocabulary measured at aged 7-years-old (Grade 1) was predictive of reading comprehension measured at age 9-years-old (Grade 3), and also found that Grade 1 reading comprehension accounted for 15% of the variance in Grade 3 vocabulary, supporting the idea of the bidirectional relationship between these two skills. Therefore, it is likely that vocabulary knowledge plays a role in the development of word-level literacy skills and particularly in reading comprehension skills, and that reading comprehension is an important contributor to vocabulary growth as children become more advanced readers.

1.2.9.2 Vocabulary in bilingual children

Children's language development is a protracted process influenced by a wide range of factors, and variation within the normal rate of development is large (De Houwer, Bornstein, & Putnick, 2013). Exposure to more than one language adds even greater complexity to the linguistic experience, and bilingual children's language development has been shown to be related to factors such as; (1) the age at which they first received regular exposure to their languages, (2) the proportion of language exposure in each language, (3) the characteristics of the language they hear from their parents and teachers, (4) parental characteristics, including language proficiency, education level, and generational status, (5) children's own usage of their languages (Hammer, Komaroff, Rodriguez, Lopez, Scarpino, & Goldstein, 2012; De Houwer, Bornstein, & Putnick, 2013; Duursma, et al., 2007; Gamez & Levine, 2013).

Given the additional factors that impact on linguistic development when learning more than one language, it is reasonable to assume that monolingual and bilingual children may differ in their rate of language acquisition. The distributed nature of bilingual children's languages means that they must develop at a faster rate than monolingual children in each of their languages if they are to attain similar levels of competency (Melby-Lervåg & Lervåg, 2014). Research that has considered vocabulary development (as a subset of language) has found that young bilingual children (1;6 to 3;0 years) showed similar rates of learning and similarly sized total or conceptual vocabularies (based on concepts known in both languages) as compared to monolingual children (Pearson, Fernandez, Lewedeg, & Oller, 1997). Furthermore, there is also evidence that the nature of children's vocabulary knowledge, in terms of the knowledge of different types of words, is similar for children learning one or more languages (Conboy & Thal, 2006; David & Wei, 2008; Levey & Cruz, 2003).

However, research has consistently shown that bilingual children have smaller language-specific vocabularies, and this prompts the question of whether and if bilingual children reach similar levels of vocabulary knowledge to monolingual children (Hoff, 2013). Hammer, Lawrence, and Miccio (2008) found that 2- to 4-year-old Spanish-English bilingual children receiving English-language childcare in the US showed increases in their standard scores on measures of vocabulary over the 2-year period. Although children who were exposed to both English and Spanish at home (simultaneous bilinguals) maintained their English language advantage over children whose home environment was Spanish-only (sequential bilinguals), sequential bilinguals showed faster rates of development. Furthermore, although simultaneous bilinguals' vocabulary standard scores were in the low average range for monolingual children by the end of the study, sequential bilingual children's scores remained over one SD below norm means. These results mirror other findings from similar samples that bilingual children's vocabulary knowledge falls one to two SDs below monolingual norms at this early point in development (Páez et al., 2007). Furthermore, there is evidence that differences in vocabulary knowledge between mono- and bilingual children persist into later school years. This suggests that even in cases when bilingual children show faster vocabulary growth, their rate of learning is insufficient to allow them to close the gap on their monolingual peers (Verhoeven, 2000; Droop & Verhoeven, 3003; Jean & Geva, 2009). Farnia and Geva (2011) used growth curve analyses to examine the vocabulary development of bilingual children from diverse linguistic backgrounds and their monolingual peers growing up in Canada, and found that growth was very similar across the groups, and as such the gap between the groups persisted even after all children had received 6 years of formal education in English.

With regards to the relationship between vocabulary and literacy, the bilingual literature parallels monolingual research in that the majority of the studies have focused on reading comprehension. Nevertheless, there is evidence that L2 vocabulary knowledge plays a significant, although relatively limited, role in the development of word reading accuracy skills for bilingual children (Gottardo, 2002; Davison, Hammer, & Lawrence, 2011). For example, Jean and Geva (2009) found that for 10- to 11-year-old children in Canada, vocabulary skills were predictive of word reading accuracy for both monolingual and bilingual children, even after controlling for the effects of PA, RAN, and WM. Furthermore, for both groups vocabulary knowledge explained a very similar proportion of variance in reading accuracy (approximately 7%), suggesting that vocabulary knowledge may support word recognition in a similar way for children of different language backgrounds. However, others have failed to replicate these findings, and have instead demonstrated weak correlations and nonsignificant predictive relationships between vocabulary and measures of reading accuracy for bilingual children (Swanson, Rosston, Gerber, & Solari, 2008; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; Geva, Yaghoub-Zadeh, & Schuster, 2000).

In one of the very few studies of reading fluency in bilingual children, Geva and Yaghoub-Zadeh (2006) found that for 7- to 8-year-old Canadian children from mixed linguistic backgrounds, expressive vocabulary accounted for 7% of variance in both word and text reading fluency, although measures of RAN and PA showed much stronger patterns of association. Crosson and Lesaux (2010) also found small, significant correlations between vocabulary and word reading fluency in 10- to 11-year-old bilingual children, although relatively little is known about the role of vocabulary in this literacy outcome for younger children. Similarly, the limited research in the area suggests that vocabulary plays a limited role in the spelling development of bilingual children (San Francisco, Mo, Carlo, August, & Snow, 2006; Arab-Moghaddam, & Sénéchal, 2001)

Given the predictive role of OL skills in reading comprehension, and the documented L2 vocabulary weaknesses of bilingual children, it is unsurprising that a relatively large amount of research has focused on elucidating the nature of the relationship between these variables. Indeed, results have consistently confirmed that vocabulary plays a strong role in reading comprehension for bilingual children, and may even be a stronger predictor than for monolingual children (Melby-Lervåg & Lervåg, 2014; Babayiğit, 2014; Hutchinson, Whiteley, Smith, & Connors, 2003). For example, Lervåg and Aukrust (2010) measured both vocabulary depth and breadth in a large sample (N=289) of monolingual Norwegian-speaking and Urdu-Norwegian bilingual children aged 7- to 8-years-old. Results suggested that while both decoding and vocabulary predicted initial levels of reading comprehension skill, vocabulary alone predicted reading comprehension growth, and was also a stronger predictor for bilingual children. Furthermore, vocabulary knowledge explained the group differences in reading comprehension. The lower vocabulary scores of bilingual children fully explained their correspondingly lower reading comprehension scores, a result that has been replicated in a British population (Babayiğit, 2014).

1.2.9.3 Grammar in monolingual children

Grammar is broadly concerned with the structure of language, and can be subdivided into aspects relating to the internal structure of words or linguistic units (morphology), and aspects relating to the ordering of words within sentences (syntax; Carter & McCarthy, 2006). Grammatical awareness is a term that refers to both implicit and explicit knowledge of grammatical structures, and while the potential link between grammatical awareness (including both syntactic and morphological aspects) has been the subject of considerably less research than other cognitive and linguistic predictors, there is evidence that it is related to word reading (Kirby et al., 2012), reading comprehension (Deacon & Kirby, 2004; Kieffer & Lesaux, 2008), and spelling (Muter & Snowling, 1997; Nagy, Berninger, & Aboot, 2006). As with vocabulary, the link between grammatical knowledge and reading comprehension is intuitive, in that it is likely that an understanding of both word and sentence structure is important in constructing meaning from text (Oakhill, Cain & Bryant, 2003). However, the link between word-level skills (including word reading and spelling) and grammatical knowledge is more debated. Syntactical awareness may influence children's word reading, either directly through providing contextual support (Rego & Bryant, 1993; Muter and Snowling, 1997) or indirectly by supporting the development of word recognition skills (Tunmer, 1989). Morphological awareness may be important for more advanced word reading and spelling skills, as children gradually move towards decoding and encoding words using larger morphemic units as opposed to direct letter-sound correspondences (Foorman, Petscher, & Bishop, 2012).

Some studies have examined the extent to which global measures of grammatical awareness, tapping both morphological and syntactic knowledge, are related to different aspects of reading development. In their UK study, Muter and colleagues (2004) found that grammatical skills (measured using word order correction and morphological generation tasks) assessed when children were 5- to 6-years-old were predictive of reading comprehension (but not word reading) one year later. Adlof, Catts, and Lee (2010) followed a relatively large sample of US children (N=433) from kindergarten through Grades 2 and 8, and examined the predictive relationship between broad measures of receptive and expressive grammatical awareness and reading comprehension. Both measures showed strong correlations with reading comprehension in Grades 2 and 8, and grammatical completion was a particularly strong predictor of Grade 8 reading comprehension. With regards to spelling, Muter and Snowling (1997) found that for 9-year-old UK children, concurrently measured grammatical skill (using an oral cloze task) was a significant unique predictor of orthographic choice (selecting the correct spelling of a word from a pair), but not of children's independent spelling attempts, even after controlling for vocabulary and reading accuracy. The authors interpret this as evidence of the specific contribution of grammatical awareness to orthographic knowledge.

Together these studies provide evidence that even broad measures of grammatical awareness show a relationship with reading comprehension and potentially spelling.

Other research has chosen to focus on the relationships between either syntactic or morphological awareness and literacy skills. Turning first to measures of syntactic awareness, Oakhill and colleagues (2003) used a receptive syntactic measure and found that while syntactic skill was not related to either reading accuracy or comprehension in UK children aged 7- to 8-years-old, it was significantly correlated with both skills in children one year later. Furthermore, in 8- to 9-year-olds, syntactic awareness explained unique variance in reading comprehension, even after controlling for vocabulary and IQ. The same authors reported slightly contradictory results more recently (Oakhill & Cain, 2012). They found that the same measure of syntactic awareness was again significantly correlated with, but not a unique predictor of, reading comprehension skills in children aged 8- to 11-years-old, and was not related to reading accuracy. The authors suggest that this does not necessarily mean that syntactic skills are unimportant, only that they contribute to predicting comprehension in conjunction with other language skills such as vocabulary. However, Cain (2007) found that while the relationship between reading comprehension and syntactic awareness was mediated by language and memory factors for reading comprehension, syntactic awareness and word reading shared unique variance. As such, there are contradictory results as to the relationships between syntactic knowledge and different components of reading skill.

Given that many English words, especially those of lower word frequency, are morphologically complex, there has been a growing interest in the relationship between morphological awareness and literacy development (Nagy et al., 2006). Nunes, Bryant, and Barros (2012) found that, for English children, the ability to read and spell words using larger morphemic units was predictive of children's concurrently measured reading comprehension and fluency after controlling for age and verbal IQ. This provides evidence of the role of morphological awareness in word reading, and the downstream influence on more advanced reading skills. Kirby et al. (2012) examined the role of morphological awareness in five reading outcomes (word reading accuracy and speed, nonword reading, text reading speed, and reading comprehension) in Canadian children (N=103) aged 6- to 8-years-old at yearly time points. The results suggested that morphological awareness made significant unique contributions to all five outcome measures when assessed concurrently in children aged 8-years-old, and in 7-year-olds for all measures except word reading speed. The influence of morphological skills on text-based and comprehension tasks was greater than word-based tasks, and this measure accounted for unique variance in reading comprehension even after word reading was controlled. Similar findings for the unique contribution of morphological awareness to reading comprehension have also been reported elsewhere (Deacon & Kirby, 2004; Kieffer & Lesaux, 2008), and this grammatical skill has also been linked to spelling (Nagy et al., 2006).

As such, it seems that there is a more consistent relationship between morphological awareness, as compared to syntactic awareness, and literacy outcomes. Furthermore, it is important to consider that some differences may stem from task effects (Cain, 2007), as well as the developmental nature of both language and literacy skills. Indeed, there is some support for the conclusion that grammatical awareness in general is likely to play a bigger role in literacy skills in older children, as the texts they encounter contain more complex syntax and more morphologically complex words (Wolter, Wood, & D'zatko, 2009).

1.2.9.4 Grammar in bilingual children

The development of grammatical awareness in bilingual children's individual languages has generally been found to be independent, and there is evidence that the acquisition of morphosyntactic structures follows a similar progression to that seen in monolingual learners (Hammer et al., 2014). However, as with vocabulary, bilingual children's grammatical knowledge has consistently been shown to be more limited as compared to monolingual children's, at least when considering their languages separately (Nicoladis & Marchak, 2011; Geva & Zadeh, 2006; Geva, 2006). The differences in the quality and quantity of the language input that children receive in each of their languages is once again thought to be the key differentiating factor in the development of grammar knowledge in mono- and bilingual children (Paradis, Nicoladis, Crago, & Genesee, 2010), although there are likely to be numerous other contributing factors. For example, Paradis (2010) examined the development of verb morphology in English in 43 French-English bilingual children (mean age 6;10 years) growing up in Canada. She found that the complexity of the morphological structure being assessed and task used to measure children's knowledge were explanatory factors in addition to the amount of exposure to English the children received.

The research considering the extent to which grammar knowledge in bilingual children's individual languages transfers across languages has been mixed, although it is likely to be the case that any influence will be more prominent in younger children, especially from their first or dominant language to their weaker language, and particularly on measures tapping expressive rather than receptive grammar (Hammer et al., 2014). However, generally results find that measures of grammar show only low cross-linguistic correlations (Swanson, Rosston, Gerber, & Solari, 2008; Gottardo, 2002), suggesting that children need to develop an understanding of grammatical structures independently in each language.

More limited overall language skills are likely to make grammatical awareness tasks more challenging for bilingual children as compared to monolingual children, raising the possibility that the predictive relationship between grammar and literacy skills may be different for children learning more than one language (Jongejan et al., 2007). As for monolingual children, considerably more research has considered the influence of bilingual children's grammatical knowledge on reading comprehension as compared to other literacy outcomes. A recent study by Kieffer, Biancarosa, and Mancilla-Martinez (2013) examined the role of morphological awareness in reading comprehension for 11- to 13-year-old Spanish-English bilingual children in the US. Using multivariate path analyses, the authors found that this aspect of grammatical knowledge showed not only a direct effect on reading comprehension, but also indirect effects through vocabulary and passage reading fluency. Furthermore, the nature of these relationships was stable across children of different language dominances (Spanish, English, or balanced), as well as across different grade levels. This provides evidence that morphological awareness contributes to text-level reading skills, both in terms of fluency and comprehension, in older bilingual children.

Other research has directly considered the relationship between components of grammar and word reading accuracy and fluency (Jongejan et al., 2007; Abu-Rabia & Siegel, 2002; Chiappe & Siegel, 2006). Ramirez, Chen, Geva, and Kiefer (2010) assessed the derivational morphological awareness of Spanish-English 9- to 10-year-old and 12- to 13-year-old bilingual children. Results from hierarchical regression analyses revealed that English morphological awareness explained a small but significant unique proportion (6%) of the variance in English word reading, and Spanish morphological awareness was an even stronger predictor of Spanish word reading. With regards to syntactic knowledge, results have tended to show a limited influence of this facet of grammatical knowledge on word reading (Cormier & Kelson, 2000; Gottardo, Yan, Siegel, & Wade-Woolley, 2001), even in instances where the same task did show a predictive relationship with reading for monolingual children (Jongejan et al., 2007; Lesaux & Siegel, 2003). As such, there is some suggestion that the relationship between grammar knowledge, and particularly syntactical awareness, and word reading may be contingent on children having a certain level of linguistic proficiency in the target language (Jongejan et al., 2007). Relatedly, Geva and Zadeh (2006) found that for Canadian 7-year-old bilingual children from mixed linguistic backgrounds, syntactic knowledge was a significant predictor of both word and text reading fluency. The authors interpreted this finding as evidence that children’s OL skills were sufficient to play a role in their reading due to the relatively simplistic linguistic nature of the reading material.

Both syntactic and morphological knowledge have been shown to play a role in bilingual children’s reading comprehension skills (Kieffer & Lesaux, 2008; Farnia & Geva, 2013; Geva & Farnia, 2012; Jeon & Yamashita, 2014). In a large sample of Canadian monolingual children and bilingual children from mixed linguistic backgrounds (N=824), Lesaux et al. (2007) found that grammatical knowledge (as measured by an oral cloze task) was a significant predictor of reading comprehension for children from both language backgrounds, and the strength of the predictive relationship was similar across groups. Similarly, Swanson et al. (2008) also found that their oral cloze measure was a significant concurrent predictor of reading comprehension in bilingual 8- to 9-year-old children in the US, and explained more variance than vocabulary. Therefore, as for monolingual children, the available research suggests that grammatical knowledge plays an important role in bilingual children's understanding of text.

Finally, the available research on the spelling of bilingual children suggests that grammatical knowledge plays a relatively limited role in the development of this literacy skill (Geva, 2006; Jongejan, Verhoeven, & Siegel, 2007). Although theoretically it is plausible that morphological awareness may assist in bilingual children's spelling attempts in a similar way to that seen for monolingual children, this remains to be considered.

1.2.9.5 Listening comprehension in monolingual children

In the broadest sense, listening comprehension is the ability to understand spoken language. Good listening comprehension requires not only the understanding of individual words (vocabulary) and sentences (grammar), but also for the listener to go a step further to build a mental model of the text as a whole through an understanding of inferencing and integrating the information with background knowledge (see section 1.1.3 , Hogan, Adlof, & Alonzo, 2014; Kintsch & Kintsch, 2005). As discussed earlier in this chapter, the core claim of the SVR is that successful reading comprehension is the product of an individual's decoding and listening comprehension skills (see section 1.1.1), and in line with this idea research has tended to focus on the role of listening comprehension in reading comprehension over other literacy outcomes. However, a small number of studies have considered the relationships between listening comprehension and reading accuracy and fluency, and these will be discussed first.

Nation and Snowling (2004) investigated the role of OL skills, as measured by vocabulary, semantic knowledge, and listening comprehension, in children's word reading and reading comprehension in the UK. Seventy-two children were assessed at approximately 8;6 years of age, and then followed up at age 13 years. In addition to finding that OL skills were predictive of reading comprehension at both time points, the authors also found that all three measures of language were significant unique predictors of word recognition, both concurrently and longitudinally. Furthermore, listening comprehension at age 8;6 years explained a significant 4.2% of unique variance in exception word reading at 13 years (more than either vocabulary or semantic skills), even after controlling for phonological and decoding skills. Similar findings were reported by Wise and colleagues (2007), who also found that for US and Canadian children (N=279) in Grade 2 and 3 (approximately 7;10 years), structural equation modelling results revealed that listening comprehension had a small but significant effect on word recognition. These authors note that the role of listening comprehension in word recognition could be due to its reliance on vocabulary, although the findings from Nation and Snowling (2004) suggest that listening comprehension explains more variance (at least in exception word reading) than vocabulary alone.

With regards to reading fluency, Kim, Wagner, and Lopez (2012) found that while listening comprehension was not uniquely related to text reading fluency in their structural equation models of all 7- to 8-year-old US children (N=270), there was a unique relationship between these two components for more advanced readers. The authors interpreted this as support for the idea that once children have sufficiently automatic word recognition skills, OL skills begin to play a role in the fluency with which they can read connected text.

While the literature on the relationship between listening comprehension and word reading accuracy and fluency is relatively sparse, more research has considered the role of listening comprehension in reading comprehension. Numerous studies have found that for children with sufficient word reading skills, listening comprehension is the strongest predictor of their reading comprehension (de Jong & van der Leij, 2002; Gough et al., 1996; Babayiğit & Stainthorp, 2011), and that the predictive power of listening comprehension increases as children grow older and become more proficient readers (Tilstra et al., 2009; Kershaw & Schatschneider, 2012). In their large study (N=527) of children in Grades 2, 4, and 8 in the US, Catts, Hogan, Adlof, and Weismer (2005) examined the shared and unique contribution of word recognition and listening comprehension to reading comprehension. Together these two predictors explained a large proportion of the variance in reading comprehension, and the unique contribution of listening comprehension increased from 9% in Grade 2, to 21% in Grade 4, and 36% in Grade 8. Others have also reported increasing contributions of listening comprehension to reading comprehension over time (Tilstra et al., 2009). However, these results relate to English, an inconsistent orthography, and it may be the case that listening comprehension shows a stronger relationship with reading comprehension earlier in development for children learning consistent orthographies where word reading accuracy develops very quickly (Babayiğit & Stainthorp, 2013).

It is also relevant to consider whether measuring listening comprehension adds any predictive power over simple measures of its components (i.e. vocabulary and grammar) in terms of explaining reading comprehension. Babayiğit and Stainthorp (2013) considered the contribution of listening comprehension, along with vocabulary, grammar, and verbal STM, to reading comprehension in Turkish-speaking children, and examined to what extent the influence of listening comprehension on reading comprehension was explained by the contribution of the component language skills. The study followed children from the initial assessment point in their kindergarten year (5;8 years), through Grade 1 (6;7 years), and Grade 2 (7;7 years). Kindergarten listening comprehension explained an additional 11% of the variance in Grade 1 reading comprehension, even after the three component language skills were included in the model, suggesting that the language components only partially explained the relationship between listening and reading comprehension. However, in Grade 2, the unique contribution of listening comprehension was smaller (5%) and nonsignificant, and the authors suggested that this could mean that at this point the component language skills fully accounted for the variance in reading comprehension explained by listening comprehension. However, the small sample size precludes any firm conclusions on this point. There is corroborating evidence that listening comprehension may be a useful predictor beyond direct measures of lower-level language skills, as de Jong and van der Leij (2002) found that for Dutch children of approximately 9-years-old, listening comprehension had a greater influence on reading comprehension than vocabulary, and the impact of vocabulary on reading comprehension was fully accounted for by listening comprehension. However, other studies have found that measures of vocabulary alone were more predictive of reading comprehension than listening comprehension (Protopapas, Sideridis, Mouzaki & Simos, 2007; Verhoeven & van Leeuwe, 2008), and clearly this is an area that would benefit from further investigation.

1.2.9.6 Listening comprehension in bilingual children

Given bilingual children's within language weaknesses in vocabulary and grammar knowledge, it is unsurprising that they also show weaknesses in their listening comprehension skills as compared to monolingual children (Droop & Verhoeven, 2003; Geva & Farnia, 2012). Comparisons of mono- and bilingual children have also suggested that bilingual children do not show faster rates of development in listening comprehension in their L2, and as such group differences persist for years after children begin formal education. For example, Hutchinson et al. (2003) found that British monolingual children showed a greater increase in listening comprehension scores from Year 2 to 3 (starting age 6;10 years) than bilingual children from diverse linguistic backgrounds, but the groups made similar advances from Year 3 to 4. Verhoeven and van Leeuwe (2012) found that although group differences between monolingual Dutch and bilingual Dutch learners from diverse backgrounds tended to narrow over time from Grade 1 to 5, they remained significant at the final testing point. In a relatively small scale study of primarily Spanish-speaking language minority children in the US, Mancilla-Martinez, Kieffer, Biancarosa, Christodoulou, and Snow (2011) reported that while children's listening comprehension standard scores in Grades 5 and 6 were approximately a half SD below the norm means, and these scores improved by Grade 7. As such, the available evidence suggests that bilingual children's L2 listening comprehension skills generally develop at a similar rate to monolingual children from comparable backgrounds. Since bilingual children often begin education with more limited listening comprehension skills, this similar rate of development means that if bilingual children are able to catch up to their monolingual peers at all, it takes numerous years of education.

Indeed, some research has specifically considered the impact of educational environment on the development of listening comprehension in bilingual children (Carlisle & Beeman, 2000; Proctor, August, Carlo, & Snow, 2006). Often this research has had at its core an interest in the transfer of skills from children's L1 to their L2, as it may be the case that children can take advantage of certain aspects of linguistic comprehension development in their primary language while listening in their additional language (Cummins, 1984). Results in terms of cross-linguistic correlations for measures of listening comprehension are mixed. Nakamoto and colleagues (2008) reported a moderate and significant (r =.31) correlation between listening comprehension measured in Spanish and English for US 8- to 9-year-old bilingual children. Carlisle and Beeman (2000) also assessed listening comprehension in Spanish (L1) and English (L2) and found a strong, significant correlation between these measures for children in Grade 1 in the US who were receiving English instruction, but there was no significant cross-linguistic correlation for children receiving Spanish instruction. Proctor and colleagues (2006) also examined this discrepancy in findings depending on children's instructional setting. Results from their study of 10-year-old Spanish-English bilingual children revealed small but negative correlations between listening comprehension measured in children's two languages, suggesting that greater proficiency in one language was related to weaker skills in their other. Furthermore, English-instructed children significantly outperformed Spanish-instructed children on all English OL measures, including listening comprehension, while the Spanish-instructed children showed significantly better performance on Spanish language measures. So, while it is unclear to what extent children are able to take advantage of language skills in the L1 while listening in their L2, it seems clear that the language of instruction plays an important role in the development of proficient listening comprehension within a language for bilingual children. Furthermore, factors mentioned previously as having an impact on the development of vocabulary and grammar (see section 1.2.9.2) will also have an impact on listening comprehension through their influence on these component language skills, and potentially also directly.

There is now also good evidence to suggest that, like for monolingual children, listening comprehension is an important predictor of bilingual children's reading comprehension skills (Proctor, Carlo, August, & Snow, 2005; Crosson & Lesaux, 2010; Kieffer et al., 2013; Lesaux, Crosson, Kieffer, & Pierce, 2010; Nakamoto, Lindsey, & Manis, 2012). Geva and Farnia (2012) examined the predictors of reading comprehension in Canadian bilingual children (mean age 10;6 years) from diverse backgrounds on concurrent language and literacy measures, while controlling for similar skills three years earlier. Results suggested that listening comprehension showed a stronger predictive relationship with reading comprehension than both vocabulary and grammar. One interpretation of this result is that more complex measures of linguistic knowledge are better predictors of reading comprehension for bilingual as well as monolingual children (although it should be noted listening comprehension was not a significant unique predictor for the monolingual children in this study, possibly due to ceiling effects on the task). Zadeh, Farnia and Geva (2012) also found that listening comprehension in Grade 1 contributed to both reading fluency and comprehension measured in Grade 3 for Canadian bilingual children. A large-scale study of Dutch bilingual children and their monolingual peers from Grades 1 to 6 (initial age 6;8 years) suggested that the predictive pattern between word decoding, listening comprehension, and reading comprehension was similar across language groups. Furthermore, for both mono- and bilingual children, the impact of word decoding decreased while the contribution of listening comprehension increased as children aged (Verhoeven & van Leeuwe, 2012), a result that has also been found in another Dutch sample of similarly aged children (Droop & Verhoeven, 2003).

The considerably more limited research on the relationship between listening comprehension and reading accuracy and fluency has suggested that this broader language measure plays a much more limited role in the development of word-level reading skills for bilingual children. Crosson and Lesaux (2010) found only weak, nonsignificant relationships between listening comprehension and decoding and word- and text reading fluency for 10-year-old Spanish-English bilingual children. Kieffer and colleagues (2013) reported very similar results for similar measures with 11- to 13-year-old Spanish-English bilingual children. Zadeh and colleagues' (2012) direct effects models also showed no significant contribution of Grade 1 listening comprehension to Grade 2 word reading skills for Canadian mixed-language bilingual children. As such, it seems that for bilingual children's word-level reading, listening comprehension is not often a robust predictor, and where any influence of OL does exist it is likely to be more easily discernable for the individual component aspects of language (i.e., vocabulary and grammar). Conversely, as for monolingual children, the similarity of the demands of comprehension across modalities makes listening comprehension a good predictor of reading comprehension for bilingual children, even beyond the influence of vocabulary and grammar knowledge.

1.2.9.7 Oral language as a unified construct in monolingual and bilingual children

In addition to studies that have considered the role of different component language aspects on literacy, others have conceptualised OL skills more broadly and as one unified predictor (Catts, Fey, Zhang, & Tomblin, 1999; Storch & Whitehurst, 2002; Sénéchal & LeFevre, 2002). The NELP's (2008) meta-analysis revealed that composite measures of OL that included multiple measures of different language components (i.e., vocabulary, grammar, and listening comprehension) showed strong correlations with both reading accuracy and comprehension, and these correlations were larger than those demonstrated by the language components when assessed individually. This could suggest that more global OL measures successfully explain greater variance in literacy outcomes, although it cannot be ruled out that this may be an artefact of the increased reliabilities of composite measures that include more items from which to gain stable scores (NELP, 2008).

However, research examining the structure of OL in monolingual children has provided some support for the idea that language, at least in young children, could be seen as a unified construct. Tomblin and Zhang (2006) examined the dimensionality of language in a large sample of US children in kindergarten, and Grades 2, 4, and 8 (approximate ages 6-, 7-, 9-, and 13-years-old respectively), using multiple measures of vocabulary and grammar. Their results suggested that while there was some evidence of dissociation between vocabulary and grammar at all ages, confirmatory factor analysis revealed that not until children reached Grade 8 was the two-factor model of language superior to the one-dimensional model. This finding of a unidimensional language factor in younger children is also supported by the results of Klem et al. (2015) who found that for monolingual Norwegian children aged 4- to 6-years-old, vocabulary, grammar, and sentence repetition formed a singular latent language factor. Using structural equation modelling, Foorman, Herrera, Petscher, Mitchell, and Truckenmiller (2015), demonstrated that for monolingual children in kindergarten, Grade 1, and Grade 2, the best model fit was found when multiple measures of vocabulary, syntax, and listening comprehension formed a single latent variable. While less is known about the interrelationships between components of OL in bilingual children, there is some suggestion that measures of OL correlate at least as strongly, if not more strongly, in bilingual children as compared to their monolingual peers, suggesting that OL skills are also interrelated in an L2 (Geva & Farnia, 2012). Together, these results provide empirical support for the idea that, at least in young children of a similar age to those in the current study, OL is likely to be best conceptualised as a singular construct.

1.3 Summary

Findings from research with monolingual children suggest quite clearly that the strongest predictors of word- and text-level literacy skills are somewhat different. While PA, LK, and RAN play a vital role in the development of reading accuracy and fluency and spelling, their contribution to reading comprehension seems primarily to be mediated by their role in the development of lower-level literacy skills. VM provides support for the development of these aforementioned cognitive predictors, as well as contributing directly to literacy acquisition through the importance of being able to hold and process information during decoding, encoding, and comprehension. As suggested by the SVR, OL skills show the greatest influence on text-level skills including both fluency and comprehension, although vocabulary and grammatical knowledge may also play a role in word reading and spelling skills.

With regards to bilingual children, the available literature provides relatively clear evidence that PA, LK, and RAN are of similar importance to literacy development for children learning in their L1 or L2. Furthermore, bilingual children appear to have similar competencies to monolingual children on these measures at an early stage in their development, perhaps because these skills seem to show evidence of at least some cross-linguistic relationships that allow children to take advantage of L1 learning in the development of their L2 abilities. VM also seems to be important for literacy development in bilingual children, and may even be a relative strength for these learners when measures are not too demanding on their OL skills. Once again, this could be due to language-independent processes underpinning broader memory ability. OL skills do not show these same patterns of transfer and are generally believed to develop relatively independently in each of the child's languages. This, along with the complex and protracted nature of language development in general, may explain consistent findings of OL weaknesses in bilingual children's individual languages. While bilingual children would need to show faster rates of growth in their language skills to 'catch up' with their monolingual peers, results generally suggest that these children progress at a similar or even slower rate of development. This is perhaps not surprising given the distributed nature of their language exposure. It is still unclear if the relationships between language skills and literacy outcomes are different for mono- and bilingual children, although some have suggested that bilingual children may need to rely on lower-level skills (i.e., PA and RAN) for longer to compensate for language weaknesses. Others have suggested that certain levels of language proficiency are necessary for language components to show similar predictive patterns to literacy for bilingual children as compared to those seen for monolingual populations. While both of these suggestions require further examination, it is clear that understanding the role of OL in literacy development in an L2 is vital. The nature of bilingual language learning means that differences in the language skills of mono- and bilingual children are to be expected (Uccelli & Páez, 2007), and so the important consideration is whether these differences mean that bilingual children are at a disadvantage with regards to learning to read and write.

Chapter 2 - Literacy skills in monolingual and bilingual children

As discussed in the previous chapter, the foundations of literacy are laid early, long before children are introduced to formal education, and the process of learning to read and write is qualitatively different when it is done in an L2 rather than an L1. Children's experiences during their early years help to shape the development of important skills that underpin their subsequent reading and writing abilities, and the factors that influence the development of literacy are many and varied (NELP, 2008; Lesaux, Koda, Siegel, & Shanahan, 2006). Furthermore, learning to read and write is in itself a cumulative process in which lower-level abilities form the basis from which more advanced higher-level skills develop (Perfetti, 1985; Snow, Burns, & Griffin, 1998). Specifically, becoming proficient in decoding and sight word reading leads on to reading fluency, and the ability to read both accurately and automatically is a core contributing aspect of developing reading comprehension skills. As such, if the development of lower-level skills is compromised, this may have important implications for children's ability to become more advanced readers and writers (see section 1.1). However, higher-level literacy is also dependent on children's broader skills, and most particularly their linguistic knowledge (see section 1.2.9), and L2 learners' language knowledge may therefore have an important impact on their literacy development.

While the previous chapter considered similarities and differences between mono- and bilingual children in terms of core predictors of literacy (see section 1.2), this chapter will consider how children from these two language backgrounds compare on their performance and development on four literacy skills - *reading accuracy*, *reading fluency*, *reading comprehension* and *spelling*. The aim of this chapter is to outline to what extent children developing literacy in their L2 look similar and different to their monolingual peers, and to identify areas of relative strength or weakness for this group of learners. Longitudinal studies and studies that included both a group of L2 learners and an appropriately matched group of L1 learners will be the primary focus of this review. In addition to comparisons of the performance of these two groups, potential moderating factors, including cross-linguistic influences from children's L1, will also be considered.

2.1 Reading accuracy

Evidence suggests that skilled word reading is comprised of both efficient sight word reading and decoding skills. Automaticity in word recognition (sight word reading) is important for ensuring that sufficient resources are available for higher-level reading processes, while decoding provides children with the ability to read novel words and words out of context (Lesaux, Koda, Siegel, & Shanahan, 2006). As such, measures of both real and nonword reading (referred to throughout this thesis jointly as word reading) provide dissociable and useful insight into children's profile of reading skill. Furthermore, it has been suggested that while sight word reading is relatively code-related, decoding and metalinguistic skills do show evidence of cross-linguistic transfer (Bialystok, McBride-Chang, & Luk, 2005; Melby-Lervåg & Lervåg, 2011). Therefore, children may be able to benefit from skills learned in their L1 when learning to read in an L2. Melby-Lervåg and Lervåg's (2011) meta-analysis of cross-linguistic relationships in reading skills found that L1 and L2 decoding do show a strong average correlation (r = .54), and the strength of the cross-linguistic relationship depends on the structural similarities (e.g., phonology, syntax) between children's languages and whether they are alphabetic in nature, with stronger relationships across more similar alphabetic languages. As such, cross-linguistic effects on word reading are not uniform, and depend on the type of reading task as well as individual characteristics of the languages a bilingual child is learning. However, despite these potential individual differences in children's word reading development, research from monolingual children would suggest that word reading accuracy as a broad concept develops quickly once children begin formal education. Mounting evidence suggests that this is also true for children learning to read in their L2 (Caravolas, Lervåg, Defior, Seidlová-Málková, & Hulme, 2013; Melby-Lervåg & Lervåg, 2014).

The development of word reading in bilingual learners has been considered more extensively than other aspects of literacy, and developmental studies in this area have tended to focus on young children in the early stages of reading. Findings converge to suggest that even in the very first years of education, the reading accuracy abilities of mono- and bilingual children are very similar (Chiappe, Siegel, & Wade-Woolley, 2002; Chiappe, Siegel, & Gottardo, 2002; Verhoeven, 2000; Jongejan et al., 2007; Geva et al., 2000; Chiappe & Siegel, 2006; Lervåg & Aukurst, 2010; Burgoyne, Whiteley, & Hutchinson, 2011). For example, in a large-scale study of bilingual children from diverse linguistic backgrounds and their monolingual English-speaking Canadian peers, there were no significant group differences in either kindergarten (5;4 years) or one year later in Grade 1 (Chiappe, Siegel, & Wade-Woolley, 2002). Similarly, Nakamoto et al., (2007) examined the development of Spanish-English bilingual children from low-SES backgrounds in the US, and followed their performance from Grade 1 to 6 (starting age approximately 5;7 years). The results showed that bilingual children's reading accuracy fell within the average range as compared to monolingual norms at all time points. These findings have also been extended to populations in the UK. Hutchinson et al. (2003) demonstrated that EAL children from diverse linguistic backgrounds performed comparably on measures of reading accuracy and showed similar development to their monolingual peers in Years 2 to 4 (starting age 6;9 years). As such, research evidence from populations differing in their geographic locations and SES backgrounds provide consistent evidence that bilingual learners acquire word reading skills so quickly as to make their performance comparable to monolingual children even within the earliest years of education.

Although less research has focused on older children, the available evidence suggests that word reading remains a strength for bilingual learners into adolescence (Abu-Rabia & Siegel, 2002; Da Fontoura & Siegel, 1995; Geva & Farnia, 2012; Babayiğit, 2015). Jean and Geva (2009) found no difference between bilingual children from diverse linguistic backgrounds (mean age 10;8 years) and their monolingual Canadian English-speaking peers (mean age 10;10 years) in either Grade 5 or 6. Similarly aged bilingual children (from diverse linguistic backgrounds) in the UK have also been found to have comparable reading accuracy levels to their monolingual peers (Babayiğit, 2015). There is also some suggestion that learning two languages in childhood may enhance children's reading accuracy skills. In a study of Canadian children, D'Angiulli, Siegel, and Serra (2001) examined the performance of Italian-English bilingual children from middle SES backgrounds, all of whom were born in Canada and had completed all of their education in Canadian schools. The bilingual children and a sample of their L1-English peers were divided into more and less skilled reader groups. Results revealed that the more skilled bilingual children outperformed their monolingual skilled reader peers on measures of word reading in both the 9- to 10-year-old group and the 11- to 13-year-old group. The older bilingual skilled readers also outperformed their monolingual peers on nonword reading, and in several instances, the performance of the less skilled bilingual children did not significantly differ from the more skilled monolinguals. While it is important to note that these results stem from children from relatively affluent backgrounds and very specific linguistic, educational, and cultural experiences, this does provide some evidence that bilingual children can show advantages in their word reading skills.

There is also some support for the idea that mono- and bilingual children may use different strategies during word reading. Chiappe and Siegel (2006) followed Canadian children longitudinally for one year from Grade 1 to 2, and examined children's reading of regular words, exception words, and nonwords. In addition to this, the authors examined the errors children made on the WRAT-3 reading test (Wilkinson, 1995). Overall mono- and bilingual children (from diverse linguistic backgrounds) showed similar error patterns and reading strategies, with the exception that bilingual children attempted to read more unfamiliar words and were more likely to apply grapheme-phoneme correspondence rules when reading these words. Mumtaz and Humphreys (2001) reported similar findings of regularisation errors in the reading attempts of bilingual Urdu-English children in the UK. Together these results suggest that bilingual children learn to apply grapheme-phoneme correspondence rules with at least as much success as their monolingual peers, and in some cases may use this strategy more and in ways that may not always be successful (i.e., for irregular words).

However, overall these findings converge to suggest that even in instances where children are learning to read in an L2 in which they have relatively limited linguistic capabilities, their word reading skills develop quickly and in such a way as to make them comparable to their monolingual peers even in their early years of education. This has been confirmed for children learning relatively consistent orthographies, such as Norwegian (Lervåg & Aukurst, 2010) and Dutch (Jongejan et al., 2007), as well as children learning the inconsistent English orthography (Hutchinson et al., 2003), suggesting that this finding is relatively stable across languages despite the orthographic properties of the script children are learning. There is also recent meta-analytic evidence to support these assertions, as a review of studies comparing the decoding skills of mono- and bilingual children found that the small significant advantage seen for monolingual children initially changed to suggest an advantage for bilingual children once corrections for publication bias were conducted (Melby-Lervåg & Lervåg, 2014). An additional finding from this meta-analysis was the impact of geography; namely that studies from Canada were more likely to find results in favour of bilingual children, while the opposite was true for studies from the US and Europe. The authors suggested this might reflect the differing cultures and levels of education in the immigrant populations of these areas. This highlights the need to consider the role of the educational and sociopolitical environment in which bilingual children are living and learning to read.

2.2 Reading fluency

In comparison to our understanding of reading accuracy, our knowledge of the development and role of reading fluency in skilled reading is still limited. As such, this section will first give a short account of our understanding of this concept based on literature with both mono- and bilingual populations, before considering the small literature that compares reading fluency skills in L1 and L2 children.

Reading fluency, sometimes referred to as reading efficiency or automaticity, involves both accurate and fast reading, and can refer to both word- and text-level reading skills (Geva & Yaghoub-Zadeh, 2006). It has been suggested that the nature of reading fluency changes as children become more proficient readers. For younger and less skilled readers, fluency develops as a function of increases in children's decoding and word reading skills, including the ability to effortlessly access larger orthographic units of text from lexical memory to facilitate word identification (Wolf & Katzir-Cohen, 2001). Once children are able to read at the word-level with limited conscious effort, attentional resources can be shifted from lower-level word processing to focus on higher-level text processing. As such, fluency is believed to be an important component in reading comprehension, because without a certain level of word reading fluency, children will not have sufficient attentional resources available to build meaning from the text (Stanovich, 1980; Geva & Farnia, 2012).

This developmental perspective supports the view that word reading fluency and text reading fluency are dissociable constructs, and that the relationship between these constructs and reading comprehension may change as children become better readers. Indeed, there is evidence from both mono- and bilingual children that while word reading fluency explains more variance in younger readers, text reading fluency contributes uniquely to reading comprehension in older and more advanced readers (Kim & Wagner, 2015; Geva & Farnia, 2012).

Differences between these constructs have also been found in terms of their relationship with broader language competencies. While language skills are not thought to play a substantial role in the reading of decontextualized word lists for monolingual children, reading connected text is believed to be related to children’s vocabulary, syntactical awareness, and listening comprehension skills (Puranik, Petscher, Al Otaiba, Catts, & Lonigan, 2008; Cohen-Mimran, 2009; Geva & Farnia, 2012). As noted by Crosson and Lesaux (2010), this gives rise to the possibility that children learning to read in their L2 may be at risk of weaker text reading skills, given the consistent finding that these children show OL weaknesses in their L2. Underdeveloped text reading fluency may then be a contributing factor to poorer reading comprehension in L2 learners. Crosson & Lesaux (2010) did find an interaction between these constructs in a group of Grade 5 US Spanish-English bilingual children such that only those readers with both efficient text fluency and strong OL skills demonstrated good reading comprehension in their L2. Relatedly, Riedel (2007) found that text fluency was a less reliable predictor of reading comprehension in Grade 1 US monolingual children with low levels of vocabulary knowledge, supporting the idea that the relationship between reading fluency and reading comprehension may be dependent on children having a certain level of OL proficiency (Crosson & Lesaux, 2010; Geva & Farnia, 2012).

Given these findings, it is useful to consider the literature comparing reading fluency in L1 and L2 learners in terms of word and text reading fluency skills separately. With regards to word reading, in a large-scale longitudinal study of Canadian monolingual children and bilingual children from diverse linguistic backgrounds in kindergarten (5;4 years) through Grade 2 (7;10 years), Lesaux and Siegel (2003) found that L2 children actually outperformed their L1 peers on one-minute word and nonword reading lists at both time points. In a later study of the same sample, Lesaux and colleagues (2007) found no differences in the word and nonword reading fluency of the two language groups once they had reached Grade 4, and these comparable word reading rates remained into Grade 7 (Lipka & Siegel, 2012). The results of this long-term study therefore suggest that learning to read in an L2 does not negatively impact word reading fluency development.

There is also evidence that text reading fluency is similar in mono- and bilingual learners. For example, Geva and Yaghoub Zadeh (2006) demonstrated comparable levels of both word and text reading fluency in bilingual children from diverse linguistic backgrounds and their monolingual English-speaking Canadian peers. In a longitudinal study of Canadian children in Grades 2 to 5 (10- to 11-years-old in Grade 5), Geva and Farnia (2012) examined both the word and text fluency skills of mono- and bilingual children from diverse linguistic backgrounds, as well as the predictors of these skills for both groups. There were no differences between the groups in the rate at which they read both isolated words and words in context, and text fluency was found to contribute uniquely to reading comprehension in Grade 5 for both groups. In one of very few studies to consider a UK population, Babayiğit (2014) examined how long it took students to read a text from a standardised reading comprehension assessment. Once again, she found no difference between children from monolingual and mixed-language bilingual backgrounds in Year 5 (9- to 10-years-old), despite significant group differences in OL skills.

While Geva and Yaghoub-Zadeh (2006) also found that OL skills were predictive of both word- and text-level skills in both mono- and bilingual learners, these findings contradict the results from Crosson and Lesaux (2010), who found no predictive relationship between vocabulary and text reading fluency in Spanish-English bilingual children. As such, it is still unclear exactly what role L2 children's more limited OL skills play in their development of both word and text reading fluency. Although the available research in this area is still very limited and has tended to focus on word reading fluency, primarily from Canadian samples, the findings are consistent in demonstrating that mono- and bilingual children attain very similar levels of reading fluency, even in cases where the predictors of their fluency skills seem to be different. However, clearly further research in this area is important, and should include more diverse samples and longitudinal designs.

2.3 Reading comprehension

Given what is known about the important role of OL skills in even young children's reading comprehension abilities (see section 1.2.9), and the consistent finding that bilingual children show language weaknesses in their additional language (Geva, 2006), reading comprehension is an area of potential concern for these learners. There is a growing consensus that, despite bilingual children's similar levels of proficiency in reading accuracy and fluency, their reading comprehension skills lag behind those of their monolingual peers from an early point in their development (Melby-Lervåg & Lervåg, 2014). For example, in a large scale study of Dutch children in the first two years of formal education (initial mean age of 6;8 years), Verhoeven (2000) reported differences on reading comprehension measures between mono- and bilingual learners in the first year of education, and these differences were sustained by the end of the children's second year of school. Similarly in a UK sample, Hutchinson et al. (2003) assessed bilingual children from diverse linguistic backgrounds and monolingual English children in their 2^{nd}, 3^{rd}, and 6^{th} year of formal education (initial age 6;10 months). Bilingual children's reading comprehension was poorer at all time points, and the authors also found that bilingual children needed to decode 30% more text than their monolingual peers in order to answer the same number of comprehension questions correctly. This finding suggests that bilingual learners may utilise their relative strength in word reading to attempt to compensate for their comprehension weaknesses. Similar results were reported by Burgoyne and colleagues (2011) in that group differences in reading comprehension between Year 3 and 4 mono- and bilingual learners in the UK only emerged when children's word reading accuracy skills were controlled.

This suggests that bilingual children may be at a disadvantage in their reading comprehension skills from the beginning of school, and as such would need to show accelerated rates of development in this skill in order to reach levels of proficiency similar to their monolingual peers. However, while longitudinal evidence of the early development of bilingual children's reading comprehension is still limited, the available literature suggests that bilingual children may show slower growth in this literacy skill (Burgoyne et al., 2011). Lervåg and Aukurst (2010) recruited Norwegian monolingual and Urdu-Norwegian bilingual children four months after exposure to formal literacy instruction (mean age 7;6 years), and followed children's development using growth-curve modelling over four time points within an 18-month period. Results revealed that monolingual children performed better on two separate measures of reading comprehension at all time points, and they demonstrated faster rates of reading comprehension development as compared to their bilingual peers. Nakamoto and colleagues (2007) also investigated bilingual children's reading comprehension using growth curve modelling in a sample of US children (mean age 5;8 years) recruited in Grade 1 and followed through Grade 6. While this study did not include a control group of monolingual children, the bilingual group was compared to US norms for English-speaking children. Results revealed that although bilingual children's reading comprehension scores showed rapid growth in the first two years of early education, the children began to fall behind norm expectations by Grade 3. The authors speculated this to be due to the greater linguistic demands placed by the passages presented in Grade 3 and thereafter, whereas the passages in the earlier years were more reliant on children's decoding abilities.

While these aforementioned studies suggested less rapid reading comprehension development in bilingual learners, contradictory findings have also been reported. Verhoeven and van Leeuwe (2012) examined the reading comprehension development of 1,293 Dutch monolingual and 394 bilingual children from diverse linguistic backgrounds from Grade 1 to 6 (initial age 6;8 years). Reading comprehension was assessed in Grades 2,4, and 6. Although significant differences favouring the monolingual children were found at all time points, results also suggested that the difference between the groups decreased over time. As such, while some reports would suggest that bilingual children show slower rates of growth than their monolingual peers, other studies suggested the opposite (Lervåg & Aukurst, 2010).

However, comparisons of mono- and bilingual children's reading comprehension in upper primary school and into adolescence have revealed that group differences persist even after years of exposure to formal education. Geva and Farnia (2011) examined the reading comprehension performance of 390 English bilingual learners from diverse linguistic backgrounds and 149 monolingual children in Canada, assessed in Grade 5 (10;6 and 10;8 years respectively). Once again, monolingual children performed significantly better on the measure of reading comprehension. The authors also made comparisons between the bilingual group's performance and monolingual norms, and suggested that the bilingual children's reading comprehension was at a level more typical of monolingual children 2-3 years younger. While the use of monolingual age norms with bilingual populations should be done with caution, the finding that bilingual children lagged behind monolingual children in their reading comprehension age by about 2 years is also supported by results from a small-scale study (N=12) of 12-year-old Mirpuri-Punjabi-English speaking children who showed similar comprehension delays (Rosowsky, 2001). These results and others demonstrating group differences in older mono- and bilingual learners (Babayiğit, 2014; Aarts & Verhoeven, 1999; Hacquebord, 1994), in conjunction with the previously discussed findings on reading comprehension development, suggest that even if bilingual learners are able to develop reading comprehension skills at a faster rate, this is often insufficient for them to catch up to their monolingual peers.

However, a smaller number of studies have found contradictory results suggesting that mono- and bilingual children perform very similarly on measures of reading comprehension, and that bilingual children may even have superior comprehension abilities. Chiappe et al. (2007) compared the reading comprehension of US Korean-English bilingual children to their monolingual peers in Grade 1 (mean age 6;6 and 6;7 respectively). Results suggested that the bilingual readers performed better than the monolingual children at the end of Grade 1, and the two groups showed similar development in this skill over the first year of education.

