Language and Cognitive Development Over the Early School Years in Children Learning English as an Additional Language

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Declaration of Authorship

I, Katie Elizabeth Whiteside, hereby declare that the writing and data analyses presented within this thesis are my own work. Where I have consulted the work of others, this is clearly stated. Some of the data presented within this thesis were collected as part of the Surrey Communication and Language in Education Study (SCALES) before I commenced my PhD research and joined the project. Within SCALES, a cohort of children in reception year of primary school were screened and subsamples of these children were later assessed in Year 1 and Year 3. I started my PhD following the Year 1 assessment stage and collected data within the Year 3 assessment stage. Furthermore, I recruited and assessed additional children with EAL from the original cohort in Year 3 and organised a parent questionnaire project. The specific research questions addressed within this thesis, and the analyses undertaken, were of my own design.

Signed: K.E.Whiteside

Date: 09/02/2017

Abstract

This thesis presents a series of studies (Chapters 2-6) which explored the language and cognitive development of children learning English as an additional language (EAL) over the early school years. Chapter 2 reports that English language competence in reception year (ages 4-5 years), in both children with EAL and monolingual English-speaking peers, is predictive of concurrent behavioural functioning and academic attainment over the early school years. Furthermore, relative to monolingual peers with comparable English language proficiency in reception, children with EAL displayed advantages in behaviour and meeting academic targets. Chapter 3 explored associations between EAL status, English language proficiency, and executive function in Year 1 (ages 5-6 years). Limited support was found for the controversial theory that bilingualism is associated with executive function advantages. However, children with EAL and monolingual peers with comparably low English language proficiency differed on specific executive function measures, highlighting that such measures may help disentangle language impairment from limited language experience. Chapter 4 reports that a monolingual-normed English language battery administered in Year 1 identified children with EAL and monolingual peers who continued to display comparably low English language proficiency in Year 3 (ages 7-8 years) and had comparable academic attainment in Year 2 (ages 6-7 years). Chapter 5 demonstrated that Year 1 measures of executive function, nonword repetition, and non-verbal ability do not improve prediction of English language proficiency in Year 3 in children with EAL, over and above Year 1 performance on an English language battery. Finally, Chapter 6 explored associations between language exposure, first language development, and English language proficiency in reception and Year 3 among children with EAL. Age of early language milestones were most strongly associated with English language competence at both time points and may therefore help identify children with EAL who will likely display persistent English language difficulties.

Dissemination of Findings

Publications

Whiteside, K. E., Gooch, D., & Norbury, C. F. (2016). English language proficiency and early school attainment among children learning English as an additional language. *Child Development*. Advance online publication. https://doi.org/10.1111/cdev.12615

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Presentations

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Chapter 1: General Introduction

UK Diversity

The United Kingdom (UK) is a diverse and multicultural society, with many children growing up learning English as an additional language (EAL). Such children are educated in English, however they have been exposed to a language other than English at home since early development (Department for Education, 2015d, 2016). The 2016 School Census revealed that 20.1% of children attending state-funded primary schools in England, and 15.7% of children attending state-funded secondary schools in England, have EAL (Department for Education, 2016). These proportions have been rising quite dramatically, increasing from 12.5% and 9.5%, respectively, 10 years ago in 2006 (Department for Education and Skills, 2006). The proportion of children who have EAL varies widely between different regions in the UK. Inner London local authority areas have particularly high proportions of primary school children who have EAL, with proportions ranging between 33.4% and 74.8% (Department for Education, 2016). In contrast, fewer children have EAL in primary and secondary schools in Scotland (5.2%; The Scottish Government, 2015b) and Wales (7.0%; Welsh Government, 2016b).

The multilingual nature of the UK is characterised not only by the number of children learning EAL, but also in terms of the number of different first languages represented. The Department for Education (2015d) considers a child’s first language to be the language the child has been exposed to since early development. If a child has been exposed to a language other than English since early development, this language is reported as the child’s first language, regardless of English exposure and proficiency (Department for Education, 2015d). The term first language, together with this definition, will be used throughout this thesis, rather than other commonly used terms, such as home language, mother tongue, or heritage language. In England, over 300 different first languages are represented by school pupils (NALDIC, 2012a). The most frequently reported first languages, other than English, are Urdu, Panjabi, Bengali, and Polish, which are all spoken by at least 50,000 pupils from state-funded primary and secondary schools in England (NALDIC, 2012a). In Scotland, 144 different first languages are represented by school pupils and the most frequent, aside from English, are Polish, Urdu, Scots, and Panjabi (The Scottish Government, 2015a). Similarly, in Wales, over 102 different first languages are represented and the most frequent, aside from English, are Welsh, Polish, Bengali, and Arabic (Welsh Government, 2016a).

The large proportion of children learning multiple languages in the UK is consistent with other countries around the world. For example, approximately 21.9% of children and adolescents in the United States of America speak a language other than English in their home (U. S. Census Bureau, 2014). However, in contrast to the UK, where there is no one dominant minority language, 72.3% of children and adolescents in the United States, who speak a language other than English in their homes, have Spanish as their first language (U. S. Census Bureau, 2014). It has also been estimated that children growing up learning multiple languages are in the majority worldwide (Crystal, 2003; Tucker, 1998). As such, research on children growing up learning multiple languages is relevant not only to the current educational situation in the UK, but also around the world.