Further evidence comes from a series of studies from a large-scale research project with Canadian children (Lesaux & Siegel, 2003; Low & Siegel, 2005, Lesaux et al., 2007; Lipka & Siegel, 2012). Lesaux and colleagues (2007) reported on the reading comprehension development of mixed-language bilingual children and their monolingual English-speaking peers from kindergarten (5;4 years) through Grade 4. All children from one Canadian school district entering kindergarten in the first year of the study were included in the study. Despite relatively high attrition rates, by Grade 4 the sample remained at 824 children, of which 135 were classified as bilingual English learners. Children were tested once a year from kindergarten through Grade 4, with a focus on the comparison between the first and last testing points. Results revealed that the groups performed similarly on a measure of reading comprehension in Grade 4, and children showed similar growth rates in reading skill regardless of language group membership. Further follow-up with these children in Grade 7 found that the groups continued to perform similarly at this later time point (Lipka & Siegel, 2012; although see Low & Siegel, 2005 for evidence of weaker performance in the interim).

This highlights the importance of considering the specific demographic characteristics of the samples of studies in order to identify possible reasons for divergent results. For example, children in the Chiappe et al. (2007) study attended an award winning school in a high-SES area, suggesting that children were likely to have received strong support both at home and in school. Similarly, the children in the Lesaux and collegues (2007) sample were from a range of SES backgrounds, and the authors themselves argued that because much of the research in this area (including many of the studies previously reviewed) has been carried out with children from low-SES backgrounds, it is difficult to disentangle the relative impacts of being from a more deprived background and speaking more than one language in childhood (Lipka & Siegel, 2012).

Unsurprisingly, an additional impact on children's relative reading comprehension attainment is their OL skill in the language of instruction. In a study of Spanish-English bilingual children and their monolingual English peers in the US, Proctor, Silverman, Harring, and Montecillo (2012) examined the relationship between language proficiency and initial status and change in reading comprehension scores across one academic year for children in Grades 2, 3 and 4. The bilingual children were subdivided into those considered to have limited English proficiency and therefore labelled as English language learners (ELL), and those bilingual children considered to be relatively proficient in English, who were label non-ELLs. The 294 participants (56% monolingual, 44% bilingual) were tested at the beginning and end of the academic year, and results revealed that monolingual and bilingual non-ELL children did not differ significantly in their reading comprehension, although the groups did differ significantly on vocabulary. Both groups also performed significantly better than the ELL children on all measures. This study highlights the importance of considering level of linguistic aptitude when studying bilingual children, as their results would suggest that bilingual children with good L2 OL skills have similar reading comprehension abilities to those of monolingual children. Furthermore, the available research has demonstrated that cross-linguistic transfer of L1 OL and reading comprehension skills to L2 reading comprehension is limited (Melby-Lervåg & Lervåg, 2011), and therefore children's L2 OL proficiency is of greater importance in determining their L2 reading comprehension.

In an effort to clarify the contradictory results in this area of research, Melby-Lervåg and Lervåg (2014) recently reported a systematic meta-analytic review of 82 studies of reading comprehension outcomes and underlying components in L2 children. They found evidence to suggest L2 children show a medium sized deficit in their reading comprehension skills as compared to monolingual children. Moderator analyses also revealed that SES was not a significant moderator of reading comprehension outcomes, although this result should be interpreted cautiously due to the majority of effect sizes stemming from the same study (Cobo-Lewis, Pearson, Eilers, & Umbel, 2002), in which the way SES was stratified was not entirely clear and potentially limited the differences between groups. Another important moderator of group differences was the specific characteristics of the reading comprehension measure. Greater differences between mono- and bilingual children were found for passage reading measures as opposed to sentence reading measures, and for open-ended responses as opposed to multiple-choice questions. The authors noted that these results are in line with previous research suggesting that passage reading assessments may place greater demands on children's linguistic skills (Keenan, Betjemann, & Olson, 2008), as longer texts are likely to contain more sophisticated and involved plots. Furthermore, the difference between response types highlights the potential issues of multiple-choice questions, as it has been demonstrated that in certain instances students can successfully answer these without having read the corresponding passage (Keenan & Betjemann, 2006), a finding that draws into question the validity of such testing measures. Indeed, the importance of task effects is highlighted by the findings of Droop and Verhoeven (2003), who found that the differences between the reading comprehension scores of mono- and bilingual Dutch children (Morrocan or Turkish L1) either increased, decreased, or remained unchanged between Grades 3 and 4 depending on the measure of reading comprehension used.

An additional consideration in terms of potential biases when assessing reading comprehension in bilingual learners is the role of background knowledge. Extensive evidence suggests that having relevant background knowledge has a facilitative effect on comprehension (Droop & Verhoeven, 1998). Thus, it could be argued that if the measures used to assess comprehension rely on real-world knowledge that is relatively specific to the culture of instruction, then bilingual learners may be at a disadvantage and results may overestimate comprehension difficulties in these populations. However, some evidence suggests that lower reading comprehension scores for bilingual children persist even when background knowledge is controlled. Droop and Verhoeven (1998) found that although bilingual children were able to benefit from relevant background knowledge when reading more linguistically simple texts, this effect was less evident when children read more challenging documents. Therefore, OL weaknesses may hinder bilingual children in taking advantage of their relevant background knowledge in more linguistically demanding situations. More recently, Burgoyne, Whiteley, and Hutchinson (2013) measured the reading comprehension performance of Year 3 (aged 8;6 to 9;5 years) monolingual English and bilingual children from diverse linguistic backgrounds on a standardised measure of reading comprehension and an experimental measure for which all children were taught relevant background information (i.e., information about the people, places, and objects in the story they were asked to read). Once again, differences between the groups in favour of the monolingual children emerged. This suggests that bilingual children's reading comprehension difficulties extend beyond any disadvantages due to differences in background knowledge.

In conclusion, while longitudinal data remains limited and results in this field have been inconsistent, there is mounting evidence of reading comprehension weaknesses in bilingual children from a very early stage in their literacy development that persist into later education. Bilingual children's poorer performance on reading comprehension tasks has been linked to their more limited L2 OL skills (Babayiğit, 2015). However, there is still a great need for research to readdress contradictory results with more consistent methods, and to consider the influence of task effects on the current findings.

2.4 Spelling

Research from both monolingual and bilingual children has found that reading and spelling skills are highly correlated, and generally rely on the same component processes; phonological and orthographic processing, and memory (Lesaux, Koda, Siegel, & Shanahan, 2006). Phonological processing skills allow children to identify sounds in words, and then apply grapheme-phoneme correspondence rules to assign the sound a letter in their own spelling attempt. Orthographic processing allows children to store and retrieve the spellings of words from memory, something particularly important for English spelling development due to the large number of irregular words for children to learn. Given that both of these processes are influenced by experience, it is possible that bilingual children's more limited exposure to their L2 would put them at a disadvantage compared to their monolingual peers with respect to learning to spell in English (Lesaux, Koda, Siegel, & Shanahan, 2006).

A large proportion of the research considering the spelling development of bilingual children has focused on transfer effects from children's L1 to their L2. As learning to spell is dependent on children's understanding of the mapping between sounds and letters, and given that there is evidence that bilinguals activate both of their languages during phonetic processing (Raynolds & Uhry, 2010), researchers have investigated to what extent bilingual children rely on their knowledge of the sound structure of their native language when learning to spell in English. In a review of 27 studies examining language transfer effects on spelling in children learning English as their L2, Figueredo (2006) concluded that there was evidence of both positive and negative transfer effects in bilingual children's spelling development. Positive effects occurred when component skills such as PA transferred across languages, and more specifically when commonalities between languages (such as the same phoneme being represented by the same grapheme in both languages) meant children's existing L1 language knowledge supported L2 spelling development. Conversely, when children used their L1 knowledge strategically, but differences between the languages meant that this resulted in incorrect spelling attempts (such as when sounds were represented by different letters across languages) there was evidence of negative transfer.

The review also concluded that the extent of transfer effects is dependent on a variety of factors, including children's L1 proficiency and the distance between children's L1 and L2 in terms of factors such as the level of phonographic representation and orthographic consistency of the two scripts (Figueredo, 2006). Furthermore, while it was noted that the impact of L1 language transfer on the rate of L2 English spelling development is still unclear, the author suggested that there was growing evidence that L1 language knowledge may act as a "temporary resource" during children's L2 spelling development. This idea is in accordance with the view that transfer effects are a strategic and transitional aspect of second language learning.

Indeed, studies that have directly compared the performance of bilingual children with their monolingual peers broadly support the idea that where differences between children with different language backgrounds exist, they are transient. Several studies have found evidence of weaker L2 spelling skills in young L2 learners as compared to their monolingual peers (Lesaux & Siegel, 2003; Wang & Geva, 2003; Raynold & Uhry, 2010; Verhoeven, 2000). Verhoeven (2000) found that, although Dutch bilingual learners had similar levels of reading proficiency to their monolingual peers, their spelling skills were both less advanced and less fluent in Grade 2. This was despite the fact that the bilingual children were born and raised in the Netherlands and had completed two full years of education. However, in a longitudinal study of a large sample of Canadian children, Lesaux and Siegel (2003) found that while bilingual learners in kindergarten (5;4 years) were less able to correctly spell their own name and five simple words, by Grade 2 (7;10 years) their spelling skills for both real and nonwords had actually surpassed those of their monolingual peers.

However, there is also evidence that even very young L2 learners can demonstrate spelling abilities similar to their language-majority monolingual peers (Lesaux et al., 2007; Phillips & Marvelly, 1984; Limbos & Geva, 2001; Jongejan et al., 2007; Yeong, Fletcher, & Bayliss, 2014; Chiappe et al., 2007). For example, Wade-Woolley and Siegel (1997) found that despite Canadian Grade 2 bilingual learners being disadvantaged compared to their monolingual peers both in terms of their PA skills and their OL competencies, the two groups did not differ in their performance on measures on either word or nonword spelling. Furthermore, the small amount of available evidence suggests that bilingual children's spelling abilities remain similar to those of monolingual children even when they reach upper primary years. Using a spelling dictation test, D'Angiulli and colleagues (2001) found that both 9- to 10-year-old and 11- to 13-year-old Italian-English speaking skilled readers spelled better than monolingual children of the same age and reading ability. Furthermore, bilingual less-skilled readers outperformed monolingual less-skilled readers on the spelling task, leading the authors to suggest that the bilingual children's strong phonological skills gained from experience of the consistent Italian orthography had supported their spelling development. Two additional studies of similarly-aged Canadian children in the same area found that bilingual children from Portuguese and Italian backgrounds also performed comparably to their monolingual peers (Abu-Rabia & Siegel, 2002; Da Fontoura & Siegel, 1995). In one of the few studies examining spelling skills in bilingual children in the UK, Babayiğit (2014) found no difference in the performance of 9- to 10-year-old children from L1 and L2 English backgrounds on a standardised spelling assessment. However, cross-sectional evidence from a relatively small-scale study of US Spanish-English bilingual children suggested that bilingual children did make more spelling errors compared to monolingual children, both in Grades 2 to 3 and Grades 5 to 6, and that these errors were influenced by their L1 Spanish (Fashola, Drum, Mayer, & Kang, 1996). Older children made fewer errors than younger children, suggesting perhaps for this group of children, more sustained educational input was required for spelling skills to reflect the qualities of monolingual children's skills. However, overall there is converging evidence that, although some L2 learners may show spelling weaknesses in the very earliest years of their educational experience in their L2, their spelling skills quickly develop to levels that are comparable to those of monolingual children.

Relatedly, there is evidence that the spelling skills of children learning in their L2 are very sensitive to instruction. San Francisco et al. (2006) found that only those bilingual Spanish-English children receiving Spanish literacy teaching in the absence of English instruction demonstrated Spanish-influence spelling patterns, while Spanish-English children and monolingual children receiving English instruction performed very similarly. Raynolds, Uhy, and Brunner (2013) demonstrated that while 5- to 6-year-old mono- and bilingual US English-speaking children showed no difference in their spelling of short vowels (which were taught in their kindergarten classes), bilingual children showed significantly worse performance on the untaught long vowels. Together with the findings previously discussed, these results would suggest that instruction plays an important role for children learning to spell in their L2, and with sufficient experience of their L2 orthography they are likely to quickly reach levels of proficiency similar to those of monolingual children.

Overall, the literature on spelling development is fairly limited, and has tended to focus on transfer effects from children's L1 to their L2. While studies in this area need to be replicated and extended, there is some evidence that bilingual children can perform similarly to their monolingual peers, even very early in their spelling development. Children learning to spell in their L2 may rely on their L1 OL skills in the beginning stages of spelling acquisition, resulting in both positive and negative effects, but these transfer effects quickly fade so that mono- and bilingual children's spelling skills appear similar. However, more research is clearly needed to examine spelling development in bilingual children in more detail.

2.5 Summary

What emerges when the evidence presented in this chapter is considered as a whole is a picture of both strengths and weaknesses in the literacy development of children learning in their L2. A growing literature suggests that word-level skills such as spelling and especially word reading advance at a very similar pace in mono- and bilingual learners, and one explanation for this may be that skills in these areas, and in underlying contributing skills such as PA, seem to show transfer across children's languages (Melby-Lervåg & Lervåg, 2011). This allows bilingual children to take advantage of their experiences in their L1, and may explain the similar performance of children from different language backgrounds.

However, text-level skills and most notably reading comprehension can be challenging for bilingual children, and this could be at least partially explained by the notable L2 OL weaknesses of these children, as well as the finding that the transfer of L1 language skills to L2 reading comprehension is small (Melby-Lervåg & Lervåg, 2011). This gives rise to the possibility that strong word reading skills may to some extent mask bilingual children's more limited L2 comprehension abilities, especially in the early years and particularly in inconsistent orthographies where the development of decoding plays a more prolonged role in early literacy development (Seymour et al., 2003, Florit & Cain, 2011). The impact of underdeveloped comprehension skills should not be underestimated, as being able to understand the content of texts is not only a key outcome measure in itself, but also a vital skill that is predictive of future educational success (OECD, 2000).

However, there are still many unknowns in this field, and further research will be key to identifying more clearly the factors associated with positive outcomes for bilingual learners. While there is relative consistency in the findings for word reading, much less is known about reading fluency and spelling. Reading comprehension skills in bilingual readers has received more attention in the recent years, but the contradictory findings in this area and the impact of task effects mean that more research is needed to clarify and explain the available results.

2.6 The current study

Research with monolingual children has contributed greatly to our understanding of the precursors and predictors of literacy development, and there is clear evidence that the foundations for learning to read and write are laid long before children begin formal education. Early skills in code-related skills including PA, LK, and RAN, along with VM and OL abilities, are known to be important early contributors to literacy learning in children's first or native language, and superior performance in these underlying skills is often found to be associated with stronger literacy outcomes. As such, extensive research with monolingual samples has explored the development and relative contributions of these skills to predicting children's future reading and writing success.

However, our understanding of the development of these skills in children learning to read and spell in their L2 is still somewhat limited. Although there is growing evidence that literacy learning is underpinned by similar skills whether the process occurs in an L1 or an L2, there have been relatively few direct comparisons of the performance, development, and predictive significance of cognitive and linguistic skills to literacy learning in mono- and bilingual children. Most notably, there has been a lack of longitudinal research including both mono- and bilingual children, and almost no studies have considered the development of bilingual children from their preschool years into early education. This type of study has both theoretical and practical importance, and is fundamental to establishing whether those skills considered to be useful identifiers of children at risk of later literacy difficulties are equally valid for children learning in an L2. This is an area of particular importance in England and the UK, given the growing number of children overall and especially in primary schools who learn EAL (Strand et al., 2015; DfE, 2016). Research in English settings has been particularly limited, and it is important to consider whether research findings from children from other social and educational contexts generalise to children growing up in England.

Similarly, there is also value in establishing whether different aspects of literacy achievement, including reading accuracy, fluency, comprehension, and spelling, show similar rates of development in mono- and bilingual children. Although current evidence is limited, the available research from UK and international studies would suggest that while lower-level skills (such as word reading and spelling) develop similarly whether children are learning in an L1 or an L2, text-level skills (such as reading comprehension) may develop more slowly or differently in an L2. However, as research into text-level reading skills (including text reading fluency and comprehension) in young bilingual children is still sparse, this research sought to investigate these and other skills in EAL and monolingual children.

The current project followed the development of cognitive and linguistic predictor skills in a group of EAL children from Nursery (t1, t2), through Reception (t3), Year 1 (t4), and Year 2 (t5), and included a comprehensive battery of measures including PA, LK, RAN, along with VM, and OL measures of vocabulary, grammar, and listening comprehension. Additionally, children's literacy skills on word and text reading accuracy and fluency, reading comprehension, and spelling were assessed in Reception through to Year 2, and compared to a group of their monolingual peers in Years 1 and 2. Both bespoke and standardised measures were used, and the performance of both groups of children on standardised measures was also compared to norms (where available). Although most standardised measures were normed on monolingual samples, and therefore should not be used diagnostically with EAL children, comparisons to norms provided a measure of whether both groups were showing performance within what would be considered the normal range for their age. The advantage of including a monolingual comparison group from the same schools and classrooms as the EAL children was that this limited the potential weakness that group differences on outcomes measures could be influenced by differences in children's profiles on background variables (i.e., SES, educational background).

Therefore, the current study represents a comprehensive account of the performance and development of cognitive and linguistic predictor skills, and literacy outcome skills, in a group of EAL children and their monolingual peers. It also represents one of the first studies to follow the development of an EAL sample from before school entry through the first three years of formal education. The central aims of the project were to assess the development of known cognitive and linguistic predictors of literacy in EAL children and their monolingual peers, and to examine how these predictor variables explained individual differences in the literacy achievement of both groups of children. The specific research questions associated with this study were:

1) How do EAL children perform on measures of linguistic and cognitive predictors of literacy in Nursery, Reception, Year 1, and Year 2, and how does their performance compare to that of monolingual children?
    a) How do these skills develop in EAL children from Nursery to Year 2, and in monolingual children from Year 1 to Year 2?
    b) What similarities and differences exist between EAL and monolingual children in terms of performance and development of these predictors during their early education?
2) How do EAL and monolingual children perform on broad measures of literacy attainment (reading accuracy, fluency, and comprehension, and spelling) in Reception to Year 2?
    a) Do EAL and monolingual children perform differently on any specific literacy skills?
    b) Are there similarities or differences in the rate of development of literacy skills for EAL and monolingual children?

3) What are the relationships between the linguistic and cognitive predictor variables and the literacy outcomes for both EAL and monolingual children?
   a) What are the similarities and differences in the relationships between various cognitive and linguistic predictors, and literacy skills for these two groups of children?
   b) Do the same cognitive and linguistic skills contribute similarly to the prediction of literacy outcomes for EAL and monolingual children?

Chapter 3 - Method

This chapter will present details of the design of the previous and current projects that led to the collection of the current data. Demographic information about both the monolingual and EAL participants, as well how they were recruited, will also be addressed. Lastly, all materials used and the procedure for data collection will be outlined.

3.1 Design

The current project was designed as a longitudinal follow-on project from a previous intervention study involving EAL children in Nursery. This original project included two testing points in Nursery, after which many children moved on to different settings. The current study re-recruited as many of these original participants as possible once they reached Reception, along with a monolingual comparison group once all children reached Year 1. All these children were then followed through to Year 2. Further details of these two projects are given below, and an overview of the study design is shown in Figure 3.1.

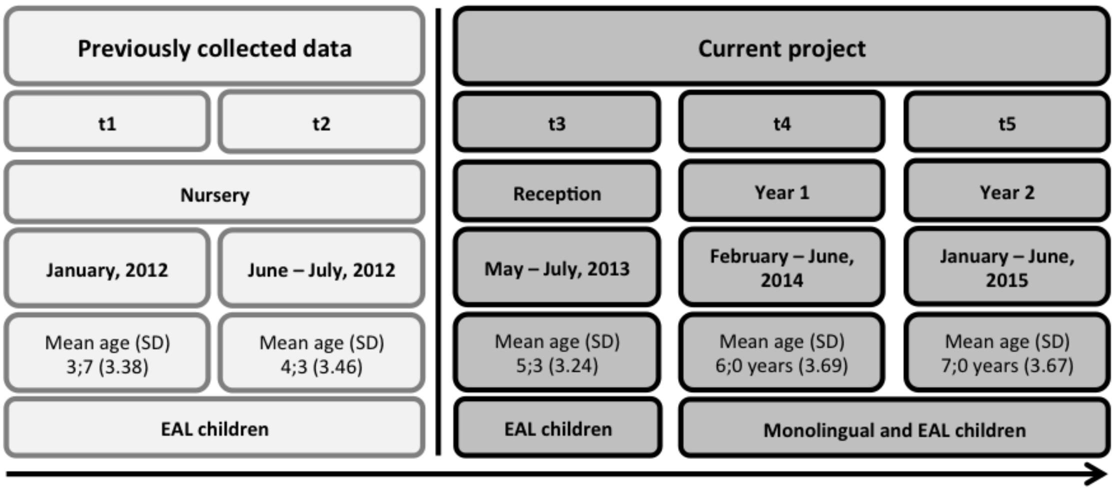

Figure 3.1. Overview of study design and time points from the previous project and the current project, including when data were collected, the educational phase of the children, mean ages and SDs, and which group of children were included in testing at each time point. Time points from the previous project are shown in a lighter shade, while the time points from the current project are in the darker shade.

3.1.1 Previously collected data

The aims of the original project, run during the academic year of 2011-2012 by Dr Silke Fricke from the Department of Human Communication Sciences at the University of Sheffield, were to develop and evaluate a 10-week English language intervention for EAL children in nursery. Twelve nurseries and children centres from the Sheffield area were recruited into the project, and all EAL children in each setting were screened on a test battery assessing basic vocabulary knowledge and grammatical awareness. The eight children at each setting with the poorest language scores (excluding those children who had not yet acquired any English) were selected and invited to participate in the project, giving a total participant sample of 96 children. Of the eight participants from each setting, four were randomly assigned to the intervention condition, while the remaining four children were included as a waiting control group. The project officially concluded in July of 2012 when children were at the end of their time in Nursery. As the intervention did not result in significant differences between the intervention and waiting control group on any measure except taught vocabulary, all children were treated as one group in the current study (Fricke & Millard, 2016).

Children were assessed on a battery of language and pre-literacy skills both before (t1; January, 2012) and after (t2; June – July, 2012) the intervention. Of relevance to the current study are the measures of children's vocabulary, grammatical awareness, LSK, and PA. Further details of the specific t1 and t2 measures that were analysed in the current study can be found in section 3.3.

3.1.2 The current project

Building upon this previously collected data, the current work followed the development of the aforementioned EAL children over an additional two years. Recruitment for this project began in March, 2012, at which point children had moved from Nursery to Reception classes.

In addition to the EAL children, monolingual children from the same schools were also recruited to form a peer comparison group. In an effort to make the two groups as equally matched as possible, it was originally intended that for each child with EAL in each school, a monolingual English-speaking child matched on age and gender would also be recruited. However, in many of the schools the vast majority of the children were EAL speakers, and the numbers of monolingual children were very low. This necessitated that the recruitment process be different for each school, and accordingly there were variable numbers of both EAL children and monolingual children in each setting.

The project consisted of three main time points (t3, t4, and t5), and one additional subordinate testing point (t3.1). This extra testing point was included so that nonverbal intelligence (NVIQ) could be measured without increasing the length of the test battery at any of the main testing points, and this was done between t3 and t4, in September to December of 2013. Linguistic and cognitive predictors of literacy (PA, RAN, LSK, vocabulary, grammar, and listening comprehension) and early literacy outcomes (single word reading and spelling) were assessed at the end of EAL children's Reception year, when children were approximately 5-years-old (t3). While it was initially the intention to test all children in both groups at t3, it was not possible to recruit a sufficient numbers of monolingual children at this earlier point. However, both EAL and monolingual children were assessed on the main test battery of cognitive and linguistic predictors (PA, RAN, vocabulary, grammar, and listening comprehension) and literacy outcome measures (reading accuracy and fluency, reading comprehension, and spelling) in the middle of Year 1 (t4), and a year later in the middle of Year 2 (t5). This meant that for the EAL children data were available at five time points, spanning from Nursery (t1 and t2, previously collected data) to Reception (t3), Year 1 (t4), and Year 2 (t5). Monolingual children were assessed at two time points in Year 1 (t4) and Year 2 (t5).

Ethical approval for this project was received from the Ethics Review Committee of the Department of Human Communication Sciences in line with University of Sheffield ethics procedures (see appendix 1).

3.2 Participants

In total the current project included 53 EAL children, and 54 of their monolingual English-speaking peers. All children were recruited from the same schools and classrooms, but the two groups will be described separately due to their different pathways into the project.

3.2.1 EAL children

The EAL children had all taken part in the language intervention study previously described. This original study included 96 children from 12 different preschool settings across Sheffield, England. For the current project, every effort was made to contact all of the children involved with the original project. Since the completion of the intervention study, children had moved from Nursery settings to Reception classes. This made it necessary to establish contact with the children's new schools before attempting to contact parents. At the end of the intervention project, Nurseries provided information about where children were expected to attend Reception classes in the following autumn. Information was provided for 92 children, as four children had moved Nursery during or just after the previous project and their new Nurseries could not be identified. This information was collated and used to establish an overview of the anticipated new settings of all the EAL children (see Table 3.1). For 9 of these 18 settings, the Nursery that had been involved with the intervention was part of or directly linked to the school itself.

All of the new settings as well as the schools adjoined to the participating Nurseries were contacted and invited to participate in the current study. Initially invitations were sent by post to the head teachers or contact persons identified from the previous project, and subsequently followed up with email and phone calls. School consent was received for 11 schools, which together represented 76 of the original sample of 96 children (79.2%). Once consent had been received from the school, parent information letters and consent forms were given to schools to distribute to the parents of the available children from the original intervention.

The English Index of Multiple Deprivation (IMD) rating of the postcode of each school was used as an indicator of the SES-background of the children in the study. The IMD takes into account multiple measures of deprivation (including income, employment, education, health, crime, barriers to housing, and living environment deprivation) in small areas, and assigns each area a ranking out of the total 32,844 areas in England. Lower numbers indicate more deprived areas. The ranking of each school is shown in Table 3.1, as is the decile of this ranking. As can be seen, all schools but one that participated in the current project were in areas that were among the 20% most deprived areas in England, and most were within the 10% most deprived areas. The only exception was School II, which was within the 50% most deprived areas in England.

Table 3.1
Overview of the anticipated Reception settings for 92 of the original 96 EAL participants for which this information was known, along with whether each school consented to be involved in the current project, the number of EAL and monolingual children recruited, and the IMD ranking of each school.

School	School consent received	EAL children previously involved in project	EAL children recruited into current project	Monolingual children recruited into current project	Index of Multiple Deprivation ranking, with decile
School I	Yes	9	8	8	6053 (2)
School II	Yes	8	6	8	14732 (5)
School III	Yes	7	5	8	2389 (1)
School IV	Yes	2	2	0	602 (1)
School V	Yes	8	5	3	1549 (1)
School VII	Yes	6	5	9	447 (1)
School VIII	Yes	9	8	7	4932 (2)
School IX	Yes	11	5	0	1740 (1)
School X	Yes	6	3	4	990 (1)
School XI	Yes	4	4	7	1577 (1)
School XII	Yes	6	2	0	2158 (1)
School XIII	No	9	0	0	2898 (1)
School XIV	No	2	0	0	553 (1)
School XV	No	1	0	0	11319 (4)
School XVI	No	1	0	0	583 (1)
School XVII	No	1	0	0	15421 (5)
School XVIII	No	1	0	0	14309 (5)
School XIX	No	1	0	0	469 (1)
Total	11	92	53	54	

Note. Schools that did not consent to be involved in the current project are shown in grey. For the IMD ranking, lower numbers indicate more deprived areas.

Despite the relative uniformity of the level of deprivation of the schools’ neighbours, there were notable differences between the settings. The proportion of pupils designated as EAL varied widely between schools, although in many settings this proportion was very high. All schools in the project were inspected by Ofsted (Office for Standards in Education, Child’s Services and Skills) either immediately before, during, or immediately after the conclusion of this project, and school ratings' ranged from the lowest rating of Inadequate through to the highest rating of Outstanding. However, the majority of settings were rated as Good. These differences reflected variations in the schools' success in terms of leadership, children's behaviour and achievement, and the quality of teaching. However, there were also noticeable differences in the way schools prioritized and approached their relationships with parents, as well as the visibility with which they acknowledged and celebrated the diversity of their EAL community. Furthermore, although most of the schools were community schools, several were academy schools or became academy schools at some point during the project. This contributes to the possibility that the settings differed in their approach to the national curriculum.

Unfortunately, it was not possible to contact and recruit all of the original 96 children, and some attrition also occurred after the initial recruitment at t3. Reasons for attrition at each time point for EAL children are outlined in Table 3.2.

Table 3.2
Summary of reasons for EAL participant attrition at each time point.

Reasons for attrition		**Number of children**
t3		
Child's school did not consent to be involved in the current project		16
Child moved schools and new school could not be identified		6
Child's family moved abroad		2
Child left school to be home-schooled		1
Child was on long-term leave during recruitment		3
School asked that the child not be included		1
Parents did not return consent form, or actively did not consent		14
Consent was received, but teacher requested child not be included		1
	Total	*44*
t4		
Child moved school and new school could not be identified/recruited		1
	Total	*45*
t5		
Child moved school and new school could not be identified/recruited		4
Child's family moved abroad		2
	Total	*51*

An overview of the total number of EAL participants recruited into the project, including how many were tested at each time point and demographic information on their age and gender, is given in Table 3.3. The t1 testing point (from the original intervention) comprised both a screening session and a pre-test session, conducted less than three months apart. As the measures relevant to the current project were not duplicated in these two sessions, and because these sessions were so close in proximity, they were treated as one time point. The demographic data shown below reflects the earlier session at t1.

Table 3.3
Overview of number of children tested at each time point, and details of the age and gender.

	Group	Total	Female	Male	Age range (years; months)	Mean age (years; months)	SD (months)
t1							
	EAL	96	46	50	3;2 – 4;1	3;7	3.38
t2							
	EAL	88	46	42	3;10 – 4;8	4;3	3.46
t3							
	EAL	39	21	18	4;9 – 5;9	5;3	3.24
t4							
	EAL	51	28	23	5;5 – 6;5	5;11	3.45
	Monolingual	53	29	24	5;6 – 7;0	6;1	3.78
t5							
	EAL	45	24	21	6;6 – 7;6	6;11	3.41
	Monolingual	49	27	22	6;6 – 8;0	7;0	3.73

Demographic information on children's language backgrounds was collected as part of the original project when children were in Nursery. Children were from diverse linguistic backgrounds, and the original sample included speakers of 27 different home languages, and the current sample represented native speakers of 21 different languages. The languages spoken by the children recruited into the current project can be seen in Table 3.4.

Table 3.4
Languages noted as the primary home language by parents of EAL children.

Language	Total	Language	Total
Arabic	11	Turkish	1
Punjabi	7	Russian/Georgian	1
Urdu	6	Amharic	1
Kurdish	2	Ndebele	1
Somali	5	Tigrinya	1
Yemini	1	English	3
Malayalam	1	Farsi	1
Pashto	2	Enko	1
Polish	2	Hungarian	1
Roma	3	Shoma	1
Urdu/Punjabi	1		

3.2.2 Monolingual English-speaking children

Monolingual English-speaking children were recruited from the same schools and classrooms as EAL children. Due to varying numbers of monolingual children, the recruitment process was different in the various schools. Only two schools had sufficient numbers of monolingual children to attempt to match children in the two groups on age and gender (Schools I and II). However, in School II the first round of monolingual participants matched to the EAL children did not all consent to be involved, and so additional monolingual children from the same classrooms as the EAL children were approached and recruited into the project, regardless of their age and gender.

In six other schools, all monolingual children were contacted, and all children who consented were included in the project (Schools II, V, VI, VII, IX, and X). One school asked to select the monolingual children who were contacted based on their assessment of parent involvement, and as such only a subset of parents of monolingual children were contacted in this school (School XI). Two schools did not have any monolingual children enrolled in the Reception classes at the time of recruitment (Schools IV and VIII). All monolingual parents were contacted in the same way as for the EAL children, through parent information letters distributed by classroom teachers. An overview of the number of monolingual children recruited from each setting is shown in Table 3.1, and demographic details of the children can be found in Table 3.3. Similarly to the EAL children, a small number of monolingual children could not be followed up at all time points, and reasons for attrition in this sample are shown in Table 3.5.

Table 3.5
Summary of reasons for monolingual participant attrition at each time point.

Reasons for attrition		Number of children
t4		
Child moved school and new school could not be identified/recruited		1
	Total	*1*
t5		
Child moved school and new school could not be identified/recruited		4
	Total	*5*

3.3 Measures

This section will first outline the cognitive and linguistic measures used in this thesis, which included assessments of code-related skills (PA, LSK, RAN), VM, and language measures (vocabulary, grammar, and listening comprehension; see Table 3.6). Table 3.7 shows when all literacy measures (reading accuracy, reading fluency, reading comprehension, and spelling) were assessed. In addition to the predictor and literacy measures described, a small number of measures were collected but not analysed, and the details of these measures and rationale for why they were not included in the analyses are set out in section 3.3.1 . For all measures of predictor and literacy skills, self-corrections were accepted and given full points if they resulted in a correct response. For all standardised measures, assessment procedures were done following manual directions unless otherwise noted.

3.3.1 Cognitive and linguistic predictor measures

The measures used to assess code-related predictors (PA, LK, RAN), VM, and OL (vocabulary, grammar, and listening comprehension) at all time points are outlined in Table 3.6, and described below.

3.3.1.1 Phonological awareness

In order to capture the changing nature of children's PA skills, five different measures of PA were used. At t1 and t2, bespoke measures of *Rhyme awareness* and *Alliteration matching* were included. At t3 and t4 measures of *Sound isolation* and *Sound deletion* were used, both from the *YARC – Early Reading Battery* (Hulme et al., 2009). At t5, the *PhAB Spoonerisms* task was used (Fredrickson, Frith, & Reason, 1997).

Table 3.6
All cognitive and linguistic measures included at each time point of the project

	t1	t2	t3	t4	t5
	EAL children			Monolingual and EAL children	
Phonological Awareness					
Alliteration matching	✓	✓			
Rhyme awareness	✓	✓			
YARC Sound deletion			✓	✓	
YARC Sound isolation			✓	✓	
PhAB Spoonerisms					✓
Letter Sound Knowledge					
YARC Letter-sound knowledge	✓	✓	✓		
RAN					
Colours			✓	✓	✓
Shapes			✓	✓	✓
Numbers				✓	✓
Letters				✓	✓
Verbal memory					
CELF digit span forwards			✓	✓	✓
CELF digit span backwards					
Vocabulary					
RAPT Information score	✓	✓	✓	✓	✓
CELF Expressive vocabulary (EV)	✓	✓	✓	✓	✓
BPVS			✓	✓	✓
Grammar					
RAPT Grammar score	✓	✓	✓	✓	✓
CELF Sentence structure (SS)	✓	✓	✓	✓	✓
CELF Word structure (WS)			✓	✓	✓
Listening Comprehension			✓	✓	✓
Nonverbal IQ					
WPPSI Block design			✓		

Note. York Assessment of Reading Comprehension (YARC); Phonological Assessment Battery (PhAB); Comprehensive Assessment of Language Fundamentals (CELF); Renfrew Action Picture Test (RAPT); British Picture Vocabulary Scales (BPVS); Wechsler Preschool and Primary Scale of Intelligence (WPPSI)

3.3.1.1.1 Alliteration Matching (t1-t2)

To assess children's early PA skills, the alliteration matching task used by Carroll and Snowling (2001) was adapted for use with young EAL children with low levels of English vocabulary knowledge. This adaptation included, as far as possible, only early acquired and frequent English words. For each of the items children were told they would hear a word and then they should choose which of 3 other words started with the same sound. All items included the stimulus (e.g, *house*), a target (e.g., *hat*), a phonological distractor (e.g., *foot*), and a semantic distractor (e.g., *door*). A picture that children were asked to point to as their answer accompanied each of the possible responses. There were five test items preceded by two practice items, and children received a score of 1 point for each correct response and 0 points for each incorrect or no response, to give a total raw score out of a possible 5 points.

3.3.1.1.2 Rhyme Awareness (t1-t2)

This measure was an adaptation of task used by Muter, Hulme, and Snowling (1997), and once again the items were adjusted to include early acquired and frequent English words in order to be more appropriate for EAL children's vocabulary knowledge. Children were told they would hear a word and then they should choose which of 3 other words rhymed, or "*sounded a bit the same*." Each item included the stimulus (e.g., *cat*), a target (e.g., *hat*), an onset distractor (e.g., *car*), and a semantic distractor (e.g., *dog*). Picture supports were also available for each of the 3 possible responses, and children were asked to point to their answer. The test included a total of 2 practice items and 5 test items, and children received a score of 1 point for each correct response and 0 points for each incorrect or no response, to give a total raw score out of a possible 5 points

3.3.1.1.3 York Assessment of Reading Comprehension (YARC) - Sound isolation (t3-t4)

This test was used to measure children's ability to isolate sounds within spoken words. The measure consisted of 18 items (12 test items, 6 practice items) all of which were nonwords. The first 6 items required children to isolate the first phoneme in the nonword, and the next 6 items required the isolation of the final phoneme in the nonwords, and 3 practice items preceded each section. Although standard administration of this test did not require it, picture supports in the form of alien-like creatures were used for each item to encourage young children to engage with the task. The nonwords were introduced to the children as the names of the alien creatures in the pictures. For each item, the experimenter showed the alien image and spoke the corresponding nonword, and the child was then asked to identify either the first or final phoneme in each item. Correct responses received 1 point, while incorrect and no responses received 0 points, to give a total raw score out of a possible 12 points. Internal reliability for this subtest is $\alpha = 0.88$ (Hulme et al., 2009).

3.3.1.1.4 YARC Sound deletion (t3-t4)

The *Sound deletion* subtest measured children's ability to identify and remove sounds within spoken words, and consisted of 19 real words (12 test items, 7 practice items). The to-be-deleted sound progressed from syllables, to final phonemes, initial phonemes, and medial phonemes, and practice items preceded each change in the position of the deletions. During administration, each child was shown a series of pictures individually and asked to repeat the word correctly first, and then again without either the first, final, or middle phoneme. Correct responses received 1 point, while incorrect and no responses received 0 points, to give a total raw score out of a possible 12 points. Internal consistency reliability for this test is α = 0.93. (Hulme et al., 2009).

3.3.1.1.5 Phonological Assessment Battery – Spoonerisms (PhAB Spoonerisms; t5)

The *PhAB Spoonerism* task (Frederikson, Frith, & Reason, 1997) consisted of two parts; Part 1 was a semi-spoonerism task in which children replaced the first sound of words with a different sound, while Part 2 was a full spoonerism task in which children were required to switch the first sounds of two words. The manual guidelines suggested to only administer Part 2 to children over 7 years, and to only allow 3 minutes for each of the two parts. However, at t5 all children were between 6- to 7-years-old, and in order to have consistency all children were administered both parts and testing was only discontinued after a child made 3 consecutive errors (the manual specified discontinuation rule). Each part contained 10 items, and each correct response in Part 1 received 1 point. For Part 2, children received 1 point for each correct word, making each item worth a possible 2 points. Incorrect and no responses in either part received 0 points, giving a total out of 10 points for Part 1, and 20 for Part 2 (total maximum 30). For each item, the experimenter read out the item, and if the child did not respond within 20 seconds, an encouraging prompt ("*Do you want to give it a try, or shall we try another one*") was given. If the child still did not respond, the item received a score of 0 and testing moved on. This measure reports standard scores for children aged 6;0 – 14;11 years, although as the administration of this assessment was different to the standard version outlined in the manual, the standard scores were not used. Internal consistency reliability for children 6;0-7;11 on this task is α = .95.

3.3.1.2 YARC Letter-Sound Knowledge (LSK; t1-t3)

Children's knowledge of letter-sounds was assessed using the *LSK* subtest from the *YARC* Early Reading battery (Hulme et al., 2009). At t1 and t2, the core version of this measure was used, which assessed knowledge of 17 letters and digraphs. At t3, the extended version of the measure was used, for which children were presented with 32 letters and digraphs and asked to name the associated sounds. For both versions of the measure, if children gave the letter-name instead of the sound, they were prompted to name the sound instead. Correct responses scored 1 point, while incorrect responses, letter-names in the absence of the letter-sounds, and no responses scored 0 points. Total scores were combined to give raw scores out of a possible 17 points for the core version, and 32 points for the extended version. Internal reliability for the core version of this test is reported as α = .95, and α = .98 for the extended version, and the measure reports norms (based on a UK sample that included EAL children) for children aged between 4;0 – 7;11. As children's average performance on this measure was already at ceiling at t3, it was removed from the test battery at t4.

3.3.1.3 Rapid Automatized Naming (RAN; t3-t5)

At t3, the RAN subtest of the Clinical Evaluation of Language Fundamentals - 4 (Semel, Wigg, & Second, 2006) was used, and consisted of 3 types of test trials; RAN of colours, RAN of shapes, and RAN of colours and shapes, each with 36 stimuli. At the beginning of the test, three practice trials were administered, each corresponding to one of the test trails. In the practice trials, children were presented with rows of the stimuli they were to name. First, the experimenter named all the stimuli in the first row to familiarise the child with the procedure. The child was then asked to name all the stimuli in the subsequent row(s). For RAN colour, the stimuli included the colours *yellow*, *red*, *green*, and *blue*. For RAN shapes, the stimuli included *circle*, *square*, *triangle*, and *star*. For RAN colours and shapes, the stimuli were combinations of these colours and shapes (e.g., *red star*, *blue square*). If children made a mistake they were corrected and asked to name the stimuli again. If they were still unable to name all the practice stimuli correctly, that test trials was not administered. Once all practice trials had been administered, the test trials were administered in the order RAN colours, RAN shapes, and then RAN colours and shapes. The test trials included the same stimuli as the practice trials, and children were asked to name all items sequentially as quickly and accurately as they could. The time taken to name all stimuli and the number of errors made were recorded for each of the three RAN trials.

The aforementioned administration procedure adhered to manual guidelines. However, many children became distracted and inattentive towards the end of this task. Many children found the combined RAN colours and shapes trial particularly difficult, often taking several minutes to complete the 36 test stimuli. This may have affected the validity of this measure, as it was not clear that the items were truly automatic for children at this age. To overcome this limitation, the RAN colours and shapes tests were rescored from the audio recordings such that only the number of correctly named items and the number of errors made in the first 30 seconds of each test measure were scored and included in analysis. Due to the poor performance on the combined colours and shapes trials, this test was excluded from analyses.

In response to the difficulties encountered with this task at t3, the testing procedure was changed for t4 and t5 so that children were given 30 seconds to name as many stimuli correctly as they could. Therefore, the rescoring of the t3 data and the test administration at t4 and t5 resulted in comparable data. Alphanumeric stimuli were included in addition to colour and shape stimuli at t4 and t5, as children had been enrolled in formal education for over 16 months at that time and could therefore be assumed to be familiar with such stimuli. As such, the RAN measures at t4 and t5 included colours, shapes, letters, and numbers. For each type of RAN, 2 6x6 matrices of randomly arranged stimuli were created. The colours and shapes from the

CELF 4 (Semel et al., 2006) were used again in the new procedure. The letter and number RAN tasks were developed based on Denckla and Rudel's (1976) pioneering work in this field, and included the letters *d*, *a*, *s*, *p*, and *o*, and the numbers *6*, *4*, *7*, *9*, and *2*. For testing, the same procedure was used with regards to the practice trials, and for the test trials the number of correctly named items and the number of errors were recorded. The testing order of the RAN test trials was colours, shapes, letters, and then numbers.

3.3.1.4 Clinical Evaluation of Language Fundamentals - Digit Span (t3-t5)

At t3, t4 and t5, the Number Repetition subtest (hereafter referred to as Digit span) of the *CELF 4* (Semel et al., 2006) was used to assess children's short-term and working memory skills. This measure consisted of two subtests: *Digit span forwards* (STM) and *Digit span backwards* (WM). The *Digit span forwards* measure was comprised of 8 2-part items, while the *Digit span backwards* section contained 7 2-part items. Each item consisted of two parts (a, b), and testing was discontinued if a child scored 0 on both parts of any item. For the *Digit span forwards* section of the test, children were asked to repeat sequences of numbers of increasing length in exactly the same order as they heard them spoken. The *Digit span backwards* section of the measure required children to listen to strings of numbers of increasing length and then repeat them back in the reverse order they heard them spoken. If testing was discontinued on the *Digit span forwards* section, testing continued with the *Digit span backwards* section. Children received 1 point for each correct sequence, giving a total raw score out of 16 on the *Digit span forwards* section, a total out of 14 on the *Digit span backwards* section, and a total out of 30 points overall. This measure reports age norms (based on a UK sample without a specified EAL subgroup) for individuals aged between 6;0 – 21;11 years old, and test-retest reliability of this measure averaged across age ranges is $r = .79$.

3.3.1.5 Vocabulary

Children's vocabulary knowledge was assessed using three measures, including two measures of expressive vocabulary (*Renfrew Action Picture Test - Information*, *CELF Expressive Vocabulary*), and one measure of receptive vocabulary (*British Picture Vocabulary Scale*).

3.3.1.5.1 Renfrew Action Picture Test – Information (RAPT Information; t1-t5)

The Renfrew Action Picture Test (*RAPT*; Renfrew, 2010) was used to assess the informational content of children's spoken language. The measure consisted of 10 questions designed to elicit specific vocabulary items, including both nouns and verbs. Children were shown 10 cards depicting events or situations. The experimenter asked the specific question for each item and the child responded to the question based on the corresponding picture. This measure provided both an index of children's expressive vocabulary and morphosyntactic knowledge, and the relevant information for the Information score (expressive vocabulary) is presented here (information on the Grammar score is presented in section 3.3.1.6.1). Specific vocabulary items received points for each question, and the individual scores for each of the 10 questions were combined to give a total Information score out of a possible 40. This measure was administered in the same way and according to manual guidelines at all time points. The author scored all children's responses on this measure at t3-t5, and a trained research assistant independently scored 20% of the total sample at t5 to establish inter-rater reliability, which was r = .98.

3.3.1.5.2 CELF Expressive Vocabulary (CELF EV; t1-t5)

At t1, t2, and t3, children's expressive vocabulary was measured using the *Expressive vocabulary* subtest of the *CELF Preschool 2* (Wiig, Secord, & Semel, 2004). The test contained 2 practice items and 20 test items (17 nouns, 3 verbs) from a range of semantic categories. For each item the child was shown a coloured picture and the examiner asked the child to identify the subject of the image. Testing was discontinued if a child scored 0 on 7 consecutive items.

Children's responses were scored according to the test manual guidelines, such that the target response or a semantically correct or regionally appropriate response was awarded 2 points, a related but not identical response scored 1 point, and a semantically inappropriate or no response scored 0 points. The raw score was calculated by adding together the scores on all individual items for a total out of a possible 40 points. This test has norms for UK children (without a specified EAL subgroup) aged 3;0 – 6;11 years, and test-retest reliability corrected for the effects of variability in the standardization sample of r = .90.

At t4 and t5, the equivalent *Expressive vocabulary* measure from the *CELF 4* (Semel et al., 2006) was used. This alternate version was chosen because children were reaching the upper age limit of the *CELF Preschool 2* and the *CELF 4* was considered more appropriate given the ages and skills of both EAL and monolingual children. *CELF 4 Expressive Vocabulary* contained 27 items including both nouns and verbs. Administration and scoring were conducted as previously described for the *CELF Preschool 2* version of this measure. Scores on all items were added together to give a total out of a possible 54 points. This test has UK norms (without a specified EAL subgroup) for children aged 5;0 – 9;11 years, and the average split-half reliability of the measure averaged across age-ranges was r = .85

3.3.1.5.3 British Picture Vocabulary Scale (BPVS; t3-t5)

To assess children's receptive vocabulary, the British Picture Vocabulary Scales – Third Edition (BPVS-III; *BPVS*; Dunn, Dunn, Styles, & Sewell, 2009) was used. For each item the child heard a spoken word and was asked to indicate which of 4 coloured images depicted the word they heard. The test consisted of 14 sets of 12 items, and each consecutive set contained vocabulary of increasing difficulty. The items in this measure covered a wide range of word classes and semantic categories.

The starting point of the test was determined by each child's age, as the *BPVS* specifies an appropriate starting set by age-range. If a child made more than 1 error in the initial set, testing was reversed and the sets were administered backwards until the child made only 1 error in a set (the basal set). Testing then progressed forwards until the child made 8 or more errors in a set (the ceiling set). Each correct response received 1 point, and each incorrect or no response scored 0. This test includes norms for children aged 3;0 to 16;0 years; and the norming procedure included UK children (without a specified EAL subgroup). This measure was included at t3, t4 and t5, and administration and scoring were identical at all time points. Given the complex nature of establishing reliability for this type of measures, detailed information about the *BPVS's* reliability can be found in the test manual.

3.3.1.6 Grammar

Similarly to vocabulary, children's grammatical knowledge was assessed using two expressive measures (*RAPT Grammar*, *CELF Word Structure*), and one receptive measure (*CELF Sentence Structure*).

3.3.1.6.1 RAPT Grammar (t1-t5)

The *RAPT* (Renfrew, 2010) was also used to assess the expressive morphosyntax of children's spoken language. The measure as previously described in section 3.3.1.5.1 elicited specific grammatical constructions; the present participle (*–ing*), regular past tense (*–ed*), irregular past tense, future tense, possessive (*–s*), nominative pronouns (*he, she, it*), relative pronouns (*that, which, who*), regular plural nouns (*–s*), irregular plural nouns, auxiliary (*is, has, was*), passive (*got, been*), coordinating conjunction (*and*), subordinating conjunction (*because*), and determiners (*a, the*). The scores on individual items were combined to form a total Grammar score out of a possible 38 points. Inter-rater reliability was $r = .98$ (see section 3.3.1.5.1 for method of calculation).

3.3.1.6.2 CELF Sentence Structure (CELF SS; t1-t5)

At t1, t2, and t3, the *Sentence Structure* subtest of the *CELF Preschool 2* (Wiig, Secord, & Semel, 2004) was used to assess children's comprehension of syntactic structures in spoken sentences. The test was comprised of 22 test items (and 2 practice items) assessing understanding of 12 different grammatical constructs (prepositional phrase, verb condition, modification, copula, infinitive, negation, passive, relative clause, compound sentence, indirect object, indirect request, and subordinate clause).

For each item, the child heard a sentence spoken by the examiner and was asked to identify the picture that matched the spoken statement from an array of 4 images. Testing was discontinued if the child scored 0 on 5 consecutive items. Scoring was done in accordance with the manual guidelines, and correct responses scored 1 point while incorrect or no responses score 0 points.

Scores on all items were added together to form the total raw score out of a possible total of 22 points. This test has norms for UK children (without a specified EAL subgroup) aged 3;0 – 6;11 years, and test-retest reliability corrected for the effects of variability in the standardization sample of *r* = .78.

Once again, at t4 and t5, the equivalent *Sentence structure* measure from the *CELF 4* (Semel et al., 2006) was used. This version of the measure contained 26 items and assessed children's comprehension of 13 grammatical constructs (negation, modification, prepositional phrase, indirect object, infinitive, verb phrase, relative clause, subordinate clause, interrogative, passive, direct request, indirect request, and compound).

Administration and scoring for this measure was identical to that described for the *CELF Preschool 2* (Wiig, Secord, & Semel, 2004) version of the measure, with the exception that there was no discontinuation rule and all items were administered. Children scored a total raw score out of a possible 26 points. This test had norms based on UK children aged 5;0 – 8;11 years, and the average split-half reliability of the measure was *r* = .71.

3.3.1.6.3 CELF Word Structure (CELF WS; t3-t5)

The *CELF Preschool 2* (Wiig, Secord, & Semel, 2004) subtest *Word Structure* was used to measure children's ability to use morphology and pronouns correctly at t3. The test consisted of 24 items (and 2 practice items) assessing 7 categories of morphological structures (preposition, regular plural, possessive noun, progressive *–ing*, verb tense, copula, pronoun, and derivational form).

The procedure took the form of an oral cloze task, in which children were first given an example of a target structure in a sentence spoken by the examiner while they viewed a supporting image in the stimulus book. The examiner then spoke the beginning of a sentence that the child completed with a word with the correct target structure, based on the supporting image. Testing was discontinued if the child scored 0 on 8 consecutive items. A score of 1 was given if the child said the target response or used the target structure correctly in another word also applicable to the context. A score of 0 was given if the child failed to use the target structure correctly or did not respond, giving a total raw score out of possible total of 24 points. This test had norms based on UK children (without a specified EAL subgroup) aged 3;0 – 6;11 years. Test-retest reliability corrected for the effects of variability in the standardization sample for this measure was *r* = .86.

At t4 and t5, the *CELF 4* version of this measure was used. This version of the measure consisted of 32 items assessing 17 word structures (regular plural, irregular plural, third person singular, possessive nouns, derivation of nouns, contractible copula, auxiliary + *ing*, possessive pronouns, regular past tense, objective pronouns, future tense, comparative and superlative, uncontractible copula/auxiliary, derivation of adjectives, reflexive pronouns, subjective pronouns, and irregular past tense). As with the *CELF Preschool 2* version, the task was designed as an oral cloze task. There was no discontinuation rule and all 32 items were administered, and correct responses or responses demonstrating correct usage of the target structure received 1 point, while incorrect and no responses scored 0 points to give a total out of 32 points. This measure included norms based on UK children aged 5;0 – 8;11 years, and the average split-half reliability of the measure was r = .84.

3.3.1.7 Listening comprehension (t3-t5)

At t3, children's listening comprehension was assessed using a short story entitled "Snowy," which was originally a passage from *YARC Reading Comprehension* that was adapted for use as a listening comprehension task (Hulme, et al., 2009; Fricke, Bowyer-Crane, Haley, Hulme, & Snowling, 2013). Children listened to the 6-sentence story about a boy and his rabbit being read by a male voice over headphones. They were then asked 8 open comprehension questions relating to the story. Each correct response to the comprehension questions received 1 point, while incorrect or no responses scored 0 points, to give a total out of 8 points.

At t4, a different story entitled "Sandcastles," which was also an adaptation of a *YARC* passage, was used (Fricke et al., 2013). This story was about a child visiting the seaside. Once again the text consisted of 6 sentences, and comprehension was measured using 8 open questions, scored in the same way as the previous story. The same male voice read this story, and children used headphones to listen to the sound recording.

At t5, in order to avoid ceiling effects, both stories were administered ("Snowy", followed by "Sandcastles") and a combined score was measured out of a possible 16 correct responses. Inter-rater reliability was assessed using the same procedure as described in section 3.3.1.5.1, and inter-rater reliability across the two passages on this measure was r = .99.

3.3.1.8 Wechsler Preschool and Primary Scale of Intelligence - Block Design (WPPSI)

Children's NVIQ was assessed using the *Block Design* subtest of the *WPPSI* (Wechsler, 2002). This measure required children to recreate a block design from either a model or an image, and to do so as quickly and accurately as possible. The measure contained 20 items, and items 1-12 required the experimenter to model how to make the design with the blocks, which then remained in place for the child to use as a reference as they attempted to recreate the design. For item 13, the experimenter showed the child an image of the target design and modelled how to assemble the design with the blocks, after which the model was taken apart and the child attempted to recreate the model based on the image. For the final 7 items the child was only shown the image of the design. All items had an assigned time limit, and if the design was not completed within the time limit, the item scored 0 and testing moved on. All children began at item 6 as was appropriate for their age. Testing was discontinued after 3 consecutive scores of zero. Correct responses on items 6-20 received 2 points, while incorrect or no responses received 0 points. Scoring of the responses was done following manual instructions. As NVIQ is generally considered a stable trait (Deary, Whalley, Lemmon, Crawford, & Starr, 2000), this measure was not administered again once all children had been assessed once at t3.1 (beginning or end of Year 1).

3.3.2 Literacy outcome measures

Four literacy outcomes were assessed at different time points during this project, including reading accuracy, reading fluency, reading comprehension, and spelling (see Table 3.7). For reading accuracy and fluency, measures of both word and text reading were taken, and these are described separately as the text reading measures were part of the *YARC* passage reading comprehension assessment.

Table 3.7
Literacy measures included at each time point of the project

	t1	t2	t3	t4	t5
	EAL children			Monolingual and EAL children	
DTWRP			✓	✓	✓
TOWRE				✓	✓
YARC Text reading accuracy				✓	✓
YARC Text reading fluency				✓	✓
YARC Text reading comprehension				✓	✓
Spelling			✓	✓	✓

3.3.2.1 Diagnostic Test of Word Reading Processes (DTWRP; t3-t5)

The *DTWRP* (Forum for Research in Literacy and Language, Institute of Education, 2012) measured single word reading and consisted of three subtests; Nonword reading, Exception word reading, and Regular word reading, which were administered in this order. Each list contained 30 items of increasing difficulty. Children were shown a test plate containing all of the items and asked to read as many as they could. Where children decoded a word but did not independently blend the sounds, they were prompted to do so. Testing was discontinued if children made 5 consecutive errors. Correct responses of correctly read or blended words received 1 point, while incorrect or no responses received 0 points, with a total out of a possible 30 points on each of the 3 subtests. This measure reported age norms based on a UK norming sample (including an EAL subgroup) for children aged between 5;0 – 12;11, and reliability for the complete test was $\alpha = .99$.

3.3.2.2 Test of Word Reading Efficiency – Second Edition (TOWRE; t4-t5)

Children's word reading fluency was assessed using the Test of Word Reading Efficiency – Second Edition (*TOWRE*; Torgesen, Wagner, & Rashotte, 2011) at t4 and t5. This measure consisted of two subtests; the sight word reading efficiency subtest (real words), and the phonemic decoding efficiency subtest (nonwords), administered in this order. For each subtest children were first shown a practice list of 8 items and asked to read these out loud. In instances when a child was unable to read any of the practice items, the test items were not administered. For the test items, children were told they would be shown a list of words and that the words would get progressively harder further down the list. They were asked to read as many words as quickly and accurately as they could from as soon as the test plate was turned over to reveal the words. The number of words children read correctly in 45 seconds was recorded. Scoring was done following the manual guidelines, with reference to the acceptable pronunciations for the nonwords. At both time points Form A of both measures was used. The *TOWRE* reports age norms based on a US sample (without a specified EAL subgroup) from 6;0 – 24;11 years, and same form reliability for sight word efficiency was .91, and .90 for phonemic decoding efficiency.

3.3.2.3 YARC Text reading accuracy, fluency, and comprehension (t4-t5)

The *Passage Reading* test of the *YARC* (Hulme, et al., 2009) was used to assess children's text reading accuracy, fluency, and comprehension skills. At t4, two passages (Beginner and Level 1) were selected from Form B of the measure. The Beginner passage involved shared reading, in which the experimenter and the child traded off turns, each reading one sentence of the six-sentence passage at a time. Children were encouraged to read independently and sound out words they were unfamiliar with, but in cases when the child could not read a word, the experimenter provided it. Other reading errors were also corrected to ensure that reading comprehension was not jeopardised. The number of reading errors made (accuracy) was recorded, and if the child made 16 or more errors testing was discontinued and the comprehension questions were not administered. If testing was discontinued on the Beginner passage, the child was not tested on the Level 1 passage.

For the Level 1 passage, the child read the six-sentence story independently out loud to the experimenter. For this passage, reading time (fluency) was recorded in seconds in addition to the number of reading errors (accuracy), and was measured from the first sound of the first word to the last sound of the last word. Again, words that the child was unable to read were provided and reading errors were corrected. For this passage, if the child made 16 or more errors, the reading time was not recorded but the experimenter encouraged the child to finish the passage and try to answer the comprehension questions. However, if this was not possible, testing was discontinued and the child received a score of 0 on the comprehension questions for this passage.

After each passage, the child was asked 8 comprehension questions. It was permissible for the child to look back on the text while answering these questions. Some questions could be answered based directly on what was provided in the text, while others required the child to make inferences about the story. Scoring was done according to manual guidelines, and each correct response scored 1 point, while incorrect or no responses scored 0 points. This gave a raw score out of a total of 16 points overall. This measure reported norms based on a UK sample (including EAL children) for children aged 5;0 to 11;0 years, and internal consistency ratings of $\alpha = .67$-$.94$ for accuracy, fluency, and comprehension for both Beginner and Level 1 passages.

For t5, the Level 1 and Level 2 passages from Form B of the measure were used to increase the difficulty for children given their more advanced reading skills at t5 (Year 2). The Level 1 passage was identical to the one children saw at t4, and administration and scoring of the passage in terms of accuracy, fluency, and the comprehension questions was identical to that previously described. For Level 2, once again administration and scoring was identical with the exception that if children made 16 or more reading errors, the test was discontinued and children were not given the opportunity to try to complete the comprehension questions. If testing was discontinued on Level 1, children were not administered the Level 2 passage. The final raw score for the comprehension questions was again out of a total possible 16 points. These passages have UK age norms (with an EAL subgroup) for children aged 5;0 to 11;11 years, and reliability estimates using the Spearman-Brown Prophecy Formula on successive pairs were .84 for the Beginner-Level 1 pair, and .81 for the Level 1-Level 2 pair. Inter-rater reliability for the scoring of the reading comprehension questions was assessed using the same procedure described in section 3.3.1.5.1, and reliability across the two successive passages was $r = .99$.

3.3.2.4 Spelling (t3-t5)

At t3, children's spelling abilities were assessed using a simple spelling test containing 5 words (*dog, cup, tent, book, heart;* Caravolas, Hulme, & Snowling, 2001). The children were first asked to spell their own names before beginning the spelling assessment. Each item appeared as a picture, which the children were asked to name and then spell. If children could not name the item, the correct word was given to them. Children's spelling of their own name was scored as percentage letters correct, while the test items were phonetically scored for consonant correctness, and overall orthographic correctness following guidelines by Fricke and colleagues (2013).

At t4, an additional 5 words were included to increase the difficulty of the measure to be in line with children's developmental stage (*chick, train, cake, dress, peach*; Caravolas et al., 2001), however all administration and scoring procedures remained identical aside from an increase in the total possible raw score to 10 points.

At t5, the 10-word version was extended to include an additional 10 words (*bottle*, *kitchen*, *dolphin*, *squirrel*, *mountain*, *gorilla, throne*, *lightning*, *wheelbarrow*, *screwdriver*) to limit the risk that children would reach ceiling on this measure. The criteria for selecting the new words in this measure were that the words be imageable, that they were regular in their spellings to ensure that the previously used phonetic scoring criteria could be applied, and that the concepts were considered age-appropriate. Furthermore, efforts were made to include some longer words with less common spelling patterns in order to increase the difficulty of the measure. The same scoring procedure (consonant correctness and orthographic correctness) was applied.

3.3.1 Selection of measures

It should be noted that each of the constructs chosen for measurement could have been assessed in a number of different ways, and in many cases using a variety of different standardised measures. The decision to include these particular test tools was based on both theoretical and practical considerations. Firstly, a number of the measures were predetermined by the measures used in the previous study (i.e. *Alliteration matching*, *Rhyme awareness*, *YARC LSK*, and *CELF SS* and *EV*). It was therefore practical to continue using the *YARC* and the *CELF*, and to include the other relevant subtests from these measures in the subsequent test batteries (e.g. *CELF WS, CELF digit span, YARC Sound isolation and Sound deletion)*. There were also theoretical advantages to this decision, as both of these measures were either developed for a UK population (*YARC*) or re-normed and adjusted for a UK population (*CELF*). Furthermore, the use of multiple subtests from the same measures meant that the comparative norming sample was more consistent than if various different standardised measures had been used to assess these constructs. In cases where these test measures did not include relevant and appropriately challenging subtests of the constructs, other standardised measures were chosen based on commonly used and robust assessments cited in the field, with a preference for measures developed or normed on UK samples (e.g. *BPVS*, *DTWRP*) although this was not always possible (i.e. *TOWRE*). Where bespoke measures were chosen (i.e. listening comprehension, spelling), this was primarily the result of being unable to identify or locate a standardised measure that was short enough for inclusion in the already extensive test battery. In those cases, previously used bespoke measures familiar to the author were selected. These bespoke measures were not without issue, as the spelling measure needed to be adapted over the course of the study, and the listening comprehension measure was based on a passage meant for reading rather than listening. This meant that the passage was fairly simplistic, and included vocabulary and grammar appropriate for children's reading level as compared to their linguistic skills. Therefore, it would have been preferable to include a more robust measure of listening comprehension (for example, the *CELF Understanding Spoken Paragraphs*), but in this case other assessments were prioritised in terms of the testing time.

An additional important point is that the use of standardised measures with bilingual children could be considered controversial, as there are a number of reasons these assessments may be less appropriate for use with children learning multiple languages. These include issues around content bias, as the standardised measures included in this study were developed based on the typical cultural and societal experiences of English-speaking monolingual children. This raises the possibility that the concepts and behaviours children encountered in these measures were more familiar to English monolingual children, thereby artificially inflating the differences between groups (Laing & Kahmi, 2003; Genesee, Paradis, & Crago, 2011). Furthermore, these types of assessments do not consider children's exposure to their various languages, and so it is inappropriate to make any diagnostic assessments of children's language proficiency, as levels of performance may be completely acceptable based on children's level of exposure to the specific language. However, because the aims of this project were to examine the development of EAL children's skills over time, it would have been difficult to do this without using some form of a benchmark (in this case standard scores). There are also numerous difficulties associated with attempting to norm a measure on a multilingual sample, and ensuring the representativeness of a norming sample for the specific population would be no easy feat given the enormous heterogeneity within bilingual children. Furthermore, despite it's flaws, this methodology takes the same approach as the educational system, which still bases the expectations of children's development on a monolingual model, and bilingual children are measured against these expectations. For these reasons, and although it should be acknowledged that the use of standardised measures with an EAL sample is not ideal, it was considered important to assess both groups of children using the same standardised measures and their accompanying norms.

3.3.2 Excluded measures

Aside from the previously discussed language measures taken in Nursery (*CELF Preschool 2* and *RAPT* measures), the previous project included a series of other standardised and bespoke language measures. A description of these measures and the EAL children's scores on these measures can be found in Fricke and Millard (2016). In addition to this, when children were in Reception, the *YARC Early Word Reading Test* (Hulme, et al., 2009) was also included in the assessment battery. This measure was originally included because there were concerns that the EAL children's performance on the *DTWRP* may be at floor at this time point, and the Early Word Reading Test had norms for younger children. However, as the *DTWRP* was more appropriate for use with older children, and because the distribution of children's scores on the *DTWRP* in Reception was sufficiently close to normal, children's scores on the *Early Word Reading Test* were not used. Furthermore, children's scores on the *Early Word Reading Test* and the *DTWRP* were very similar and significantly correlated at t1 ($r = .91$, $p < .001$), providing further support that these measures assessed very similar skills.

3.3.3 Demographic data measures

In order to gain a better understanding of language and background factors that could influence children's development, a series of questionnaires were administered to parents, teachers, and children.

3.3.3.1 Parent questionnaires (t5)

Parent questionnaires were distributed to parents in both groups. The questionnaires for the parents of EAL children (Fricke & Millard, 2016; Schaefer, Fricke, Bowyer-Crane, Millard, & Hulme, (in prep.); see appendix 2) included questions about the following major areas:

- Family background: health problems, developmental disorders
- Educational and language background of the main carers
- Language and literacy environment in the home: books/reading, computers, language spoken by other family members in the home
- General development of the child: health and hearing problems, language(s) development, time spent in home-language and English-language environments (day-care, clubs, with friends, etc.)

The version for parents of EAL children was also translated into Arabic, which was the language reportedly spoken by the most parents in the sample. However, due to the high number of other languages represented in this sample, it was not possible to translate the measure into any other languages. However, most schools reported that their policy was to not send translated material home to parents, and so parents expected English language material.

The version of the questionnaire given to parents of the monolingual children was identical with the exception that some of the questions on the English language proficiency of the main carers were removed to reflect the language experiences of the monolingual parents (see appendix 2). All parents were told that upon returning the completed questionnaire they would be entered into a prize draw for a gift certificate as compensation for their participation.

The parent questionnaire was distributed to parents at t5 and sent to all 45 EAL and 49 Monolingual parents by letters sent home with the children from school. Unfortunately, only 31 were returned, representing a 33% return rate. For this reason the data from the parent questionnaires will not be reported further, as this low return rate meant the data were unlikely to give sufficiently representative information about the sample.

3.3.3.2 Teacher questionnaires (t4-t5)

At both t4 and t5, every child's teacher was asked to complete two questionnaires; the Children's Communication Checklist – Short (CCC-S; Bishop & Norbury, 2009), and the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The CCC-S included 13 questions that assessed various aspects of speech, language and communication. The SDQ consisted of 25 questionnaires relating to emotional symptoms (5 items), conduct problems (5 items) hyperactivity/inattention (5 items), peer relationship problems (5 items) and prosocial behaviour (5 items). Completion of the questionnaires by the teachers was voluntary, and in most cases the questionnaires were completed and returned to the author or research assistants during school visits. In some instances, questionnaires were completed later and posted back to the author. At t4, 86 questionnaires were returned (83% return rate), and at t5 57 were returned (61% return rate). Although these data were collected, it is beyond the scope of the current work to consider the results of these questionnaires, and this will be the topic of a future publication.

3.3.3.3 Child questionnaire (t5)

In order to gain some additional information about EAL children's language background, a short child questionnaire was designed to ask children directly about their language experience and preferences. The questionnaire included 7 short questions about which languages the child spoke at home and with different members of their family and friends, which language they enjoyed speaking the most, and whether they were learning to read and write in a language other than English (see appendix 3). This was administered to all 45 EAL children at t5. The questionnaire was usually completed at the end of the testing session, and children were explicitly told that there were no correct responses and that it was their choice whether they wanted to respond. The tester then read out the questions, and children's responses were audio recorded for later transcription. Similarly to the teacher questionnaires, the data from the child questionnaires will be the subject of future work and will be not be discussed further in this thesis.

3.4 Procedure

For all testing sessions in the previous project (t1-t2), assessments were conducted in children's Nursery settings, and further details of the testing sessions are given in Fricke and Millard (2016).

In the current project (t3-t5), children were seen individually in their school in a quiet space outside the classroom for all testing sessions. Due to the length of the test battery, at each time point children were seen twice for 30-minutes on different days. Each child was told that they were being asked to do some jobs and that it was their choice if they would like to participate in the activities. They were reminded throughout sessions that they were allowed to go back to the classroom at any point. The author carried out the majority of the assessments, but due to time restrictions a small group of research assistants were trained and employed to carry out a minority of the testing sessions at each time point.

While efforts were made to carry out the assessments in a fixed order to ensure that task effects were uniform across the participants, this was not always possible due to factors such as time limits and testers working with two children in the same room (in which case one tester reversed the testing order). However, the ordering of the tasks at all time points in the current project (t3-t5) was done strategically, and several considerations were taken into account:

- Each testing session began with a receptive measure, in order to allow children some time to familiarise themselves with the tester and the testing procedure before they were required to speak.
- Tasks were ordered so that there was continuous variation in the cognitive skills that were being assessed. This was done to limit the possibility that children would become bored or frustrated if a particular skill was challenging to them.
- Consideration was given to tasks that were likely to be particularly challenging for children, and these were not included as the first or last tasks, or one after another.

All sessions were audio-recorded, and these recordings were used to transcribe and check children’s responses offline. All transcription and data checking of transcribed data was done prior to scoring on these measures. The author did all transcription and data checking at t3, however at both t4 and t5, trained research assistants aided in the transcribing and scoring of some of the data due to large volume of data and time consuming nature of transcription (*RAPT Information* and *Grammar*, *Listening comprehension*, *YARC Reading comprehension*, *RAN*, *Spelling*). For the *RAPT* measures, *Listening comprehension,* and *YARC Reading comprehension,* research assistants transcribed the data and the author then did all the scoring. For the *RAN* measure, a speech and language therapy student was trained to do the scoring of this measure at both t4 and t5. The research assistant who did the spelling scoring was a qualified speech and language therapist with phonetic training and extensive experience of scoring this specific spelling measure, and she scored this measure at t3-t5. The author did all data checking.

Chapter 4 - Performance and development of cognitive and linguistic predictors in monolingual and EAL children

This chapter will consider the development of linguistic and cognitive predictors of literacy in both monolingual and EAL children, and addresses the first of three research questions outlined in Chapter 2.

1) How do EAL children perform on measures of linguistic and cognitive predictors of literacy in Nursery, Reception, Year 1, and Year 2, and how does their performance compare to that of monolingual children?
    a) How do these skills develop in EAL children from Nursery to Year 2, and in monolingual children from Year 1 to Year 2?
    b) What similarities and differences exist between EAL and monolingual children in terms of performance and development of these predictors during their early education?

Throughout this chapter, results for monolingual children are presented in blue ( ), while results presented in green ( ) are for EAL children.

Prior to considering the results related to the research question, the impact of background variables (gender and age) and control variables (NVIQ) will be examined.

4.1 Background and control variables – Gender, age and NVIQ

Differences between girls and boys were examined for the raw scores of all measures (cognitive and linguistic predictors and literacy outcomes) from t1-t5 for the two language groups separately. As some measures did not meet parametric assumptions, both parametric (independent t-tests) and nonparametric (Mann-Whitney tests) analyses were run on all measures to compare the performance of boys and girls. In all instances, the results of the parametric and nonparametric analyses were very similar in terms of significance values and effect sizes, and therefore only the results of the parametric independent t-tests are reported here. For the majority of measures no gender differences were found, and the small number of significant comparisons are reported below for the language groups separately. In all instances, girls outperformed boys.

Monolingual

- t4 *Spelling* – $t(50) = -2.57$, $p = .013$, $r = .34$
- t4 *CELF SS* – $t(51) = -2.18$, $p = .034$, $r = .29$
- t4 *YARC Reading comprehension*– $t(49) = -2.13$, $p = .038$, $r = .29$

EAL

- t2 *CELF SS* – *t*(80) = -2.39, *p* = .019, *r* = .26
- t3 *RAPT Information* – *t*(37) = -4.23, *p* < .001, *r* = .57
- t3 *RAPT Grammar* – *t*(37) = -2.83, *p* = .007, *r* = .42
- t3 *YARC Sound deletion* – *t*(36) = -2.06, *p* = .047, *r* = .32
- t4 *BPVS* – *t*(36) = -2.37, *p* = .022, r = .32
- t4 *RAPT Grammar* – *t*(49) = -2.09, *p* = .042, r = .29
- t4 *CELF SS* – *t*(49) = -2.67, *p* = .010, r = .36

At t4 and t5, the mean age (in months) of the two language groups was also compared. At t4, monolingual children had a higher average age (*M* = 72.94, *SD* = 3.78) than EAL children (*M* = 71.35, *SD* = 3.45), and this difference was significant (*t*(102) = -2.24, *p* = .027, *r* = .22). Similarly at t5, monolingual children were older (*M*= 84.35, *SD* =3.73) than EAL children (*M*=82.62, *SD* = 3.41), and this difference was significant (*t*(102) = -2.33, *p* = .022, *r* = .24). Although these differences are the result of being unable to select and age-match the monolingual children to their EAL peers, the differences between groups was small, both in the number of months the groups differed by and the effect size of the difference. However, this discrepancy will be considered in the interpretation of the results.

NVIQ was assessed for all children at either the beginning or end of Year 1, and an independent t-test showed no significant differences between monolingual and EAL on this measure (*t*(104) = -1.64, *p* = .105, *r* = .16). Correlations between NVIQ and all cognitive and linguistic predictors and literacy outcomes are shown in appendix 4. There were few significant correlations between NVIQ and measures at t1 to t3, and the majority of measures at t4 to t5 showed weak to moderate correlations with NVIQ in both groups. However, approximately half of these relationships at t4 and t5 were significant for both groups of children. As such, NVIQ was considered as a covariate in the ANOVA analyses that follow. However, in many instances NVIQ as a covariate violated the assumption of homogeneity of regression slopes, which suggests that the influence of this variable was not consistent across groups, and this complicates the interpretation of the main effects in the model (Field, 2009). For this reason, and because the groups were already matched in terms of NVIQ (i.e., not significantly different), NVIQ was not controlled in the ANOVA analyses.

4.2 Cognitive and linguistic predictors: performance and development for EAL and monolingual children

In order to address the aforementioned research questions, EAL children's scores on measures of cognitive and linguistic predictors of literacy were considered from t1-t5. Monolingual children were assessed at t4 and t5, and thus the groups could only be compared at these final two testing points. For this reason, EAL children's performance and development on predictor measures from t1-t4 will be considered independently, and then the groups will be compared in terms of performance and development from t4-t5.

Descriptive statistics for EAL children's performance on all cognitive and linguistic predictor measures included at t1-t3 are shown in Table 4.1, and results from the *RAPT* measures are shown in Figure 4.1 and Figure 4.3. Both monolingual and EAL children's performance on the predictor measures from t4-t5 are shown for the different predictors separately in Table 4.2 through Table 4.7, while results for the *CELF* measures are shown in Figure 4.2 and Figure 4.4.

EAL children's development from t1-t4 or t3-t4 (depending on when the measures were collected) was analysed using repeated measures ANOVAs. It should be noted that many of the variables did not meet parametric assumptions for at least one time point (as established by examining whether values of skewness and kurtosis for each measure suggested significant departures from the normal distribution), and therefore nonparametric analyses (Friedman's tests) examining development were also carried out for all measures. In all instances, the parametric and nonparametric tests yielded very similar results in terms of significance values and effect sizes, and therefore only the results of the parametric repeated measures ANOVAs will be reported here. Additionally, because only a subset of children had data available at all relevant time points between t1-t4, the descriptive statistics for these children included in the statistical analyses are shown in appendix 5.

When the terms floor and ceiling effects are used, they refer to instances when 50% or more of all children scored either the two lowest possible scores (floor effects) or the two highest possible scores (ceiling effects).

In order to consider how monolingual and EAL children compared in their performance and development from t4-t5, 2 × 2 mixed ANOVAs (hereafter referred to only as mixed ANOVAs) were used, with time as the within subjects variable (t4, t5), and language status as the between subjects variable (monolingual, EAL).

Table 4.1
Descriptive statistics for linguistic and cognitive predictors at t1, t2, and t3 for EAL children

	t1					t2					t3				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
PA															
Rhyme awareness-raw (5)	90	0.96	1.00	1.04	0-4	79	1.56	1.00	1.08	0-4					
Alliteration matching-raw(5)	96	0.52	0.00	0.73	0-4	88	1.08	1.00	1.16	0-5					
YARC Sound isolation-raw (12)											39	7.74	8.00	2.27	3-11
YARC Sound isolation-standard											39	108.62	110.00	7.75	92-123
YARC Sound deletion-raw (12)											38	4.82	5.00	2.75	0-11
YARC Sound deletion-standard											38	104.13	106.00	13.59	72-131
LSK															
YARC LSK core-raw (17)	95	.35	0.00	1.15	0–8	88	1.33	0.00	2.27	0-9					
YARC LSK extended-raw (32)											39	28.54	30.00	4.75	8-32
YARC LSK core/extended-standard						49	89.37	84.00	12.79	74-121	39	115.00	114.00	13.22	80-131
RAN															
Colours (36)											39	22.77	24.00	5.83	7-36
Shapes (36)											38	17.11	16.00	7.14	4-36
VM															
CELF digit span forward-raw (16)											38	5.03	5.00	1.38	2-7
CELF digit span forward-scale											38	7.68	8.00	2.05	3-11
CELF digit span backward-raw (14)											38	1.11	1.00	1.20	0-3
CELF digit span backward-scale											38	8.87	8.50	3.16	4-13
Vocabulary															
RAPT Information-raw	90	7.69	7.00	6.53	0-27.5	82	11.21	11.25	6.73	0-26.5	39	23.83	25.00	5.52	12-33
CELF EV-raw (20)	96	2.44	0.00	3.53	0-15	82	5.80	4.00	5.54	0-20	38	15.08	13.50	7.67	4-30
CELF EV-scale	96	3.09	2.00	2.21	1–10	82	3.96	3.50	2.73	1-10	38	6.66	6.50	2.66	2-12
BPVS-raw (168)											39	56.18	54.00	13.28	35-93
BPVS-scale											39	85.56	85.00	8.70	73-115
Grammar															
RAPT Grammar-raw	90	4.47	3.00	4.86	0-18	82	8.20	7.00	6.15	0-26.5	39	17.72	18.00	5.12	8-28
CELF SS-raw (22)	95	2.47	1.00	3.14	0-12	82	6.39	6.00	4.37	0-15	38	13.16	13.00	3.14	5-18
CELF SS-scale	95	2.98	2.00	2.30	1-9	80	4.75	5.00	2.72	1-11	38	6.97	7.00	1.70	3-10
CELF WS-raw (24)											38	11.55	11.50	5.28	3 - 22
CELF WS-scale											38	6.47	6.00	3.15	2-13
Listening comp-raw (8)											38	3.26	3.00	1.69	0-7

Note. Maximum scores are shown in parentheses next to the measure names.

4.2.1 Phonological awareness

Due to the changing nature of children's PA skills (Bowey, 2005), it was necessary to use different assessments at different time points (see section 3.3.1.1): *Alliteration matching* and *Rhyme awareness* were used at t1-t2, *Sound isolation* and *Sound deletion* at t3-t4, and *Spoonerisms* at t5. Although EAL children's performance cannot be compared across the different measures, results showed that children's raw scores on the bespoke measures of both *Alliteration matching* and *Rhyme awareness* were generally low but improved from t1-t2 (see Table 4.1). Similarly, this group's raw scores on *Sound isolation* and *Sound deletion* increased from t3-t4 (see Table 4.1 and Table 4.2). As these two measures included standardised norms, it was also possible to demonstrate that at both t3 and t4 children's average standard scores were well within the normal range. Standard scores were not used for the *Spoonerisms* task, and because this measure was only used at one time point, it was only considered in terms of a monolingual and EAL group comparison.

Table 4.2

Descriptives for measures of PA for monolingual and EAL children at t4 and t5

	Mono					EAL				
	N	***M***	***Mdn***	***SD***	***Range***	***N***	***M***	***Mdn***	***SD***	***Range***
t4										
Sound isolation-raw (12)	53	10.25	11.00	2.17	2-12	51	10.12	11.00	2.21	3-12
Sound isolation-standard	53	105.43	106.00	12.48	69-123	51	106.61	106.00	12.26	69-123
Sound deletion-raw (12)	53	7.43	7.00	2.46	0-12	51	7.22	8.00	2.98	0-12
Sound deletion-standard	53	104.15	105.00	12.56	69-131	51	104.92	108.00	14.86	69-131
t5										
Spoonerisms-raw (30)	49	9.06	7.00	6.73	1-24	45	6.60	5.00	5.99	0-21

Note. Maximum scores are shown in parentheses next to the measure names.

Children's performance on the measures of PA at t1 and t2 (*Alliteration matching*, *Rhyme awareness*) were very low and at floor at both time points. Although these floor effects do to some extent complicate the interpretation of the statistical analyses examining developmental gains on these measures, the repeated measures ANOVAs revealed that these increases in raw scores were significant for both *Alliteration matching* ($F(1, 87) = 15.61$, $p < .001$, $r = .39$) and *Rhyme awareness* ($F(1, 87) = 12.94$, $p = .001$, $r = .38$). This suggests that EAL children's PA skills on these two measures improved significantly from t1-t2.

Similarly for the PA measures at t3-t4 (*Sound isolation*, *Sound deletion*), raw scores on both *Sound isolation* ($F(1, 37) = 70.80$, $p < .001$, $r = .81$), and *Sound deletion* ($F(1, 36) = 43.04$, $p < .001$, $r = .74$) increased significantly over time. However, the same was not true of the standard scores, as these were very similar and not significantly different at t3 and t4 for either *Sound isolation* ($F(1, 37) = .062$, $p = .804$, $r = .04$) or *Sound deletion* ($F(1, 36) = .37$, $p = .549$, $r = .10$). This suggests that children made advances in their PA skills from t3 to t4, and these improvements over time were in line with age expected gains based on the norms for these measures. Furthermore, when considering EAL children's standard scores on these measures, at t3 no children scored outside the normal range on *Sound isolation* (standard score < 85), and at t4 only 4% of children had standard scores below this range. Similarly for *Sound deletion*, at t3 only 11% and at t4 only 10% had skills below the normal range.

Group comparisons of monolingual and EAL children were only possible at t4 and t5, and because different measures of PA were used at these two time points, it was only possible to compare groups in terms of their performance (but not their development) on PA. At t4, monolingual and EAL children had very similar raw and standard scores on both measures of *Sound isolation* and *Sound deletion*, and both groups' standard scores were just above the norm mean (see Table 4.2). Statistical comparisons (independent ANOVAs) showed that these groups differences were not significant for *Sound isolation* raw scores ($F(1, 102) = .089$, $p = .766$, $r = .03$) or standard scores ($F(1, 102) = .234$, $p = .630$, $r = .05$). Similarly for *Sound deletion*, there were no significant groups differences for either raw scores ($F(1, 102) = .166$, $p = .684$, $r = .04$) or standard scores ($F(1, 102) = .082$, $p = .775$, $r = .03$). This suggests that both groups had very similar and age-appropriate PA skills at this time point. Similarly to the proportion reported for EAL children above, only 8% of monolingual children had standard scores on *Sound isolation* below the normal range, and this was only true of 6% of children on *Sound deletion.*

At t5, monolingual and EAL children completed a Spoonerism task, and the descriptive statistics suggested that monolingual children had slightly higher average performance on this measure. The independent ANOVA results revealed that this small trend was nonsignificant ($F(1, 92) = 3.49$, $p = .065$, $r = .19$).

4.2.2 Letter-sound knowledge

EAL children's *LSK* was assessed at t1-t3, and during this time children's performance improved dramatically and went from being at floor at both t1 and t2 (i.e., in Nursery), to showing ceiling effects at t3 (see Table 4.1). The repeated measures ANOVA confirmed that this improvement was highly significant ($F(1.23, 44.09) = 1090.49$, $p < .001$). Note that Mauchly's test indicated that sphericity had been violated ($\chi^2(2) = 35.10$, $p < .001$), and therefore the aforementioned results are reported using the Greenhouse-Geisser estimate of sphercity correction. The repeated contrasts showed that children's progress from t1-t2 was significant ($F(1, 36) = 18.12$, $p < .001$, $r = .58$), as was their improvement from t2-t3 ($F(1, 36) = 1104.54$, $p < .001$, $r = .98$). At t2 and t3, standard scores were also available for this measure, and the descriptive statistics revealed that EAL children's scores were well within the normal range at both time points, and they also increased over time. The repeated measures ANOVA showed that this increase in standard scores was significant (F(1, 36) = 79.48, p < .001, r =.83). Overall this suggests that although these children had very low *LSK* in Nursery, their knowledge in this area increased significantly over time, and these improvements exceeded norm expectations. This conclusion is strengthened by results suggesting that although 55% of EAL children had standard scores below the normal range at t2, this number decreased to only 3% at t3. Due to these strong results at t3, *LSK* was not reassessed at t4 and t5, so there were no monolingual and EAL comparisons.

4.2.3 Rapid automatized naming

Measures of RAN *colours* and *shapes* were included at t3 for EAL children, and measures of RAN *colours*, *shapes*, *shapes*, and *numbers* were included at t4-t5 for both monolingual and EAL children.

At both t3 and t4 EAL children named more *colours* than *shapes* correctly, and the number of correctly named items increased for both of these measures from t3-t4 (see Table 4.1 for t3 data, and Table 4.3 for t4 data). This increase in scores was significant for both RAN *colours* (F(1, 37) = 60.31, p < .001, r =.79) and *shapes* (F(1, 36) = 15.61, p < .001, r =.55). Similarly, at t4 and t5 both monolingual and EAL children had the lowest scores for RAN *shapes*, followed by *colours*, while the number of *shapes* and *numbers* children named correctly was similar and greater than the other two stimuli. Scores were very similar for monolingual and EAL children on all four RAN measures at both t4 and t5, although in all instances the means favoured EAL children (see Table 4.3).

Table 4.3
Descriptives for RAN raw scores (number of correctly named items) at t4 and t5 for monolingual and EAL children

	t4					t5				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
RAN										
Colours (72)										
Monolingual	53	27.96	26.00	6.90	13 - 43	49	33.92	34.00	5.52	21 - 49
EAL	51	29.55	29.00	5.90	18 - 42	45	35.78	36.00	7.42	14 - 50
Shapes (72)										
Monolingual	51	19.41	21.00	7.10	2 - 31	48	24.21	23.00	6.35	10 - 37
EAL	49	21.10	21.00	7.27	7 - 36	44	24.50	24.00	7.50	9 - 40
Numbers (72)										
Monolingual	53	35.15	36.00	9.16	0 - 52	49	42.08	43.00	8.85	21 - 60
EAL	50	35.80	36.00	9.41	14 - 58	45	45.80	48.00	10.38	24 - 67
Letters (72)										
Monolingual	53	34.13	35.00	8.38	5 - 51	49	42.06	41.00	8.21	26 - 58
EAL	51	35.08	36.00	9.51	8 - 52	45	44.60	46.00	10.69	17 - 70

Note. Maximum scores are shown in parentheses next to the measure names.

The results of mixed ANOVA analyses for RAN *colours* showed a significant main effect of time ($F(1, 92) = 89.85$, $p < .001$, $r = .70$), a nonsignificant main effect of language status ($F(1, 92) = 2.17$, $p = .144$, $r = .15$), and a nonsignificant interaction ($F(1, 92) = .07$, $p = .788$, $r = .03$). Similarly for RAN *shapes*, the mixed ANOVA revealed a significant main effect of time ($F(1, 87) = 37.74$, $p < .001$, $r = .55$), a nonsignificant main effect of language status ($F(1, 87) = .45$, $p = .504$, $r = .07$), and a nonsignificant interaction ($F(1, 87) = .52$, $p = .472$, $r = .08$). For RAN *shapes*, there was a significant main effect of time ($F(1, 91) = 83.71$, $p < .001$, $r = .69$), a nonsignificant main effect of language status ($F(1, 91) = 2.45$, $p = .121$, $r = .16$), and a nonsignificant interaction ($F(1, 91) = 3.49$, $p = .065$, $r = .19$). Finally, for RAN *numbers* there was a significant main effect of time ($F(1, 92) = 174.97$, $p < .001$, $r = .81$), a nonsignificant main effect of language status ($F(1, 92) = 1.03$, $p = .313$, $r = .11$), and a nonsignificant interaction ($F(1, 92) = 1.50$, $p = .223$, $r = .13$). As such, monolingual and EAL children showed both similar performance and development on all RAN measures from t4-t5.

4.2.4 Verbal Memory

STM and WM were measured using *Digit span forwards* and *backwards*, respectively, and these measures were included at t3-t5 for EAL children, and t4-t5 for monolingual children. As the measure was a subtest of the *CELF 4*, standard (scale) scores were available at all time points.

As would be expected, at both t3 and t4, EAL children's average score on the measure of *Digit span forwards* was higher than their score on *Digit span backwards*, and for both of these measures their standard scores were in the low-average range. From t3-t4, raw and standard scores on both measures of digit span increased (see Table 4.1 and Table 4.4). The repeated measures ANOVAs examining development from t3-t4 revealed that these increases in scores were significant for *Digit span forwards* raw scores ($F(1, 36) = 20.98$, $p < .001$, $r = .61$) and standard scores ($F(1, 36) = 12.38$, $p = .001$, $r = .51$), as well as for *Digit span backwards* raw scores ($F(1, 36) = 23.91$, $p < .001$, $r = .63$). However, there was no significant increase in children's *Digit span backwards* standard score from t3-t4 ($F(1, 36) = 1.42$, $p = .242$, $r = .19$). Overall these results suggest that EAL children made significant improvements in their *Digit span forwards* and *backward* from t3-t4, and while these gains were in line with norm expected gains for *Digit span backwards*, for *Digit span forwards* children's development exceeded norm expectations. This discrepancy between the two measures in terms of standard score development may be due to the fact that EAL children's t3 standard scores on the forwards task were lower than for the backwards task, but by t4 the group's standard scores on both measures were very similar. However, by t4 EAL children's skills on these measures were still only in the low-average range. The proportion of children who had standard scores below the normal range at t3 was 18% of EAL children on *Digit span forwards* and this number increased to 20% at t4. For *Digit span backwards*, at t3 47% of these children had scores below the normal range and this decreased to 22% at t4. This suggests that by t4 a similar proportion of children showed weak skills on these measures.

Results from t4 and t5 (see Table 4.4) suggested that overall the groups were generally relatively similar in terms their raw and standard scores for both *Digit span forwards* and *backwards*, and all average standard scores were within the normal range. Both monolingual and EAL children showed improvements in their raw scores on the *Digit span forwards* and *backwards*, but monolingual children's standard scores decreased over time, while EAL children's standard scores increased. Although raw and standard mean scores favoured monolingual children at t4, at t5 all scores were very similar across groups. Only 13% of monolingual children scored below the normal range on *Digit span forwards* at t4, and this figure was only 8% on *Digit span backwards.* These proportions are lower than those reported for EAL children above. Similarly at t5, 16% of EAL children and 14% of monolingual children were below the normal range on *Digit span forwards,* while only 7% of EAL and 2% of monolingual children were below this range on *Digit span backwards.*

Table 4.4
Descriptives for CELF digit span (forward, backward) at t4 and t5 for monolingual and EAL children

	t4					t5				
	N	***M***	***Mdn***	***SD***	***Range***	***N***	***M***	***Mdn***	***SD***	***Range***
Digit span forward-raw (16)										
Monolingual	53	6.26	6.00	1.52	3-10	49	7.08	7.00	1.62	4-12
EAL	51	5.82	6.00	1.48	2-9	45	7.13	7.00	1.84	3-11
Digit span forward-standard										
Monolingual	53	9.19	9.00	2.60	4-14	49	8.96	9.00	2.35	4-15
EAL	51	8.59	9.00	2.65	2-14	45	9.38	10.00	2.58	3-14
Digit span backward-raw (14)										
Monolingual	53	2.75	2.00	1.36	0-7	49	3.04	3.00	1.04	2-6
EAL	51	2.08	2.00	1.43	0-6	45	2.98	3.00	1.22	1-6
Digit span backward-standard										
Monolingual	53	10.75	10.00	2.37	4-16	49	9.41	9.00	2.16	6-14
EAL	51	9.35	10.00	3.12	4-15	45	9.51	10.00	2.61	4-14

Note. Maximum scores are shown in parentheses next to the measure names

The mixed ANOVA for *Digit span forwards* revealed a significant main effect of time (F(1, 92) = 40.70, p < .001, r =.55), a nonsignificant main effect of language status (F(1, 92) = .22, p = .640, r =.05), and a nonsignificant interaction (F(1, 92) = 1.52, p = .220, r =.13). Analyses of the standard scores for this task showed no significant main effect for time (F(1, 92) = .357, p = .551, r =.06) or language status (F(1, 92) = .00, p = .986, r =.00), and a nonsignificant interaction (F(1, 92) = 2.86, p = .094, r =.17). This suggests that the groups were similar both in terms of their performance and development on *Digit span forwards*, and their improvements in terms of raw scores were in line with norm expected gains.

Results of the mixed ANOVA for *Digit span backwards* revealed that for the raw scores, there was a significant main effect of time ($F(1, 92) = 26.56$, $p < .001$, $r = .47$), a nonsignificant main effect of language status ($F(1, 92) = 1.89$, $p = .172$, $r = .14$), but a significant interaction ($F(1, 92) = 4.12$, $p = .045$, $r = .21$). Results for the standard scores also showed a significant main effect of time ($F(1, 92) = 6.20$, $p = .015$, $r = .25$), a nonsignificant main effect of language status ($F(1, 92) = 1.58$, p = .212, $r = .13$), and a significant interaction ($F(1, 92) = 6.64$, $p = .012$, $r = .26$). Thus, the groups differed significantly in how they progressed over time on the *Digit span backwards* task on both raw and standard scores. For raw scores the EAL children made significantly greater progress over time. However, for standard scores, the EAL children remained relatively similar across the two time points, but the monolingual group's average standard score was lower in t5 as compared to t4. This suggests that although EAL children's development was in line with norm-expected gains, monolingual children made less progress than would be expected on this measure over the year.

4.2.5 Vocabulary

Children's vocabulary skills were assessed using two measures of expressive vocabulary (*RAPT Information* score, *CELF EV*) and one measure of receptive vocabulary (*BPVS*). The *RAPT Information* (see Figure 4.1) and *CELF EV* (see Figure 4.2) were both administered to EAL children from t1-t5. All t1-t3 data for these measures are shown in Table 4.1, while t4-t5 data for both EAL and monolingual children can be found in Table 4.5. The *BPVS* was measured in EAL children from t3-t4 (see Table 4.1 for t3 data), and at both the final time points with monolingual children (t4-t5, see Table 4.5).

Table 4.5
Descriptives for measures of vocabulary at t4 and t5 for monolingual and EAL children

	t4					t5				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
RAPT Info (40)										
Monolingual	53	31.48	32.00	3.06	23.5-36	49	32.14	32.00	3.20	23.5-8
EAL	51	27.84	29.00	5.15	14-35.5	45	29.80	30.00	3.79	21-37
CELF EV-raw										
Monolingual	53	24.23	23.00	8.11	4-46	49	30.22	31.00	10.08	8-54
EAL	51	13.18	13.00	8.31	2-33	45	20.78	19.00	7.15	5-37
CELF EV-standard										
Monolingual	53	9.30	9.00	2.64	3-16	49	8.65	9.00	3.50	1-18
EAL	51	5.78	6.00	3.14	1-12	45	5.64	5.00	2.39	1-11
BPVS-raw (168)										
Monolingual	53	82.28	81.00	14.13	54-118	49	92.57	92.00	16.64	65-139
EAL	51	64.43	63.00	13.26	26-94	45	75.60	75.00	10.30	51-100
BPVS-standard										
Monolingual	53	92.85	92.00	11.51	72-124	49	93.04	93.00	14.07	70-135
EAL	51	81.33	83.00	8.04	69-103	45	79.98	78.00	8.29	69-100

Note. Maximum scores are shown in parentheses next to the measure names.

4.2.5.1 RAPT – Information score

The *RAPT* was administered in the same way to EAL children at all time points (t1-t5), and it was therefore possible to examine growth across three years of development. The results for the *RAPT Information* score will be discussed here. While this measure does not include standard scores, the manual does provide mean scores by age bands based on a norming sample, and these were used to consider whether EAL children's scores fell within one SD of the norming mean. Figure 4.1 shows the mean score of the norming sample (in red), and one SD above and below the norm mean (in dotted red lines), while the development of EAL children is depicted in green. The figure, along with the descriptive statistics shown in Table 4.1 and Table 4.6, suggests that EAL children made steady progress in their expressive vocabulary, and their performance by t5 was within one SD of the mean reported for the norming sample. The results of the repeated measures ANOVA revealed that children's development was significant across the first four time points ($F(3, 105) = 167.17$, $p < .001$), and repeated contrasts found significant improvements from t1-t2 ($F(1, 35) = 20.65$, $p < .001$, $r = .61$), t2-t3 ($F(1, 35) = 105.41$, $p < .001$, $r = .87$), and t3-t4 ($F(1, 35) = 24.22$, $p < .001$, $r = .64$).

At both t4 and t5 monolingual children had higher raw scores on this measure than EAL children, although both groups showed increases in their scores from t4-t5. The mixed ANOVA revealed a significant main effect of time ($F(1, 92) = 6.15$, $p = .015$, $r = .25$), a significant main effect of language status ($F(1, 92) = 18.95$, $p < .001$, $r = .41$), and a nonsignificant interaction ($F(1, 92) = 1.00$, $p = .320$, $r = .10$). These results suggest that monolingual children significantly outperform the EAL children on this measure, although both groups made significant progress from t4 to t5. Furthermore, the rate of growth was similar for the two language groups.

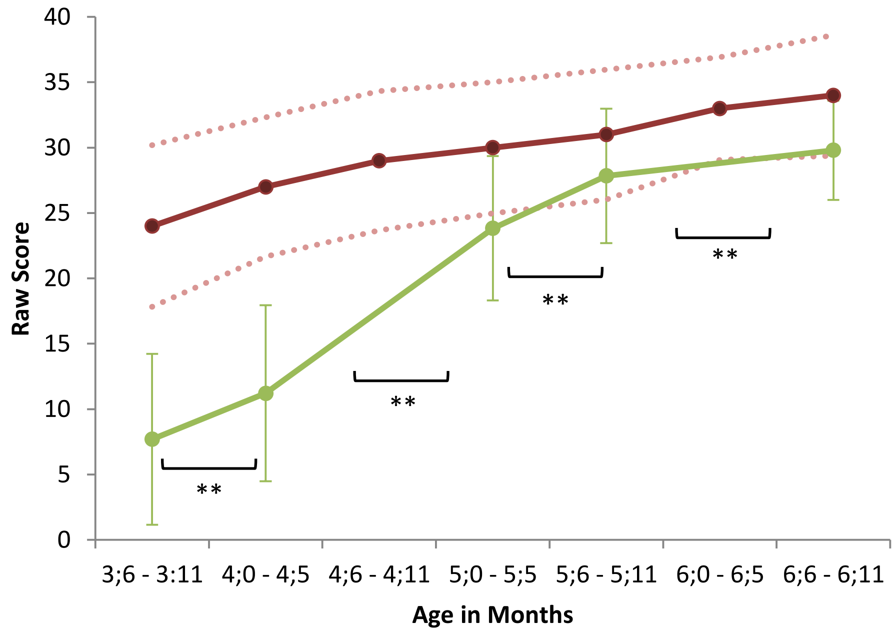

Figure 4.1
RAPT Info raw score (max = 40) development for EAL children from t1 to t5. EAL children's scores are depicted in green, and error bars represent SDs. The norm mean reported for *RAPT Information* for each age band is shown in solid red, while one SD above and below the norm mean is depicted by dotted red lines. Significant pairwise comparisons (from the repeated measures ANOVAs between t1-t4, and the mixed ANOVA from t4-t5) are shown with bars, where ** $p < .01$.

4.2.5.2 CELF Expressive Vocabulary

As stated in section 3.3.1.5.2, between t3 and t4 the version of the *CELF* used to assess children was changed from the *CELF Preschool 2* to the *CELF 4*. As a result of this, it was not possible to compare children's development in terms of raw scores at t1-t3 and at t4-5. For this reason, EALs children's growth on *CELF EV* from t1-t4 will be considered using their standard (scale) scores, which are comparable across the two versions of this measure. Monolingual and EAL children's performance and development at t4-t5 will be considered using both raw and standard scores, as the version of *CELF* used at these two final time points was the same.

Between t1-t3, EAL children's standard scores on this measure increased, with a particularly large increase between t2-t3 (see Table 4.1). However, between t3-t4, children's *CELF EV* standard scores decreased slightly (see Table 4.5), and this group's average standard score was below the normal range at all time points between t1-t4. Results of the repeated measures ANOVA showed that EAL children's standard scores increased significantly overall from t1-t4 ($F(3, 105) = 24.30$, $p <.001$), and repeated contrasts revealed that children's progress from t1-t2 ($F(1, 35) = 6.59$, $p =.015$, $r =.40$), and from t2-t3 ($F(1, 35) = 34.33$, $p <.001$, $r =.70$) was significant. However, children's average scale score at t4 was not significantly different compared to t3 ($F(1, 35) = .26$, $p =.612$, $r =.09$). This suggests that while EAL children's performance on *CELF EV* increased significantly and faster than would be expected given norms for this measure between t1-t3, between t3-t4 these children showed development in line with norm expectations.

Monolingual children's raw and standard scores were higher than those of EAL children at both t4 and t5 (see Table 4.5), and the gap between children on their raw scores remained similar over time (see Figure 4.2). In terms of standard scores, both monolingual and EAL groups demonstrated lower mean standard scores at t5 as compared to t4, although once again the monolingual group showed higher average performance at both time points. The results of the mixed ANOVA for the raw scores on *CELF EV* confirmed that there was a significant main effect of time ($F(1, 92) = 120.75$, $p < .001$, $r = .75$), a significant main effect of language status ($F(1, 92) = 41.44$, $p < .001$, $r = .56$), and a nonsignificant interaction ($F(1, 92) = 2.09$, $p = .152$, $r = .15$). The mixed ANOVA for the standard scores showed that the decrease in scores from t4 to t5 was significant for both groups ($F(1, 92) = 4.15$, $p = .044$, $r = .21$), as was the monolingual advantage ($F(1, 92) = 34.59$, $p < .001$, $r = .52$). Furthermore, the interaction was nonsignificant ($F(1, 92) = 1.10$, $p = .297$, $r = .11$), suggesting that the groups were similar in terms of their changes in scores over time. Overall, these results suggest that monolingual children had more advanced vocabulary knowledge on this measure. Although both groups showed significant progress in their raw scores, their standard scores suggested that they made weaker gains than would be anticipated based on the norms. Furthermore, this rate of development was very similar across groups.

An additional way that both EAL and monolingual children's standard scores were considered was in terms of the proportion of children who scored more than one SD below the normal range (scale score < 7). For EAL children, this number started at 89% at t1, and decreased slightly to 81% by t2, and even further to 50% by t3. However, by t4 this number had increased again to 55%, and 69% by t5, suggesting that although there was an increase in the number of EAL children scoring within the normal range between t1 to t3, there was a decrease in this same figure from t3 to t5. The number of children below the normal range on this measure also increased for monolingual children, and was only 13% at t4, but went up to 29% by t5.

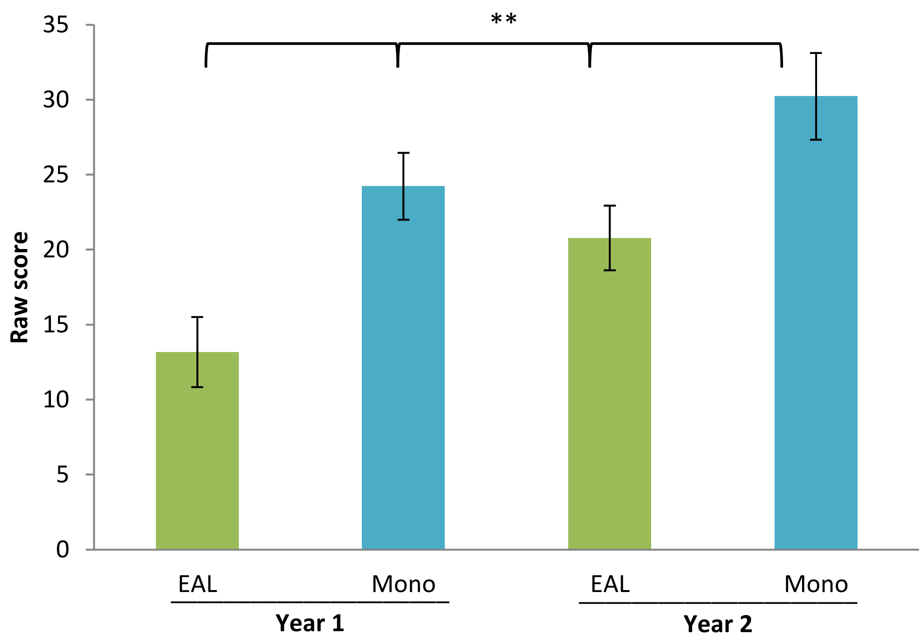

Figure 4.2
EAL and monolingual children's mean raw scores on *CELF EV* (max = 54) at t4 and t5, with 95% confidence intervals. Significance bars represent the main effect of language status from mixed ANOVAs, and therefore compare group performance across time points. ** $p < .01$

4.2.5.3 BPVS

In terms of EAL children's development on the *BPVS* from t3-t4, this group's average raw score was higher at t4 as compared to t3, while their standard scores showed a decrease from being on the border of the normal range at t3 to being below it at t4 (see Table 4.1 and Table 4.5). Repeated measures ANOVAs confirmed that this improvement in raw scores was significant ($F(1, 37) = 88.70$, $p < .001$, $r = .84$), while the decrease in standard scores was also significant ($F(1, 37) = 4.71$, $p = .036$, $r = .34$). Together these results suggest that although children could identify more words correctly on this measure at t4 as compared to t3, this improvement was less than would be expected based on the norms.

At t4 and t5, monolingual children had higher average raw and standard scores on this measure, and while EAL children's standard scores suggested they had vocabulary skills outside the normal range, monolingual children had approximately average performance on this measure (see Table 4.5). Both groups showed gains in their raw scores from t4-t5, but while monolingual children's standard scores remained very similar across time points, EAL children's decreased slightly. The mixed ANOVA on the raw scores revealed a significant main effect of time ($F(1, 92) = 114.12$, $p < .001$, $r = .74$), a significant main effect of language status ($F(1, 92) = 42.82$, $p < .001$, $r = .56$), and a nonsignificant interaction ($F(1, 92) = .002$, $p = .967$, $r = .00$). This suggests that both groups made significant progress over time, and their rates of development were very similar, although monolingual children performed significantly better than EAL children at both time points. For the standard scores, the main effect of time was nonsignificant (F(1, 92) = 1.85, p = .177, r =.14), the main effect of language status remained significant (F(1, 92) = 34.34, p < .001, r =.52), and there was a nonsignificant interaction (F(1, 92) = 1.13, p =.290, r =.11). As such, both groups' progress was enough to maintain their relative standard scores, and their rates of development were similar, although once again monolingual children had significantly higher standard scores on this measure.

In contrast, an increasing number of children in both groups had standard scores outside of the normal range (standard score < 85). For EAL children, the proportion of children with a standard score below 85 increased from 49% at t3, to 61% at t4, to 64% at t5. Similarly for monolingual children, these figures increased from 25% at t4, to 33% at t5, showing a consistent pattern for the relative strength of both groups receptive vocabulary to decrease over time.

4.2.6 Grammar

Similarly to vocabulary, this study included two measures of expressive grammar (*RAPT Grammar*; *CELF WS*), and one measure of receptive grammar (*CELF SS*). EAL children's grammatical performance and development was considered for the measures of *RAPT Grammar* (see Figure 4.3) and *CELF SS* from t1-t4, and from t3-t4 for *CELF WS* (see Table 4.1 for t1-t3 data, and Table 4.6 for t4 data). Monolingual and EAL children's performance and development on all three measures of grammar will be compared from t4-t5 (see Table 4.6 and Figure 4.4).

Table 4.6
Descriptives for measures of grammar at t4 and t5 for monolingual and EAL children

	t4					t5				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
RAPT Gram-raw(38)										
Monolingual	53	24.73	25.00	4.16	10-33	49	27.04	27.00	3.56	20-35
EAL	51	20.61	22.00	5.49	5-28.5	45	24.79	26.00	4.51	14-32.5
CELF SS-raw										
Monolingual	53	19.64	19.00	3.46	11-26	49	22.33	23.00	3.13	13-26
EAL	51	16.14	16.00	4.15	8-26	45	19.78	20.00	3.34	10-26
CELF SS-standard										
Monolingual	53	8.85	9.00	3.10	2-14	49	8.78	9.00	3.26	2-13
EAL	51	6.84	7.00	2.96	1-14	45	6.44	6.00	2.85	1-13
CELF WS-raw										
Monolingual	53	19.64	19.00	4.74	6-32	49	24.14	24.00	4.03	16-31
EAL	51	15.45	17.00	6.49	1-27	45	21.44	22.00	5.04	8-30
CELF WS-standard										
Monolingual	53	8.72	9.00	2.83	2-19	49	9.37	9.00	2.50	5-13
EAL	51	6.84	7.00	3.21	1-13	45	8.07	8.00	2.74	2-13

Note. Maximum scores are shown in parentheses next to the measure names.

4.2.6.1 RAPT Grammar score

The results of the *RAPT Grammar* score from the RAPT are considered in the same was as the previously reported *RAPT Information* score results (see section 4.2.5.1 for description of how results are displayed in figures). In terms of EAL children's development, while children's scores on this measure were very low at t1 and t2, there were large increases in their scores across all time points, and by t3 the average raw score was approximately within one SD of the norm sample mean. Furthermore, this relative position compared to the norm sample remained approximately the same from t3-t5 (see Figure 4.3 and Table 4.6). The repeated measures ANOVA showed that EAL children made significant progress in their raw scores across all time points ($F(2.46, 86.14) = 157.71$, $p < .001$). Mauchly's test indicated that sphericity had been violated in these analyses ($\chi^2(5) = 12.02$, $p = .035$), and therefore the aforementioned results are reported using the Greenhouse-Geisser estimate of sphercity correction. Repeated contrasts revealed that this improvement was significant between t1-t2 ($F(1, 35) = 36.22$, $p < .001$, r =.71), t2-t3 ($F(1, 35) = 113.11$, $p < .001$, r =.87), and t3-t4 ($F(1, 35) = 28.69$, $p < .001$, r =.67).

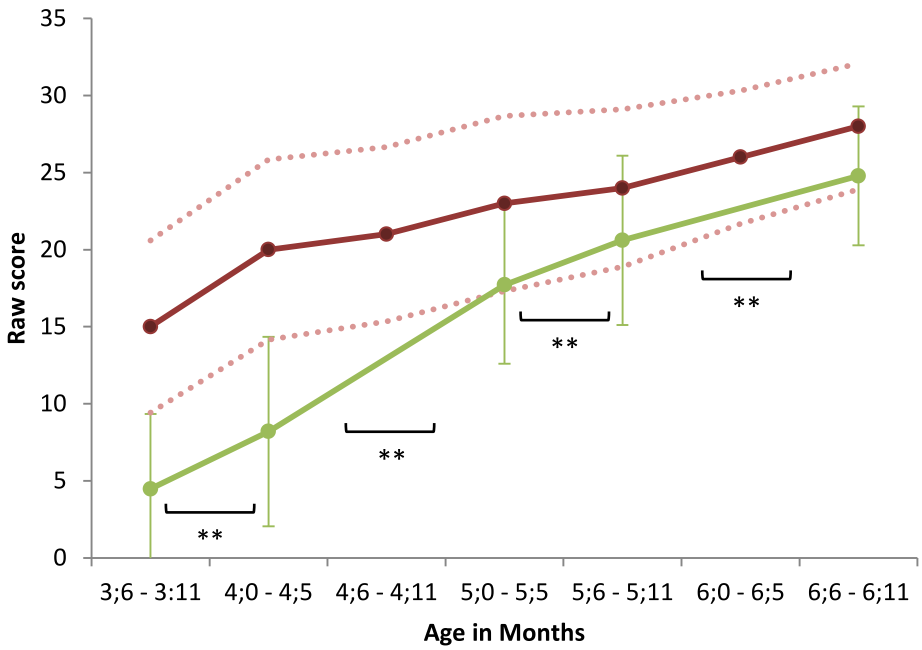

Figure 4.3
RAPT Grammar raw score (max = 38) development for EAL children from t1 to t5. EAL children's scores are depicted in green, and error bars represent SDs. The norm mean reported for *RAPT Grammar* for each age band is shown in solid red, while one SD above and below the norm mean is depicted by dotted red lines. Significant pairwise comparisons (from the repeated measures ANOVAs between t1-t4, and the mixed ANOVA from t4-t5) are shown with bars, where ** p < .01

At t4 and t5, monolingual children had higher average raw scores than EAL children, and both groups showed increases in their scores from t4-t5 (see Table 4.6). Results of the mixed ANOVA demonstrated a significant main effect of time ($F(1, 92) = 60.86$, $p < .001$, r =.63), a significant main effect of language status ($F(1, 92) = 17.80$, $p < .001$, $r = .40$), and a significant interaction ($F(1, 92) = 8.79$, $p = .004$, $r = .30$). While both groups' performance on this measure improved over time, and monolingual children continued to score higher than EAL children at t5, EAL children's rate of growth between t4 and t5 was significantly greater than their monolingual peers'.

4.2.6.2 CELF Sentence Structure

As discussed previously, EAL children's development on *CELF SS* from t1-t4 was only analysed in terms of children's standard scores (see section 4.2.5.2). Although EAL children had very low scores on this measure at the first two time points (t1-t2), these increased dramatically from t2-t3. However, between t3-t4, EAL children's average standard scores on this measure decreased slightly (see Table 4.1 and Table 4.6). At all time points EAL children's standard scores reflected that children's performance on this measure was either very weak (t1-t2), or just below the normal range (t3-t4). The results of repeated measures ANOVAs for t1-t4 confirmed that EAL children's improvement was significant overall ($F(3, 102) = 23.65$, $p < .001$), and repeated contrasts revealed that children's gains from t1-t2 were significant ($F(1, 34) = 19.51$, $p < .001$, $r = .60$), as were those from t2-t3 ($F(1, 34) = 6.92$, $p = .013$, $r = .41$), but the decrease in scores from t3-t4 was not significant ($F(1, 34) = .51$, $p = .480$, $r = .12$). As such, while children made gains in advance of norm expectations between t1-t3, these levelled off between t3-t4 and were more in line with norm expected development during this time.

Turning to the performance and development of monolingual and EAL children at t4-t5, it was again clear that monolingual children showed an advantage in terms of both raw and standard scores on this measure. As Figure 4.4 illustrates, both monolingual and EAL children's raw scores on *CELF SS* increased over time, and this improvement was of a similar magnitude across groups. Furthermore, it is noteworthy that EAL children's results at t5 are similar to monolingual children's at t4. However, average standard scores remained very similar across the two time points, suggesting below average performance for EAL children and low-average performance by the monolingual children. The mixed ANOVA analyses of the raw scores showed a significant main effect of time ($F(1, 92) = 93.29$, $p < .001$, $r = .71$), a significant main effect of language status ($F(1, 92) = 20.46$, $p < .001$, $r = .43$), and a nonsignificant interaction ($F(1, 92) = 1.04$, $p = .310$, $r = .11$), supporting the conclusion that monolingual children performed better and the groups developed at a similar rate. The mixed ANOVA of the standard scores showed a nonsignificant main effect of time ($F(1, 92) = 1.24$, $p = .268$, $r = .12$), a significant main effect of language status ($F(1, 92) = 14.74$, $p < .001$, $r = .37$), and a nonsignificant interaction ($F(1, 92) = .84$, $p = .363$, $r = .09$), confirming that both the relative level of performance and the difference in mean scores between groups remained similar over time.

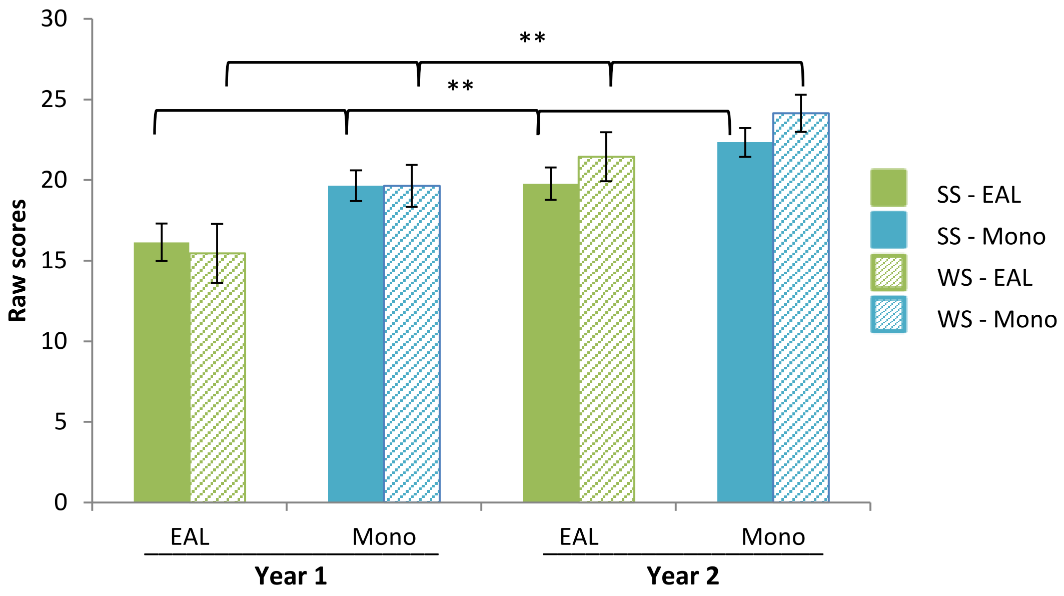

Figure 4.4
Monolingual and EAL children's mean raw scores on *CELF SS* (max = 26) and WS (max = 32) at t4 and t5, with 95% confidence intervals. Significance bars represent the main effect of language status from mixed ANOVAs, and therefore compare group performance across time points. ** *p* < .01

Once again, the number of children scoring below the normal range (scale score < 7) was considered for both groups, and for EAL children this number went from 87% at t1, to 68% at t2, to 40% at t3, suggesting a consistent downward trend in the number of children below the normal range on this measure. However, by t4 this number had increased slightly to 43%, and by t5 53% of EAL children had below-average standard scores on this measure. A similar increase in the number of children below the normal range was also seen for monolingual children (although at much lower rates), as only 19% of children had standard scores below 7 at t4, but this increased to 25% by t5.

4.2.6.3 CELF Word Structure

Unlike *CELF EV* and *CELF SS, CELF WS* was only measured from t3-t5, however the same change from the *CELF Preschool 2* to the *CELF 4* version of the WS measure still made it necessary to only consider standard score development of EAL children from t3-t4 (see Table 4.1 and Table 4.6). Although this group's average standard score did increase very slightly from t3-t4, at both time points it fell just below the normal range, and the results of the repeated measures ANOVA revealed that this improvement was not significant ($F(1, 36) = .35$, $p = .559$, $r = .10$). As such, EAL children's gains on this measure were in line with norm expectations.

In terms of monolingual and EAL children's performance and development at t4-t5, monolingual children had consistently higher raw and standard scores at both time points (see Table 4.6). Mean raw scores are also shown in Figure 4.4, and while mean scores for monolingual children are clearly higher at both time points, the difference between groups is smaller at t5. EAL children's average standard score at t4 was just outside the normal range, while monolingual children's was in the low-average range, and both groups showed increases in their standard scores from t4-t5. Notably, EAL children's standard score on this measure are actually within the normal range at t5. The results of the mixed ANOVA of the raw scores revealed a significant main effect of time ($F(1, 92) = 156.38$, $p < .001$, $r = .79$), a significant main effect of language status ($F(1, 92) = 12.10$, $p = .001$, $r = .34$), and a nonsignificant interaction ($F(1, 92) = 2.29$, $p = .134$, $r = .16$), suggesting performance advantages for monolingual children, although similar developmental gains across groups. The mixed ANOVA for the standard scores also showed a significant main effect of time ($F(1, 92) = 10.55$, $p = .002$, $r = .32$), a significant main effect of language ($F(1, 92) = 8.34$, $p = .005$, $r = .29$), and a nonsignificant interaction ($F(1, 92) = .61$, $p = .437$, $r = .08$). These results demonstrate that both groups actually made significantly stronger progress than would be expected based on the norms, although monolingual children still had higher scores and development was similar for the two language groups.

Unlike previous results, for *CELF WS* the number of children with standard scores outside of the normal range (scale score < 7) actually decreased over time, from 53% of EAL children at t3, to 47% at t4, to 22% at t5. Similarly for monolingual children, these figures decreased slightly from 15% at t4, to 14% at t5, showing a consistent pattern of strengthening skills across.

4.2.7 Listening comprehension

EAL children's listening comprehension was assessed at t3-t5, and at t4-t5 for monolingual children. Consideration of EAL children's performance and development on listening comprehension from t3-t4 showed that children were only able to answer a limited number of comprehension questions correctly at either time point, and the average comprehension score actually decreased over this period (see Table 4.1 and Table 4.7). The results of the repeated measures ANOVA of the listening comprehension score confirmed that this decrease was significant ($F(1, 36) = 25.36$, $p < .001$, $r = .64$). These two measures were identical in format, with the same number of questions to answer, but the story children heard and were asked questions about was different across the two time points.

Table 4.7
Descriptives for listening comprehension at t4 and t5 for monolingual and EAL children

	t4					t5				
	N	***M***	***Mdn***	***SD***	***Range***	***N***	***M***	***Mdn***	***SD***	***Range***
Single passage (8)										
Monolingual	53	2.94	3.00	1.66	0-7	49	4.37	4.00	1.70	1-8
EAL	51	1.63	1.00	1.59	0-6	44	2.98	2.50	1.80	0-8
Composite score (16)										
Monolingual						49	9.80	10.00	2.77	3-15
EAL						44	7.66	8.00	2.87	1-13

Note. Maximum scores are shown in parentheses next to the measure names.

In terms of the comparison of monolingual and EAL children's performance and development at t4-t5, at t4 children listened to only one passage (with a maximum score of 8), while at t5 children heard two passages and their comprehension score was a composite of two measures (with a maximum score of 16), and this was done to avoid ceiling effects. The analyses were done on the t4 score and the t5 composite score, but raw scores for both t5 scores (the single passage used at t4, and the composite of the two passages used at t5) are presented in Table 4.7. As with all previous language measures monolingual children showed clearly superior performance on this measure, although both groups showed increases in their scores over time. Results of the mixed ANOVA (on t4 and t5 composite scores) showed a significant main effect of time ($F(1, 91) = 533.70$, $p < .001$, $r = .92$), a significant main effect of language status ($F(1, 91) = 19.82$, $p < .001$, $r = .42$), and a nonsignificant interaction ($F(1, 91) = 2.14$, $p = .147$, $r = .15$), demonstrating again that monolingual children answered more questions correctly, and the groups showed significant and similar improvement over time.

4.3 Discussion

The previously presented results will now be discussed with regards to the research questions set out at the beginning of this chapter. EAL children's early development will be considered in terms of their performance and progress on raw scores, and as compared to standardised norms where available. Group comparisons of the EAL and monolingual children will be used to consider the similarities and differences in the groups' performance and development from t4 to t5, with an aim to identifying areas of strength and weakness in the early cognitive and linguistic development of EAL children as assessed in their L2. It should be noted that the discussion of children's standard scores will make reference to whether children make appropriate gains, and this term is used to denote that children's achievement relative to the norming sample of the measure remains constant from one time point to the next. Significant improvements in standard scores would suggest children advance more than would be expected based on the norming population of the measure used to test the construct. Finally, in order to make the discussion of the current findings more comparable to results in the literature, time points will now be discussed in terms of their corresponding educational phases, including Nursery (t1-t2), Reception (t3), Year 1 (t4), and Year 2 (t5).

4.3.1 Phonological Awareness

Due to the changing nature of children's PA skills, there was no measure that was appropriate for use at all five time points. As such, the consideration of the development of this skill in EAL children is based on assessments used at consecutive time points, and as compared to standardised norms (when available) and their monolingual peers (see section 3.3.1.1).

EAL children's PA skills in Nursery (t1-t2) were assessed using measures of *Alliteration matching* and *Rhyme awareness*, and children's performance on both measures was at floor at t1, and still low at t2. Given what is understood about the general progression in PA skills, measures of rhyme and alliteration awareness would be developmentally appropriate for preschool children (Anthony & Francis, 2005), and studies using similar measures to those used in the current study with monolingual English-speaking pre-schoolers have found they could be used reliably to measure PA in these young children (Muter et al., 1997; Lonigan, Burgess, Anthony, & Barker, 1998; Anthony, et al., 2002). However, low scores on alliteration and rhyme awareness tasks are not uncommon even in monolingual samples (Lonigan et al., 1998; Maclean, Bryant, & Bradley, 1987). Furthermore, both alliteration and rhyme awareness are influenced by factors such as children's ethnicity, maternal education levels, SES, home literacy environments, and exposure to nursery rhymes (in the case of rhyme awareness; Fernandez-Fein & Baker, 1997; Lundberg, Larsman, & Strid, 2012). Although timing and funding issues, along with low response rates, somewhat limited the amount of background information that could be collected for participants in the current study, it was clear that children from this sample were predominantly from schools serving low-SES families (see section 3.2). This factor, along with other aspects of their home environments, may have predisposed these children to poorer performance on these measures. A last point to make about EAL children's early PA skills is that their home language is of particular importance, as characteristics such as the complexity and saliency of different linguistic units will influence the rate of PA development in their L1 (Anthony & Francis, 2005), and the similarity between their L1 and L2 (in this case English) will have an impact of the degree of transfer across their languages (Bialystok, Luk, & Kwan, 2005). As such, children's low performance on these measures could be because at this early point in their development they had not received sufficient experience in their L2 to have robust PA skills on these measures, and their L1 language and home experiences either did not transfer or were too limited to support the development of these skills in their L2 at this early point. Indeed, several studies of pre-school bilingual children have found that their L2 PA skills were more limited as compared to those of monolingual children (Hammer & Miccio, 2006; Hammer, Miccio, & Wagstaff, 2003; Páez et al., 2007).

However, in Reception and Year 1 when PA was assessed using *Sound isolation* and *Sound deletion*, EAL children had standard scores on these measures that were well within the normal range for monolingual children, and in Year 1 there were no differences between the EAL children and their monolingual peers on either measure in terms of raw and standard scores. These results are consistent with findings that children learning in their L2 have L2 PA skills very similar to those of monolingual children once they enter school (Jean & Geva, 2009; Jongejan et al., 2007; Geva & Zadeh, 2006; Lesaux et al., 2007). For example, Chiappe, Siegel, and Gottardo (2002) examined group differences on measures of rhyme and phoneme deletion at the beginning and end of kindergarten for monolingual children and bilingual children from diverse linguistic backgrounds growing up in Canada. They found that although monolingual children had higher scores on both measures at the beginning of the year, by the end of the year there were no significant group differences on phoneme deletion (although the group difference on rhyme remained significant). These results support the suggestion that even if bilingual children have weaker PA in their L2 at a very early point in their development, as may have been the case for the current EAL children in Nursery, mono- and bilingual group differences abate relatively quickly. This may be especially true for measures of phoneme awareness, which seem somewhat less reliant on culturally different home experiences than measures of rhyme awareness (Fernandez-Fein & Baker, 1997).

Regarding development, EAL children made significant progress in their PA skills as measured by raw scores on *Alliteration matching* and *Rhyme awareness* in Nursery, and on *Sound isolation* and *Sound deletion* from Reception to Year 1, showing that children clearly display good improvements in their PA over time. EAL children also maintained their standard scores on *Sound isolation* and *Sound deletion* from Reception to Year 1, suggesting that their development was in line with norm expected gains, and in Year 1 there were no differences between the EAL children and their monolingual peers on either measure in terms of raw and standard scores. Together these results suggest that EAL children's PA skills develop at least as quickly as monolingual children's, especially once they enter formal education. This is consistent with the results of Kieffer and Vukovic (2013), who specifically examined the growth trajectories of low-income mono- and bilingual children (aged approximately 6- to 10-years-old) growing up in the US on measures of language and literacy, including a sound deletion task similar to that used in Reception and Year 1 in the current study. The results suggested not only that the groups did not differ significantly in their standard scores at any of the three time points, but also that the trajectory of the groups' development was not different. This adds support to the conclusion that PA development in EAL and monolingual children is relatively similar during early education.

Despite these similarities, monolingual children had a slightly higher mean score than EAL children on the measure of *Spoonerisms* used in Year 2, although this difference was not significant. Although the lack of significance means that this result should not be over-interpreted, it is relevant to consider the task demands associated with this *Spoonerisms* measure. The task required children to isolate and swap phonemes within real words, and was therefore likely to draw on WM and vocabulary knowledge in addition to PA, and spoonerism tasks have been found to correlate moderately to strongly with both vocabulary and memory measures (Babayiğit & Stainthorp, 2011). While the two groups did not differ in their WM skills, EAL children were clearly disadvantaged in terms of their vocabulary, suggesting that this could be an underlying contributor to the group difference. In Year 1, both groups of children were already demonstrating strong performance on the measures of *Sound isolation* and *Sound deletion*, and so while it was appropriate to change the assessment battery to include the more challenging *Spoonerisms* task, it may have been preferable to consider a measure that placed fewer demands on children's lexical knowledge. For example, a nonword spoonerisms task in which children transposed only the first letter of words (as done in the first half of the current *Spoonerisms* task) may have been a slightly less difficult and therefore more appropriate measure of both groups' PA.

Overall, these results suggest that monolingual and EAL children perform relatively similarly on measures of PA, and there was some limited evidence that EAL children's phoneme awareness also develops in a manner consistent with monolingual norm expectations.

4.3.2 Letter Knowledge

For the current study, LK in EAL children was assessed in Nursery and Reception using a measure of *LSK*, as the educational system in England places a larger focus on the learning of letter-sounds over letter-names, in conjunction with phonics (Ellefson et al., 2009). While EAL children showed low scores on *LSK* at both time points in Nursery, by Reception their scores were at ceiling. At the end of Nursery, children's standard scores were in the low-average range, and by the end of Reception EAL children's average standard score on this measure was borderline above average, demonstrating that these children had not only appropriate *LSK* for their age as compared to norms, but also that their development exceeded norm expectations. As such, while some researchers have suggested that LK may be an area of weakness for bilingual children, especially if the development of letter-sound correspondences is protracted as a result of difficulties in distinguishing sounds in their L2 (Verhoeven, 2000; Muter & Diethelm, 2001), this was clearly not the case for the children in the current study. As the children in this EAL sample came from a large range of different linguistic backgrounds, this result seems to be true regardless of the specific phonological properties of children's L1. Furthermore, not all work with bilingual populations has found LK weaknesses as compared to monolingual children, and the current results coincide with reports of relatively equal levels of LK in mono- and bilingual samples just before or at school entry (Chiappe, Siegel, & Gottardo, 2002; Lesaux et al., 2007). One potential explanation for these discrepancies in the findings in the literature may be that the samples differed in their early literacy experiences, as it is generally believed that formal and informal literacy teaching is the largest determining factor in children's LK development (Anthony et al., 2009). For example, Verhoeven's (2000) sample of Dutch children in Grades 1 and 2 (starting age 6;8 years) from either monolingual Dutch or diverse linguistic backgrounds showed that the gap between groups on a measure of LK decreased over time as bilingual children showed more growth over a school year. This could indicate that the early difference in the groups were at least partially due to the more limited early opportunities these children had to learn Dutch letters, and that group differences levelled out once all children were exposed to formal education. Indeed, the children in the studies that found similar LK in mono- and bilingual children attended schools that focused intensively on early development of PA and LK (Chiappe, Siegel, & Gottardo, 2002; Lesaux et al., 2007), including exposure to letters in songs and activities in kindergarten. Therefore, the current findings suggest that the literacy experiences these EAL children received in their homes and Nursery settings were sufficient for them to develop appropriate pre-school levels of LSK, and once they started school they were fully able to benefit from the concentrated focus on LSK teaching to develop strong skills in this area. Furthermore, EAL children's standard scores suggested their rate of development exceeded norm expectations between the end of Nursery and Reception, which converges with the results of Verhoeven (2000) in suggesting accelerated LK development once bilingual children are exposed to formal education in their L2. Finally, these results replicate in an EAL sample the finding of ceiling effects in the LK of monolingual children learning various different languages after one year of formal education (Seymour et al., 2003).

4.3.3 Rapid automatized naming

RAN measures included *colour* and *shape* stimuli from Reception to Year 2, and *letter* and *colour* RAN measures were added in Year 1 and 2 when children were likely to have sufficient experience of the alphanumeric stimuli for them to be considered automatic. As would be expected, EAL children showed significant improvement in the number of RAN stimuli they could name from Reception to Year 1. From Year 1 to 2, the results of the comparisons of the EAL and monolingual children revealed that both groups showed significant improvements over the year on all RAN measures, and the groups' average performance and rate of development were very similar. These results are consistent with the findings of Chiappe and Siegel (2006), who assessed RAN of objects in bilingual children from diverse linguistic backgrounds and their monolingual English-speaking peers in Grades 1 and 2 in Canada. The results showed that the groups did not differ in their performance on this measure at either time point, and showed comparable improvement over the course of the year. As such, the current findings replicate this result with an EAL sample from a different educational and cultural context, and extend them to include *colour*, *shape*, and alphanumeric RAN. The results of Farnia and Geva (2013) also revealed no group differences between Canadian mono- and bilingual children from diverse linguistic backgrounds on a measure of RAN of letters in either Grade 1 (mean age approximately 6 years) or Grade 4 (mean age approximately 9 years), which suggests that children from different language backgrounds continue to show similar levels of performance on this skill. This may also be true for the children in the current sample given that EAL and monolingual children did not differ in their rates of development, although this would need further follow-up testing to confirm. Finally, although the group means always favoured the EAL children, there was no evidence these children significantly outperformed their monolingual peers on any RAN measure in the current study. In their study of Grade 1 to 4 (starting age 6;7 years) Canadian mono- and bilingual children from diverse linguistic backgrounds, Jongejan, Verhoeven, and Siegel (2007) found that the bilingual children had higher RAN of objects scores than the monolingual children. However, other authors have reported either no group differences or higher scores for monolingual children on measures of object RAN (Chiappe and Siegel, 2006; Chiappe, Siegel, & Gottardo, 2002), suggesting that results when using object stimuli may be variable and more dependent on factors such as children's linguistic knowledge than the stimuli used in the current study.

This highlights the importance of considering the RAN stimuli used in assessments of monolingual and EAL children's RAN skills. In Year 1 and 2, both groups were faster in naming *letters* and *numbers* as compared to *colours* and *shapes*, which was not surprising given the amount of exposure to letters and numbers children receive once they begin school, and similar results have also been found in studies of monolingual children using similar measures (Lervåg, Bråten, & Hulme, 2009). However, it could be questioned whether *colours* and *shapes* were truly appropriate for use with the EAL children in Reception. Although most EAL children at this time point were able to complete the *colour* and *shape* RAN tasks easily, some of them struggled to recall the names of at least one of the colour and/or shape stimuli, even after prompts were given on the practice items. Given that these children showed very strong *LSK* skills in Reception, it seems likely that the alphanumeric RAN measures could have been used at this earlier point with the EAL children, and may even have been a more reliable measure in terms of the automaticity with which the children could name the stimuli. One lesson from this could be that the appropriate stimuli for measuring RAN in young children with more limited L2 knowledge needs to be considered carefully in order to ensure that the items used to test this construct really are sufficiently familiar to the children.

4.3.4 Verbal Memory

Verbal memory was assessed using digit span tasks that tapped both STM (*Digit span forwards*) and WM (*Digit span backwards*). In Reception, EAL children had STM and WM standard scores within the normal range, and the group comparisons in Years 1 and 2 showed that monolingual and EAL children's performance was very similar and close to norm expectations on both measures of VM. Although the literature has been inconsistent with regards to whether memory is a strength for bilingual children (Namazi & Thordardottir, 2010; Engel de Abreu, Cruz-Santos, Tourinho, Martin, & Bialystok, 2012; Morales et al., 2012), some of these discrepancies may have been a result of differences in the memory measures used, and specifically their dependence on children's language skills. When the current results are compared to other studies that used measures with relatively low linguistic demands, such as digit span tasks, there is evidence that mono- and bilingual children's VM abilities are similar (Harrison et al., 2016; Kieffer & Vukovic, 2013; Morales, et al., 2012; Abu-Rabia & Siegel, 2002). One exception is the result of the previously mentioned study by Farnia and Geva (2013), who found differences between their mono- and bilingual children in favour of monolingual children on a measure of backward digit span in children aged approximately 6-years-old. Both groups were reassessed at age 10-years-old, at which point no group differences were found, suggesting that when early weaknesses in bilingual children's performance on memory measures do occur, they are likely short lived. In the current study, EAL children's STM performance in Reception was on the lower border of the average range, but this score increased significantly by Year 1. Although the lack of a monolingual comparison group in Reception means it is not possible to say whether there would have been significant group differences like those seen in the Farnia and Geva (2013) study, this does provide some support for the idea of early convergence in the VM abilities of mono- and bilingual children, at least on VM measures that require less linguistic skill.

With regards to development, it was clear that EAL children showed significant improvements in their STM and WM raw scores, and their STM standard scores from Reception to Year 1. Between Years 1 and 2, monolingual and EAL children also showed similar rates of development in their STM skills, although on the WM measure EAL children showed faster rates of raw score improvement. This difference in WM raw score development also meant that while EAL children's improvement on this measure was in line with norm expectations, monolingual children showed significant decreases in standard scores across the year. It is unclear why WM skills did not progress as expected in the monolingual children, and it is important to note that despite this significant decrease in standard scores this group's average score was still very close to the norm mean. However, this does provide some weak evidence of superior WM development in EAL children, albeit only compared to the monolingual comparison group and not the norming sample. There is some suggestion that VM, and particularly WM, may be a relative strength for bilingual children (Adesope et al., 2010). However, the current study provided only some limited evidence of superior WM development, and no suggestion of superior VM performance in EAL children. It may be that group differences on WM measures favouring bilingual children are more likely on measures that use non-verbal stimuli, as language weaknesses may mask any bilingual advantage (Morales et al., 2012). Therefore, it remains possible that had a nonverbal memory task been included, EAL advantages in terms of both performance and development may have been found.

4.3.5 Vocabulary

Considering first EAL children's average performance on all three measures of vocabulary knowledge (*RAPT Information*, *CELF EV*, *BPVS*), there was converging evidence to suggest that EAL children's lexical knowledge was very limited in Nursery-aged children, but reached an average level approximately at or just under one SD below norm means by the time children reached Reception, and this remained relatively stable through to Year 2. These results are consistent with findings from studies of Spanish-English bilingual children from low-SES backgrounds in the US that have tended to report that these young children (approximately 4- to 5-years-old) show vocabulary skills that are one to two SDs below monolingual norms (Hoff, 2013; Páez et al., 2007), and the current results extend this finding to children from lower-SES and diverse linguistic backgrounds of a similar age growing up in the UK.

The trajectory of EAL children's vocabulary development seemed to change over time. As noted, in Nursery this group's performance in terms of their raw scores on the *RAPT Information* measure and their standard scores on the *CELF EV* measure were very low, but performance on both of these tasks improved significantly from the beginning of Nursery to the end of Reception, and showed a particularly steep increase between the end of Nursery and the end of Reception. The significant increase on the *CELF EV* standard scores suggested that these EAL children improved faster than would be expected based on the norms for this measure during this time frame. However, between Reception and Year 1 (when the *BPVS* measure of receptive vocabulary was also introduced), although raw scores on the *RAPT Information* and the *BPVS* improved significantly, *CELF EV* standard scores did not change, and the *BPVS* standard scores actually significantly decreased. Together, these results suggest that EAL children showed an initial very steep trajectory of growth in vocabulary knowledge when they were first introduced to English-language childcare and educational settings, but that their development slowed after their first year in formal education, and their receptive vocabulary (*BPVS*) development did not meet norm expectations during this year. Although research into the language growth trajectories of bilingual children prior to starting formal education is very limited (Hoff, 2013), Hammer et al. (2008) also found evidence of accelerated vocabulary development in young bilingual children as compared to norm expectations. In their study examining the L1 (Spanish) and L2 (English) development of low-SES bilingual children (aged 3- to 4-years-old) attending English-language childcare settings in the US, results suggested that children showed increases in their standard scores in English receptive vocabulary over the 2 years of the study. However, the vocabulary skills children achieved were dependent on characteristics of the language exposure they received at home prior to beginning in the childcare setting, with steeper rates of growth for children who were not exposed to English at home. This may suggest that L2 vocabulary learning is fastest in the very earliest stages of exposure to a child's L2. Farnia and Geva (2011) also reported faster rates of early vocabulary learning, but in slightly older bilingual children. In their study examining the receptive vocabulary development of Canadian bilingual children from diverse linguistic backgrounds from Grades 1 to 6 (initial age 6-years-old), as compared to their monolingual peers, they found that while bilingual children showed faster rates of growth during the first 3 years of education, both groups showed deceleration in the trajectories of their vocabulary development after this point. As such, it may be the case that for both monolingual and bilingual children, vocabulary development shows an early period of rapid development, and that this may even be accelerated in L2 learners who begin with very low levels of L2 vocabulary knowledge. However, it should be noted that the current findings were only able to compare EAL children's early vocabulary development (Nursery to Year 1) to norms rather than to an appropriately matched monolingual sample, and this may explain why the timing of the deceleration in vocabulary improvement in the current results was earlier than in the Farnia and Geva (2011) study. In the current study, EAL and monolingual children's performance and development could only be directly compared in Years 1 and 2, and these comparisons will be discussed now.

Monolingual children's raw scores on the *RAPT Information* scale, and their raw and standard scores on the *CELF EV* and *BPVS* measures were significantly higher than EAL children's in both Years 1 and 2. This is consistent with the large body of evidence that has identified vocabulary knowledge as a particular area of weakness for bilingual children (Droop & Verhoeven, 2003; Verhoeven, 2000; Jean & Geva, 2009, Uccelli & Páez, 2007; August & Shanahan, 2006). Furthermore, EAL and monolingual children in the current study showed equivalent improvements on their raw scores on all three measures of vocabulary across the year, suggesting that their rate of development was similar. Both monolingual and EAL children also showed no significant change in their standard scores on the *BPVS* from Year 1 to 2, suggesting that their development was similar and sufficient to maintain their relative proficiency compared to norms. However, on the *CELF EV* both groups actually showed similar significant decreases in their standard scores over time. Following on from the previous discussion of EAL children's lexical development, there is evidence that in school-aged children, mono- and bilingual populations are similar in their rate of vocabulary learning. For example, Hutchinson and colleagues (2003) found no differences in the vocabulary development of EAL children from diverse linguistic backgrounds and their monolingual peers growing up in England between Years 2 and 4. Other findings have also suggested relatively similar rates of growth in receptive vocabulary for mono- and bilingual children aged 3- to 10-years-old (Bialystok, Luk, Peets, & Yang, 2010). A related point is that the previously discussed study by Farnia and Geva (2011) found that group differences in favour of monolingual children were maintained even after six years of education. Together these results support the conclusion that even in instances when bilingual children do show faster rates of early vocabulary learning in their L2, this growth tends to slow to a rate that is similar to monolingual children, meaning bilingual children's vocabulary knowledge is consistently more limited than that of monolingual children throughout early education.

A final point to make is that not only did the *CELF EV* standard scores of both monolingual and EAL children decrease significantly between Years 1 and 2, both groups saw increasing numbers of children who scored more than one SD below the norm mean on both *CELF EV* and the *BPVS* over time. This suggests that, regardless of the monolingual advantage seen on both of these measures, a meaningful proportion of both groups were not showing the norm expected improvements in their vocabulary development. This is an important and concerning result, and may reflect a relatively uniform impact of children's lower-SES across groups, as being from poorer backgrounds is a known risk factor for weaker language development for both mono- and bilingual children (Hoff, 2013).

4.3.6 Grammar

Similarly to vocabulary, grammatical awareness was also assessed using three measures (*RAPT Information*, *CELF SS*, *CELF WS*), all of which were broad measures of children's morphosyntactic knowledge. EAL children began Nursery with very limited grammatical knowledge, as evidenced by very low raw scores on the *RAPT Information* scale as well as very low standard scores on the *CELF SS*. This is not unexpected, given that at this point most of these children had experienced only limited exposure to English. However, by the time children reached Reception, the EAL group's average scores suggested that on all three grammatical measures children were within one SD of the norm means, and this relative level of performance remained roughly consistent through Year 2 for the *RAPT Information* score and *CELF SS*. The exception to this was that EAL children's standard score on the *CELF WS* was actually in the lower average range in Year 2. Nonetheless, group comparisons between the monolingual and EAL children showed a consistent monolingual advantage on all three measures of grammatical awareness. Bilingual children's grammatical knowledge in their individual languages has consistently been shown to be more limited as compared to monolingual learners of the same language, and the current findings replicate this result (Oller & Eilers, 2002; Babayiğit, 2015; Geva & Zadeh, 2006; Paradis et al., 2010). There is converging evidence from literature that group differences between mono- and bilingual children can be almost completely accounted for by the amount of language input children receive in their different languages (Hammer et al., 2014), so although the current study did not directly measure children's exposure to English and their additional language(s), it is likely that language input is the main contributing factor in explaining the superior grammatical skills of these monolingual children.

The interpretation of EAL children's grammatical development was complicated by slightly different results depending on the measure of grammar in question. Overall, there seemed to be a general tendency for this group to show accelerated growth between Nursery and Reception, as evidenced by significant raw score increases on *RAPT Grammar*, and significant standard score increases on the *CELF SS*. Between Reception and Year 1, although *RAPT Grammar* raw scores continued to increase, there were no significant changes in children's standard scores on the *CELF SS* or *CELF WS* during this time frame. Group comparisons between Years 1 and 2 showed that while monolingual and EAL children showed no differences in development on the measures of *CELF SS* and *CELF WS*, EAL children's raw score development on the *RAPT Grammar* scale exceeded that of monolingual children, and both group's *CELF WS* standard scores improved significantly over the year, suggesting their improvement exceeded norm expectations. As such, while it was clearly true that EAL children showed a very steep trajectory of grammatical awareness growth between Nursery and Reception, there was also some limited evidence that this accelerated development continued between Reception and Year 2 either compared to the monolingual control group (*RAPT Grammar*), or norm expectations (*CELF WS*). Longitudinal evidence using broad measures of grammatical knowledge is very limited for young bilingual children. Only a small number of longitudinal studies of school aged bilingual children have included measures of grammar (Hutchinson et al., 2003, Lesaux & Siegel, 2003; Lesaux et al., 2007; Droop & Verhoeven, 2003; Chiappe, Siegel, & Wade-Woolley, 2002), and not all of these studies directly compared the grammatical development of mono- and bilingual children. However, in the studies that did, the results were mixed. In contradiction to the findings of the current study, Chiappe, Siegel, and Wade-Woolley (2002) actually found faster growth on an oral cloze task by monolingual Canadian children as compared to bilingual children from diverse linguistic backgrounds over the course of a year of kindergarten. In a study of older children, Droop and Verhoeven (2003) found that on measures of morphosyntax, the difference between monolingual Dutch children and bilingual children from Moroccan and Turkish backgrounds decreased between Grades 3 to 4 (initial age 8- to 9-years-old). The authors noted that this could have been due to ceiling effects in the monolingual group, although other short-term longitudinal evidence has also suggested that the difference between mono- and bilingual children's syntactic knowledge may begin to narrow when children reach 9- to10-years-old (Jongejan et al., 2007). However, this result is not uniform, and the previously mentioned study by Hutchinson et al., (2003) found no group differences in the rate of development of English mono- and bilingual learners between Years 2 and 4 on a broad measure of receptive grammatical knowledge. As such, it seems that there is evidence of faster, slower, and equal grammatical development in mono- and bilingual children, and this may suggest that results relating to development may be dependent on the age of testing and the measure of grammar used. Indeed, the findings of the current study varied depending on the measure of grammatical knowledge, and so it may be important to consider very specifically what aspect of grammar is being assessed, even beyond distinctions between morphological or syntactical awareness. However, an important point is that there is evidence from older samples that significantly poorer grammatical knowledge persists in older bilingual children (Lesaux et al., 2007), suggesting that even if EAL children do in some instances show faster rates of grammatical development, it is likely to take numerous years of education before they can "close the gap" on their monolingual peers.

4.3.7 Listening comprehension

Listening comprehension was measured from Reception to Year 2 using a bespoke task that required children to listen to a short story and answer open-ended questions immediately afterwards. Surprisingly, EAL children's scores on this measure were significantly lower in Year 1 than they were in Reception. When monolingual and EAL children were compared in Years 1 and 2, monolingual children had significantly stronger listening comprehension skills at both time points, although both groups improved significantly over the year and this rate of improvement was similar across groups. The more limited listening comprehension skills of EAL children as compared to their monolingual peers are unsurprising given their aforementioned weaknesses in vocabulary and grammar knowledge, and these results replicate previous findings of poorer listening comprehension in bilingual children (Kieffer & Vukovic, 2012; Geva & Farnia, 2012). The aforementioned study by Hutchinson et al. (2003) also examined the listening comprehension skills of EAL children in the north of England, and the results from this study revealed that EAL children not only had significantly poorer listening comprehension than the monolingual children, they also made significantly less progress than their peers between Years 2 to 3 (starting age 6- to 7-years-old), although the two groups showed similar development between Years 3 to 4. Verhoeven and van Leeuwe (2012) also found that development on a measure of listening comprehension in Dutch monolingual and bilingual children from diverse linguistic backgrounds was similar across three time points from when children were 6- to 11-years-old, and the monolingual advantage was still significant at the final testing point, suggesting that listening comprehension was an area of sustained weakness for these children. Indeed, the results of these previous studies and the current work converge to suggest that bilingual learners are likely to have consistently and significantly poorer listening comprehension as compared to monolingual children, and because bilingual children seem to develop at a similar rate, rather than faster, they are likely to show sustained disadvantages on measures of listening comprehension as compared to monolingual learners.

Despite these obvious weaknesses, the finding that EAL children's listening comprehension score decreased from Reception to Year 1 was unexpected, as the previously discussed research clearly demonstrates that bilingual children's listening comprehension does improve over time (Hutchinson et al., 2003; Verhoeven & van Leeuwe, 2012). Therefore, these results most likely reflect task effects, rather than actual decreases in EAL children's listening comprehension skills. Although the length of the stories children heard and the number and format of the questions children were asked did not change across time points, the subject matter of the stories did. In Reception, the story was about a little boy and his pet rabbit, while in Year 1 the story concerned a day at the seaside building sandcastles. The experience of having a pet is likely to be more universal than that of going to the seaside, and it has been found that background knowledge can have an important impact on measures of comprehension (Burgoyne et al., 2013). As such, this decrease in listening comprehension scores from Reception to Year 1 should be interpreted cautiously, and is unlikely to mean that the listening comprehension skills of EAL children become weaker over time, especially when considered alongside the previously mentioned gains in vocabulary and grammatical knowledge.

4.4 Summary

Overall these results converge with previous findings to suggest that although bilingual children may show initial weaknesses in L2 code-related skills (PA, LSK, and RAN) and VM, their abilities in these areas develop quickly over preschool and early education. There was evidence that EAL children in this sample began formal education with appropriate levels of LSK, and that their PA and VM abilities at the end of their first year of school were within the normal range for monolingual children. Furthermore, group comparisons in Year 1 and 2 showed comparable levels of performance on PA, as well as performance and development on RAN and VM, in EAL children and their monolingual peers, suggesting that learning in an L2 did not have a negative impact on the development of these skills. As such, mono- and bilingual children may be expected to benefit from similar abilities in these foundational early literacy skills.

However, it was clear that EAL children's L2 language skills began at a very low level in Nursery and their standard scores were still below the normal range by Year 2 (with the exception of *CELF WS* for which standard scores were in the low-average range). While these children showed evidence of very weak initial language skills but accelerated development in terms of standard score increases in both vocabulary and grammar during their Nursery and Reception years, their growth rates generally levelled off and became similar to those of monolingual children once they reached Reception or Year 1. EAL children's vocabulary skills were an area of particular concern, as in numerous instances their standard scores actually decreased over time, and they showed no evidence of the faster rates of learning that would be key to "closing the gap" on their monolingual peers. While the results for EAL children's grammatical development were somewhat more positive, the findings from the three areas of language competency (vocabulary, grammar, and listening comprehension) come together to highlight that L2 language remains a persistent, if not growing, difficulty for these children.

Overall this differential profile of equivalent code-related and memory skills but weaker language abilities in EAL children as compared to their monolingual peers is likely to have an influence on their literacy development, and the next chapter will consider the performance and development of both language groups on key literacy outcomes.

Chapter 5 - Literacy skills in monolingual and EAL children

This chapter will report findings related to literacy skills for monolingual and EAL children, and will address the second research question set out in Chapter 2.

2) How do EAL and monolingual children perform on broad measures of literacy attainment (reading accuracy, fluency, and comprehension, and spelling) in Reception to Year 2?
   a) Do EAL and monolingual children perform differently on any specific literacy skills?
   b) Are there similarities or differences in the rate of development of literacy skills for EAL and monolingual children?

Two literacy outcomes were measured from t3-t5 (word reading accuracy, spelling) with EAL children only, while measures of word reading accuracy, fluency, comprehension, and spelling were included at t4 and t5 and administered to both groups. Similar to analyses of the linguistic and cognitive predictors presented in Chapter 4, for the measures assessed at t3-t5, repeated measures ANOVAs were performed on the data from EAL children at t3 and t4. For all t4-t5 measures, 2×2 mixed ANOVAs (hereafter referred to simply as mixed ANOVAs) with language status (monolingual, EAL) as the between subjects variable, and time (t4, t5) as the within subjects variable, were used to compare the performance and development of the two groups. The same colour conventions previously used for denoting results from monolingual (blue) and EAL children (green) also apply to the current chapter.

5.1 Reading accuracy

Children's reading accuracy was assessed at both the word- and text-level. Descriptive statistics for word reading accuracy for EAL children at t3 is displayed in Table 5.1, and Table 5.2 shows word and text reading accuracy at t4 and t5 for EAL and monolingual children.

5.1.1 Word reading accuracy

Word-level accuracy was measured using the *DTWRP* (Forum for Research in Literacy and Language, 2012), which consists of a measure of nonword, exception word, and regular word reading. The total score from across these three subscales was the primary focus of the current analyses. However, analyses of development and group comparisons based on the subscales individually produced very similar results to those for the total score. Furthermore, standard scores for this measure are derived from the total raw score only, and so the total raw and standard scores are presented together for continuity and comparability.

Table 5.1

Descriptive statistics for reading accuracy (DTWRP) for EAL children at t3

	t3				
	N	*M*	*Mdn*	*SD*	*Range*
Nonword raw score (30)	37	5.81	5.00	4.53	0-19
Exception word raw score (30)	37	2.89	2.00	3.33	0-16
Regular word raw score (30)	37	6.38	5.00	5.17	0-21
Total raw score (90)	37	15.08	11.00	12.29	0-47
Total standard score	37	107.19	105.00	13.93	72-131

Note. Maximum scores are shown in parentheses next to the measure names.

For EAL children's performance on the *DTWRP* at t3 and t4, EAL children's scores on the subtests at t3 are shown in Table 5.1, and in Table 5.2 for t4. Children's raw scores increased from t3 to t4, and a repeated measures ANOVA revealed that this increase was significant (F(1, 35) = 136.91, $p < .001$, $r = .89$).

Table 5.2.

Descriptive statistics for measures of word (DTWRP) and text (YARC) reading accuracy for monolingual and EAL children at t4 and t5

	t4					t5				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
Word reading										
Nonword raw score (30)										
Monolingual	53	10.32	8.00	6.32	0-26	49	14.06	12.00	6.88	3-27
EAL	51	10.53	10.00	6.10	0-23	45	15.07	15.00	7.01	1-28
Exception word raw score (30)										
Monolingual	53	8.36	7.00	6.99	0-28	49	14.69	14.00	6.83	1-28
EAL	51	8.35	7.00	6.13	0-24	45	15.42	14.00	5.77	0-27
Regular word raw score (30)										
Monolingual	53	13.38	13.00	8.35	0-29	49	19.14	20.00	6.83	5-30
EAL	51	12.92	12.00	7.10	0-27	45	19.33	21.00	6.29	2-29
Total raw score (90)										
Monolingual	53	32.06	26.00	20.95	0-82	49	47.90	46.00	19.65	9-85
EAL	51	31.80	30.00	18.52	0-74	45	49.82	52.00	17.63	3-81
Standard score										
Monolingual	53	104.40	105.00	16.49	70-131	49	101.78	100.00	14.08	76-131
EAL	51	107.29	108.00	15.59	69-131	45	104.56	104.00	12.81	69-131
Text reading										
Raw score (16)										
Monolingual	34	4.71	2.00	5.03	0-16	48	3.98	2.00	4.21	0-16
EAL	34	6.00	6.00	4.57	0-16	42	3.21	3.00	2.34	0-9
Standard score										
Monolingual	34	113.15	111.00	11.54	81-131	48	103.90	103.50	9.62	75-122
EAL	34	111.38	110.00	9.57	81-131	42	105.50	104.00	6.34	94-122

Note. Text reading accuracy represents the number of errors, so lower numbers represent more accurate reading. Maximum scores are shown in parentheses next to the measure names.

At both time points, EAL children's average standard score was well within the normal range for this measure, and their standard score at t4 was similar to and not significantly different from that at t3 ($F(1, 35) = 0.25$, $p = .618$, $r = .08$). As such, children made progress in their raw scores over time, and this increase was in line with norm expectations.

At t4, both monolingual and EAL children read approximately one third of all words correctly, and at t5 this increased to just over one half of all words in the measure (see Table 5.2). While the groups' average standard scores fell just above the norm mean at t4, there was a small decrease in both monolingual and EAL children's standard scores over time so that by t5 they were very close to the norm mean. The groups performed very similarly in terms of their raw scores at both time points, although the average standard scores always favoured EAL children. The results of the mixed ANOVA on the groups' raw scores at t4 and t5 revealed that there was a significant main effect of time ($F(1, 92) = 366.22$, $p < .001$, $r = .89$), a nonsignificant main effect of language status ($F(1, 92) = 0.07$, $p = .794$, $r = .03$), and a nonsignificant interaction ($F(1, 92) = 1.09$, $p = .300$, $r = .11$). This suggests that there were no differences in either the performance or development of monolingual and EAL children. The results of the mixed ANOVA of the standard scores showed a significant main effect of time ($F(1, 92) = 22.51$, $p < .001$, $r = .44$), a nonsignificant main effect of language status ($F(1, 92) = 1.11$, $p = .296$, $r = .11$), and a nonsignificant interaction ($F(1, 92) = 0.15$, $p = .698$, $r = .04$). In this instance, both groups showed significant decreases in their standard scores over time, although again there was no difference between the groups in terms of their overall scores or their rate of development. Additionally, when the proportion of children scoring below the normal range (standard score < 85) was considered, this number was low at all time points for both EAL (t3: 8%; t4: 10%; t5: 4%), and monolingual children (t4: 11%; t5: 8%).

5.1.2 Text reading accuracy

Text reading accuracy was assessed using the *YARC Passage Reading* measure. At both t4 and t5, children were asked to read two passages of increasing difficulty (see Table 5.2). At t4 children read the Beginner and Level 1 passages, while at t5 children read the Level 1 and Level 2 passages. As such, only the Level 1 passage was available at both time points, and therefore children's accuracy on this passage alone will be compared here. At t4, if children discontinued on the Beginner passage they were not asked to attempt the Level 1 passage. Furthermore, if children made more the 16 errors on either passage, the accuracy assessment was discontinued. For this reason some children were not included in the current analyses, as at t4 17 EAL and 19 monolingual children either discontinued the test or scored more than 16 errors. At t5, only three EAL children and one monolingual child either discontinued or scored more than 16 errors on this assessment. Therefore, the following results represent only a subsample of children from each group, although the number of monolingual and EAL children who were unable to score on this assessment was similar at both time points. Only results from the children who scored less than 17 reading errors are presented here.

The average number of errors children made was lower at t5 as compared to t4, and this was true for both groups. While EAL children made slightly more errors than monolingual children at t4, by t5 the groups were very similar. The results of the 2 × 2 mixed ANOVA revealed a significant main effect of time ($F(1, 61) = 37.06$, $p < .001$, $r = .61$), a nonsignificant main effect of language status ($F(1, 61) = 2.01$, $p = .162$, $r = .18$), and a nonsignificant interaction ($F(1, 61) = 0.48$, $p = .491$, $r = .09$). These results show that all children made fewer errors at t5, and the number of errors children made was similar and decreased in a similar way over time for monolingual and EAL children.

The average standard scores for both groups were very high at t4, and just under one SD above the norm mean for monolingual children. Both groups saw decreases in their standard scores over time, and while monolingual children had slightly higher scores at t4, EAL children's scores were slightly higher at t5. The mixed ANOVA revealed a significant main effect of time ($F(1, 61) = 18.86$, $p < .001$, $r = .49$), a nonsignificant main effect of language status ($F(1, 61) = 0.21$, $p = .647$, $r = .06$), and a nonsignificant interaction ($F(1, 61) = 0.61$, $p = .438$, $r = .10$), suggesting that scores for both groups decreased significantly over the year, and monolingual and EAL children were similar in both their performance and development over time. Similarly, the proportion of children scoring below the normal range (standard score < 85) was very low and similar for both EAL children (t4: 3%; t5; 0%), and monolingual children (t4: 3%; t5: 2%).

5.2 Reading fluency

Reading fluency was also assessed at both the word- and text-level, and descriptive statistics from both measures at t4-t5 for monolingual and EAL children are presented in Table 5.3.

5.2.1 Word reading fluency

Children's word reading fluency was assessed using the *TOWRE* (Torgesen et al., 2011), which includes subscales measuring children's reading fluency of both words and nonwords. As the standard scores are based on the results of these two subscales separately, both raw and standard scores from each subscale were analysed and presented here. At t4, 1 EAL child and 2 monolingual children were unable to score on the words subscale, while 1 EAL child and 3 monolingual children were unable to score on the nonword subscale. A further monolingual child's nonword fluency score at t4 had to be removed due to a testing error. At t5, only one EAL child was unable to score on the nonword subscale, and all children scored on the word subscale.

Firstly, for word reading fluency, at t4 both monolingual and EAL children read approximately one third of all the words in the list correctly in the allocated time, and children's scores increased at t5. Furthermore, the groups' raw scores were similar at both time points. The results of the mixed ANOVA revealed a significant main effect of time ($F(1, 90) = 372.59$, $p < .001$, $r = .90$), a nonsignificant main effect of language status ($F(1, 90) = 0.29$, $p = .591$, $r = .06$), and a nonsignificant interaction ($F(1, 90) = 2.71$, $p = .103$, $r = .17$), demonstrating that the groups showed both similar performance and development on word reading fluency. Children's standard scores on this measure also increased over time, and while both groups' means were approximately in line with the norm mean at t4, by t5 scores were considerably higher and about one SD above the norm mean for the EAL children. The mixed ANOVA revealed a significant main effect of time ($F(1, 90) = 59.80$, $p < .001$, $r = .63$), a nonsignificant main effect of language status ($F(1, 90) = 1.16$, $p = .285$, $r = .11$), and a significant interaction ($F(1, 90) = 5.11$, $p = .026$, $r = .23$).

Table 5.3.
Descriptive statistics for measures of word (TOWRE) and text (YARC) reading fluency for monolingual and EAL children at t4 and t5

			t4						t5	
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
Word reading										
Word raw score (81)										
Monolingual	51	28.47	26.00	16.82	6-72	49	46.00	49.00	16.90	10-72
EAL	50	27.86	26.50	15.22	3-61	45	49.07	53.00	15.15	3-71
Word standard score										
Monolingual	51	104.00	101.00	17.22	81-145	49	109.71	110.00	16.60	80-145
EAL	50	103.74	102.50	16.14	75-139	45	115.44	116.00	14.75	75-145
Nonword raw score (66)										
Monolingual	49	15.61	13.00	10.05	2-48	49	22.67	21.00	12.58	4-52
EAL	50	14.78	13.50	8.24	1-37	44	24.18	25.00	10.60	2-45
Nonword standard score										
Monolingual	49	108.18	106.00	14.39	81-145	49	107.43	106.00	16.66	79-145
EAL	50	107.64	108.00	13.21	76-135	44	111.20	112.50	13.28	74-136
Text reading										
Raw score (in seconds)										
Monolingual	33	105.58	82.00	81.35	20-417	47	66.17	44.00	49.70	24-257
EAL	32	105.41	97.00	62.77	32-277	42	49.38	41.50	23.53	25-129
Standard score										
Monolingual	33	100.00	98.00	12.96	74-127	47	104.49	105.00	11.15	72-129
EAL	32	98.72	96.00	10.06	74-117	42	109.07	109.00	8.33	92-125

Note. Maximum scores are shown in parentheses next to the measure names.

This suggests that although the groups were similar at t4 and all children showed improvement over time, the rate of this improvement in standard scores was significantly faster for EAL children. However, the proportion of children scoring below the normal range (standard score < 85) was similar for EAL children (t4: 8%; t5: 4%) and monolingual children (t4: 8%; t5: 6%).

This pattern of results was very similar for the nonword reading measure, as the groups showed comparable raw scores at both time points, as well as increases in their scores over time. The mixed ANOVA revealed a significant main effect of time ($F(1, 88) = 161.76$, $p < .001$, $r = .80$), a nonsignificant main effect of language status ($F(1, 88) = 0.02$, $p = .878$, $r = .02$), and a nonsignificant interaction ($F(1, 88) = 0.66$, $p = .418$, $r = .09$). As for word reading fluency, this shows that both groups read significantly more nonwords at t5, and the groups' performance and development were not different. Children's t4 standard scores were slightly higher for nonword, as compared to word, reading fluency. Furthermore, these scores were in the higher end of the normal range at both time points. Once again these scores improved by t5, and this improvement was slightly greater for EAL children. The mixed ANOVA showed a marginally significant main effect of time ($F(1, 88) = 3.79$, $p = .055$, $r = . 20$), a nonsignificant main effect of language status ($F(1, 88) = 0.40$, $p = .528$, $r = .07$), and a nonsignificant interaction ($F(1, 88) = 1.50$, $p = .225$, $r = .13$). As such, although children's standard scores did improve over time, this effect was weak and only marginally significant. Although there was a similar trend for EAL children to show faster growth over the year, for nonword reading fluency this difference in development was not significant, suggesting that on this measure the groups were relatively similar in their performance and development. Similarly, the proportion of children scoring below the normal range (standard score < 85) was relatively consistent across EAL children (t4: 6%; t5: 5%) and monolingual children (t4: 2%, t5: 10%).

5.2.2 Text reading fluency

Text reading fluency was assessed using the same measure from the *YARC Passage Reading* assessment as that used for text reading accuracy. Once again, only Level 1 was considered in these analyses for reasons discussed above (see section 5.1.2), and the time it took for children to read the passage was recorded in seconds. Similar to the accuracy measure, if children made 16 reading accuracy errors their reading time for the passage was not recorded. At t4, 19 EAL children and 20 monolingual children did not receive a fluency score on this measure, while at t5 only 3 EAL and 2 monolingual children did not score on this measure. Therefore, once again these analyses only represent the data from a subset of the participants.

Both groups read the passage faster at t5 as compared to t4, and while the average reading time was almost identical for monolingual and EAL children at t4, EAL children had a faster average reading time at t5. The mixed ANOVA analyses of the reading time in seconds showed a significant main effect of time ($F(1, 58) = 64.67$, $p < .001$, $r = .73$), a nonsignificant main effect of language status ($F(1, 58) = 0.00$, $p = .987$, $r = .00$), and a nonsignificant interaction ($F(1, 58) = 0.02$, $p = .887$, $r = .02$). As such, text reading fluency was similar both in terms of performance and improvement over time across groups. The analyses of the standard scores of this measure reveal very similar results, as average group standard scores increased for both monolingual and EAL children, but although groups had similar scores at t4, by t5 average standard scores were higher for EAL children. The mixed ANOVA showed a significant main effect of time ($F(1, 58) = 85.30$, $p < .001$, $r = .77$), a nonsignificant main effect of language status ($F(1, 58) = 0.03$, $p = .854$, $r = .02$), and a nonsignificant interaction ($F(1, 58) = 2.95$, $p = .091$, $r = .22$). This suggests that both groups showed substantial improvement in their standard scores over time, and overall the groups were similar in their performance and development on this measure of text reading fluency.

5.3 Reading comprehension

The *YARC Passage Reading* measure was also used to assess children's reading comprehension at t4 and t5. As previously mentioned, at both time points children read two passages (see section 5.1.2). The reading comprehension measure consisted of 8 open-ended comprehension questions after each passage, although these were only administered in cases when the child had not discontinued the assessment due to making too many reading errors. At t4, 3 EAL children and 2 monolingual children discontinued before answering the comprehension questions for the Beginner level passage, and 7 EAL and 5 monolingual children did not complete the comprehension questions for the Level 1 passage. At t5, 2 EAL children and 1 monolingual child did not complete the comprehension questions for Level 1 passage, while 9 EAL and 14 monolingual children discontinued prior to being administered the comprehension questions for the Level 2 passage. The measure used here is the total number of comprehension questions each child answered correctly across both passages, as the standard scores are also calculated based on the combined score across two successive passages. However, descriptive statistics for the individual passages are also presented, but not included in further analyses. In cases where the child only answered the comprehension questions for one passage, the score from that passage was used as their total score. Descriptive statistics for both raw and standard scores on this measure can be seen in Table 5.4.

In terms of children's total raw scores, monolingual children answered just over half and EAL children answered just under half of the total number of questions correctly. There was a small increase in children's raw scores at t5 as compared to t4, and this was true of both groups. At both time points, monolingual children had higher average comprehension scores. The mixed ANOVA showed a significant main effect of time ($F(1, 89) = 12.54$, $p = .001$, $r = .35$), a significant main effect of language status ($F(1, 89) = 4.25$, $p = .042$, $r = .21$), and a nonsignificant interaction ($F(1, 89) = 1.62$, $p = .207$, $r = .13$). Both groups were able to answer significantly more comprehension questions at t5, but at both time points monolingual children performed better than EAL children. Although the difference between groups was smaller at t5 as compared to t4, this slightly greater increase in scores for EAL children was not significantly different from the rate of growth shown by monolingual children.

Table 5.4.
Descriptive statistics for measures of reading comprehension (YARC) for monolingual and EAL children at t4 and t5

	t4					t5				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
Beginner level raw score (8)										
Monolingual	51	5.02	5.00	1.93	1-8					
EAL	48	3.92	4.00	2.04	0-8					
Level 1 raw score (8)										
Monolingual	48	3.94	3.50	2.48	0-8	48	6.17	6.00	1.62	2-8
EAL	44	3.25	3.00	2.31	0-8	43	5.86	6.00	1.77	1-8
Level 2 raw score (8)										
Monolingual						35	4.23	4.00	2.14	0-8
EAL						36	2.69	3.00	1.69	0-6
Total raw score (16)										
Monolingual	51	8.73	9.00	4.21	1-16	48	9.25	9.00	3.66	3-16
EAL	48	6.90	6.00	3.80	0-14	43	8.12	9.00	3.13	2-14
Total standard score										
Monolingual	51	99.45	99.00	13.43	77-131	48	101.10	98.00	12.28	76-126
EAL	48	95.75	98.00	10.42	73-115	43	98.05	99.00	9.57	74-120

Note. Maximum scores are shown in parentheses next to the measure names.

In terms of standard scores, at both time points monolingual and EAL children's performance was close to the norm mean, and there was a small increase in the average standard scores of both groups from t4 to t5. Although the means favoured monolingual children, the difference between groups was small, especially at t5. The mixed ANOVA showed a significant main effect of time ($F(1, 89) = 5.37$, $p = .023$, $r = .24$), a nonsignificant main effect of language status ($F(1, 89) = 2.37$, $p = .127$, $r = .16$), and a nonsignificant interaction ($F(1, 89) = 0.15$, $p = .701$, $r = .04$). As such, these results confirm that monolingual and EAL children were similar in their comprehension standard scores, and the groups showed a similar rate of improvement over time. Additionally, the proportion of children scoring below the normal range (standard score < 85) was similar for EAL children (15%) and monolingual children (16%) at t4, but slightly higher for EAL children at t5 (14%) as compared to monolingual children (6%) at this time point.

5.4 Spelling

Spelling was assessed using a 10-item spelling measure at t3 and t4, and a 20-item measure at t5. However, in order to make more direct comparisons of children's development, at t5 children's score on the first 10-items of the extended measure (the same 10-items used at the other two time points) will be considered. The scores on this measure reflect the number of consonants correct and overall orthographic correctness.

Table 5.5.
Descriptive statistics for spelling for EAL children at t3

	t3				
	N	*M*	*Mdn*	*SD*	*Range*
EAL	38	39.63	13.21	39.50	11-60

As shown in Table 5.5 and Table 5.6, EAL children scored higher on the spelling measure at t4 as compared to t3, and a repeated measures ANOVA revealed that this improvement was significant ($F(1, 36) = 208.12$, $p < .001$, $r = .92$).

Table 5.6.
Descriptive statistics for spelling for monolingual and EAL children at t4 and t5

	t4					t5				
	N	*M*	*Mdn*	*SD*	*Range*	*N*	*M*	*Mdn*	*SD*	*Range*
Monolingual	52	71.38	70.50	18.42	34-108	49	109.37	112.00	16.48	65-132
EAL	51	72.16	72.00	18.03	28-104	45	111.02	117.00	18.87	60-132

In terms of children's performance at t4 and t5, the two groups performed very similarly at both time points, and showed higher scores at t5 as compared to t4 (see Table 5.6). The mixed ANOVA analyses revealed a significant main effect of time ($F(1, 92) = 565.52$, $p < .001$, $r = .93$), a nonsignificant main effect of language status ($F(1, 92) = 0.27$, $p = .608$, $r = .05$), and a nonsignificant interaction ($F(1, 92) = 0.00$, $p = .981$, $r = .00$), suggesting once again that monolingual and EAL children were very similar in their performance and development on this spelling measure.

5.5 Discussion

These results will now be considered in terms of the research questions outlined at the beginning of the chapter, and the findings will be related to what is currently known from published literature.

5.5.1 Reading accuracy

Children's reading accuracy was assessed in terms of their total word reading accuracy on a measure of nonwords, exception words, and regular words, and their text reading of a short passage. On both measures, monolingual and EAL children's raw and standard scores revealed that their reading accuracy was strong and age-appropriate. While standard scores within the normal range are to be expected for the monolingual children, the current findings converge with a growing body of evidence that children learning in their L2 also have reading accuracy skills well within the normal range from a very early point in their development. This seems to be true for children from a range of different SES, cultural, educational, and linguistic backgrounds (Geva et al., 2000; Chiappe & Siegel, 2006; Nakamoto et al., 2007).

Both groups of children also showed significant improvements in their raw scores over time, and for EAL children this confirmed that they could accurately read more words in isolation in Year 1 than in Reception, and that both word and text reading accuracy was superior in Year 2 as compared to Year 1. The latter was also true for monolingual children, who were only tested at these last two time points.

However, from Year 1 to Year 2, both monolingual and EAL children's standard scores on both word and text reading accuracy significantly decreased. Although this does suggest that children in both groups did not make as much progress as would be expected (based on the norming sample) in this area of literacy, it is important to note that their scores remained at or just above the norm mean. Evidence from both monolingual and bilingual populations examining the course of early decoding and word recognition has suggested that these skills tend to show accelerated growth in the first two years of early education, when the impact of literacy instruction is most dramatic, after which point development slows down and remains relatively consistent (Aarnoutse, van Leeuwe, Voeten, & Oud, 2001; Seymour et al., 2003; Caravolas et al., 2013, Nakamoto et al., 2007). As such, this decrease in reading accuracy scores could reflect this natural deceleration in growth rates, or it could be the result of the tendency for results to regress towards the mean over time (Nakamoto et al., 2007). Further assessments in the following years would be necessary to conclude whether this downward trajectory represented a true weakening in these children's relative word reading accuracy skills over time.

When the groups were compared, it was clear that monolingual and EAL children's reading accuracy skills in Years 1 and 2 were not significantly different from one another. This finding converges with numerous studies demonstrating that children learning to read in an L2 show very similar reading accuracy to appropriately matched monolingual comparison groups (Cobo-Lewis et al., 2002, Verhoeven & van Leeuwe, 2012; Grant, Gottardo, & Geva, 2011; Jean & Geva, 2009; Melby-Lervåg & Lervåg, 2014). This result seems to be relatively independent of the language that children are learning, although there is some evidence that SES can have an impact on relative group differences (Droop & Verhoeven, 2003).

Monolingual and EAL children also showed similar amounts of improvement in their raw scores, and similar decreases in their standard scores, and there were no significant group differences in these changes over the year. Lesaux et al. (2007) examined the development of EAL children from diverse linguistic backgrounds and monolingual English-speaking children growing up in Canada from kindergarten (mean age 5;4 years) through Grade 4. They found that the trajectory of word reading accuracy, both in terms of raw scores and standard scores, was almost identical across the two groups. Hutchinson et al. (2003) also examined the word reading skills of EAL children from diverse linguistic backgrounds growing up in the north of England; note that the sample in this study was demographically very similar to the children in the current study. They found that there were no differences between EAL children and their monolingual peers in terms of their progress on a measure of text reading accuracy from Years 2 to 4. The current findings replicate this result with younger English EAL children. As such, these findings support the growing body of evidence that both performance and development of word reading accuracy are similar for children learning in their L1 or L2 (Melby-Lervåg & Lervåg, 2014).

5.5.2 Reading fluency

In Year 1, both monolingual and EAL children had well developed isolated word reading fluency of both words and nonwords. This was also true in Year 2, and at this point real word reading fluency was a particular strength for EAL children, whose standard score on this measure was one SD above the norm mean. While in Year 1 the two groups performed very similarly on both measures of word reading fluency, by Year 2 EAL children's raw and standard scores were higher for both measures, although these differences were not significant.

Very little research has considered the reading fluency of young children learning English, but in their large sample of Canadian children from either English or diverse linguistic backgrounds (mean age 7;10 years), Lesaux and Siegel (2003) found that the bilingual children outperformed their monolingual peers on measures of both word and nonword reading fluency. Similar results were reported by Geva and Zadeh (2006), who examined word reading fluency of a different sample of 7- to 8-year-old Canadian children and again found significant advantages for EAL children. As the reading measures used were different in these two aforementioned studies, it seems unlikely that task effects alone can explain the discrepancy between the current results and those reported in the literature. However, while the Canadian children represented a range of different SES backgrounds, the children in the current study were generally from more deprived backgrounds, and this could potentially account for why the results were in the same direction, but the group difference was not significant in the current study. Furthermore, using the same measures of reading fluency as those used by Geva and Zadeh (2006), Geva and Farnia (2012) found no group differences between 7- to 8-year-old monolingual and bilingual Canadian children from very similar SES backgrounds to those of both of the previous Canadian studies. Moreover, further examination of Lesaux and Siegel's (2003) sample revealed that there were no longer group differences on the fluency measure once children were 9- to 10-years-old (Lesaux et al., 2007). This suggests that even if there are early advantages for reading fluency for children learning in their L2, these are temporary and short-lived. However, importantly the findings from the literature as well as the current study converge to suggest that EAL children are at least as likely to develop strong word reading fluency from an early stage in their development, despite learning in their L2.

Similar results were also found for children's text reading fluency, and both groups had age appropriate abilities on this measure at both time points. The group comparisons were also similar to those reported for word reading fluency; in Year 1 monolingual and EAL children read the passage at a very similar rate, but by Year 2 EAL children tended to read the text faster, although once again this group difference was not significant. The aforementioned study by Geva and Farnia (2012) also included a measure of text reading fluency, and the results of this study mirror the current findings in that although the EAL children tended to read the texts faster, this difference was not significant. This study also followed children through to the age of 10- to 11-years-old, and the groups remained very similar in their text reading fluency at this later stage of reading development. In a UK sample of 10-year-old EAL children from diverse linguistic backgrounds and their monolingual peers, Babayiğit (2014) also found very similar text reading fluency abilities across groups, and the current results therefore extend the finding of equal text reading fluency skills in L1 and L2 readers to younger children in a UK context.

In terms of development, as would be expected the number of words, nonwords, and words in text children could read fluently increased significantly for both monolingual and EAL children from Year 1 to 2. Both groups also showed significant improvements in their standard scores for all three fluency measures, suggesting their skills in this area developed more over the course of the year than would be expected based on test norms for both of these measures (*TOWRE*, *YARC Passage Reading*). An additional point was that EAL children's standard (but not raw) scores on the real word reading fluency measure increased significantly more than monolingual children's, suggesting that EAL children's progress on this task relative to norm expected gains was greater than the improvement seen for their monolingual peers. Given that the gains in raw scores were equivalent, this greater increase in standard scores for EAL children may reflect the fact that EAL children were slightly younger as a group, and as such similar raw score gains actually suggest stronger development. The available literature provides very little context for considering the current findings, as longitudinal investigations of reading fluency development in English-speaking children are very limited. The abovementioned results of no group differences in either 7- to 8-year-old or 10- to 11-year-old monolingual and EAL children from Geva and Farnia (2010) provide indirect evidence that reading fluency at both the word- and text-level develops at a similar rate for monolingual and EAL children, although this was not explicitly addressed in this study. Therefore, the current results are some of the first to demonstrate equivalent growth in word and text reading fluency in young L1 and L2 learners of English.

5.5.3 Reading comprehension

When children's reading comprehension was considered in terms of their total scores across the two passages administered at each time point, the results showed that most monolingual and EAL children were generally able to correctly answer at least some comprehension questions, and both group averages' were very similar to the norm mean for this measure. This suggests that the reading comprehension abilities of monolingual and EAL children in this sample were reasonably well developed and age appropriate in both Years 1 and 2. However, monolingual children were able to answer significantly more questions correctly when children's raw scores were compared. Despite this difference in raw scores, the groups did not differ in their standard scores, although once again the means favoured monolingual children. This finding of lower reading comprehension scores in EAL children is consistent with growing evidence that reading comprehension is an area of weakness in the literacy development of children learning in their L2, and there are relatively consistent findings of group differences between L1 and L2 learners across different languages of instruction (Verhoeven, 2000; Burgoyne, Kelly, Whiteley, & Spooner, 2009; Lervåg & Aukrust, 2010; Babayiğit, 2014; Proctor et al., 2012; Melby-Lervåg & Lervåg, 2014). Conversely, there is also precedent in the literature for findings that young L2 learners have age appropriate reading comprehension skills when children's standard or percentile scores are considered, and that these types of scores do not differentiate L1 and L2 learners (Manis et al., 2004; Lesaux & Siegel, 2003). For example, Nakamoto et al. (2007) found that while bilingual children from primarily low-SES, Spanish-speaking homes had reading comprehension percentile scores close to the norm in Grades 1 and 2, by Grade 3 (8- to 9-years-old) their skills were falling below the normal range. One potential explanation for this result could be that the nature of reading comprehension, and its primary predictors, changes over time. As set out by the SVR (Gough & Tunmer, 1986), there is good evidence to support the idea that while decoding and word recognition are the primary determiners of reading comprehension ability in early readers, language skills become increasingly important in older children as the texts they encounter become more complex in their content and language use, and this has been demonstrated in both monolingual and bilingual populations (Catts, Adlof, & Ellis Weismer, 2006; Kendeou, Savage, & van den Broek, 2009; Verhoeven & van Leeuwe, 2012). The current results may therefore reflect the fact that these EAL children's word reading accuracy skills were well developed, and the relatively simplistic nature of the texts they read here (in terms of their linguistic and semantic content) meant that these children's decoding and language abilities were sufficient to make them similar to their monolingual peers in terms of standard scores. However, when groups were compared on the arguably more sensitive measure of raw scores, the significant group differences reveal that even at this early point in literacy development EAL children are at a disadvantage in terms of their ability to access the meaning of the text they read.

Both monolingual and EAL children answered more comprehension questions correctly in Year 2 than Year 1, and this improvement was significant for both groups. Similarly, average standard scores also showed small, but significant, improvement over the year, which suggests that children in both groups made relative gains in their reading comprehension abilities compared to norm expectations. Group comparisons revealed no significant differences in raw or standard score gains made by monolingual and EAL children, suggesting that the groups developed at a similar pace from Year 1 to Year 2. Previous research on the trajectory of reading comprehension development in L1 and L2 learners has reported mixed results, with evidence of slower (Lervåg & Aukrust, 2010), faster (Verhoeven & van Leeuwe, 2012), or similar (Lesaux & Siegel, 2003; Hutchinson et al., 2003) rates of reading comprehension growth by bilingual learners as compared to their monolingual peers. As the current study only includes two time points, it is particularly important to compare these results to those of longitudinal studies of similarly aged children, but studies of reading comprehension in bilingual children this young are rare. Lervåg and Aukrust (2010) studied the reading comprehension development of Urdu-Norwegian children and their monolingual Norwegian peers over the course of 18 months of early education (starting age 7;6 months), and found that on two measures of reading comprehension the bilingual Norwegian children had slower rates of growth compared to monolingual children. However, Hutchinson et al. (2003) found no differences in the reading comprehension development of EAL children from diverse linguistic backgrounds and their monolingual English peers from Year 2 to 4. One potential explanation for this discrepancy is that Norwegian is a relatively consistent orthography, while English is very inconsistent. The impact of this difference is that the development of strong word recognition skills is a more protracted process in English, and this skill may therefore be a stronger determinant of reading comprehension for a longer period of development in English as compared to Norwegian and other consistent orthographies (Florit & Cain, 2011). This could suggest that mono- and bilingual children show a similar trajectory at the beginning of literacy development. However, bilingual learners' weaknesses in other factors that contribute to reading comprehension (particularly language skills) may have an impact on their reading comprehension development at a later point for learners of English, when children's semantic and linguistic knowledge are more challenged. An additional important point is that the lack of faster reading comprehension growth in EAL children means that their disadvantage in terms of raw scores was maintained over the year, and this puts them at risk for continued or even greater reading comprehension weaknesses in the future.

5.5.4 Spelling

In Reception, EAL children had clearly developed some early spelling skills and the majority of children were able to include at least some correct consonants in their spelling attempts. Unfortunately, because a bespoke measure of spelling was used, no norms were available to provide information on whether children's skills at any time point were age-appropriate, but group comparisons in Years 1 and 2 showed that monolingual and EAL children performed very similarly, and there were no significant group differences. Therefore, although there was considerable variability in children's spelling scores, it seems that children from both language backgrounds were able to benefit from spelling instruction in a similar way. These results converge with other studies of different bilingual populations, suggesting that mono- and bilingual children have equivalent spelling skills in their language of instruction (Wade-Woolley & Siegel, 1997; Limbos & Geva, 2001; Chiappe, Siegel, & Wade-Woolley, 2002; Lesaux et al., 2007; Jongejan et al., 2007; Yeong et al., 2014). However, it should also be noted that several studies have found evidence of either stronger (Lesaux et al., 2007; Chiappe et al., 2007), weaker (Verhoeven, 2000; Wang & Geva, 2003; Raynolds & Uhry, 2010), or both stronger and weaker spelling skills in bilingual children, depending on the time of testing (Lesaux & Siegel, 2003). Although task effects due to differences in the spelling measures used are a potential explanatory factor, divergent results have been reported even from studies using the same measure of early spelling skills (Chiappe, Siegel, & Wade-Woolley, 2002; Lesaux & Siegel, 2003). Some of the studies that found group differences looked specifically at transfer effects from children's L1 to their L2, so it may be that in these more targeted, fine-grained assessments of spelling abilities, group differences are more likely to emerge. However, Verhoeven (2000) used a standardised measure of spelling with young Dutch mono- and bilingual learners from primarily Turkish and Moroccan and lower-SES backgrounds, and found group differences in both Grades 1 and 2 (starting age 6;8 years). Although there could be many important reasons for why monolingual children outperformed their bilingual peers on this standard measure, it should be noted that the size of this significant group difference was small, and both groups had standard scores at or above the norm mean. As such, it seems that overall the current findings in conjunction with previous literature support the argument that bilingual learners generally have age appropriate spelling skills that are very similar to those of their monolingual peers, at least on broad measures of early spelling attainment.

In terms of development, EAL children were able to spell significantly more words in Year 1 than in Reception, and similarly their scores in Year 2 were also significantly higher than their scores from the previous year. The same was true for the improvement in monolingual children's spelling scores from Years 1 to Year 2. Group comparisons revealed that there were no differences in the rate of this improvement over time. This developmental effect is consistent with the results of Verhoeven (2000), who found that over four testing points in Grades 1 and 2, there were no group differences in the rate of spelling improvement over time. Chiappe et al. (2007) examined the spelling skills of monolingual English and bilingual Korean-English children in California over an 18-month period of early education (starting age 6;7 months). Once again, there were no significant group differences in terms of children's development, although it is noteworthy that in this study the bilingual children significantly outperformed the monolingual children, and they differed from the current sample in that they were from high-SES backgrounds and attended an award winning school. Nonetheless, the current findings converge with the limited longitudinal data considering spelling development in mono- and bilingual children to suggest that, even when group differences in performance do exist, spelling development seems to progress very similarly regardless of children's language background.

However, further longitudinal evidence from L2 learners of different ages and educational, linguistic, and SES backgrounds will be important in evaluating the generalizability of this conclusion.

5.6 Summary

These results replicate the consistent finding that learning to read words accurately and fluently, both in isolation and in text, progresses in a similar way for children learning in their L1 and their L2. Although both monolingual and EAL children's standard scores on reading accuracy suggested that they did not make as much progress in this skill as would be predicted given norm expectations, both groups made advances in their reading fluency. The development of word reading accuracy has been shown to be fastest in the initial stages of formal education, so this decrease in accuracy standard scores may reflect a natural deceleration in the growth of this aspect of word reading, while increases in fluency standard scores suggest that both groups of children were developing automaticity in their reading skills. However, it should be noted that the text reading accuracy and fluency measures considered only a subgroup of the total sample, and because less accurate readers did not gain a fluency score, this measure likely reflects only the more able readers in both groups. While similar numbers of children from each group were included in the analyses of text reading accuracy and fluency, it is possible that these results overestimate these skills in both groups of children.

There was also strong evidence that spelling skills were similar across groups, and that this skill develops in a very similar way for monolingual and EAL children at this age. Group differences were only evident on the measure of reading comprehension, and only when considering raw scores. As such, while standard scores would suggest that both monolingual and EAL children had age-appropriate comprehension skills at this point in time, the group differences evident in the raw scores revealed that this was already an area of literacy weakness for EAL children. Furthermore, EAL children did not show the faster rates of development that would be necessary for them to 'close the gap' on their monolingual peers. Thus, consistent with previous research, these results suggest that these group differences are likely to be sustained in future. Taken together, these findings support a substantial body of evidence that lower-level literacy skills, including reading accuracy, fluency, and spelling, are similar in mono- and bilingual children (Lesaux et al., 2007; Jongejan et al., 2007; Yeong et al., 2014; Melby-Lervåg & Lervåg, 2014). However, even when bilingual children have age-appropriate reading comprehension skills, they are still likely to be less successful in understanding the meaning of what they read, even at an early stage of development.

Chapter 6 - Predictors of literacy skills in monolingual and EAL children

This chapter will consider how linguistic and cognitive predictor variables and literacy outcomes are related in monolingual and EAL children. Specifically, the third research question set out in Chapter 3 will be addressed.

3) What are the relationships between the linguistic and cognitive predictor variables and the literacy outcomes for both EAL and monolingual children?
   a) What are the similarities and differences in the relationships between various cognitive and linguistic predictors, and literacy skills for these two groups of children?
   b) Do the same cognitive and linguistic skills contribute similarly to the prediction of literacy outcomes for EAL and monolingual children?

These questions were addressed using correlational and hierarchical multiple regression analyses. Firstly, concurrent correlations between the linguistic and cognitive predictors at each time point (t1-t5) will be presented, followed by the correlations between the literacy measures at t3-t5. For EAL children, data were available at all five time points, while for monolingual children data were only collected at t4 and t5. Concurrent correlations between predictor variables will be presented for consecutive time points, with reference to whether the relationships between variables are similar across time points and groups. This same structure will also be followed in the presentation of the correlations for the literacy outcomes.

The concurrent correlational analyses for the predictor variables were used to guide the creation of theoretically motivated composites for the predictor variables at t2 (EAL children) and t4 (EAL and monolingual children), to examine the predictive relationships between variables at these time points and literacy outcomes at t5. To do this, longitudinal correlations and hierarchical multiple regressions were used. These time points were specifically selected as EAL children at t2 were still in preschool, but had a full year of exposure to English in Nursery, and so predicting children's later literacy from this time point was both practically and theoretically preferable compared to t1. The smaller sample size at t3 meant that there was insufficient power at this time point to conduct the desired hierarchical multiple regression analyses. Finally, t4 was the only time point prior to t5 when both monolingual and EAL children were tested, and so including this time point meant the predictive relationships between variables could be compared across groups.

Prior to presenting the results of the concurrent correlations, it is important to clarify which predictors and literacy outcomes were included in the current analyses, as some of the predictor variables included different subscales within the same measure, or had extended versions.

Table 6.1 outlines which versions of the individual predictor measures will be considered in this chapter.

Table 6.1
All individual predictor measures examined in the concurrent correlational analyses, including the constructs they assessed, the time points they were included in, and comments on the scores used.

Variable name	Time point(s) administered	Comments on measures
PA		
Alliteration matching	t1-t2	
Rhyme awareness	t1-t2	
YARC Sound isolation	t3-t4	
YARC Sound deletion	t3-t4	
PhAB Spoonerisms	t5	
YARC LSK	t1-t3	This measure includes both core (t1-t2) and extended (t3) versions
RAN		
Colours	t3-t5	
Shapes	t3-t4	
Letters	t4-t5	
Numbers	t4-t5	
VM		
CELF digit span – total	t3-t5	This measure of VM is the combined score of the CELF digit span forward and backward scales for each participant, and is thereby a measure of both STM and WM.
OL		
RAPT Information	t1-t5	
CELF EV	t1-t5	This measure includes both CELF Preschool (t1-t3) and CELF 4 (t4-5) versions
BPVS	t3-t5	
RAPT Grammar	t1-t5	
CELF SS	t1-t5	This measure includes both CELF Preschool (t1-t3) and CELF 4 (t4-5) versions
CELF WS	t3-t5	This measure includes both CELF Preschool (t3) and CELF 4 (t4-5) versions
Listening Comp	t3-t5	This measure includes both the individual passages (t3-t4) and the combined passages scores (t5)

In all instances for both the cognitive and linguistic predictor and literacy measures, only the raw scores (rather than standard scores) were used in the analyses. The literacy outcomes and their component variables that will be presented in the current chapter are outlined in Table 6.2. The measures of text reading accuracy and fluency that were discussed in the previous chapter (see sections 5.1.2 and 5.2.2) were excluded from the analyses in the current chapter due to the variable number of children who scored on these measures (as a result of the standardised discontinuation rules), and because the more limited sample size affected the power of the hierarchical multiple regression analyses.

Table 6.2
All literacy skills assessed, including the time points they were measured and the component variables.

Variable name	Time point(s) administered	Component measures
Reading accuracy	t3-t5	DTWRP total score (nonword, exception words, regular word subscales)
Reading fluency	t4-t5	TOWRE total score (word and nonword subscales)
Reading comprehension	t4-t5	YARC Passage Reading– total comprehension score
Spelling	t3-t5	Bespoke spelling measure

6.1 Concurrent correlations between linguistic and cognitive predictors in monolingual and EAL children at t1 to t5

As one of the aims of this work was to consider the relationships between cognitive and linguistic predictors in EAL children, as well as similarities and differences between these relationships for monolingual and EAL children over time, the concurrent relationships between variables were examined. A secondary reason for considering these concurrent relationships was to assess the strength of the correlations between measures that were believed to measure the same constructs (such as OL), as this information was used as part of a data reduction process that will be discussed later in this chapter (see section 6.3.1). Pearson's correlations were used at all time points. In addition to this, Spearman's nonparametric correlations were used on the t1 and t2 measures, as all variables showed floor effects at either one or both of these time points, and the distributions of these variables were not improved through transformations. For all sections, the relationships between measures of the same constructs will be considered first, followed by a discussion of how the different cognitive and linguistic predictors were related to each other.

6.1.1 Relationships between predictor variables at t1 for EAL children

As can be seen in Table 6.3, at t1 all measures of EAL children's OL skills (*CELF EV*, *RAPT Information*, *CELF SS*, *RAPT Grammar*) correlated strongly and significantly with one another. The two measures of PA (*Alliteration matching* and *Rhyme awareness*) were only weakly correlated, and the relationship was nonsignificant. *Rhyme awareness* showed weak to moderate correlations with measures of OL, which were significant for *RAPT Information*, *RAPT Grammar*, and *CELF SS*.

Table 6.3

Spearman's correlations (above diagonal) and Pearson's correlations (below diagonal) between cognitive and linguistic predictors for EAL children at t1

		1	2	3	4	5	6	7
1	Alliteration matching		.13	.24*	.24*	.21*	.29**	.35**
2	Rhyme awareness	.21		.30**	.28**	.21	.29**	.25*
3	LSK	.13	.21*		.33**	.33**	.51**	.31**
4	RAPT Information	.19	.27**	.42**		.73**	.86**	.56**
5	CELF EV	.16	.21	.36**	.78**		.71**	.54**
6	RAPT Grammar	.18	.28**	.40**	.88**	.72**		.55**
7	CELF SS	.29**	.32**	.35**	.55**	.52**	.57**	

Note. * $p < .05$ ** $p < .01$

Alliteration matching was only weakly related to the OL measures, and the only significant relationship was between *Alliteration matching* and *CELF SS*. LSK showed moderate and significant relationships with all measures of OL, and a weak but significant relationship with *Rhyme awareness*.

6.1.2 Relationships between predictor variables at t2 for EAL children

The same predictor variables were available at t1 and t2, and the patterns of relationships between the predictors at t2 were similar to those at t1 (see Table 6.4). The few exceptions were that while the relationships between *Alliteration matching* and OL were stronger at t5 as compared to t4, the relationships between *Rhyme awareness* and OL were weaker at t5. *Alliteration matching* was also moderately and significantly related to LSK at t5, while this relationship had been weak and not significant at t4.

Table 6.4

Spearman's correlations (above diagonal) and Pearson's correlations (below diagonal) between cognitive and linguistic predictors for EAL children at t2

		1	2	3	4	5	6	7
1	Alliteration matching		.16	.44**	.23*	.19	.21	.27*
2	Rhyme awareness	.14		.26*	.15	.11	.23*	.24*
3	LSK	.54**	.26*		.38**	.52**	.42**	.37**
4	RAPT Information	.28*	.13	.43**		.71**	.85**	.48**
5	CELF EV	.25*	.12	.47**	.72**		.73**	.44**
6	RAPT Grammar	.23*	.22	.43**	.86**	.71**		.40**
7	CELF SS	.34**	.22*	.36**	.48**	.41**	.42**	

Note. * $p < .05$ ** $p < .01$

6.1.3 Relationships between predictor variables at t3 for EAL children

At t3, additional measures of OL (*BPVS*, *CELF WS*), PA (*Sound isolation*, *Sound deletion*), RAN (*colours*, *shapes*), and VM (*CELF digit span*) were included, and the relationships between all variables can be seen in Table 6.5.

All measures of OL (*BPVS, RAPT Information, CELF EV, CELF SS, RAPT Grammar, CELF WS, Listening comprehension*) showed moderate to strong and significant correlations with each other. The two measures of PA (*Sound isolation, Sound deletion*) also showed a strong and significant relationship, as did the two measures of RAN (*colours, shapes*).

Of the two measures of PA, *Sound deletion* showed a more consistent pattern of relationships with measures of OL, and had moderate to strong and significant correlations with all other predictor measures except word-level vocabulary (*BPVS, CELF EV*). *Sound isolation* had only weak relationships with all OL measures except for moderate and significant correlations with *RAPT Grammar* and *CELF WS*. Correlations between LSK and the OL were weak and not significant, with the exception of two moderate and significant correlations with *RAPT Information* and *RAPT Grammar*. LSK was also moderately and significantly related to *Sound deletion*. Both measures of RAN showed weak relationships with language measures, with the exception that both measures were moderately correlated with *RAPT Grammar*.

Table 6.5
Pearson's correlations between cognitive and linguistic predictors for EAL children at t3

	2	3	4	5	6	7	8	9	10	11	12	13
1 YARC SI	.52**	.27	.27	.18	.27	.29	.29	.21	.33*	.22	.42**	.26
2 YARC SD	-	.39*	.32*	.12	.71**	.55**	.28	.23	.52**	.47**	.61**	.38*
3 YARC LSK		-	.52**	.36*	.12	.38*	.09	.13	.44**	.18	.27	.10
4 RAN colours			-	.54**	.24	.26	-.13	-.05	.32	.19	.08	-.12
5 RAN shapes				-	.08	.23	.10	.03	.32*	.13	.22	-.10
6 Digit recall total					-	.32*	.21	.11	.36*	.54**	.49**	.25
7 RAPT Information						-	.56**	.47**	.70**	.52**	.66**	.56**
8 CELF EV							-	.78**	.59**	.53**	.76**	.53**
9 BPVS								-	.36*	.49**	.68**	.62**
10 RAPT Grammar									-	.49**	.63**	.34*
11 CELF SS										-	.66**	.50**
12 CELF WS											-	.51**
13 Listening Comp												-

Note. * p < .05 ** p < .01. YARC SI = Sound isolation, YARC SD = Sound deletion

Relationships between RAN and PA were also weak, although there was a moderate and significant relationship between RAN *colours* and *Sound deletion*, and both measures of RAN showed moderate to strong correlations with LSK. VM generally showed weak to moderate relationships with language measures, although it was strongly correlated with *CELF SS*. While the relationship between *Sound isolation* and VM was weak, there was a strong and significant correlation between VM and *Sound deletion*. VM and the measures of both LSK and RAN were only weakly associated.

The relationships between the measures of OL, PA, and LSK at t3 were generally similar to those seen at t1 and t2, with some small exceptions. The strong, significant relationship between the two measures of PA at t3 was in contrast to the weak and not significant relationship between the two measures of this construct at t1 and t2. PA was generally more strongly related to OL at t3 as compared to at t1 and t2, while OL and LSK tended to show weaker relationships at t3 compared to at the previous time points.

6.1.4 Relationships between predictor variables at t4 for monolingual and EAL children

At t4, the test battery was once again expanded to include additional measures of RAN (*letters, numbers*), and at this time point data were available for both monolingual and EAL children. As in the previous sections, concurrent correlations between measures of the same constructs will be addressed first, followed by relationships between the different predictors. Results for monolingual children will be presented first, and then results from the EAL group will be considered in terms of how they are similar and different to those reported for the monolingual children (see Table 6.6). Additionally, results for the EAL children will also be discussed with regards to how they compare to the previous time points.

6.1.4.1 Predictor relationships in monolingual children

As expected, measures of the same constructs correlated well with each other for monolingual children at t4. All measures of OL correlated moderately to strongly and significantly with one another, and the relationship between the PA measures *Sound isolation* and *Sound deletion* was also strong and significant. Similarly, the four measures of RAN were moderately to strongly and significantly correlated.

Turning now to the correlations between different predictor variables in monolingual children, *Sound isolation* and *Sound deletion* were moderately to strongly and significantly related to all measures of RAN (with the exception of a weak and nonsignificant relationship between RAN *colours* and *Sound isolation*), although the strength of these correlations tended to be stronger between RAN and *Sound deletion* as compared to *Sound isolation*. Similarly, while the correlation between VM and *Sound isolation* was moderate and significant, *Sound deletion* and VM were strongly related. Although *Sound deletion* showed moderate to strong relationships with all measures of OL, *Sound isolation* was only weakly to moderately (although often significantly) correlated with OL.

The four measures of RAN showed similar moderate and significant relationships with VM. Although all RAN measures were weakly to moderately related to OL, the strength of these relationships tended to be stronger for RAN *colours* and *shapes*. Finally, the relationships between VM and OL were consistently strong and significant, and similar across the different measures of OL. Overall, there was a consistent pattern for the PA measure of *Sound deletion* to be more related to other cognitive and linguistic predictors than *Sound isolation* for these children. While RAN *colours* and *shapes* was more strongly related to OL, RAN *letters* and *numbers* showed stronger relationships with PA, while all measures of RAN showed similar relationships with VM.

6.1.4.1 Predictor relationships in EAL children as compared to monolingual children

Similarly to monolingual children, there were moderate to strong and significant relationships between all measures of the same constructs at t4, although for *Sound deletion* and RAN these intercorrelations tended to be stronger for EAL children.

Overall, the relationships between the predictors were similar for monolingual and EAL children, although there were some small group differences. Although the strength of relationships between alphanumeric RAN and PA were similar across groups, EAL children's PA was only moderately correlated with RAN *colours* and only weakly and nonsignficantly correlated with RAN *shapes*. Both *Sound isolation* and *Sound deletion* were strongly correlated with VM in EAL children, and both measures of PA correlated moderately to strongly with OL measures, suggesting that *Sound isolation* showed consistently stronger relationships with VM and OL in EAL as compared to monolingual children. Relationships between RAN measures and VM were generally moderate, significant, and similar across the groups, although for EAL children VM and RAN shapes were only weakly and nonsignificantly related. While all RAN measures were weakly to moderately associated with the OL measures, alphanumeric RAN tended to show stronger correlations with language skills than did RAN *colours* and *shapes*, which was the opposite pattern to that seen for monolingual children. The relationships between VM and OL were similar across groups, although slightly weaker for EAL children.

Therefore, it seemed that the pattern of relationships between predictors was very comparable across groups, with some small group differences related to the correlations between individual measures of PA and RAN and other predictors.

6.1.5 Relationships between predictor variables at t5 for monolingual and EAL children

At t5, all the variables measured at t4 were measured again, with the exception that the PA measures of *Sound isolation* and *Sound deletion* were replaced with the *Spoonerisms* task. Once again in this section, concurrent relationships between the predictors will be presented for monolingual children first, followed by a comparison of results for EAL children (see Table 6.7). The pattern of relationships will also be compared to those at previous time points for both groups.

6.1.5.1 Predictor relationships in monolingual children

In terms of the relationships between measures of the same constructs, the correlations between measures of OL in monolingual children at t5 were generally moderate to strong and significant, with the exception that *RAPT Information* and *RAPT Grammar* were only weakly and nonsignificantly related to most other OL measures. Although most of the relationships between the measures of RAN were moderate to strong and significant in nature, RAN *shapes* and *colours* were only weakly correlated.

While RAN *shapes* and *letters* were moderately and significantly related to PA, RAN *colours* and *numbers* were only weakly and nonsignificantly related to PA. PA was also moderately and significantly correlated with VM, and moderately to strongly related to OL. With the exception of a weak, nonsignificant relationship for RAN *colours*, VM and RAN were moderately and significantly related. Overall the relationships between RAN and OL were weak and nonsignificant (with the exception of moderate and significant relationships between *CELF SS* and RAN *shapes* and *letters*, and *CELF WS* and RAN *letters*). VM was weakly correlated with most measures of OL with the exception of two vocabulary measures (*BPVS*, *CELF EV*) and *Listening comprehension*, where the correlations were moderate and significant.

Overall, the was a general trend for the relationships between measures of the same constructs and between different constructs to be weaker at t5 as compared to t4, but the patterns of relationships was similar across time points.

6.1.5.2 Predictor relationships in EAL children as compared to monolingual children

Similarly to monolingual children, the correlations between all measures of OL at t5 were moderate to strong and significant, with the exception that the relationship between *CELF SS* and *Listening comprehension* was weak and nonsignificant. However, the strength of the relationships between measures of RAN were generally stronger in EAL children.

The pattern of relationships between the predictors was also very similar across groups, with some minor differences. PA and RAN were similarly related with the exception that PA and RAN *colours* showed a slightly stronger, moderate and significant relationship for EAL children. VM was moderately and significantly correlated with RAN *colours*, *letters*, and *numbers*, but showed only a weak relationship with RAN *shapes*. VM also showed weak relationships with all OL measures except grammar measures (*CELF SS*, *CELF WS*, *RAPT Grammar*), which were moderately and significantly correlated with VM. This suggests that grammar (rather than vocabulary and *Listening comprehension* in monolingual children) was related to VM in EAL children.

Similarly to the monolingual children, there was a trend for measures of different constructs to be less strongly related at t5 as compared to t4. However, measures of the same constructs (OL, RAN) showed similar moderate to strong relationships across time points. Furthermore, the pattern of correlations between variables was similar from t4 to t5, suggesting that these relationships were relatively stable over time.

Table 6.6

Pearson's correlations between cognitive and linguistic predictors at t4 for monolingual and EAL children

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	YARC Sound isolation	-	.72**	.38**	.20	.58**	.64**	.58**	.38**	.35*	.60**	.44**	.50**	.62**	.42**
2	YARC Sound deletion	.52**	-	.38**	.16	.52**	.58**	.60**	.42**	.44**	.60**	.52**	.50**	.69**	.42**
3	RAN colours	.22	.51**	-	.68**	.60**	.62**	.36**	.44**	.19	.27	.34*	.30*	.38**	.32*
4	RAN shapes	.41**	.44**	.36**	-	.49**	.52**	.17	.40**	.20	.17	.34*	.18	.19	.13
5	RAN letters	.54**	.63**	.56**	.45**	-	.85**	.38**	.38**	.20	.33*	.43**	.40**	.39**	.32*
6	RAN numbers	.46**	.58**	.56**	.51**	.79**	-	.42**	.50**	.25	.43**	.48**	.38**	.38**	.43**
7	Digit recall total	.31*	.61**	.46**	.44**	.40**	.39**		.24	.35*	.48**	.33*	.43**	.58**	.43**
8	RAPT Information	.25	.38**	.23	.26	.19	.27	.49**	-	.40**	.52**	.78**	.37**	.50**	.38**
9	CELF EV	.33*	.59**	.41**	.45**	.33*	.27	.59**	.56**	-	.77**	.46**	.43**	.51**	.56**
10	BPVS	.27	.48**	.33*	.37**	.22	.16	.61**	.46**	.82**	-	.56**	.67**	.67**	.65**
11	RAPT Grammar	.34*	.50**	.41**	.32*	.42**	.32*	.55**	.54**	.50**	.50**	-	.46**	.67**	.41**
12	CELF SS	.13	.45**	.37**	.37**	.23	.20	.57**	.43**	.67**	.64**	.47**	-	.60**	.64**
13	CELF WS	.29*	.60**	.40**	.19	.44**	.33*	.65**	.33*	.58**	.61**	.40**	.58**	-	.49**
14	Listening comprehension	.27*	.46**	.39**	.28*	.19	.14	.53**	.36**	.64**	.64**	.51**	.50**	.63**	-

Note. Correlations for monolingual children are shown below the diagonal; correlations for EAL children are shown above the diagonal. * $p < .05$ ** $p < .01$.

Table 6.7
Pearson's correlations between cognitive and linguistic predictors at t5 for monolingual and EAL children

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Spoonerism	-	.36*	.40**	.33*	.28	.47**	.45**	.44**	.30*	.42**	.29	.51**	.15
2	RAN colours	.14	-	.55**	.64**	.66**	.49**	.27	.20	.22	.43**	.27	.18	.26
3	RAN shapes	.34*	.16	-	.55**	.45**	.20	.11	.08	-.14	-.03	-.02	-.01	-.01
4	RAN letters	.38**	.50**	.33*	-	.76**	.35*	.23	.21	.26	.34*	.24	.23	.13
5	RAN numbers	.24	.47**	.41**	.53**	-	.33*	.13	.18	.22	.26	.22	.27	.13
6	Digit recall total	.41**	.16	.36*	.28*	.31*		.28	.24	.23	.46**	.36*	.47**	.23
7	RAPT Information	.32*	.11	.07	.15	.12	.19	-	.42**	.37*	.68**	.42**	.53**	.42**
8	CELF EV	.52**	.00	.11	.20	.06	.38**	.31*	-	.76**	.47**	.55**	.62**	.41**
9	BPVS	.57**	.01	.27	.31*	.04	.55**	.25	.75**	-	.47**	.56**	.53**	.47**
10	RAPT Grammar	.30*	.02	.09	-.02	-.11	.15	.62**	.34*	.26	-	.39**	.63**	.48**
11	CELF SS	.40**	-.13	.33*	.32*	.13	.27	.34*	.51**	.62**	.20	-	.55**	.19
12	CELF WS	.47**	-.04	.08	.39**	-.05	.30*	.13	.56**	.64**	.22	.43**	-	.46**
13	Listening comprehension	.36*	.07	.05	.23	-.03	.30*	.27	.66**	.65**	.28	.47**	.56**	-

Note. Correlations for monolingual children are shown below the diagonal; correlations for EAL children are shown above the diagonal.
* $p < .05$ ** $p < .01$

6.2 Concurrent correlations between literacy outcomes in monolingual and EAL children

Another aim of this thesis was to consider the relationships between literacy outcome measures in monolingual and EAL children, and to compare these relationships across groups and time points. As for the cognitive and linguistic predictors, Pearson's correlations were used to examine the concurrent relationships between the two literacy outcomes (reading accuracy, spelling) at t3 for EAL children, and the four literacy outcomes (reading accuracy, reading fluency, reading comprehension, spelling) at t4 and t5 for monolingual and EAL children. In line with the aims set out at the beginning of this chapter, this section will discuss the similarities and differences in the relationships between the different literacy outcomes for monolingual and EAL children, and consider how these relationships changed over time.

6.2.1 Relationships between literacy outcomes for EAL children at t3

At t3, when data were only available for EAL children, there was a strong, significant relationship between reading accuracy and spelling ($r = .77$, $p < .01$).

6.2.2 Relationships between literacy outcomes for monolingual and EAL children at t4

As can be seen in Table 6.8, there was a very strong relationship between reading accuracy and reading fluency for monolingual children at t4, while other literacy skills were strongly and significantly related. The three reading outcomes were more strongly related to one another than they were to spelling.

Table 6.8
Pearson's correlations between literacy outcomes at t4 for monolingual and EAL children

		1	2	3	4
1	Reading accuracy	-	.91**	.68**	.74**
2	Reading fluency	.93**	-	.71**	.77**
3	Reading comprehension	.74**	.71**	-	.69**
4	Spelling	.58**	.52**	.51**	-

Note. Correlations for monolingual children are shown below the diagonal; correlations for EAL children are shown above the diagonal. * $p < .05$ ** $p < .01$

For EAL children, the pattern and strength of the correlations between the literacy outcomes were very similar to those for monolingual children, with the exception that spelling was more strongly related to reading than for monolingual children. This meant that the strength of the relationships between all literacy outcomes was relatively consistent. Furthermore, the strength of the relationship between reading accuracy and spelling in EAL children at t4 was very similar to that found at t3.

6.2.2.1 Relationships between literacy outcomes for monolingual and EAL children at t5

As can be seen in Table 6.9, at t5 the relationships between all literacy outcomes in monolingual children remained strong and significant, or very strong and significant in the case of the correlation between reading accuracy and fluency.

Table 6.9

Pearson's correlations between literacy outcomes at t5 for monolingual and EAL children

	1	2	3	4
1 Reading accuracy	-	.87**	.61**	.78**
2 Reading fluency	.90**	-	.51**	.60**
3 Reading comprehension	.74**	.64**	-	.46**
4 Spelling	.76**	.68**	.53**	-

Note. Correlations for monolingual children are shown below the diagonal; correlations for EAL children are shown above the diagonal. * $p < .05$ ** $p < .01$

This suggests that relationships between literacy skills were relatively stable over time. The only notable exceptions were that there was a slight decrease in the strength of the relationship between reading fluency and comprehension, while reading accuracy and fluency were more strongly related to spelling at t5 as compared to at t4.

For EAL children at this time point, it was once again true that correlations between the literacy variables were similar to those seen for the monolingual group. Small group differences were found in that the relationships between reading accuracy and fluency and reading comprehension were slightly weaker in EAL children, and reading fluency and comprehension were less related to spelling for this group of children at this time point. As compared to the relationships between literacy outcomes in EAL children at t3, and t4, there was a general trend for all of these to be weaker at this final testing point. Most notably, t5 reading accuracy and fluency showed weaker relationships with reading comprehension than were seen at t4, and t5 reading fluency and comprehension were less related to spelling than at t4. However, overall the pattern of strength was similar across groups and stable across time points, with consistently strong, significant relationships between all measures of reading and spelling.

6.3 Longitudinal predictors of literacy skills in monolingual and EAL children

Given the large amount of available data and the considerable number of potential longitudinal correlations that could be analysed, it was decided to limit the examination of longitudinal relationships between predictor variables and literacy outcomes. Specifically, longitudinal relationships between linguistic and cognitive predictors measured in t2 (end of Nursery) and literacy outcomes measured at t5 (Year 2) were considered for EAL children. Additionally, the relationships between predictors measured at t4 (Year 1) and literacy outcomes at t5 (Year 2) were examined for both groups. These time points were considered for further analyses for the reasons outlined at the beginning of this chapter.

In addition to longitudinal correlation, hierarchical multiple regression and commonality analyses were conducted in order to consider the individual contributions of the predictor variables (and when available, also the autoregressors) to predicting literacy skills at t5. The order in which variables were entered into the blocks was varied to establish what percentage of variance each variable could explain independently (when entered at the first step), as well as the variance each could explain uniquely (i.e., over and above the other predictors when entered at the last step). Hierarchical multiple regression and commonality analyses were chosen over other potential statistical methods (e.g., structural equation modelling, multilevel linear modelling) due to the relatively small sample size of the current study.

6.3.1 Data preparation

Due to the large number of predictor variables, and the moderate to strong correlations between measures of the same constructs found at t2 and t4, several theoretically motivated composite variables were created. All individual variable raw scores were converted to z-scores, and the selected variables were combined using principal component analysis (PCA). The individual and composite variables used in the hierarchical multiple regressions are outlined below in

Table 6.10 for the t2 predictors, and in Table 6.11 for the t4 predictors.

Table 6.10
T2 predictors (and their component measures) used to predict t5 literacy outcomes for EAL children

Predictor name	Variable composition	Component variables	Comments
PA	Individual variable	Alliteration matching	As Alliteration matching and Rhyme awareness were not significantly correlated at t2 (see Table 6.4), they could not be combined into a composite. Alliteration matching was chosen as this measure assessed onset awareness and may therefore be more strongly linked to literacy development (Caravolas, Volín, & Hulme, 2005).
LSK	Individual variable	LSK (core)	
OL	Composite variable	RAPT Information CELF SS RAPT Grammar CELF SS	

Table 6.11
T4 predictors (and their component measures) used to predict t5 literacy outcomes for monolingual and EAL children

Predictor name	Variable composition	Component variables
Phonological Processing (PP)	Composite variable	YARC Sound isolation
		YARC Sound deletion
		RAN colours
		RAN shapes
		RAN letters
		RAN numbers
VM	Individual variable	CELF digit span total
OL	Composite variable	RAPT Information
		CELF SS
		BPVS
		RAPT Grammar
		CELF SS
		CELF WS
		Listening comprehension

For the theoretically motivated composites, the variables chosen for inclusion in each composite were included in a PCA, and in all instances the analyses returned a one-factor solution. The Kaiser-Meyer-Olkin measure was used to verify that the sampling adequacy for all composites was considered at least good (KMO > .7 for all composites, and KMO > .7 for all individual variables; Field, 2009). Additionally, the Bartlett's test of sphericity confirmed that the individual variables within the composites correlated with each other sufficiently strongly to be included in a PCA.

6.3.2 Prediction of t5 literacy outcomes from t2 predictors for EAL children

This section will consider the predictive relationships between t2 PA, LSK, and OL in EAL children and their literacy skills at t5. First, longitudinal correlations between the predictors and the literacy outcomes will be presented, and this will be followed by the results of the hierarchical multiple regressions. Hierarchical multiple regression results will be displayed in pie charts showing the unique variance explained by each predictor, along with the shared and unexplained variance. However, tables of these results are also presented in appendix 6.

6.3.2.1 Longitudinal correlations between t2 predictors and t5 literacy outcomes for EAL children

As can be seen in Table 6.12, EAL children's t2 PA was only weakly and not significantly correlated with any of the t5 literacy outcomes. LSK was moderately and significantly related to both reading accuracy and fluency, but only weakly and not significantly related to reading comprehension and spelling at t5. In contrast, t2 OL was moderately to strongly correlated with all t5 literacy skills, and showed the strongest relationship (r = .61) with reading comprehension.

Table 6.12

Pearson's correlations between t2 predictors and t5 literacy outcomes for EAL children

	t5 Reading accuracy	t5 Reading fluency	t5 Reading comprehension	t5 Spelling
t2 PA	.23	.21	.03	.10
t2 LSK	$.37^{*}$	$.34^{*}$	.16	.22
t2 OL	$.49^{**}$	$.57^{**}$	$.61^{**}$	$.36^{*}$

Note. * $p < .05$ ** $p < .01$

6.3.2.2 Hierarchical multiple regression models of t5 literacy outcomes from t2 predictors in EAL children

Figure 6.1 through Figure 6.4 show that t2 PA, LSK, and OL together predicted between 14.04 – 39.96% of variance in the t5 literacy outcomes, with the least amount of variance explained in spelling and the most in reading comprehension. The amount of variance explained by the shared contribution of the three predictors was greatest for reading accuracy (12.34%) and reading fluency (11.15%), while there was limited shared variance between the predictors for spelling (3.76%) and reading comprehension (0.62%).

Although these models predicting t5 literacy from the three t2 predictors were significant for reading accuracy ($F(3, 38) = 5.01$, $p = .005$), reading fluency ($F(3, 37) = 6.47$, $p = .001$), and reading comprehension ($F(3, 36) = 7.99$, $p < .001$), the model predicting spelling was not significant ($F(3, 38) = 2.07$, $p = .121$). This suggests that while early measures of these three skills together were significantly related to reading outcomes at t5 for EAL children, this was not the case for spelling, and so the unique contributions of the predictors to t5 spelling should be considered cautiously.

6.3.2.2.1 The predictive relationships between t2 PA and t5 literacy in EAL children

Overall, EAL children's t2 PA explained very little variance in any of the literacy outcomes, and the unique contribution of this predictor was less than 1% for reading accuracy (0.03%), reading fluency (0.16%), and spelling (0.45%). For reading comprehension, PA uniquely explained a slightly greater 2.43%. However, none of these contributions were significant.

6.3.2.2.2 The predictive relationships between t2 LSK and t5 literacy in EAL children

Similarly to PA, the unique contribution of t2 LSK to predicting all t5 literacy outcomes in EAL children was very limited. LSK explained almost no variance in reading comprehension (0.04%), slightly more in spelling (1.00%) and reading fluency (1.70%), and the most in reading accuracy (3.90%), however once again the unique contributions of this predictor were not significant for any reading or spelling outcome.

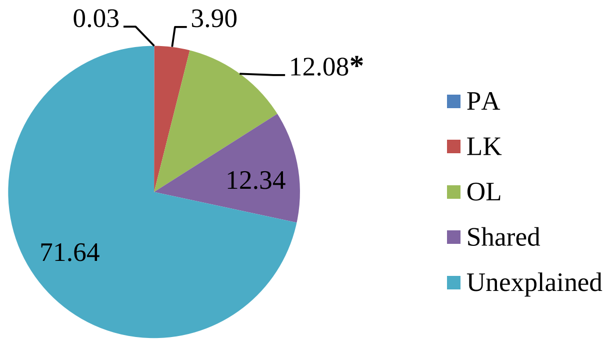

Figure 6.1
Percent of variance explained in t5 reading accuracy by the unique and shared contributions of t2 PA, LK, OL for EAL children

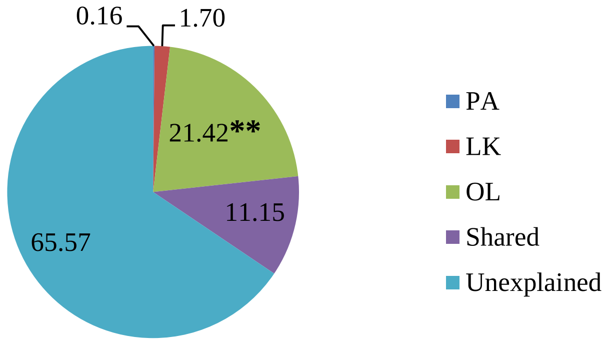

Figure 6.2
Percent of variance explained in t5 reading fluency by the unique and shared contributions of t2 PA, LK, OL for EAL children

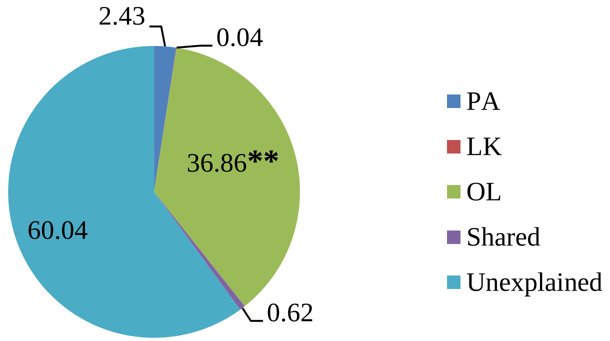

Figure 6.3
Percent of variance explained in t5 reading comprehension by the unique and shared contributions of t2 PA, LK, OL for EAL children

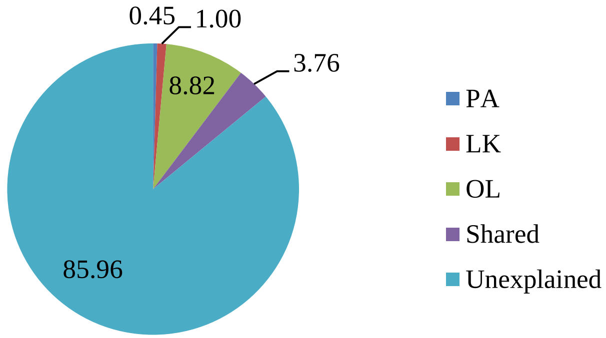

Figure 6.4
Percent of variance explained in t5 spelling by the unique and shared contributions of t2 PA, LK, OL for EAL children

6.3.2.2.3 The predictive relationships between t2 OL and t5 literacy in EAL children

EAL children's OL skills at t2 were the best predictor of all literacy outcomes at t5, making significant contributions to all reading outcomes. OL explained the most variance in reading comprehension, accounting for 36.86% of the total 39.96% of variance explained by the model. For reading fluency, the unique contribution of OL was 21.42%, and 12.08% for reading accuracy. Finally, for spelling OL uniquely explained 8.82% of variance, although it should be noted that this contribution was only marginally significant and the model overall was not significant, so this contribution should not be over interpreted.

6.3.3 Prediction of t5 literacy outcomes from t4 predictors for monolingual and EAL children

In this section, the predictive relationships between t4 PP, VM, OL, and literacy skills (autoregressors) and literacy skills at t5 will be considered for both monolingual and EAL children. Longitudinal correlations between the predictors and the literacy outcomes will be presented first, followed by the results of the hierarchical multiple regressions.

6.3.3.1 Longitudinal correlations between t4 predictors and t5 literacy outcomes for monolingual children

Longitudinal correlations between the t4 predictor and literacy measures and the t5 literacy measures in monolingual children are shown in Table 6.13. There were strong, significant relationships between t4 PP and all t5 literacy outcomes. These relationships were particularly strong for reading accuracy and fluency, and weakest for reading comprehension. VM at t4 showed moderate, significant relationships that were very similar in strength for t5 reading accuracy, fluency, and spelling, but was only weakly and not significantly correlated with t5 reading comprehension. There were similar moderate, significantly relationships between t4 OL and t5 reading accuracy, fluency, and spelling, while the longitudinal correlation between VM and reading comprehension was strong and significant. As such, overall t4 PP showed the strongest relationship with t5 reading accuracy, fluency, and spelling, while reading comprehension was most strongly related to t4 OL.

Table 6.13
Pearson's correlations between t4 predictor composites, t4 literacy measures, and t5 literacy outcomes for monolingual and EAL children

	t5 Reading accuracy	t5 Reading fluency	t5 Reading comprehension	t5 Spelling
Monolingual				
t4 PP	.78**	.82**	.51**	.68**
t4 VM	.40**	.28	.42**	.42**
t4 OL	.44**	.34*	.65**	.47**
t4 Reading accuracy	.90**	.80**	.78**	.70**
t4 Reading fluency	.86**	.84**	.70**	.62**
t4 Reading comprehension	.67**	.62**	.80**	.62**
t4 Spelling	.56**	.49**	.48**	.60**
EAL				
t4 PP	.67**	.76**	.34*	.40**
t4 VM	.60**	.49**	.61**	.54**
t4 OL	.61**	.57**	.64**	.41**
t4 Reading accuracy	.89**	.74**	.50**	.74**
t4 Reading fluency	.84**	.80**	.48**	.65**
t4 Reading comprehension	.68**	.56**	.67**	.54**
t4 Spelling	.75**	.67**	.45**	.63**

Note. * $p < .05$ ** $p < .01$

With regards to the correlations between the t4 literacy skills and t5 literacy skills in monolingual children, these relationships were consistently strong or very strong for all reading measures, with particularly strong relationships between reading accuracy and fluency. Spelling at t4 showed weaker longitudinal relationships with reading outcomes that were moderate but significant for t5 reading fluency and comprehension. However, all t4 reading measures were strongly correlated with t5 spelling. Finally, of particular relevance to the hierarchical multiple regression analyses that will follow, the autoregressive correlations between the t4 and t5 versions of all the reading measures were very strong, while the autoregressive correlation for spelling was strong and significant.

6.3.3.2 Longitudinal correlations between t4 predictors and t5 literacy outcomes for EAL children

Although there were many similarities in the pattern of strength of the correlations between t4 predictors (PP, VM, OL) and t5 literacy outcomes for EAL children as compared to their monolingual peers, there were some notable differences (see Table 6.13). The relationships between PP and all literacy skills were weaker for EAL children, and this was most pronounced for the relations to t5 reading comprehension and spelling which were moderate and significant for EAL children (as opposed to strong in the monolingual children). Conversely, t4 VM showed stronger relationships with all t5 reading and spelling measures, and these differences were particularly evident for reading accuracy and comprehension. Finally, the relationships between t4 OL and t5 reading accuracy and fluency were stronger in EAL children, and also as strong as the correlation between t4 OL and t5 reading comprehension seen in both groups. Overall this seems to suggest a pattern of weaker longitudinal relationships between measures of PP and literacy skills, but stronger relationships between VM and OL for EAL children as compared to their monolingual peers.

The longitudinal relationships between t4 and t5 literacy measures were more consistent across groups, and these relationships were generally also strong and significant for EAL children. The few exceptions were that t4 reading accuracy and fluency were only moderately to strongly related to t5 reading comprehension, and these correlations were weaker in EAL as compared to monolingual children. The relationships between t4 spelling and t5 reading accuracy and fluency were stronger in EAL children, and were strong and significant. Finally, the autoregressive correlation between t4 and t5 reading accuracy was weaker in EAL children, although still strong and significant.

Overall this suggests that PP was more strongly related to literacy in monolingual children, while VM and OL showed stronger relationships to literacy skills in EAL children, but there were fairly consistent and strong longitudinal relationships between literacy measures across groups.

6.3.3.3 Hierarchical multiple regression models of t5 literacy outcomes from t4 predictors in monolingual children

As can be seen in Figure 6.5, Figure 6.7, Figure 6.9, and Figure 6.11, the predictors at t4 (PP, VM, OL) along with the relevant t4 literacy skill (autoregressor) predicted between 60.32% - 86.76% of the variance in the t5 literacy outcomes, with the largest amounts of variance accounted for in t5 reading accuracy and fluency, followed by reading comprehension, and finally spelling. For all t5 literacy outcomes, the majority of explained variance was accounted for by the shared contribution of the three predictors and the autoregressor together (33.81% - 59.83%), suggesting that there was considerable overlap in the explanatory power of predictors and the autoregressors. The autoregressors also explained the most unique variance in all reading outcome models, uniquely accounting for significant amounts of variance in reading accuracy (23.54%), reading fluency (15.99%), and reading comprehension (13.56%). For t5 reading comprehension, t4 reading comprehension was also the only significant unique predictor in the model. For t5 spelling, although t4 PP predicted more variance than t4 spelling, the latter still uniquely explained a significant 9.05% of variance. Overall, the final models predicting t5 literacy skills from the t4 predictors (PP, VM, OL, autoregressor) were significant for reading accuracy ($F(4, 42) = 68.83$, $p < .001$), reading fluency ($F(4, 39) = 47.36$, $p < .001$), reading comprehension ($F(4, 41) = 20.70$, $p < .001$), and spelling ($F(4, 42) = 15.96$, $p < .001$).

6.3.3.3.1 The predictive relationships between t4 PP and t5 literacy in monolingual children

Aside from the autoregressors, t4 PP was the best unique predictor of all t5 literacy outcomes for monolingual children. PP explained the most unique variance in spelling (15.31%), followed by reading fluency (9.23%), and then reading accuracy (2.86%), and was a significant unique predictor of these three literacy skills. For reading comprehension, PP explained a smaller and nonsignificant amount of unique variance (1.91%). However, in all instances the variance explained by PP alone was greater than either VM or OL.

6.3.3.3.2 The predictive relationships between t4 VM and t5 literacy in monolingual children

Monolingual children’s VM was not a strong predictor of most literacy outcomes, and explained very limited and nonsignificant amounts of variance in reading accuracy (0.16%), reading comprehension (0.21%), and spelling (0.04%). For reading fluency, VM was a significant predictor, but only explained a relatively modest amount of unique variance (2.91%).

6.3.3.3.3 The predictive relationships between t4 OL and t5 literacy in monolingual children

OL at t4 was also not a strong predictor of t5 literacy skills in monolingual children. The unique variance explained by this predictor was very small for reading accuracy (0.38%), reading fluency (0.00%), reading comprehension (1.32%), and spelling (2.11%), and none of these unique contributions were significant in the literacy outcome models.

Overall PP was clearly the strongest unique predictor of all literacy skills (over and above the respective autoregressors), and made significant contributions to all literacy outcomes except reading comprehension. VM was a significant predictor of reading fluency, while OL did not uniquely predict any literacy outcomes for monolingual children.

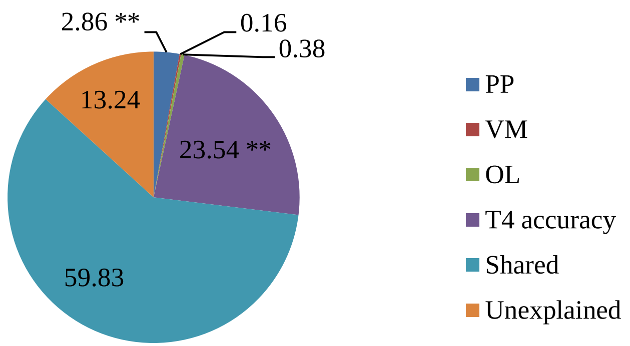

Figure 6.5
Percent of variance explained in t5 reading accuracy by the unique and shared contributions of t4 PP, VM, OL, and t4 reading accuracy for monolingual children

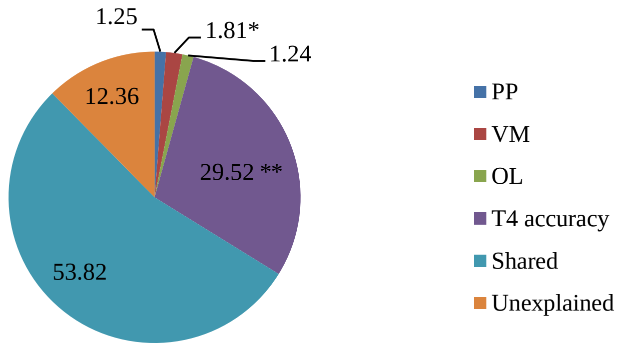

Figure 6.6
Percent of variance explained in t5 reading accuracy by the unique and shared contributions of t4 PP, VM, OL, and t4 reading accuracy for EAL children

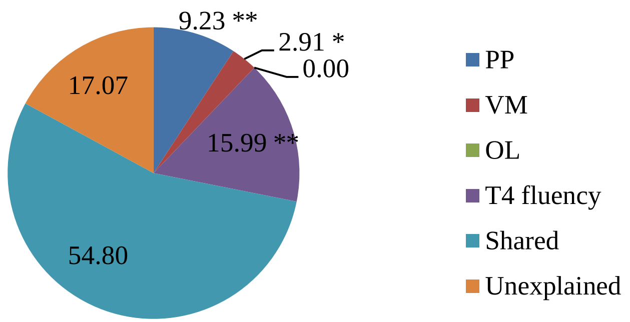

Figure 6.7
Percent of variance explained in t5 reading fluency by the unique and shared contributions of t4 PP, VM, OL, and t4 reading fluency for monolingual children

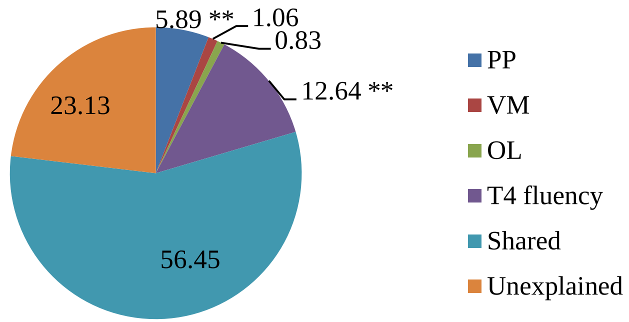

Figure 6.8
Percent of variance explained in t5 reading fluency by the unique and shared contributions of t4 PP, VM, OL, and t4 reading fluency for EAL children

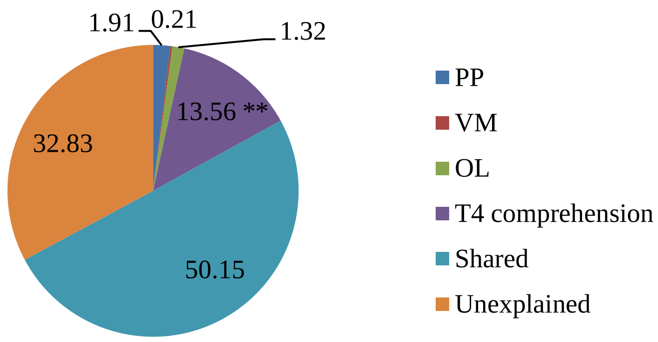

Figure 6.9
Percent of variance explained in t5 reading comprehension by the unique and shared contributions of t4 PP, VM, OL, and t4 reading comprehension for monolingual children

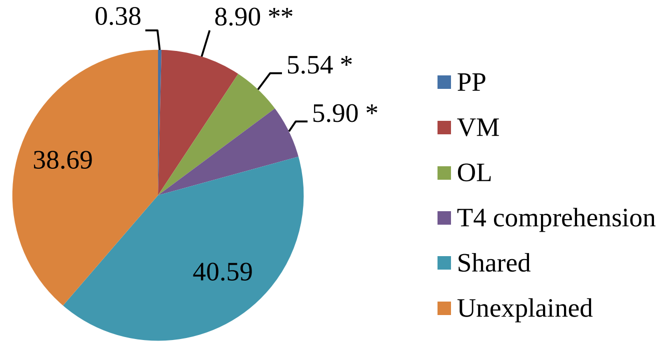

Figure 6.10
Percent of variance explained in t5 reading comprehension by the unique and shared contributions of t4 PP, VM, OL, and t4 reading comprehension for EAL children

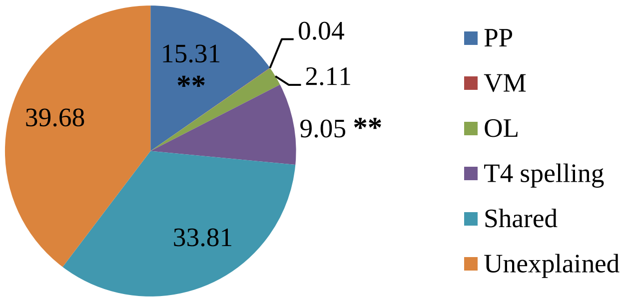

Figure 6.11
Percent of variance explained in t5 spelling by the unique and shared contributions of t4 PP, VM, OL, and t4 spelling for monolingual children

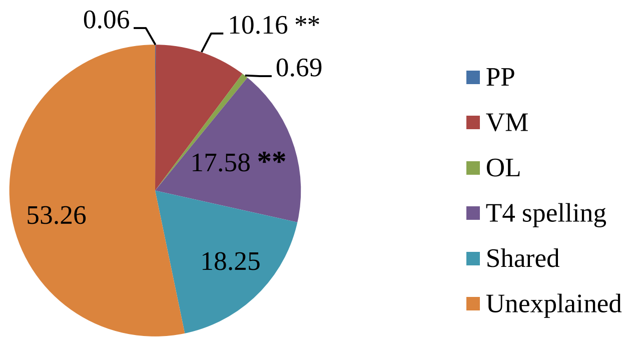

Figure 6.12
Percent of variance explained in t5 spelling by the unique and shared contributions of t4 PP, VM, OL, and t4 spelling for EAL children

6.3.3.4 Hierarchical multiple regression models of t5 literacy outcomes from t4 predictors in EAL children

For EAL children, t4 predictors (PP, VM, and OL) and autoregressors together explained between 46.74% - 87.64% of the variance in the four literacy outcomes, with the most variance accounted for in reading accuracy, followed by reading fluency, reading comprehension, and the least explained in spelling (see Figure 6.6, Figure 6.8, Figure 6.10, and Figure 6.12). Similar to the monolingual children, the majority of the explained variance in each model was explained by the shared contribution of the three predictors and the relevant autoregressor. This proportion was between 18.25% - 56.45%, and highest for reading fluency, followed by reading accuracy, reading comprehension, and finally spelling. EAL children's t4 literacy skills were the best unique predictor of their t5 performance on the same measure of literacy for three literacy outcomes, and these t4 autoregressors explained a significant 29.52% of the variance in t5 reading accuracy, 12.64% in t5 reading fluency, and 17.58% in t5 spelling. Although VM contributed more to the model of t5 reading comprehension than did t4 reading comprehension, this autoregressor still uniquely explained a significant 5.90% of the variance in this outcome. Together, the three predictors and the autoregressors significantly predicted t5 reading accuracy ($F(4, 39) = 69.16$, $p < .001$), reading fluency ($F(4, 39) = 32.41$, $p < .001$), reading comprehension ($F(4, 38) = 15.05$, $p < .001$), and spelling ($F(4, 39) = 8.56$, $p < .001$).

Compared to the monolingual children, the models of reading accuracy and fluency demonstrated similar amounts of explained and shared variance, and the variance explained by the t4 autoregressor was also relatively similar across groups for these two literacy outcomes. However, for t5 reading comprehension, although the amount of explained variance was similar across groups, more of this was shared between the predictors for monolingual children, and the role of the autoregressor was also larger for monolingual as compared to EAL children. For t5 spelling, the model explained less total variance for EAL children, and while the predictors and autoregressor shared less variance in the model for EAL children, the autoregressor explained more unique variance in these children compared to monolingual children.

6.3.3.4.1 The predictive relationships between t4 PP and t5 literacy in EAL children

Overall, t4 PP was not a strong unique predictor of t5 literacy skills in EAL children, and explained only small amounts of unique variance in reading accuracy (1.25%), reading comprehension (0.38%), and spelling (0.06%). Although it should be noted that the contribution of PP to predicting reading accuracy was marginally significant, PP was not a unique predictor of reading comprehension or spelling. However, PP uniquely and significantly explained 5.89% of the variance in reading fluency.

6.3.3.4.2 The predictive relationships between t4 VM and t5 literacy in EAL children

EAL children's t4 VM was generally a good predictor of their t5 literacy skills, and explained particularly large and significant amounts of variance in reading comprehension (8.90%) and spelling (10.16%). Although VM's unique contribution to reading fluency was small and nonsignificant (1.06%), the slightly larger amount of uniquely explained variance in reading accuracy (1.81%) made it a significant predictor of this literacy skill.

6.3.3.4.3 The predictive relationships between t4 OL and t5 literacy in EAL children

Although t4 OL predicted a significant amount of variance in t5 reading comprehension (5.54%), it explained only small and nonsignificant amounts of variance in reading fluency (0.83%) and spelling (0.69%). For t5 reading accuracy, OL uniquely explained 1.24% of variance in the total model, and this contribution was marginally significant. As such, overall OL was not a strong predictor of any literacy skills except reading comprehension.

Overall, for EAL children VM was the most consistent predictor of t5 literacy skills, and was a unique predictor of reading accuracy, reading comprehension and spelling. While t4 PP only significantly predicted t5 reading fluency, t4 OL was only a significant predictor of t5 reading comprehension. Compared to monolingual children, this would suggest that PP was a less consistently unique predictor of literacy for EAL children, while VM was a stronger predictor for this group. The contribution of OL to predicting literacy skills was similarly minimal across groups for reading accuracy, reading fluency, and spelling, but OL was a more important predictor of reading comprehension for EAL children.

6.4 Summary

In summary, the results of the concurrent correlational analyses on cognitive and linguistic predictors in both monolingual and EAL children suggested that the relationships between measures of the same construct were generally at least moderate to strong, and this remained consistent across time. Similarly, aside from a few differences based on individual measures within constructs, the relationships between constructs (PA, LSK, RAN, VM, and OL) remained relatively constant over time and relatively consistent across groups. The concurrent and longitudinal relationships between literacy measures were generally moderate to very strong, and similar across time points and groups, suggesting that literacy skills are relatively stable across development. As such, there was evidence that the groups did not differ greatly in how cognitive and linguistic skills, and literacy skills, related to each other.

The results of the hierarchical multiple regressions revealed that t2 OL (but not PA or LSK) was a strong, unique predictor of all reading (but not spelling) outcomes at t5 for EAL children. With regards to group comparisons of the predictive significance of t4 skills to t5 literacy, it was clear that the t4 autoregressor was the strongest unique predictor for the majority of literacy outcomes. Furthermore, the majority of explained variance was shared by the contributions of all the predictors, suggesting that these skills may co-determine literacy outcomes. However, there was also evidence that while PP was the strongest unique predictor for most literacy skills for monolingual children, VM was more important for EAL children, and OL contributed more to reading comprehension in EAL as compared to monolingual children. As such, there were important group differences in the unique contributions of the predictors of children's reading and spelling skills.

6.5 Discussion

These results will now be considered in terms of how they address the research questions set out at the beginning of this chapter. As in the previous discussion sections, the time points will be discussed in terms of their educational phases, including Nursery (t1, t2), Reception (t3), Year 1 (t4), and Year 2 (t5), as this makes comparisons to the literature more straightforward.

The concurrent relationships between the individual cognitive and linguistic predictor measures will be discussed first, with consideration of the results from Nursery to Year 2 for EAL children, and in Years 1 and 2 for monolingual children. The results from both groups in Year 1 and 2 will also be discussed in terms of group differences in the relationships between predictor variables. Thereafter, the concurrent relationships between the literacy outcomes will be considered in a similar way.

The discussion of the predictive relationships between the predictors and literacy outcomes will focus on the predictor measures used in the hierarchical multiple regression models. As such, the contributions of LSK, PP (including PA in Nursery for EAL children), VM and OL will each be considered, with a focus first on the results from models predicting Year 2 literacy from EAL children's Nursery skills (LSK, PA, OL), followed by both groups' results for PP, VM, and OL in Year 1 for Year 2 literacy skills. Similarities and differences in the relative importance of these predictors for monolingual and EAL children will be considered within the context of previous research findings.

6.5.1 Concurrent relationships between cognitive and linguistic predictors in monolingual and EAL children

The findings for the concurrent relationships between individual measures of the same construct will be considered first, followed by a review of the relationships between the different cognitive and linguistic predictor variables for both monolingual and EAL children. In order to not repeat results, each predictor section discusses only those relationships that were not covered in previous sections.

6.5.1.1 Concurrent relationships between measures of the same constructs in monolingual and EAL children

As would be expected, measures of the same construct generally showed moderate to strong and significant intercorrelations, and these will be discussed briefly for the three predictor constructs that were assessed using multiple measures (PA, RAN, OL).

EAL children's PA was assessed using *Alliteration matching* and *Rhyme awareness* in Nursery, and at both of the time points these two measures were only weakly and not significantly related. A weak and nonsignificant relationship between similar measures of PA (rhyme and alliteration oddity) was reported by Lonigan and colleagues (1998) in their sample of 2- and 3-year-old children, although the relationship between these measures was stronger and significant in their sample of older children (4- to 5-year-olds). Similar to the current study, the majority of children in Lonigan et al.'s study performed very poorly on both measures with few performing above chance, suggesting that in both cases the lack of relationship between the measures could simply reflect limited variability due to floor effects. Despite the care taken in the current study to design the rhyme and alliteration measures so they were less linguistically demanding for EAL children, these measures may have been too difficult for children at this early point, especially in the case of rhyme awareness, which (as previously mentioned in section 4.3.1) is particularly sensitive to effects of SES, maternal education, and experience of nursery rhymes that may differ across languages and cultures (Fernandez-Fein & Baker, 1997). However, similarly to the Lonigan et al. (1998) findings, in the current study the PA measures (*Sound isolation*, *Sound deletion*) used with EAL children in Reception correlated strongly and significantly with each other, and this was also true for monolingual and EAL children when the same measures were used in Year 1. This is consistent with other findings that different measures of PA correlate highly with each other in mono- (Wagner et al., 1997) and bilingual (Nakamoto et al., 2007) children, and also in line with the results of factor analytic studies that have suggested that PA is a unified construct in monolingual children (Anthony & Lonigan, 2004). As such, the lack of significant relationships between the Nursery measures of PA are likely a result of floor effects on this measure, but they had the consequence that *Rhyme awareness* and *Alliteration matching* could not be combined into a composite variable to predict later literacy.

The multiple measures of RAN were generally at least moderately to strongly and significantly related, with particularly strong relationships between the alphanumeric measures, and this was true for both monolingual and EAL children in Years 1 and 2. This is consistent with previous research suggesting strong relationships between nonalphanumeric and alphanumeric RAN, the latter of which tends to show stronger relationships with literacy skills (Lervåg & Hulme, 2009).

Finally, the various measures of OL including vocabulary, grammar, and listening comprehension were consistently and significantly related to each other in EAL children at all time points between Nursery and Year 2, and in monolingual children in Years 1 and 2. This would be expected given previous research demonstrating that language is a unified construct, especially in younger children (Klem et al., 2015, Tomblin & Zhang, 2006). Furthermore, the finding that the correlations were generally similar in strength across groups supports the idea that EAL children's L2 language skills are at least as strongly related to each other as those of monolingual children (Swanson et al., 2008; Geva & Farnia, 2012).

6.5.1.2 Concurrent relationships between predictor measures in monolingual and EAL children

As LSK was only measured with EAL children in Nursery and Reception, the concurrent correlations between this variable and other predictors will be considered first, with reference to literature from both mono- and bilingual populations. All other measures were assessed with both monolingual and EAL children, so these will be discussed after the LSK results with consideration to whether the findings were similar across groups and how this relates to findings in the literature.

6.5.1.2.1 Concurrent relationships between LSK and other predictors in EAL children in Nursery and Reception

In both Nursery and Reception, PA and LSK were weakly to moderately, and primarily significantly, correlated with one another in EAL children. As noted previously, EAL children's performance on this measure was at or near floor in Nursery, but at ceiling in Reception (see section 4.2.2), and these issues of limited variability in the measure may have affected the strength of these correlations. LSK and PA tend to show relatively strong relationships with one another in mono- and bilingual samples (Muter & Diethelm, 2001; Verhoeven, 2000), and it has been suggested that there is a reciprocal relationship between these constructs (Bowey, 2005, Lerner & Lonigan, 2016). Although the current work cannot address whether this is true in this EAL sample, the results do suggest that LSK and PA are related during development for EAL children learning in their L2, and together could be important for children's learning of the alphabetic principle (Byrne & Fielding-Barnsley, 1989).

In Reception, the only time point that included measures of both LSK and RAN (*colours*, *shapes*), there were moderate to strong and significant relationships between these two predictors. Although the relationships between LSK and alphanumeric RAN tend to be stronger than for nonalphanumeric stimuli, the current results concur with other studies showing moderate and significant relationships between early LSK and nonalphanumeric RAN in bilingual children (Lindsey et al., 2003), and similar results have also been reported in monolingual samples (Schatschneider et al., 2004).

LSK and VM were also only measured simultaneously in Reception, and there was a weak and nonsignificant relationship between these two predictors in EAL children at this point. The relationship between LSK and VM has been debated, and one suggestion is that VM plays a role in the acquisition of LSK due to the importance of holding phonological representations in a short-term store in order to link these with their orthographic representation and secure these representations in long-term memory (de Jong & Olson, 2004). However, EAL children had very strong LSK at this point, and the lack of relationship between these variables could reflect that their LSK could be accessed relatively automatically without much involvement from VM.

In Nursery there were moderate or strong and significant correlations between measures of LSK and OL, but by Reception the strength of these relationships weakened considerably. One possible interpretation of these results could be that EAL children with stronger OL skills in Nursery were likely to also demonstrate stronger LSK skills. In turn, stronger LSK skills could either be a direct consequence of superior OL skills or because superior language skills would better allow children to access the informal teaching activities that support LSK learning in Nursery settings. It is generally believed that LSK is highly dependent on informal and formal teaching practices (Anthony, et al., 2009), and results from monolingual children have not found OL (or at least vocabulary) to predict children's LSK (de Jong & Olson, 2004). Therefore, it may be that the relationship between LSK and OL reflects children's exposure to and ability to engage with literacy teaching. This may also explain why the relationship between LSK and OL was weaker in Reception, as by this point children have been in formal education for almost a full year and their abilities were more likely to reflect the influence of teaching, rather than their L2 language skills (Caravolas, 2004; Ellefson et al., 2009).

6.5.1.2.2 Concurrent relationships between PA and other predictors in monolingual and EAL children

Although PA and RAN were only weakly and nonsignificantly related in EAL children in Reception, in Years 1 and 2 there were generally moderate and significant relationships between these two constructs for both monolingual and EAL children. In Year 1, these relationships were stronger than at any other time point, with particularly strong correlations between the measures of PA and alphanumeric RAN, and all patterns of correlation were very similar across groups. There is theoretical support for the idea that both PA and RAN measure the integrity of children's phonological representations (Melby-Lervåg et al., 2012; Wagner & Torgesen, 1987), and the literature has generally shown measures of these two skills to be at least moderately related for both mono- and bilingual children (Swanson et al., 2003; Gottardo, Collins, Baciu, & Gebotys, 2008). The Year 1 results were of specific importance due to the forming of composite variables at this time point for prediction of literacy in Year 2, and the strong correlations between PA and RAN at this time provided good support for the decision to combine these measures into a composite of children's phonological processing.

PA (*Sound isolation*, *Sound deletion)* and VM were first measured concurrently in EAL children in Reception, and at this point the two PA measures showed different relationships with

VM. While there was a strong relationship between VM and *Sound deletion*, VM was only weakly and not significantly related to *Sound isolation* at this time point. Similarly, in Year 1 when both groups completed these two PA tasks, there were stronger relationships between *Sound deletion* (as compared to *Sound isolation*) and VM in both monolingual and EAL children, although at this point *Sound isolation* was also strongly related to VM for EAL children. These results are likely to reflect the different requirements of these two tasks; the storage and processing demands of deleting a sound are likely to exceed those of simple identification (Tunmer & Hoover, 1992). This argument is strengthened by the results from Year 2 when the *Spoonerisms* task was used, as this measure also requires active manipulation of phonological material and showed moderate and significant relationships with VM that were of similar strength for monolingual and EAL children, and similar in strength to correlations between these two constructs reported in the literature (Babayiğit & Stainthorp, 2011).

Although PA and OL in EAL children in Nursery were generally only weakly (although often significantly) related, the strength of the relationships between these constructs increased over time, and was often at least moderate and significant once EAL children reached Reception. In Years 1 and 2, when the monolingual and EAL children could be compared, PA and OL tended to show moderate to strong and significant relationships that were of similar strength across groups. Language skills, and particularly vocabulary, have been suggested to be an important contributing factor in the development of PA in monolingual children (Metsala & Walley, 1998), and previous literature has also found vocabulary and PA to be moderately and significantly related in preschool bilingual children (Dickinson, et al., 2004). As such, stronger correlations between these two constructs in EAL children in Nursery would have been expected, but these weak early correlations may reflect the aforementioned floor effects in the PA measures. Once EAL children were older, OL and PA were more strongly and significantly related, and this was also true for their monolingual peers. This pattern of results is consistent with previous research demonstrating that language, and particularly vocabulary, is strongly related to PA skills (Sénéchal, Ouellette, & Rodney, 2006; Storch & Whitehurst, 2002).

6.5.1.2.3 Concurrent relationships between RAN and other predictors in monolingual and EAL children

For EAL children in Reception, RAN and VM were only weakly and nonsignficantly related. In Years 1 and 2, both groups showed similar weak to moderate, but often significant, relationships between these two constructs, although for both groups these correlations were slightly stronger in Year 1. These weak correlations between RAN and VM may reflect that RAN taps children's automatic retrieval of phonological information from long-term memory, and this requires relatively little involvement from STM and WM functioning (Bowey, 2005; Wagner & Torgesen, 1987). Furthermore, similar results of weak or moderate and often not significant relationships between these two constructs have been reported in other studies of both mono-and bilingual children (Scarborough, 1998, Babayiğit & Stainthorp, 2011, Georgiou, Das, & Hayward, 2008, Lesaux, Lipka, & Siegel, 2006).

Overall, RAN *colours* and *shapes* showed negligible to weak relationships with language for EAL children in Reception. In Year 1, all measures of RAN for EAL children and measures of colour and shape RAN for monolingual children showed moderate and significant relationships with language skills, but these relationships weakened over time and by Year 2 both groups showed similar weak and nonsignificant relationships between these two constructs. These results are in line with previous research suggesting that generally RAN performance is relatively independent of broader OL skills for both mono- or bilingual children (Harrison, et al., 2016; Jongejan, et al., 2007; Swanson, et al., 2003), although it is clearly important that children have sufficient experience of the specific linguistic material in the RAN tasks for the stimuli to be considered automatized.

6.5.1.2.4 Concurrent relationships between VM and OL in monolingual and EAL children

For EAL children in Reception, and both monolingual and EAL children in Years 1 and 2, VM and OL were generally only weakly to moderately correlated, although in many cases these relationships were significant. For both groups these two constructs showed the strongest relationships in Year 1, and these were particularly strong for monolingual children. These results in Year 1 are in line with the idea that measures of VM, and particularly WM, may show strong relationships with OL due to the importance of memory for language comprehension. However, studies of both mono- and bilingual children have found that the relationship between these two constructs is often only moderate, and is generally similar across groups (Babayiğit & Stainthorp, 2011, Lesaux, Lipka, & Siegel, 2006; Harrison et al., 2016), and this was also true in the current study.

6.5.1.2.5 Summary of relationships between concurrent predictors

Overall, the strongest concurrent correlations tended to be between PA and measures of RAN, VM, OL, while the weakest were between RAN and OL. Most importantly, the relationships between all of these cognitive and linguistic predictors were similar in strength for monolingual and EAL children. Although zero-order correlations should be interpreted cautiously as they cannot determine direction of effects and are vulnerable to the influences of third variables, overall the current findings suggest that the patterns between cognitive and linguistic skills in a child’s L2 are similar to those seen in children learning only in their L1.

6.5.2 Concurrent relationships between literacy skills in monolingual and EAL children

Correlations between all measures of literacy in Reception for EAL children, and in Years 1 and 2 for monolingual and EAL children were consistently strong or very strong, and the strength of the relationships was very similar across groups. These results are to be expected given that reading (including reading accuracy and fluency) and spelling are believed to be underpinned by the same processes in both mono- and bilingual children (Lesaux, Koda, Siegel, & Shanahan, 2006), and reading comprehension is dependent on children's lower-level reading skills (Catts, Herrera, Nielsen, & Bridges, 2015; Adlof et al., 2006). Furthermore, these results are in line with findings from both mono- and bilingual samples that have shown not only strong concurrent correlations between measures of reading and spelling (Muter, et al., 2004; Babayiğit & Stainthorp, 2011; Geva & Farnia, 2012; Lesaux, et al., 2006; Jean & Geva, 2009), but also that early literacy skills are the best predictors of later literacy skills (Roth, et al., 2002, Parrila, Kirby, & McQuarrie, 2004, Georgiou, Parrila, & Papadopoulos, 2008, LaFrance & Gottardo, 2005). This latter point also relates to the decision to include, when available, earlier measures of the same literacy skill in the predictive models of later literacy. Including the autoregressor allows for the consideration of predictors of growth beyond what would be expected based on earlier skill in the same domain (Parrila et al., 2004), and the results of predictive models of literacy in Year 2 for both monolingual and EAL children will now be discussed.

6.5.3 Predictive relationships between cognitive and linguistic predictors and literacy outcomes in monolingual and EAL children

This section will consider the results of the hierarchical multiple regression models, in conjunction with the longitudinal correlations, in predicting literacy skills in both monolingual and EAL children. For EAL children, LSK, PA, and OL in Nursery were used to predict literacy skills (reading accuracy, reading fluency, reading comprehension, spelling) in Year 2. For both monolingual and EAL children, PP, VM, and OL measured in Year 1 were entered into models predicting these same four literacy skills in Year 2, and these models also included the appropriate autoregressor.

The unique predictive significance of Nursery LSK for EAL children's later reading and spelling will be considered first, followed by a consideration of the results for PP (including Nursery PA for EAL children), VM, and OL for both monolingual and EAL children.

6.5.3.1 Preschool LSK as a predictor of literacy in EAL children

Although EAL children's LSK at the end of Nursery showed moderate and significant relationships with both reading accuracy and fluency in Year 2, the longitudinal relationships between this predictor and reading comprehension and spelling were weak and not significant. Similarly, the hierarchical multiple regression analyses revealed that this early measure of LSK was not a significant unique predictor of any literacy skills in Year 2. This result is somewhat surprising given that LSK has been shown to be a consistently strong unique predictor of later reading accuracy, spelling, and reading comprehension when measured in monolingual children in preschool (Foulin, 2005; NELP, 2008; Scarborough, 1998) and in bilingual children in their first year of formal education (Lesaux et al., 2007; Muter & Diethelm, 2001; Chiappe, Siegel, & Gottardo, 2002; Goodrich et al., 2016). There is good evidence to support the idea that LSK, in conjunction with PA skills, is a necessary component in children's learning of the alphabetic principle (Byrne & Fielding-Barnsley, 1989), and as such children with stronger LSK prior to beginning formal literacy teaching are likely to show accelerated development in alphabetic reading and spelling (Foulin, 2005). For EAL children, an understanding of the abstract relationship between letters and sounds could potentially develop in their L1 prior to their need to learn reading and writing skills in their L2, but language specific knowledge of letter-sound correspondences in the language of instruction is likely to be of at least as much importance for literacy development in bilingual as monolingual children (Bialystok, 2001). As such, although preschool LSK was not a significant unique predictor of later reading and spelling skills, it is unlikely that it was unimportant in the literacy development of these EAL children.

As noted previously, EAL children had very low levels of LSK at the end of Nursery, and the lack of variability in this measure could account for its limited predictive power. It is commonly found that LSK develops quickly in both mono- and bilingual learners once they are introduced to formal education (Schatschneider et al., 2004; Seymour et al., 2003), and in the current study children went from performing very poorly at the end of Nursery to being at ceiling on this task at the end of Reception (see 4.3.2). As such, had this measure been administered at a point closer to the very beginning of school, the findings may have been more similar to the previously cited studies assessing children's LK skills at an early point in formal LK learning (Lesaux et al., 2007; Muter & Diethelm, 2001; Chiappe, Siegel, & Gottardo, 2002; Goodrich et al., 2016).

A final methodological point is that the assessment used in the current study was a measure of LSK, rather than LNK. There is some suggestion that LNK may develop prior to, and act as a precursor of, LSK (Foulin, 2005). This presents the possibility that a measure of LNK could have provided higher scores and had stronger predictive power in the current study. However, it should be noted that this developmental progression from LNK to LSK is less pronounced in UK contexts, where there is a stronger focus on LSK from an early age (Ellefson et al., 2009).

6.5.3.2 PP as a predictor of literacy in monolingual and EAL children

This section will consider the contribution of EAL children's Nursery PA to explaining individual differences in literacy outcomes in Year 2, as well as the role of Year 1 PP (PA, RAN) in explaining variance in literacy skills in Year 2 for both monolingual and EAL children.

6.5.3.2.1 Preschool PA as a predictor of later literacy in EAL children

EAL children's PA skills in Nursery explained very little variance in and did not significantly predict any literacy outcomes in Year 2. This finding is unexpected given that preschool PA skills have consistently been shown to predict later literacy abilities in monolingual children, especially for reading accuracy (Caravolas, et al., 2012; NELP, 2008; Lonigan et al., 2000; Goswami, 2001). Although there is a notable lack of longitudinal studies considering the prediction of later literacy skills from bilingual children's preschool PA, studies that have examined bilingual children's PA abilities when they were in their first months of formal education have found that PA was a unique predictor of later reading accuracy, reading comprehension, and spelling (Chiappe, Siegel, & Gottardo, 2002; Lesaux et al., 2007). However, in a study of Spanish-English bilingual children from low-SES backgrounds growing up in the US, Lindsey and colleagues (2003) found that PA (sound matching) measured when children were at the beginning of kindergarten (mean age 5;7 years) explained only limited variance in Grade 1 word and nonword reading and reading comprehension. However, this same PA measure at the end of kindergarten explained considerably more variance in all three of these literacy skills, and was a significant unique predictor of all three skills. This could indicate that very early measures of PA are less useful predictors of literacy than measures taken once children have received more formal education. Similarly, in one of the very few studies of bilingual children's preschool PA skills, Rinaldi and Páez (2008) found no significant relationship between PA measured at the end of preschool and Grade 1 word reading (once OL skills had been controlled) in a group of Spanish-English children from low-SES backgrounds in the US. The authors suggested that the lack of a significant relationship between PA and reading could be due to the increased importance of preschool language skills over PA for predicting later literacy in bilingual children, and this argument will be considered further in the discussion of OL skills in section 6.5.3.4.1.

Indeed, as discussed in Chapter 4 (see section 4.3.1), bilingual children learning in their L2 have been shown to begin school with more limited levels of PA as compared to their monolingual peers, but these skills tend to show very fast development once children are introduced to formal education (Hammer, Jia, & Uchikoshi, 2011). In the current study, EAL children's performance on both measures of PA in Nursery was very low, but once they reached the end of their first year of education they had skills well within the normal range for monolingual children. Although it is important to note that the current findings of low preschool performance on PA could have been a task effect, and different results could have been found if other measures were used, it is also possible that PA is simply a less useful predictor in young EAL children until they reach a certain level of linguistic proficiency and have developed more robust PA skills in their L2 (Rinaldi & Páez, 2008).

6.5.3.2.2 Year 1 PP as a predictor of reading accuracy in monolingual and EAL children

While Year 1 PP was a unique predictor of Year 2 reading accuracy for monolingual children, this variable explained a smaller and only marginally significant amount of variance in this literacy outcome for EAL children. However, for both groups there were strong longitudinal correlations between PP and reading accuracy, and together these results suggest that PP skills are important in the development of word reading for both groups of children. The importance of phonological skills for reading development is one of the most ubiquitous findings within literacy research, and there is strong evidence that both PA and RAN contribute causally to children's reading accuracy development in monolingual (Byrne et al., 2000; Schatschneider, et al., 2004; NELP, 2008; Babayiğit & Stainthorp, 2011; Hulme et al., 2012; Caravolas, et al., 2012) and bilingual children (Lesaux & Siegel, 2003; Lesaux et al., 2006; Nakamoto, et al., 2007; Zadeh, et al., 2012). Studies that have directly compared the predictive significance of PP to reading accuracy in monolingual and bilingual children have found good evidence that these predictors play a similar role in the development of this literacy skill for children learning in their L1 and L2 (Jongejan, et al., 2007; Kieffer & Vukovic, 2013), and the current results are broadly in line with this suggestion.

6.5.3.2.3 Year 1 PP as a predictor of reading fluency in monolingual and EAL children

For both monolingual and EAL children, PP was a significant predictor of Year 2 reading fluency, although the amount of variance this predictor explained was greater for monolingual (9.23%) than EAL children (5.89%). Furthermore, for both monolingual and EAL children, PP explained more variance in reading fluency than accuracy. These two facets of reading skill are related but dissociable constructs, as the latter requires accurate but also relatively automatic reading of words either in isolation or text (Crosson & Lesaux, 2010). As such, it is reasonable to consider that the predictors of reading accuracy and fluency may be slightly different. Although there has been considerable interest in the role of RAN in predicting children's later reading fluency (Norton & Wolf, 2012), both PA and RAN have been shown to be important for reading fluency in mono- and bilingual children (Lervåg & Hulme, 2009; Zadeh et al., 2012). For example, in a large-scale longitudinal study of monolingual Norwegian children from just prior to the onset of formal education (mean age 6;4 years) to one year later, Lervåg and Hulme (2009) found that PA and RAN contributed very similar amounts of variance to reading fluency in these early readers, suggesting that these skills are of similar importance to the development of reading fluency in young monolingual children. Zadeh and colleagues (2012) examined predictors of English (L2) reading fluency in 308 children from diverse linguistic backgrounds in Canada. Their results revealed that measures of PA and RAN in Grade 1 (6- to 7-years-old) showed similar direct effects on a composite measure of word and text reading fluency in Grade 3. As such, the current findings converge with evidence from both monolingual and bilingual populations of similar ages to the children in the current study to suggest the importance of broad PP skills for the development of early reading fluency.

6.5.3.2.4 Year 1 PP as a predictor of reading comprehension in monolingual and EAL children

For both monolingual and EAL children, Year 1 PP was not a significant predictor of Year 2 reading comprehension. Turning first to the results for monolingual children, although some studies have found that PA and RAN measures were longitudinal predictors of children's reading comprehension skills (Johnston & Kirby, 2006; Parrila et al., 2004), this finding is inconsistent (Muter, et al., 2004). For example, in their longitudinal study of young children (starting age 4;9 years) in the UK, Muter and colleagues (2004) found that while PA in Year 1 contributed significantly to the development of word recognition in Year 2, only Year 2 word recognition was predictive of reading comprehension in Year 3. A recent study including both monolingual and bilingual children who showed good English (L2) proficiency, specifically considered the relationships between PA and RAN and later reading comprehension (Catts et al., 2015). This study found that while the influence of kindergarten (age 5- to 6-years-old) PA on Grade 3 reading comprehension was fully mediated by the contribution of this predictor to word reading accuracy, RAN showed a small direct relationship with reading comprehension. A similar meditational study has also been conducted with bilingual children (Zadeh, et al., 2012), and in this study the effects of earlier PA and RAN on later reading comprehension were fully mediated through their influence on reading accuracy and fluency. In line with the central claims of the SVR (Gough & Tunmer, 1986), in both mono- and bilingual populations there is growing support for the idea that the primary influence of PP skills on reading comprehension is through their role in the development of skilled word reading.

6.5.3.2.5 Year 1 PP as a predictor of spelling in monolingual and EAL children

PP did not play the same predictive role in the spelling development of monolingual and EAL children. For monolingual children, PP in Year 1 explained a large and significant amount of variance in Year 2 spelling, and accounted for more variance than even the autoregressor. Conversely for EAL children, PP explained almost no unique variance in later spelling skills.

Ehri (1997) posited that the early stages of learning to spell are very similar to those of learning to read in that both are reliant on children's abilities to use grapheme-phoneme (or for spelling, phoneme-grapheme) correspondences to build representations of the words to be read or spelled. This process is heavily reliant on children's PA, but RAN has also been shown to be a consistent predictor of spelling development in monolingual children (NELP, 2008). A recent large-scale study of English, Spanish, Czech, and Slovak children in their first year of formal education revealed that earlier measures of both PA and RAN explained relatively similar and significant amounts of variance in spelling skills 10 months later (Caravolas, et al., 2012). The current findings converge with these results to confirm the important role of PP skills in early spelling development for monolingual children.

The current finding that PP was not a significant predictor of spelling in EAL children is surprising, given that research has generally suggested that the underpinning skills in spelling development are broadly similar for mono- and bilingual children (Lesaux et al., 2006), and several studies have found that both PA and RAN are predictive of early spelling skills in bilingual children (Harrison et al., 2016; Yeong & Liow, 2011; Jongejan, et al., 2007). However, it could be that the impact of these skills was through their contribution to earlier spelling skills, as the autoregressor explained a large amount of unique variance in Year 2 spelling. Another possibility is that spelling draws on cognitive skills slightly differently in mono- and bilingual children, and may require more involvement from VM for bilingual children, and this suggestion will be discussed further in section 6.5.3.3.4.

6.5.3.3 VM as a predictor of literacy in monolingual and EAL children

The following section will consider the role of Year 1 VM to Year 2 literacy skills for both monolingual and EAL children.

6.5.3.3.1 Year 1 VM as a predictor of reading accuracy in monolingual and EAL children

While VM explained only a very small and nonsignificant amount of unique variance in reading accuracy for monolingual children, the unique contribution of this predictor for EAL children was slightly greater and significant. It has been suggested that VM skills are important for word reading due to the need to temporarily hold phonemes in mind in order to construct phonological representations that can be matched to lexical representations in long-term memory (Gathercole, 1995). However, numerous studies with monolingual children have suggested that VM does not uniquely predict word reading once measures of PP (PA, RAN) are controlled (Caravolas, et al., 2012; Ziegler, et al., 2010; Melby-Lervåg et al., 2012), and these findings are in line with the current results for monolingual children. The current results for EAL children suggest that VM plays a larger role in accurate word reading for these children compared to their monolingual peers, perhaps because early word reading in an L2 draws of memory resources in a different way than for L1 learners. However, it should be noted that VW skills have not generally been shown to be more important for word reading in bilingual children. Lesaux et al., (2007) found VM measured in kindergarten (mean age 5;4 years) contributed significantly to word reading in Grade 4 for both Canadian monolingual and bilingual children from diverse linguistic backgrounds and from mixed SES backgrounds. This effect did not interact with language status, suggesting that the predictive role of VM was similar for mono- and bilingual children. Chiappe, Siegel, and Wade-Woolley (2002) even found that while VM in kindergarten (mean age 5;4 years) was a significant predictor of Grade 1 word reading for monolingual English Canadian children, it was not for bilingual children (mixed L1s). However, in both of the aforementioned studies, the measure of VM placed large demands on children's linguistic knowledge and this could have influenced the results. Chiappe, Siegel, and Wade-Woolley (2002) themselves suggested the use of a digit span task (as used in the current study) to investigate the relationship between VM and literacy acquisition, and so this highlights the importance of considering the specific characteristics of the VM measure used when comparing results. Therefore, it may be the case that VM (as assessed by measures that are not overly linguistically demanding) shows stronger relationships with word reading development in EAL children as compared to their monolingual peers, although this finding would need future replication using similar measures.

6.5.3.3.2 Year 1 VM as a predictor of reading fluency in monolingual and EAL children

Children's Year 1 VM explained a small amount of unique variance in reading fluency for both monolingual and EAL children, but was only a significant predictor of this outcome for monolingual children. VM's significant unique contribution to reading fluency for monolingual children is surprising given that the longitudinal correlation between Year 1 VM and Year 2 reading fluency was weak and not significant for this group, and was actually stronger and significant in EAL children. One potential explanation for these contradictory findings between the correlational and regression analyses could be that because the relationships between VM and the other predictor variables (PP, OL) were stronger than the relationship between VM and reading fluency, suppression effects could have occurred (Cohen & Cohen, 1983; Krus & Wilkinson, 1986). For monolingual children there was a particularly strong relationship between VM and OL in Year 1 ($r = .73$), and so this could have affected the results and inflated the apparent contribution of VM to this outcome for monolingual children.

The relationship between VM and reading fluency has received less attention than between VM and reading accuracy, and it is unclear whether this predictor is likely to contribute directly to the development of fluent reading beyond its previously discussed role in reading accuracy. It is possible that text reading fluency will draw more on memory resources than isolated word reading (Kim, 2015), and there is some evidence that, at least for monolingual children, WM is more important for fluent reading than STM (Kibby, Lee, & Dyer, 2014). For example, in a the large-scale study of 7- to 8-year-old children learning five different European languages, Ziegler et al., (2010) found that STM (measured using forward digit span) was not significantly predictive of concurrently measured word reading speed. Similarly, Kibby and colleagues (2014) found that backwards, but not forwards, digit span explained a small but significant amount of unique variance in concurrently measured text reading fluency in 8- to 12-year-old English speaking children from the US. In terms of the group comparisons, Geva and Farnia (2012) found weak to moderate but significant concurrent correlations between WM and both word and text reading fluency in 10- to 11-year-old children, and the strength of these relationships was similar for monolingual English speaking Canadian children and bilingual children from diverse linguistic backgrounds. As such, the current findings of a greater role of VM in reading fluency for monolingual children should be interpreted with caution given the lack of significant longitudinal correlation between these constructs, along with the findings from the literature that have suggested that the relationship between VM and reading fluency may be particularly between WM and text reading, and similar for mono- and bilingual children.

6.5.3.3.3 Year 1 VM as a predictor of reading comprehension in monolingual and EAL children

For EAL children, VM explained a relatively large amount of unique variance (8.90%) in reading comprehension, and was a significant unique predictor of this literacy skill. Conversely for monolingual children, VM made only a very small and nonsignificant unique contribution to the prediction of reading comprehension. It is generally believed that reading comprehension is likely to draw considerably on children’s VM skills, due to the need to hold both word- and text-level information in mind, and to synthesise the linguistic content in the text with background knowledge (Oakhill & Cain, 2012). WM especially has been shown to be an important concurrent and longitudinal predictor of reading comprehension skills in both mono- and bilingual children, especially in older children reading more advanced texts (Cain et al., 2004; Seigneuric, Ehrlich, Oakhill, & Yuill, 2000; Carretti, et al., 2009; Lesaux et al., 2007). For example, Farnia and Geva (2013) found that in a large sample of both L1 English children and L2 children from diverse linguistic backgrounds growing up in Canada, WM assessed when children were approximately 6-years-old, and STM assessed at approximately 9-years-old were both significant predictors of reading comprehension in 11-year-old children, suggesting important but potentially different roles of both aspects of VM for later reading comprehension. As such, although the current results for EAL children are in line with previous research, the finding that VM was not a unique predictor of monolingual children’s reading comprehension was somewhat surprising. However, some research with monolingual children has suggested that WM may be a stronger predictor in later reading comprehension skills. One study of 7- to 9-year-old monolingual children reported that WM at age 8-years-old significantly predicted reading comprehension at age 9-years-old, but early WM skills did not, and the authors therefore suggested that WM may become increasing important once word recognition skills are more automatic (Seigneuric & Ehrlich, 2005). The current results do not exclude the possibility that VM may go on to be an important predictor of monolingual children’s later reading comprehension skills. However, they do suggest that for this group of EAL children, VM was a relatively stronger predictor at this early point, perhaps because their more limited OL skills mean their VM resources play a larger predictive role in the comprehension of these children.

6.5.3.3.4 Year 1 VM as a predictor of spelling in monolingual and EAL children

Once again for spelling, while VM explained a large and significant amount of unique variance in the model for EAL children, it was not a unique predictor for monolingual children. The role of VM in children’s spelling development has been suggested to be similar to its role in word reading, in that both require children to hold a temporary representation in mind while retrieving its sublexical and lexical components from long term memory (Berninger et al., 2010), and this process is likely to be similar for children whether they are learning in their L1 or L2. Nonetheless, similar to reading, VM is not always found to be a unique predictor of this literacy component in monolingual children when PP components are also included as predictors (Caravolas, et al., 2012). A small number of studies have compared the predictors of spelling in mono- and bilingual children, and contrary to the current findings, they have tended to find VM to be a stronger spelling predictor in monolingual children (Jongejan, et al., 2007; Harrison et al., 2016). For example, Jongejan, et al. (2007) examined concurrent predictors of spelling skills in 6- to 10-year-old Canadian monolingual and mixed language bilingual children, and found that VM significantly predicted spelling in monolingual but not bilingual children. In a study of a different sample of Canadian children, Harrison et al. (2016) found that for 8- to 9-year-old monolingual and bilingual children, VM was not a significant predictor of their concurrently measured spelling skills, and only PP contributing unique variance to this skill. One potential reason for these differing findings is that while Jongejan and colleagues used a memory for sentences task that places considerable demands on children's language skills, the Harrison et al. (2016) study used a measure a backward digit span task similar to the one used in the current study. However, the similarity between the measures used by Harrison and colleagues and the current study makes it unclear why the findings were so different. It is relevant to note that both of these aforementioned studies only examined concurrent predictors, so one potential explanation for the discrepant findings is that VM capacity may simply be a more important longitudinal predictor for EAL children, as the processes involved with spelling may be less automatic or may require more memory capacity in an L2.

6.5.3.4 OL as a predictor of literacy in monolingual and EAL children

Finally, the predictive significance of children's OL skills will be discussed. Firstly, the role of Nursery OL in explaining Year 2 literacy variance in EAL children will be presented, followed by the contribution of Year 1 OL to literacy in Year 2 in both monolingual and EAL children.

6.5.3.4.1 Preschool OL as a predictor of later literacy in EAL children

EAL children's language skills at the end of Nursery were assessed using four measures of vocabulary and grammar that were combined into one OL composite. This language composite was subsequently used to predict children's reading accuracy, fluency, comprehension, and spelling skills in Year 2, and the results revealed that this early measures of OL was a significant unique predictor of all reading outcomes, but not spelling.

These results converge with other studies of bilingual preschool children to highlight the importance of early language skills, particularly in their L2, for later literacy development in their language of instruction (Lindsey et al., 2003; Hammer & Miccio, 2006). Of particular relevance to the current findings are the results of a study of a large sample of Spanish-English bilingual children (N=234) from low-SES backgrounds attending preschool early education centres (Head Start) in the US (Rinaldi & Páez, 2008). Measures of OL and PA were administered when children were 4-years-old and used to predict their word reading skills at age 6-years-old, when children had entered formal education. The results suggested that after controlling for home income, OL skills (but not PA) explained significant unique variance in word reading. While PA is known to be an important preschool predictor of literacy skills in monolingual children (NELP, 2008), the authors of this study suggested that low levels of OL may hinder the predictive associations between PA and literacy for children learning in their L2. Furthermore, they drew attention to the potential distinction between the most important predictors of literacy in L2 learners, suggesting that in preschool OL may be the dominant predictor, while PP skills may become more important once children enter school and they develop stronger PP abilities. These aforementioned results are consistent with those in the current study in suggesting that, more so than PA and LSK, OL is a key preschool determinant of later literacy for children learning in their L2. While Rinaldi and Páez's work only included measures of word reading, the current study extends these findings to include reading fluency and comprehension, and even suggests that OL may be of greater importance for the longitudinal prediction of these two latter literacy skills. Although in the current study OL did not significantly predict spelling, the contribution of OL to the spelling model was marginally significant, and there was a moderate and significant longitudinal correlation between these two constructs. As such, it may be that preschool OL still contributes to EAL children's spelling, but other predictors are more important for this literacy skill than for reading.

6.5.3.4.2 Year 1 OL as a predictor of reading accuracy in monolingual and EAL children

For both monolingual and EAL children, OL skills in Year 1 explained only small amounts of variance in Year 2 reading accuracy, although for EAL children this contribution was marginally significant. Various OL components have been suggested to be important for the development of word reading, and those that have received the most consideration are vocabulary and morphological awareness (Wise, et al., 2007; Foorman, et al., 2012). Vocabulary knowledge may support word reading in a number of ways, including directly through the benefit of well-defined phonological representations of words for identification of partially decoded words, as well as more indirectly through the support of semantic knowledge for word reading in context (Wise, et al., 2007). Morphological knowledge may contribute to the development of more advanced reading skills as children begin to use larger morphemic units in word recognition (Foorman, et al., 2012). Consequently there are sound theoretical reasons to believe that OL knowledge may be related to even young children's reading accuracy, and numerous studies of both mono- and bilingual children have found that early OL skills make significant contributions to word reading (Kirby, et al., 2008; Nation & Snowling, 2004; Ricketts, Nation, & Bishop, 2007; Gottardo, 2002; Jean & Geva, 2009). However, for younger mono- and bilingual readers, code-related skills (PA, RAN, and LK) are still considered to be stronger predictors of this aspect of literacy than OL (Storch & Whitehurst, 2002; Geva, 2006), and it is not uncommon for the contributions of OL to be nonsignificant after PP and LSK are also considered in the prediction of literacy (Muter, et al., 2004; Geva, et al., 2000). The current findings support this idea, and suggest that although OL likely plays a contributing role in early word reading skills for both monolingual children and EAL, its influence at this early stage is either lesser or shared with code-related predictors that are known to exert a strong influence on reading accuracy in children in the first two or three years of education.

6.5.3.4.3 Year 1 OL as a predictor of reading fluency in monolingual and EAL children

Similar to the results for reading accuracy, OL explained very little variance in and was not a significant predictor of reading fluency for either monolingual or EAL children. This is unsurprising given the previously reviewed results for reading accuracy, as fluent word reading was strongly correlated with accurate word reading, and is likely to be underpinned by very similar processes, especially in young children (Ziegler, et al., 2010). Furthermore, in considering these results it is important to note that the reading fluency measure used was a speeded word list reading task. Evidence from monolingual children has suggested that word reading fluency is generally considered to be less dependent on OL than text reading fluency, and even in instances when there is a significant relationship between OL and text reading fluency, it tends to be in older, more advanced readers (Wolf & Katzir-Cohen, 2001; Kim et al., 2012). For example, Kim and colleagues (2012) found that for monolingual children, the relationship between listening comprehension and reading fluency was dependent on children's age and reading skill, as these constructs were only related in children once they were approximately 8-years-old, or younger very able readers. Although studies of the predictors of bilingual children's reading fluency are still very limited, Zadeh, Farnia and Geva (2012) did find that for a large sample of English L2 learners from diverse linguistic backgrounds, listening comprehension in Grade 1 was a significant unique contributor to Grade 3 reading fluency (measured using a word and text reading composite). Although this result is different from the current findings, it may have been that the text reading component, as well as the fact that the children's reading fluency was measured in children at least one year older than in the current study, could explain the discrepancy in the results. As such, the current finding suggest that OL plays no large independent role in the word reading fluency development of young monolingual or EAL children, and this is broadly supported by the literature.

6.5.3.4.4 Year 1 OL as a predictor of reading comprehension in monolingual and EAL children

The predictive role of Year 1 OL for children's Year 2 reading comprehension was different across the language groups; while language explained only a small amount of variance in this literacy skill for monolingual children, the amount of variance OL explained in EAL children's reading comprehension was considerably larger and significant. These results for monolingual children are somewhat surprising, given that there are consistent findings that language skills are important predictors of reading comprehension even in early readers (Cain, et al., 2004; Kershaw & Schatschneider, 2012; Tunmer & Chapman, 2012; Florit & Cain, 2011). However, as the SVR asserts, this result may reflect that word reading is a bigger determinant of reading comprehension in younger children for whom lower-level literacy skills act as a bottleneck to more advanced comprehension skills that are much more reliant on OL (Verhoeven & van Leeuwe, 2012). This is likely to be especially true for inconsistent orthographies, like English, where the development of word reading is a more protracted process and therefore is a stronger determinant of comprehension for a longer period in early development. However, the finding that OL played a significant role in the reading comprehension of the EAL children is consistent with a growing body of evidence that suggests that language skills in the language of instruction are a more important determinant of reading comprehension for bilingual as compared to monolingual children (Verhoeven, 2000; Droop & Verhoeven, 2003; Lervåg & Aukrust, 2010; Proctor, et al., 2012; Geva & Farnia, 2012; Babayiğit, 2014). This highlights the importance of supporting the language skills of these children, given the likelihood of OL weaknesses in this population (Geva, 2006).

6.5.3.4.5 Year 1 OL as a predictor of spelling in monolingual and EAL children

OL explained only small and nonsignificant amounts of variance in spelling for both monolingual and EAL children. While it is possible that OL could contribute to early reading and spelling skills in a similar way (through the benefit of well-defined phonological representations for encoding), there is limited support for the role of OL skills in the early spelling development of either monolingual (Kim, Apel, & Al Otaiba, 2013) or bilingual children (Jongejan, et al., 2007; Harrison, et al., 2016; Geva, 2006), especially once children's PP skills have been controlled. Results from the literature therefore converge with the current findings to suggest that OL skills play a relatively limited or indirect role in both mono- and bilingual children's early spelling development.

6.5.4 Summary

In conclusion, the findings of this study suggested that the relationships between cognitive and linguistic predictors of literacy were similar across monolingual and EAL children, and broadly in line with findings from the literature. Similarly, for both groups there were strong concurrent and longitudinal relationships between reading accuracy, fluency, comprehension and spelling, demonstrating that these literacy skills are highly related to one another and show stability over time. Furthermore, for the vast majority of the predictive models, children's Year 1 literacy skills were the best predictor of their Year 2 literacy skills, adding to the abundant evidence that early literacy skills are the foundation on which later literacy skills are built.

However, group differences emerged in the individual contributions of these cognitive and linguistic predictors to explaining literacy outcomes. Contrary to previous findings from monolingual samples, neither LSK nor PA were strong preschool predictors of EAL children's later reading or spelling. Instead, OL was a strong, unique predictor of all Year 2 reading outcomes for this group. This somewhat surprising result may reflect that EAL children's underdeveloped L2 proficiency may limit the predictive relationships between these code-related skills and later literacy, and therefore OL may be the most prominent preschool literacy predictor in this group of children. As very few studies of bilingual children's cognitive and linguistic skills span from before school to after entry into formal education, this finding adds to the current understanding of bilingual development in an important way, although it should be acknowledged that it is unclear whether this finding would generalise to other samples.

The results from school aged monolingual and EAL children revealed group differences in the individual predictive significance of PP, VM, and OL. In line with large amounts of previous research, PP was the strongest predictor of monolingual children's literacy skills in general, and also contributed to reading accuracy and fluency in a similar way for both groups of children. However, the role of VM in explaining individual differences in literacy skills was generally stronger for EAL as compared to monolingual children, and particularly for reading comprehension and spelling. This finding is not in line with previous research, although this could reflect that previous studies in this area have often used VM measures that place large demands on children's linguistic knowledge. Therefore, these findings could suggest that literacy skills draw on cognitive skills differently for children learning in their L2, although this finding would need replication before firm conclusions should be drawn. Finally, in line with a small but growing body of evidence, OL was a stronger individual predictor of reading comprehension in EAL children, highlighting the importance of monitoring and supporting bilingual children's L2 proficiency for their longer-term literacy and academic success.

Chapter 7 – General discussion and conclusions

Within the context of a growing EAL population in the UK, the current study set out to examine the development of cognitive and linguistic skills associated with later literacy in a group of bilingual children from Nursery to Year 2, and to compare the performance and development of these skills in EAL children and their monolingual peers in Years 1 and 2. These groups were also compared on their literacy skills, and the attainment as well as the rate of growth in these areas was compared across groups. Finally, the ability of these cognitive and linguistic skills to predict both groups of children's later literacy skills was evaluated. The findings from Chapters 4, 5, and 6 will now be considered together, and the strengths, limitations, and practical applications of the current work will be discussed.

7.1 Performance and development of cognitive and linguistic predictors of literacy

The first set of research questions considered EAL children's development of and performance on measures of cognitive and linguistic predictors of literacy skills, and how these children's skills compared to those of their monolingual peers. The results in terms of whether EAL children were similar to monolingual norms and their peers differed depending on the predictor in question, with converging results for predictors that are generally considered code-related (PA, LK, RAN; Storch & Whitehurst, 2002; Kieffer & Vukovic, 2012), and different patterns of performance and development for VM and measures of OL (vocabulary, grammar, listening comprehension). The overarching findings for these three types of predictors (code-related predictors, VM, and OL) will be discussed in turn.

When EAL children were in nursery, their skills on the two code-related predictors PA and LSK were assessed, and children's scores on both types of measures were very low. This is perhaps unsurprising, as many of these children would have received only limited exposure to the English language, and PA especially is known to be very dependent on children's language experiences in the specific language (Foorman et al., 2015). However, both of these skills showed rapid growth over their time in Nursery and Reception, and by the end of their first year of formal education, EAL children's average standard scores on measures of PA were well within the normal range based on test norms, and their standard scores on LSK were in the high average range. Furthermore, the increase in standard scores on the LSK measure between the end of Nursery and the end of Reception suggested that EAL children showed accelerated growth on this skill, in advance of what would be expected based on standardised norms. These results mirror previous findings suggesting that bilingual children often have relatively limited L2 skills on measures of code-related predictors when they begin either preschool or school, and these skills are often weaker than those of their monolingual peers (Hammer et al., 2003; Hammer & Miccio, 2006; Páez, Tabors, & Lopez, 2007). However, there is also good evidence to suggest that code-related skills develop very quickly and become very similar to those of monolingual children once bilingual children are exposed to formal education (Chiappe, Siegel, & Gottardo, 2002; Geva & Yaghoub-Zadeh, 2006; Lesaux et al., 2007; Jean & Geva, 2009). In Years 1 and 2, EAL children's performance and development on measures of PA and RAN were also not significantly different from those of their monolingual peers, providing evidence that these bilingual children's relative proficiency on these measures was sustained over time (Lesaux et al., 2007; Farnia & Geva, 2013). Overall, these results converge with previous evidence to suggest EAL children develop their skills on code-related predictors very quickly, even if they enter preschool with very low levels of performance on these measures. Furthermore, these results support Kieffer and Vukovic's (2012) assertion that difficulties in code-related skills are likely to be seen with a similar prevalence in mono- and bilingual learners.

EAL children's VM skills, both in terms of their STM and WM, were within the normal range compared to test norms already by the time children were first assessed in Reception, although consideration of their standard scores suggested that children's WM was stronger than their STM at this point. However, STM showed faster improvement than WM, and by the end of Year 2, EAL children performed very similarly to their monolingual peers and very close to the norm mean on both the STM and WM measure. Although there have been inconsistent findings with regards to how bilingual children perform on measures of memory, and particularly VM, the current findings support the conclusion that on measures of memory that are not excessively dependent on children's broader language skills, initial discrepancies between bilingual children and their monolingual peers or norms are short-lived and the memory skills of children from these two language backgrounds are fairly equivalent from an early point in their education (Harrison et al., 2016; Morales et al., 2012; Abu-Rabia & Siegel, 2002; Farnia & Geva, 2013). Similar to the results for code-related predictors, Kieffer and Vukovic (2013) argued that VM weaknesses were unlikely to be much more common in bilingual children as compared to their monolingual peers, and the current findings support this argument. A relevant aside is that there has been considerable discussion about the potential benefits that learning more than one language may have for an individual's memory, and some meta-analytic evidence does support this claim (Adesope et al., 2010). However, studies that have investigated these memory benefits have included diverse samples and both nonverbal and verbal measures, and there is some suggestion that a bilingual advantage is more likely to be found when nonverbal measures are used (Morales et al., 2012). These differences in both sample and measure characteristics could explain why there was no strong evidence of better memory performance by bilingual children in the current study.

These positive findings for code-related predictors and VM are in contrast to the results of EAL children's performance on measures of OL. Unsurprisingly, EAL children began Nursery with very low levels of both vocabulary and grammar knowledge, but similar to the code-related predictors, both of these skills showed accelerated growth in advance of norm expectations between Nursery and Reception. These results converge with others in the literature to suggest that early L2 language development is characterised by rapid growth in both vocabulary and grammatical skills (Hammer et al., 2008; Chiappe, Siegel, & Wade-Woolley, 2002). Despite this fast rate of development, by the time children reached the end of nursery their scores compared to norm means were approximately one standard deviation below the norm mean for measures of both vocabulary and grammar, and children’s language skills remained relatively consistently at this level compared to norm means in Years 1 and 2. Some studies have compared the growth rate of language skills in mono- and bilingual children, and there is precedent for the finding that even in instances when bilingual children show faster rates of growth in their early vocabulary skills, they do not close the gap on their monolingual peers (Farnia & Geva, 2011). Indeed, the monolingual children in the current study outperformed EAL children on all language measures of vocabulary, grammar, and listening comprehension in both Years 1 and 2, as has been consistently found when mono- and bilingual children have been compared (Droop & Verhoeven, 2003; Verhoeven, 2000; Jean & Geva, 2009, Uccelli & Páez, 2007; August & Shanahan, 2006; Geva & Zadeh, 2006; Paradis et al., 2010; Kieffer & Vukovic, 2012).

However, there were also differences between the measures of vocabulary and grammar, suggesting that the former was an area of particular weakness for these EAL children. EAL children’s *BPVS* standard scores decreased significantly between Reception and Year 1. Furthermore, their *CELF EV* standard scores decreased significantly between Years 1 and 2, and an increasing number of children showed standard scores below the normal range in each successive year. Conversely, EAL children’s raw scores on the *RAPT Grammar* measure increased at a faster rate than their monolingual peers between Years 1 and 2. Additionally, children’s average standard score on the *CELF WS* was the only language measure score to fall within the normal range. This is consistent with other evidence that has shown that group differences between mono- and bilingual children on measures of grammatical knowledge are generally smaller than when vocabulary skills are compared, and that vocabulary may be an area of particular difficulty for children learning an L2 in early childhood (August, Carlo, Dressler, & Snow, 2005; Geva & Zadeh, 2006; Hutchinson, et al., 2003; Melby-Lervåg & Lervåg, 2014; Murphy, 2014).

The finding that increasing numbers of children had standard scores below the normal range on measures of both vocabulary and grammar was not unique to the EAL children, as monolingual children also showed growing language weaknesses. Furthermore, like for the EAL children, monolingual children’s *CELF EV* standard scores decreased significantly between Years 1 and 2, suggesting that there may have been a shared influence on language development in these two groups. The most likely explanation for this finding is children's SES backgrounds, as children from both groups attended schools in predominantly low-SES areas. SES is a known powerful predictor of language development in monolingual children, with robust effects on this outcome regardless of the indices used to determine SES (Hoff, 2006; Hoff, 2013). There is consistent evidence to suggest that monolingual children from lower-SES backgrounds experience less child-directed speech than children from more affluent backgrounds (Hoff, 2006), and more limited L2 language exposure is also considered a main determinant of L2 language weaknesses in bilingual children (Hammer et al., 2014). It is also noteworthy that SES-related differences in language ability are most notable for vocabulary skills (Hart & Risley, 1995; Hoff, 2006), and for both mono- and bilingual children the proportion of children with standard scores below the normal range on measures of vocabulary was consistently higher than for grammar measures in both Years 1 and 2. As such, although monolingual children's OL skills remained consistently stronger those of their EAL peers, there was a similar pattern of weakening vocabulary and grammar skills on most measures that could suggest that being from a more deprived background has a comparable effect of the language development of mono- and bilingual learners.

Therefore, the argument could be made that because being from a more deprived background is a known risk factor for language weakness, and there are consistent findings of more limited L2 language skills in children learning multiple languages, the EAL children in the current study faced dual risk factors for weak L2 OL skills. Indeed, many studies that have examined bilingual learners, particularly in the US, have included children from lower-SES backgrounds, as bilingual children are generally more likely to come from deprived backgrounds (Hammer, et al., 2014). There is some evidence that this is also true for the EAL population in England (Department for Education and Skills, 2006). Therefore, although the current sample reflects the common demographic characteristics of a large proportion of the population in question, it does have the effect that the influences of language status and SES background are confounded (Hoff, 2013). This makes it important to consider to what extent any findings are a reflection of children's EAL or SES background, although unfortunately the design of the current study does not make it possible to disentangle these two influences. Recent evidence suggests that the impact of SES and being bilingual are independent rather than interactive, but future research will be important in considering this more thoroughly (Calvo & Bialystok, 2014).

In summary, while EAL and monolingual children's performance and development on measures of code-related and VM skills were similar, L2 OL skills and particularly vocabulary were an area of weakness for EAL children. As the groups did not differ in their development on the vast majority of measures, it is possible that these areas of relative strength and weakness will be sustained over at least the first years of early education (Kieffer & Vukovic, 2013).

7.2 Performance and development of literacy skills

Similarly to the findings for the cognitive and linguistic predictors, there were divergent results in terms of monolingual and EAL children's relative performance and development dependent on the literacy skill in question. As has been noted in previous research, in the current study word-level skills (word reading accuracy, fluency, and spelling) developed similarly in mono- and bilingual children (Lesaux et al., 2006). EAL children had reading accuracy scores just above the norm mean already at the end of their first year of education, and this group's standard scores on both reading accuracy and fluency remained very close to the norm mean through to the end of Year 2. This was also true for monolingual children, and in line with previous research, the groups had comparable levels of reading accuracy and fluency in both Years 1 and 2 (Verhoeven & van Leeuwe, 2012; Grant et al., 2011; Jean & Geva, 2009; Melby-Lervåg & Lervåg, 2014; Geva & Farnia, 2012; Lesaux et al., 2007). Similarly, spelling skills were also comparable across the groups, as has also been demonstrated in previous research (Wade-Woolley & Siegel, 1997; Limbos & Geva, 2001; Chiappe, Siegel, & Wade-Woolley, 2002; Lesaux et al., 2007; Jongejan et al., 2007; Yeong et al., 2014). However, there were notable group differences in terms of children's text-level reading comprehension skills. Although both monolingual and EAL children had reading comprehension standard scores close to the norm, EAL children's raw scores were significantly lower than those of their monolingual peers. Reading comprehension is a known area of weakness for children learning in their L2, so these results are not altogether surprising (Burgoyne et al., 2009; Lervåg & Aukrust, 2010; Babayiğit, 2014; Melby-Lervåg & Lervåg, 2014). However, other comparisons of bilingual children to monolingual norms have also suggested age-appropriate skills in the first years of education, perhaps because reading comprehension at this early stage is more strongly influenced by word-level reading skills (Manis et al., 2004; Lesaux & Siegel, 2003; Nakamoto et al., 2007). The current results also highlight the advantage of comparing EAL children's performance to both an appropriate monolingual control group as well as standardised norms, as this revealed that EAL children may have age-appropriate skills that are still less advanced than the monolingual children in their classrooms.

These results are also in line with what would have been predicted based on monolingual and EAL children's cognitive and linguistic skills that were previously discussed. Specifically, given what is known about the importance of code-related and VM skills for the development of proficient word reading accuracy, fluency, and spelling in both mono- and bilingual children (NELP, 2008; Lesaux et al., 2006), and because performance on these predictors was similar across groups, it is perhaps unsurprising that monolingual and EAL children also had comparable performance on these literacy skills. Additionally, given the known contribution of OL skills to reading comprehension, the consistent L2 language weaknesses of the EAL children compared to their monolingual peers corresponded with their more limited reading comprehension at the group level. These results are therefore also consistent with the central arguments of the SVR (Gough & Tunmer, 1986), as the EAL children developed accurate and fluent word reading skills. However, these skills were insufficient to ensure equally successful reading comprehension when compared to monolingual children with more advanced linguistic proficiency. Indeed, studies of bilingual children have demonstrated that group differences in reading comprehension between mono- and bilingual learners were principally determined by differences in OL skills (Lervåg & Aukrust, 2010; Babayiğit, 2014).

Despite the previous discussion of these various literacy skills as relatively independent and separable, it must be noted that literacy skills are generally very strongly related (Muter, et al., 2004; Lesaux, et al., 2006; Jean & Geva, 2009; Babayiğit & Stainthorp, 2011; Geva & Farnia, 2012), as was also evidenced in the current study by strong correlations between the different measures of reading and spelling at all time points. Furthermore, literacy development is a cumulative process in which lower-level skills, such as word reading and spelling, form the basis for more advanced higher-level literacy skills, including reading comprehension (Perfetti, 1985; Snow et al., 1998). The necessary skills for successful reading also change over time, as the knowledge and abilities necessary to comprehend texts at the Year 6 level, for example, are far more advanced than those required at the Year 1 level (Kieffer & Vukovic, 2013). Similarly, it is likely that even word reading draws upon more advanced skills as children become older and the texts children encounter include more complex orthographic patterns and polysyllabic words (Leach, Scarborough, & Rescorla, 2003). This highlights the possibility that even if children demonstrate age-appropriate skills early in their literacy development, they may not maintain this relative level of mastery as reading and writing skills become more challenging. Increasing cases of reading difficulties (including word reading and reading comprehension weaknesses) in upper-elementary aged children have been reported in both the mono- and bilingual literature. Some researchers have referred to this trend as the “fourth-grade slump” (Chall, 1983; Kieffer & Vukovic, 2013; Lipka, Lesaux, & Siegel, 2006; Leach, et al., 2003). There was some limited support for this trend in the current data, as both monolingual and EAL children’s reading accuracy standard scores decreased significant between Years 1 and 2. These results mirror those of Kieffer and Vukovic (2013), who examined reading accuracy in monolingual and EAL children from low-SES backgrounds in the US. They found that although both groups had reading skills in advance of national norms in Grade 1, by Grade 4 both groups’ averages were below the norm. Furthermore, a considerable proportion of monolingual and EAL children who had adequate reading accuracy in Grade 1 demonstrated reading difficulties by Grade 4. This emphasises the importance of not assuming that children’s relative proficiency levels on literacy skills are fixed, especially as the demands on their skills increase over the course of literacy development.

7.3 The role of cognitive and linguistic skills in literacy development

Research with monolingual children has suggested that many of the foundational skills that underpin children's literacy development begin to form prior to formal literacy instruction (NELP, 2008), but research into preschool predictors of later literacy in bilingual children learning in their L2 has been relatively limited. As such, the current study examined predictors of literacy in EAL children both before and after school entry, and compared the relative contribution of these predictors to various literacy skills in young school-aged monolingual and EAL children.

While both PA and LSK have been consistently shown to be among the strongest preschool predictors of later literacy skills for monolingual children (Foulin, 2005), and for bilingual children in the first months of formal education (Muter & Diethelm, 2001; Chiappe, Siegel, & Gottardo, 2002; Lesaux et al., 2007; Goodrich et al., 2016), this was not found in the current study. Surprisingly, neither PA nor LSK skills measured at the end of Nursery were significant predictors of any literacy skills at the end of Year 2. One suggested role of PA and LSK together in the development of literacy skills is their contribution to children's understanding of the alphabetic principle, and to their ability to apply phonic strategies to reading and spelling attempts (Byrne & Fielding-Barnsley, 1989; Bowey, 2005; Lerner & Lonigan, 2016). As the EAL children in the current study went on to develop strong PA and LSK skills in line with norm-referenced age-expectations by the end of their Reception year, and because these children had well developed word reading and spelling skills (as compared to norms and their monolingual peers) at all time points, it is clear that EAL children were able to grasp this central concept in alphabetic literacy. Therefore, it is unlikely that these code-related skills were unimportant for children's literacy learning, and the lack of predictive significance of these variables at the end of Nursery may simply reflect the fact that at this early point in EAL children's L2 development, their performance on these measures was too limited to make them good predictors of their later literacy skills.

However, broader PP skills (including both PA and RAN) as measured in Year 1 contributed relatively similarly to the prediction of reading accuracy, fluency, and reading comprehension in Year 2 for both mono- and bilingual children, although in all instances PP explained more unique variance for monolingual children. These results are consistent with the growing literature suggesting not only that PP plays a fundamental role literacy acquisition for monolingual (Hulme et al., 2012; Caravolas et al., 2012) and bilingual children, but that the contribution of this cognitive ability is relatively similar for mono- and bilingual learners (Lesaux & Siegel, 2003; Lesaux et al., 2006; Nakamoto, et al., 2007; Zadeh, et al., 2012). However, there were differences between the groups in terms of the contribution of PP skills to spelling. For monolingual children PP explained a large amount of unique variance, while for EAL children it explained almost no unique variance in this literacy outcome. Although a lack of unique contribution to a model does not imply that a skill is unimportant, but only that it's influence may be shared with other predictors, this does suggest that there may be differences in the relative importance of PP for spelling skills for children learning in their L1 and L2. Across all literacy outcomes there was a consistent finding that PP explained more unique variance for monolingual children, leading to the suggestion that other skills may play a larger unique role in literacy prediction for EAL children.

In line with this previous point, VM was a stronger literacy predictor for EAL children, and explained significant unique variance in Year 2 reading accuracy, reading comprehension, and spelling for EAL children, but was only a unique predictor of reading fluency for monolingual children. Given that the increased contribution of VM to explaining EAL children's literacy skills was consistent across the majority of literacy outcomes, this could suggest that these EAL children used different cognitive strategies in their reading and writing. For example, there is some suggestion that being less proficient in an L2 may result in greater demands on VM, and particularly WM, during reading (Swanson, Orosco, Lussier, Gerber, & Guzman-Orth, 2011), and this argument could be applied to interpretation of the current results. However, it should be noted that these findings diverge from previous research with bilingual children, where results have suggested that code-related skills were of greater importance than VM for reading and spelling outcomes (Jongejan et al., 2007; Harrison, et al., 2016), or that the contribution of VM to predicting literacy was similar for mono- and bilingual children (Lesaux et al., 2007; Geva & Farnia, 2012). As such, these results would need replication in similar samples before firm conclusions could be made.

The current study also demonstrated that, in contrast to LSK and PA, EAL children's OL skills in Nursery were significantly predictive of all reading outcomes in Year 2. These results, along with others in the literature (Lindsey et al., 2003; Hammer & Miccio, 2006; Rinaldi & Páez, 2008), demonstrate the key role of early language skills in the literacy development of EAL children. Furthermore, there was some indication that these OL skill were more important than the code-related skills that are typically found to be key preschool literacy predictors for monolingual children (NELP, 2008). Further evidence of this comes from a series of studies analysing data from the Early Childhood Longitudinal Study – Kindergarten cohort, a large-scale study examining the complex interactions of background, educational, and linguistic variables in children between kindergarten and Grade 8 in the US (Kieffer, 2008; 2011). The results of these studies suggested that on broad measures of reading achievement (including both decoding and reading comprehension), L2 learners who entered kindergarten with limited English language skills developed reading skills slightly faster than national norms, but their growth trajectories were insufficient to close the reading gap even by Grade 8. However, L2 learners with more advanced English proficiency in kindergarten caught up to national averages by Grade 1, and maintained these relative levels of proficiency through Grade 8. Additionally, when L1 and L2 learners were match on SES, L2 learners with limited English language skills still began school with lower levels of reading skill, but showed faster rates of development that meant that their reading achievement converged with those of their L1 peers from similar SES backgrounds by Grade 8. These results highlight the potential impact and interaction of early OL proficiency and SES background in determining the achievement and development of EAL children, and this should be explored further in future work in a UK context.

The impact of Year 1 OL in predicting literacy skills was more limited for both monolingual and EAL children, and the only significant unique contribution of language skills to literacy was to the reading comprehension of EAL children. Despite the aforementioned results pertaining to the predictive significance of preschool OL skills for EAL children, it is not uncommon in the literature to find that OL measured once children enter school is a weaker predictor of word reading and spelling than code-related skills such as LSK and PP (Geva, 2006), and this is also true for monolingual children (Storch & Whitehurst, 2002; Muter et al., 2004). However, the finding that OL was a stronger longitudinal predictor of reading comprehension in EAL children than their monolingual peers is in line with a growing body of evidence that highlights the increased importance of linguistic skills for this literacy outcome for bilingual children (Droop & Verhoeven, 2003; Proctor et al., 2012; Lervåg & Aukrust, 2010; Verhoeven, 2000; Geva & Farnia, 2012; Babayiğit, 2014). Together, these results suggest that early OL proficiency is a fundamental predictor of bilingual children's broader literacy attainment, and continues to be disproportionately important for reading comprehension in this group of learners compared to their monolingual peers.

Taken together, these results suggest an overall pattern for code-related predictors to play a slightly more limited role in the literacy skill development of these EAL children as compared to previous results from monolingual and bilingual samples, as well as compared to their monolingual peers, while VM and OL skills were of greater importance for EAL learners. However, in interpreting these results, it is useful to consider the arguments of Paris (2005) on the differential nature of literacy predictors. Of most relevance to current results is Paris' assertion that there are meaningful differences in the theoretical and methodological constraints associated with different skills. For example, PA and LSK could be considered constrained skills that develop from very low levels of proficiency to complete mastery within a relatively short period. This short developmental span means that children's performance on these measures is only normally distributed for a limited time, and only during this specific point in children's learning of these skills will they have sufficient variance to show robust associations with other skills. These constraints are both conceptual (there are only a set number of letter-sound correspondences for each language) and methodological (measures of PA are often more conscribed that measures of broader language skills). Other skills, such as vocabulary and listening comprehension, develop before, during, and after children master these constrained skills. Furthermore, individuals reach different levels of proficiency in these abilities. Within the context of the current study then, the lack of predictive significance of LSK and PA in Nursery for later literacy skills could reflect that at this point children's skills were too skewed (either for legitimate conceptual reasons or for methodological ones) to be related to literacy skills. However, as Paris notes, this is not to say that these constrained skills are unimportant, but only that they are insufficient to the development of more advanced literacy abilities. Indeed, broader abilities including OL are likely to have a sustained impact on literacy skills throughout childhood and into adulthood, and the current results highlight that this may be even more true when learning in an L2.

Despite the finding that the unique contributions of these individual skills to literacy were in some instances significant, it is important to highlight that in the vast majority of cases for both monolingual and EAL children the autoregressor was the strongest predictor of later reading and spelling ability. This emphasises the stability of children's literacy skills, as has been noted consistently in the literature (LaFrance & Gottardo, 2005; Roth et al., 2002; Parrila et al., 2004; Georgiou, Parrila, & Papadopoulos, 2008). Furthermore, considerable amounts of explained variance in most models was explained by the shared contributions of the predictors, suggesting that although these skills were considered independent, similar processes may underpin them, and this was supported by finding that in many instances the predictor variables were significantly related to each other.

Finally, there was a consistent trend for the models of monolingual children's literacy skills to have more explained variance than EAL children's, and this was particularly pronounced for the prediction of reading comprehension and spelling. This may suggest that for these bilingual children, there were other contributing factors in the development of these skills that were unaccounted for in the current study. One obvious candidate is children's L1 language skills, although the role of cross-linguistic influences have tended to be more strong in studies of decoding and spelling, as compared to reading comprehension (Figuerdo, 2006; Melby-Lervåg & Lervåg, 2011). Nonetheless, there are likely to be other individual, social, and instructional variables that could play a greater role in literacy development in EAL children than their monolingual peers (Goldenberg, Rueda, & August, 2006), and identifying these additional independent and interacting influences will be of importance in the future.

7.4 Strengths, limitations, and future directions

As previously noted (see section 2.6), one important and differentiating aspect of this study was that the longitudinal design followed the development of cognitive and linguistic skills in EAL children from their preschool years through to their first three years of early education. There have been very few studies that have examined this transition into school in bilingual children, along with the role of early language and pre-literacy skills on later literacy achievement (Hoff, 2013), and as such this work fills an important gap in the research. Furthermore, this project benefitted from the inclusion of a monolingual comparison group from similar SES and educational backgrounds to the EAL children, and both groups were compared to norms from appropriately standardised measures. These two different forms of comparison allowed the EAL children's development to be considered in terms of how they compared to their peers from the same schools as well as to more wider-reaching norms, and this design was particularly relevant as it was able to highlight when trends in the development of children from both groups were similar and different as compared to standardised norms. Finally, this work added to the relatively small amount of research conducted with EAL children based in the UK, and therefore extends our understanding of bilingual children's cognitive, linguistic, and literacy development to children growing up in this specific social and educational context.

Nonetheless, there are a number of important limitations that should be taken into account when considering the current findings. Firstly, this study was a follow-on project from an intervention study designed for EAL children with limited English language proficiency in Nursery. As part of the recruitment process for this previous study, all children in the participating Nurseries were screened, and the eight children with the most limited English skills were selected for inclusion in the intervention (Fricke & Millard, 2016). As such, the current sample was specifically selected to include EAL children with the weakest language skills, and this may limit the generalizability of these results to unselected EAL samples. However, this is a common issue in EAL and bilingual samples more broadly, given that these children are known to be very heterogeneous in terms of their language exposure and skills, as well as their social and educational backgrounds (Strand et al., 2015). Furthermore, provisions for L2 learners vary widely from school to school and across local authorities (Institute of Education, 2009), so the importance of considering the specific experiences of the EAL children when interpreting research findings is not unique to the current study.

Another sampling consideration is that attrition in this study was high. A relatively large proportion of the original sample from the previous project could not be re-recruited into the current study, and the nature of this attribution was not random. There were several schools that did not consent to be involved in the follow-on project, and this may have introduced bias into the specific group of EAL children who were included in the current project. Similarly, parent information sheets and consent forms were not translated into the languages of all the EAL children's families due to limited resources, and this makes it possible that the study included primarily those children from families with sufficient English language skills to understand the project information sheets. It would have been preferable to either translate versions of these materials, or to employ translators to explain and answer parents' questions in person, but given the large number of languages spoken by the current sample and the limited resources of this project, this was not possible.

Although it was a strength that this work included a monolingual comparison group, these children were not recruited until all children in the project were in Year 1. Although this was unavoidable given that the original intervention project was specifically concerned with evaluating an intervention rather than considering longer-term development, the impact of this was that EAL children's performance and development could only be compared to that of monolingual children at two time points. Bowey (2005) notes that although two time point designs are a good starting point for consideration of development, it is important to remember that findings from these types of studies cannot be generalised to other points in development or to different starting levels of proficiency in the measured skills. Therefore, given that it was not possible to retrospectively compare EAL children to their monolingual peers, it would have been preferable to follow these two groups of children for longer into their primary school years. However, this was beyond the scope of the current work, and should instead be the focus of future research.

As is commonly the case, this study would also have benefitted from a larger sample size overall and in both groups individually. This issue is particularly relevant for the consideration of the hierarchical multiple regression analyses, as the current sample size makes it likely that only large effects would be identified as significant (Field, 2009), and a larger sample would have made these analyses more robust. This issue also had the knock-on effect that in order to limit the number of predictors entered into the regression models, measures of PA and RAN were combined into the PP composite, and measures of vocabulary and grammar (and listening comprehension in Year 1) were combined into OL composites. Although it would not have been defensible to include all of these measures individually given the current sample size, previous research has suggested that PA and RAN may play independent roles in predicting literacy (Caravolas, et al., 2012; Anthony et al., 2007), and this may also be true for the different facets of OL skills (Muter, et al., 2004; Jeon & Yamashita, 2014). As such, a larger sample size would have allowed for the consideration of these individual influences.

Finally, for EAL children only their performance and development of their L2 skills was considered. As noted in the first two literature review chapters, children's L1 abilities are not only important in their own right, there are also potential cross-linguistic influences from children's L1 that impact on the rate at which children acquire different skills in their L2 (Genesee & Geva, 2006; Figuerdo, 2006; Melby-Lervåg & Lervåg, 2011). It is therefore acknowledged that although it would have been preferable to have measures of children's L1 skills, this was not possible given that even in the current relatively small sample, over 20 different languages were represented. Therefore, although documenting children's L1 skills and development is of theoretical importance, the practical issues involved with this make it very challenging. This is especially true in countries like the UK with a highly multicultural school population (Strand et al., 2015). However, this would be a useful and important avenue for future research.

7.5 Practical implications

The results of the current study suggest that cognitive and linguistic skills associated with literacy development are not equally affected by the experience of learning in an L2. As noted, code-related and VM skills seem to develop in bilingual children at a relatively similar rate to monolingual children learning in their L1, while L2 language skills remain an area of continued weakness for bilingual children. Similarly for literacy skills themselves, while word-level reading and spelling are often similar for mono- and bilingual children, reading comprehension may be an area of early and sustained weakness for L2 learners. The relevance of these findings is most noteworthy for the identification of bilingual children at risk of future literacy weaknesses. The current work adds to the evidence suggesting that because early word-level literacy skills are generally not negatively affected for children learning in an L2, weaknesses in this area should not be considered a temporary result of bilingualism and should trigger similar assessment and early intervention efforts as those used for monolingual children (August & Erickson, 2006; Shanahan & Beck, 2006). Similarly, because these lower-level literacy skills show relatively equivalent progression for L1 and L2 learners, there is no need to focus additional teaching time on teaching LSK or phonics for bilingual children.

However, possibly the most important implication of the current research is the need to provide sustained support for EAL children's L2 language skills. This is not a novel suggestion (see reviews in August & Shanahan, 2006; Melby-Lervåg & Lervåg, 2014), but it is one that is of particular importance to the current UK educational system given the growing number of EAL children. A recent large-scale study using the National Pupil Database in England noted that those children with more limited English language exposure trailed behind monolingual English speaking children in their educational attainment into secondary school (Strand et al., 2015). The current finding of somewhat weaker reading comprehension skills in EAL children (as compared to their monolingual peers) raises the possibility that these children may go on to have less access to texts that provide a rich source of additional vocabulary and language learning, not to mention the academic content so important for school achievement (Lonigan, Farver, Nakamoto, & Eppe, 2013). Thus, many children in the current study, and other EAL children across the country, would likely benefit from early and sustained English language support. Currently, the provision of this type of support varies widely across schools and local authorities, and may not continue once children are deemed to have reached sufficient levels of conversational or social English proficiency (Institute of Education, 2009). However, the current findings suggest that there is a need for language support to continue even after children have become "advanced EAL learners" in order to build children's academic language (DfES, 2006), as their language skills are likely to continue to be more limited without this sustained support.

However, as noted by Strand and colleagues (2015), schools are reporting decreases in their EAL-specific funding and funding overall, making it difficult for them to sustain the provisions currently in place, let alone to add support for this group of learners. This is an area of concern, and something that should be considered carefully in policy going forward in order to avoid unfairly disadvantaging this specific group of children.

Although the current study cannot address what types of intervention or support would be most useful for enhancing children's language proficiency, a recent review sets out the available evidence for EAL interventions for language and literacy (Murphy & Unthiah, 2015). The authors highlight that there are a number of established and promising interventions aimed at improving EAL children's language (and particularly vocabulary skills) that have been evaluated in other English-speaking countries, and could therefore be trialled in the UK. For example, Solari and Gerber (2008) evaluated and compared the effectiveness of three different interventions that varied in their focus on PA, alphabetic knowledge, and listening comprehension. Californian Spanish-English EAL children in kindergarten (mean age 5;6 years) received interventions focused on PA skills, PA and alphabetic knowledge (with some limited listening comprehension training), or listening comprehension (with some limited PA and alphabetic knowledge training). Results suggested that children who received the listening comprehension intervention outperformed the other groups in not only listening comprehension measures, but also on measures of PA, and all groups performed similarly on early literacy measures. This study is therefore some of the first work to clearly demonstrate that it is not only possible to teach and improve young EAL children's listening comprehension skills, but that this can be done with no adverse effects on children's PA and early literacy skills. Very similar results were reported more recently by Filippini, Gerber, and Leafstedt (2012), adding further support for the conclusion that increased focus on vocabulary learning in early educational settings can improve both children's language and PA skills.

Although still limited, there have also been studies of interventions within a UK context (Dockrell, Stuart, & King, 2010; Fricke & Millard, 2016). Dockrell and colleagues (2010) considered the effectiveness of early intervention for EAL children in preschool. The primary focus of this study was the efficacy of the *Talking Time* intervention, which aimed to develop children's vocabulary, broader language, and narrative skills through play-acting, structured storybook discussions, and narrative activities that linked children's learning with their own experiences. Children who received the *Talking Time* intervention were compared to children who received a similarly structured intervention with more passive exposure to storybooks, and to children who received standard preschool provision. Results suggested that EAL children who received *Talking Time* outperformed the other two groups on measures of verbal comprehension, vocabulary, and sentence repetition, although not on narrative skills. This evidence suggests that even very young children (between 3-4 years) learning English in their preschool setting can show significant improvements in their L2 oral language development when teachers provide sustained opportunities to actively engage in activities and discussions that are related to their immediate and broader experiences. The authors also highlight that the staff involved with the *Talking Time* intervention received more training, and were explicitly required to model and recast children's language, and this could have been an important component in the success of this intervention. Overall, the results of this study suggest the importance of providing and encouraging EAL children's L2 language learning through active opportunities to practice language in an environment where adults model and correct their language. It is also worth noting that understanding the impact of staff training on EAL children's language development would be a useful, and future work should examine both the efficacy and practicality of language support for EAL children in UK preschool and school settings.

7.6 Summary and conclusions

The current study used a longitudinal design to examine the development of cognitive, linguistic, and literacy skills in EAL children from the middle of their Nursery year into Year 2 of primary school, and compared this group's performance and development on these skills to those of monolingual children from the same schools in Years 1 and 2. In Nursery, EAL children had very limited scores on PA, LSK, and language measures, but these skills showed rapid development in advance of norm-expectations between their Nursery and Reception year. However, once children had been in formal education for one year, their rate of development tended to slow and was generally not significantly different from the development of their monolingual peers. As such, there was evidence that when EAL children first enter English-language childcare and educational settings, their pre-literacy and language skills show accelerated growth, but once they reach their second year of educational their development is similar to that of their monolingual peers.

Whether EAL children showed similar abilities to monolingual children (either in terms of norms or the monolingual comparison group) depended on the cognitive, linguistic, or literacy skill in question. The current results replicate previous findings suggesting that on measures of code-related skills (including PA, LSK, and RAN) EAL children quickly reached levels of proficiency similar to those of L1 learners. Although EAL children's initial VM skills were in the low-average range, by Years 1 and 2 monolingual and EAL children showed comparable STM and WM capacities. However, consistent with large amounts of previous research on bilingual populations, language skills were an area of considerable and sustained weakness for EAL children. Within language skills, EAL children's vocabulary knowledge was particularly limited, although both mono- and bilingual children showed evidence of increasing weaknesses on this aspect of language proficiency. This profile of similar skills on code-related and VM measures, but group differences on OL, would lead to the prediction based on the SVR that the two groups should be similar in terms of their word-level literacy skills (reading accuracy, fluency, and spelling), but EAL children may have more limited reading comprehension skills. This prediction was borne out, as although both monolingual and EAL children had age-appropriate reading comprehension skills, monolingual children already showed significantly better comprehension of text.

The final aim of this work was to consider the role of cognitive and linguistic predictors, including phonological skills, LSK, VM, and language, in explaining individual differences in children's literacy outcomes in Year 2. Contrary to previous research with monolingual children, preschool PA and LSK were not found to be significant unique predictors of later reading and spelling for EAL children. Instead, language skills were a strong and consistent predictor of all later reading outcomes, suggesting that there may be important group differences in the preschool skills associated with later literacy success. Although the Year 1 predictors of Year 2 reading accuracy and fluency were similar for monolingual and EAL children, there was a general trend for phonological skills to be a stronger determinant of literacy in monolingual children, while VM showed stronger relationships with literacy (and particularly reading comprehension and spelling) in EAL children. Although this latter finding would need replication before strong conclusions are drawn, this may suggest that L2 learners draw on cognitive skills differently from the peers learning in an L1. Finally, the current results add to a growing body of evidence suggesting that OL plays a stronger role in determining the reading comprehension of EAL children as compared to their monolingual peers, suggesting that for this aspect of literacy, language remains an important predictor from preschool into school-aged children.

The current findings represent some of the first work in England to follow the development of EAL children from their preschool years into early education, and to consider the role of children's abilities prior to formal education in determining later literacy success. These findings add to both our theoretical understanding of the underpinnings of literacy development in L1 and L2 learners, and also highlight skills that could be considered in screening for literacy weaknesses. Finally, the findings of this study confirm a need to focus sustained attention on supporting the language skills of EAL children, even beyond the point of conversational proficiency in English. As the requirements of literacy and broader educational attainment become more demanding in terms of children's linguistic skills, it is likely that these EAL children will be underprepared for these challenges, and future work should consider the efficacy and practicality of language support for this group of children.

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Appendices

Appendix 1: Departmental ethics approval

ETHICS REVIEWER'S COMMENTS FORM

This form is for use when ethically reviewing a research ethics application form.

1. Name of Ethics Reviewer:	Dr Richard Body Dr Sarah Spencer Dr Catherine Tattersall
2. Research Project Title:	Learning English as an additional language in the classroom
3. Principal Investigator (or Supervisor):	Dea Nielsen
4. Academic Department / School:	Human Communication Sciences
5. I confirm that I do not have a conflict of interest with the project application	

6. I confirm that, in my judgment, the application should:			
Be approved:	**Be approved with *suggested* amendments in '7' below:** and/or	**Be approved providing *requirements* specified in '8' below are met:**	**<u>NOT</u> be approved for the reason(s) given in '9' below:**
X			

7. Approved with the following suggested, optional amendments (i.e. it is left to the discretion of the applicant whether or not to accept the amendments and, if accepted, the ethics reviewers do not need to see the amendments):

8a. Approved providing the following, compulsory requirements are met (ethics reviewers <u>do not</u> need to see the required changes)

8b. Approved providing the following, compulsory requirements are met (ethics reviewers <u>need to see the required changes, which should be highlighted in the resubmitted form</u>):

9. Not approved for the following reason(s):

10. Date of Ethics Review: 26/02/13

Signature of reviewer:

Dr Richard Body

Appendix 2: Parent/carer questionnaire for EAL and monolingual families

The University Of Sheffield.

Learning English as an Additional Language in the Classroom

Parent/Carer Questionnaire

You have given consent for your child to take part in the research project *Learning English as an additional in the Classroom.*

We are now asking parents/carers to help us by providing some information about their own and their child's language background.

- This information will only be used to analyse and evaluate the project data.
- All information will be treated as strictly confidential.
- Children's names will be replaced by letter/number codes.

We would be extremely grateful if you could spend a few minutes answering the questions but please leave blank any questions you would rather not answer.

If you return the **completed** questionnaire to your child's class teacher, you will be entered into a prize draw for the chance to win one of three £15 gift vouchers for Tesco!

Returning the questionnaire:
Please hand the questionnaire to your child's class teacher.

If you have any questions or would like any further information please do not hesitate to contact Dea Nielsen at the Department of Human Communication Sciences, University of Sheffield; 362 Mushroom Lane, Sheffield S10 2TS; Tel: 0114-2222400; Email: d.nielsen@sheffield.ac.uk

To be completed by the child's main caregiver i.e. the person who spends most time with the child.

Please specify your relationship to the child [e.g. mother, father, grandmother]: ______________________

Your child's name: ____

Gender: ☐ male ☐ female Home postcode______________________

ABOUT YOUR CHILD

1. **How old was your child when he/she first spoke a word?**

   ☐ 6-12 months (before or around 1st birthday) ☐ 13-18months (around 1 ½ years)

   ☐ 19-24 months (shortly before or around 2nd birthday) ☐ 24 months or later (after 2nd birthday)

2. **Are you ever concerned about your child's use of their home language** [this might be English or it might be another language]? ☐ not at all ☐ sometimes ☐ often ☐ always

3. **Is it easy for your family or friends to understand what your child is saying?**

   ☐ very easy ☐ easy enough ☐ sometimes not easy ☐ no, very hard

4. **Does your child get frustrated if he/she cannot communicate his/her ideas?**

   ☐ not at all ☐ sometimes ☐ often ☐ frequently

5. **Does your child like to read books or have books read to them?**

   ☐ never ☐ rarely ☐ sometimes ☐ very much

6. **In what language(s) are your child's children's books** [please list all]? 1)____________________

   2)____________________ 3)____________________ 4)____________________

7. **How many of your child's books are in a language other than English?**

   ☐ all ☐ most ☐ many ☐ some ☐ hardly any ☐ none

8. **Does your child watch TV?** ☐ Yes ☐ No

9. **If YES, in what language(s) does your child watch TV** [please list all]? 1)________________________
 2)________________________ 3)________________________ 4)________________________

10. **If YES, how often does your child watch TV in a language <u>other</u> than English?**
 ☐ always ☐ mostly ☐ often ☐ sometimes ☐ rarely ☐ never

11. **Did your child attend a daycare centre/crèche before they started nursery?** ☐ Yes ☐ No

 12. **If YES, how old was your child when he/she started to go to the daycare centre/crèche?**
 ☐ 0-½year ☐ ½-1 year ☐ 1-1½ year ☐ 1½-2 years ☐ 2-2½ years ☐ 2½-3years ☐ 3-3½years

13. **Did your child attend a nursery before they started school (Reception)?** ☐ Yes ☐ No

 14. **If YES, how old was your child when he/she started to go to nursery?**
 ☐ 2½-3years ☐ 3-3½years ☐ 3½-4years

 15. **If YES, how many days a week did your child attend nursery?** ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

 16. **If YES, how many hours a week did your child attend nursery?**
 ☐ <6 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐21-25 ☐ 26-30 ☐ 31-35 ☐>35

FAMILY BACKGROUND

17. **Is there any history in your child's family (i.e. parents, grandparents and siblings) of problems in the following** [please tick as appropriate]?
 ☐ Difficulties with learning ☐ Problems following directions or understanding questions
 ☐ Problems saying a word correctly ☐ Other, please specify: ________________________
 ☐ Problems with reading and/or writing ☐ None of the above
 ☐ Language problems, e.g. in producing sentences

18. **What is the highest level of education of the child's mother/female carer?**
 ☐ Primary school ☐ Secondary school ☐ Further Education/College ☐ University (Undergraduate)
 ☐ University (Postgraduate) ☐ Other, please specify: ________________________

19. **What is the highest level of education of the child's father/male carer?**
 ☐ Primary school ☐ Secondary school ☐ Further Education/College ☐ University (Undergraduate)
 ☐ University (Postgraduate) ☐ Other, please specify: ________________________

Is your child growing up with more than one language? ☐Yes ☐ No

If NO, you have now finished the questionnaire. Thank you for your time.

If YES, please continue with the questionnaire.

QUESTIONS FOR FAMILIES WHOSE CHILD SPEAKS A LANGUAGE OR LANGUAGES OTHER THAN ENGLISH

20. **Which language or languages <u>in addition to English</u> does your child learn and speak?**
1) ________________________ 2) ________________________ 3) ________________________

21. **What language does your child hear the most outside of school?** ____________________

22. **What language does your child speak the most outside of school?** ____________________

23. **Was your child born in the UK?** ☐ Yes ☐ No

24. **If NO, what is your child's country of birth?** ____________________

25. **If NO, at what age did your child move to the UK?**

☐ 0-½ year ☐ ½-1 year ☐ 1-1½ years ☐ 1½-2 years ☐ 2-2½ years ☐ 2½-3years ☐ 3-3½years

26. **What is your first language/mother tongue** [please complete for both parents/carers]?

Father/male carer ____________ Mother/female carer ____________

27. **In which country did you go to school** [please complete for both parents/carers]?

Father/male carer ____________ Mother/female carer ____________

28. **Can you read and write in English** [please complete for both parents/carers]?

Father/male carer ☐ Yes ☐ No Mother/female carer ☐ Yes ☐ No

29. **What language(s) are used to talk to the child by** [please list all]:

a) Mother/female carer ____________________

b) Father/male carer ____________________

c) Relatives ____________________

d) Neighbours ____________________

e) Your child's friends ____________________

30. **How often is your child spoken to in a language other than English by:**

a) Mother/female carer:	☐ always	☐ mostly	☐ often	☐ sometimes	☐ rarely	☐ never
b) Father/male carer:	☐ always	☐ mostly	☐ often	☐ sometimes	☐ rarely	☐ never
c) Relatives	☐ always	☐ mostly	☐ often	☐ sometimes	☐ rarely	☐ never
d) Neighbours	☐ always	☐ mostly	☐ often	☐ sometimes	☐ rarely	☐ never
e) Your child's friends	☐ always	☐ mostly	☐ often	☐ sometimes	☐ rarely	☐ never

31. **Does your child have any siblings (brothers or sisters)?** ☐ Yes ☐ No

32. **If YES, what language(s) do the siblings speak to each other** [please list all]?1)____________

2)____________ 3)____________ 4)____________

33. **If YES, how often do the siblings speak to each other in a language other than English?**

☐ always ☐ mostly ☐ often ☐ sometimes ☐ rarely ☐ never

34. **How often does your child attend any extra-curricular activities where they speak English (e.g. sports, music class, clubs etc.)?** ☐ every day ☐ at least once a week ☐ occasionally ☐ never

35. **How often does your child attend extra-curricular activities where they speak a language other than English (e.g. sports, music class, clubs etc.)?** ☐ every day ☐ at least once a week ☐ occasionally ☐ never

36. **How often does your child receive formal instruction in a language other than English (language classes, working through a language workbook, etc.)** ☐ every day ☐ at least once a week ☐ occasionally ☐ never

MANY THANKS FOR COMPLETING THE QUESTIONNAIRE!

Appendix 3: Child Questionnaire for EAL children

Please start this questionnaire by saying *"Now I'm going to ask you some questions about the languages you speak. You don't have to answer my questions. If you don't want to answer a question, that's okay, just say you would like to skip it."* Then ask the questions in order, and encourage children's answers to ensure that as much as possible they have given a clear response, but there is no need to elaborate once an answer is given. Responses can be transcribed offline if responses are not transcribed during the testing session.

Which languages do you speak at home?

Which language do you speak most to your mum?

Which language do you speak most to your dad?

Which language do you speak most to your brothers or sisters?

Which language do you speak with most of your friends?

Which language do you like to speak the most?

You've done such a good job with reading and writing in English. Have you been learning to read and write in (child's other language(s)) as well? Yes No

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Appendix 4 – Correlations between NVIQ and cognitive, linguistic, and literacy skills in EAL and monolingual children at t1 to t5

Correlations between NVIQ and cognitive and linguistic skills in EAL children at t1

	Alliteration	Rhyme	LSK	RAPT info	CELF EV	RAPT info	CELF SS
NVIQ	.018	-.014	.250	.050	.052	.005	.181

Correlations between NVIQ and cognitive and linguistic skills in EAL children at t2

	Alliteration	Rhyme	LSK	RAPT info	CELF EV	RAPT grammar	CELF SS
NVIQ	.021	.138	.070	.156	.155	.081	.360*

Correlations between NVIQ and cognitive and linguistic skills in EAL children at t3

	YARC Sound isolation	YARC Sound deletion	YARC LSK	RAN colours	RAN shapes	CELF digit span forwards	CELF digit span backwards	RAPT information	CELF EV	BPVS	RAPT grammar	CELF SS	CELF WS	Listening comp	DTWRP	Spelling
NVIQ	.182	.425**	.412**	.266	.121	.295	.489**	.250	-.019	.217	.121	.410*	.280	.076	.405*	.296

Correlations between NVIQ and cognitive and linguistic skills in EAL children at t4

	YARC Sound isolation	YARC Sound deletion	RAN colours	RAN shapes	RAN letters	RAN numbers	CELF digit span forwards	CELF digit span backwards	RAPT information	CELF EV	BPVS	RAPT grammar	CELF SS	CELF WS	Listening comp
NVIQ	.272	.387**	.465**	.346*	.428**	.264	.028	.552**	.122	.218	.277*	.229	.404**	.294*	.199

Correlations between NVIQ and literacy skills in EAL children at t4

	DTWRP	TOWRE - words	TOWRE - nonwords	Text reading accuracy - Beginner level	Text reading accuracy - Level 1	Text reading fluency - Level 1	Text reading comp	Spelling
NVIQ	.456**	.343*	.387**	-.312*	-.530**	-.274	.200	.404**

Correlations between NVIQ and cognitive and linguistic skills in monolingual children at t4

	YARC Sound isolation	YARC Sound deletion	RAN colours	RAN shapes	RAN letters	RAN numbers	CELF digit span forwards	CELF digit span backwards	RAPT information	CELF EV	BPVS	RAPT grammar	CELF SS	CELF WS	Listening comp
NVIQ	.378**	.391**	.214	.396**	.127	.193	.434**	.594**	.453**	.478**	.580**	.306*	.486**	.482**	.381**

Correlations between NVIQ and literacy skills in monolingual children at t4

	DTWRP	TOWRE - words	TOWRE - nonwords	Text reading accuracy - Beginner level	Text reading accuracy - Level 1	Text reading fluency - Level 1	Text reading comp	Spelling
NVIQ	.487**	.359**	.406**	-.339*	-.417*	-.332	.428**	.301*

Correlations between NVIQ and cognitive and linguistic skills in EAL children at t5

	PhAB Spoonerisms	RAN colours	RAN shapes	RAN letters	RAN numbers	CELF digit span forwards	CELF digit span backwards	RAPT information	CELF EV	BPVS	RAPT grammar	CELF SS	CELF WS	Listening comp
NVIQ	.418**	.262	.281	.221	.092	.101	.230	.424**	.538**	.424**	.331*	.316*	.499**	.219

Correlations between NVIQ and literacy skills in EAL children at t5

	DTWRP	TOWRE - words	TOWRE - nonwords	Text reading accuracy - Level 1	Text reading accuracy - Level 2	Text reading fluency - Level 1	Text reading fluency - Level 2	Text reading comp	Spelling (20 items)
NVIQ	.495**	.391**	.391**	-.383*	-.412*	-.321*	-.275	.236	.233

Correlations between NVIQ and cognitive and linguistic skills in monolingual children at t5

	PhAB Spoonerisms	RAN colours	RAN shapes	RAN letters	RAN numbers	CELF digit span forwards	CELF digit span backwards	RAPT information	CELF EV	BPVS	RAPT grammar	CELF SS	CELF WS	Listening comp
NVIQ	.475**	.033	.112	.026	-.012	.529**	.293*	.176	.505**	.501**	.406**	.192	.369**	.297*

Correlations between NVIQ and literacy skills in EAL children at t5

	DTWRP	TOWRE - words	TOWRE - nonwords	Text reading accuracy - Level 1	Text reading accuracy - Level 2	Text reading fluency - Level 1	Text reading fluency - Level 2	Text reading comp	Spelling (20 items)
NVIQ	.298*	.135	.206	-.043	-.373*	-.102	-.224	.464**	.365**

Appendix 5: *Descriptive statistics for linguistic and cognitive predictors at t1, t2, and t3 for EAL children included in statistical analyses*

	t1			t2			t3			t4		
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
PA												
Rhyme awareness-raw (5)	88	0.55	0.74	88	1.08	1.16						
Alliteration matching-raw(5)	76	0.95	1.02	76	1.58	1.09						
YARC Sound isolation-raw (12)							38	7.82	2.25	38	10.37	1.96
YARC Sound isolation-standard							38	108.87	7.69	38	108.47	10.24
YARC Sound deletion-raw (12)							37	4.95	2.67	37	7.41	2.64
YARC Sound deletion-standard							37	105.00	12.67	37	106.14	12.51
LSK												
YARC LSK core-raw (17)	37	.54	0.54	37	1.84	2.54						
YARC LSK extended-raw (32)							37	28.43	4.85			
YARC LSK core/extended-standard				37	91.14	12.38	37	115.22	13.38			
RAN												
Colours (36)							38	22.89	5.85	38	29.92	5.70
Shapes (36)							37	17.32	7.12	37	21.57	7.16
VM												
CELF digit span forward-raw (16)							37	5.12	1.31	37	6.14	1.34
CELF digit span forward-scale							37	7.81	1.93	37	9.16	2.48
CELF digit span backward-raw (14)							37	1.14	1.21	37	2.19	1.51
CELF digit span backward-scale							37	8.95	3.16	37	9.54	3.22
Vocabulary												
RAPT Information-raw	36	8.74	7.01	36	12.85	6.73	36	24.01	5.22	36	28.28	4.89
CELF EV-scale	36	3.64	2.34	36	4.56	2.61	36	6.36	2.40	36	6.17	2.74
BPVS-raw (168)							38	55.21	11.98	38	66.89	11.35
BPVS-scale							38	84.79	7.32	38	82.79	7.77
Grammar												
RAPT Grammar-raw	36	5.13	5.52	36	9.64	6.49	36	17.61	4.80	36	20.99	5.13
CELF SS-scale	35	3.63	2.62	35	5.89	2.38	35	6.89	1.68	35	7.23	2.86
CELF WS-scale							37	6.38	3.13	37	6.73	2.84
Listening comp-raw (8)							37	3.27	1.71	37	1.70	1.60

Note. Maximum scores for the measures are shown in parentheses next to the measure names.

Appendix 6: Results of the hierarchical multiple regressions of cognitive and linguistic skills at t2 and t4 predicting literacy skills at t5

Results of the hierarchical multiple regression analyses predicting reading accuracy at t5 from cognitive and linguistic skills at t2 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PA	.058	.124	.000	.898	-.021
LSK	.161	.009	.039	.158	.241
OL	.240	.001	.121	.016	.392

Results of the hierarchical multiple regression analyses predicting reading fluency at t5 from cognitive and linguistic skills at t2 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PA	.048	.168	.002	.767	-.047
LSK	.128	.022	.017	.334	.159
OL	.327	.000	.214	.001	.521

Results of the hierarchical multiple regression analyses predicting reading comprehension at t5 from cognitive and linguistic skills at t2 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PA	.001	.853	.024	.235	-.182
LSK	.027	.307	.000	.875	-.025
OL	.366	.000	.369	.000	.676

Results of the hierarchical multiple regression analyses predicting spelling at t5 from cognitive and linguistic skills at t2 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PA	.010	.519	.005	.657	-.079
LSK	.052	.146	.010	.509	.122
OL	.130	.019	.088	.056	.335

Results of the hierarchical multiple regression analyses predicting reading accuracy at t5 from cognitive and linguistic skills at t4 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.447	.000	.013	.054	.146
VM	.311	.000	.018	.022	.160
OL	.361	.000	.012	.055	.140
t4 accuracy	.790	.000	.295	.000	.681

Results of the hierarchical multiple regression analyses predicting reading accuracy at t5 from cognitive and linguistic skills at t4 in monolingual children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.613	.000	.029	.004	.255
VM	.184	.003	.002	.477	-.060
OL	.180	.003	.004	.279	-.093
t4 accuracy	.825	.000	.235	.000	.807

Results of the hierarchical multiple regression analyses predicting reading fluency at t5 from cognitive and linguistic skills at t4 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.584	.000	.059	.003	.342
VM	.242	.001	.011	.189	.121
OL	.327	.000	.008	.243	.115
t4 fluency	.636	.000	.126	.000	.479

Results of the hierarchical multiple regression analyses predicting reading fluency at t5 from cognitive and linguistic skills at t4 in monolingual children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.643	.000	.092	.000	.451
VM	.049	.150	.029	.014	-.251
OL	.057	.120	.000	.961	.005
t4 fluency	.701	.000	.160	.000	.624

Results of the hierarchical multiple regression analyses predicting reading comprehension at t5 from cognitive and linguistic skills at t4 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.112	.028	.004	.545	-.072
VM	.377	.000	.089	.005	.346
OL	.405	.000	.055	.025	.312
t4 comprehension	.446	.000	.059	.021	.338

Results of the hierarchical multiple regression analyses predicting reading comprehension at t5 from cognitive and linguistic skills at t4 in monolingual children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.260	.000	.019	.130	.171
VM	.195	.002	.002	.608	-.067
OL	.414	.000	.013	.206	.205
t4 comprehension	.644	.000	.136	.000	.600

Results of the hierarchical multiple regression analyses predicting spelling at t5 from cognitive and linguistic skills at t4 in EAL children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.163	.007	.001	.829	.032
VM	.237	.001	.102	.010	.375
OL	.144	.011	.007	.482	-.112
t4 spelling	.351	.000	.176	.001	.531

Results of the hierarchical multiple regression analyses predicting spelling at t5 from cognitive and linguistic skills at t4 in monolingual children

Blocks	Entered first		Entered last		
	R^2 Change	Sig F change	R^2 Change	Sig F change	B
PP	.466	.000	.153	.000	.473
VM	.193	.002	.000	.839	-.029
OL	.211	.001	.021	.143	.206
t4 spelling	.348	.000	.091	.003	.337