The broad topic of this thesis is the language and cognitive development of children learning EAL. This thesis considers the academic attainment and social, emotional, and behavioural development of children with EAL and evaluates the extent to which these outcomes depend upon levels of English language proficiency. This thesis also considers the theory that growing up learning multiple languages is associated with advantages in executive function. However, the main aim of this thesis is to enhance understanding of individual differences in English language competence among children with EAL, with a view of improving prediction of those who will experience persistent English language difficulties, which may go beyond limited exposure and may reflect an underlying language impairment.

Academic Attainment

In England, data from national curriculum assessments, completed within all state-maintained schools, indicate that learning EAL is associated with poorer attainment throughout primary school. In 2015, 60% of reception year children with EAL (ages 4-5 years) were rated by their teachers as achieving a good level of development on the Early Years Foundation Stage Profile at the end of the school year, compared to 68% of monolingual English-speaking children (Department for Education, 2015a). Children were regarded as achieving a good level of development if they were rated as achieving at least the expected level across 12 key early learning goals, which relate to the following areas of learning: communication and language; physical development; personal, social, and emotional development; literacy; and mathematics (Department for Education, 2015a). Of these learning areas, the widest attainment gap between children with EAL and monolingual peers in the 2015 assessments was in communication and language development, particularly in *speaking*. Indeed, 73% of children with EAL were rated as achieving at least the expected level in speaking at the end of reception year, relative to 87% of monolingual children.

Similar trends were revealed in the 2015 Key Stage 1 and Key Stage 2 assessments, which assessed the attainment of pupils in Year 2 (ages 6-7 years; Department for Education, 2015c) and Year 6 (ages 10-11 years; Department for Education, 2015b). In the Year 2 assessments, a lower proportion of children with EAL achieved the expected level of development in each subject (reading, writing, mathematics, science, and speaking and listening), relative to monolingual children (Department for Education, 2015c). Comparable to the reception year data, the widest attainment gap between children with EAL and monolingual peers in Year 2 was in speaking and listening. Specifically, 91% of monolingual children achieved at least the expected level of development in speaking and listening, compared to 85% of children with EAL. Similarly, in the Year 6 assessments, a lower proportion of children with EAL achieved the expected level of development within the core subject areas (reading, writing and mathematics), relative to monolingual children (Department for Education, 2015b). Overall, data from the 2015 national curriculum assessments reveal that learning EAL is associated with lower attainment throughout primary school, particularly in language and communication.

Strand, Malmberg, and Hall (2015) analysed data from the 2013 national curriculum assessments and concluded that the attainment gap between children with EAL and monolingual peers narrows, but is maintained, across primary school. Furthermore, Strand et al. noted that there is considerable variation in academic attainment among children with EAL and reported that male sex, younger relative age, low socioeconomic status, special education needs, and arriving in the UK part way through primary school were all associated with low academic attainment in Year 6 assessments among children with EAL. However, Strand et al. noted that English language proficiency is likely to be the most important predictor of attainment among children with EAL. Children learning EAL are a heterogeneous group in terms of levels of language exposure and proficiency in both English and their first language (NALDIC, 2012b; Strand et al., 2015). Indeed, the EAL label applies to both children who have received little to no exposure to English prior to school entry, but have full proficiency in their first language, as well as to children who have been exposed to both English and a heritage language since infancy and may indeed have English as their stronger language (NALDIC, 2012b; Strand et al., 2015).

A small number of studies have demonstrated that the academic attainment gap between children with EAL and monolingual peers varies depending upon levels of English language proficiency among children with EAL (Goldfeld, O'Connor, Mithen, Sayers, & Brinkman, 2014; Halle, Hair, Wandner, McNamara, & Chien, 2012; McLeod, Harrison, Whiteford, & Walker, 2016; Strand & Demie, 2005). These studies will be outlined in detail in Chapter 2. Importantly, however, only two of these previous studies, Goldfeld et al. (2014) and McLeod et al. (2016), considered the language proficiency of the monolingual comparison children. This is an important consideration, as language proficiency is associated with academic attainment in monolingual children (Dockrell, Ricketts, Palikara, Charman, & Lindsay, 2012; Norbury et al., 2015). As will be discussed in Chapter 2, the studies by Goldfeld et al. and McLeod et al. were limited by their binary measures of language proficiency. There is therefore a need for more research to consider associations between EAL status, English language proficiency, and academic attainment, as well as for such research to use stronger, continuous measures of language proficiency. This gap in the literature is addressed in Chapter 2.

Executive Function

In contrast to reports highlighting language and academic difficulties associated with growing up learning EAL, a separate body of research has associated bilingualism with cognitive advantages. In particular, it has been hypothesised that bilingual children and adults have enhanced executive function relative to monolingual peers (Bialystok, Craik, Green, & Gollan, 2009). Executive functions are cognitive control processes which regulate goal-orientated cognitions and behaviour (Gioia, Isquith, & Guy, 2001; Miyake et al., 2000). Examples include inhibiting a dominant response or irrelevant information, shifting attention between tasks or cognitions, and updating and monitoring information held in mind (working memory; Miyake et al., 2000). Research has indicated that both languages spoken by bilinguals are activated, even when individuals are focusing on just using one language (Martin, Dering, Thomas, & Thierry, 2009; Poarch & van Hell, 2012a). It has been proposed that bilinguals use executive functions to control the competing languages, for example they must inhibit or suppress interference caused by the two competing languages, switch between different languages, and monitor concurrently active languages (Bialystok, 2011; Bialystok et al., 2009). This constant utilisation of executive functions by bilinguals is thought to lead to a general enhancement of executive function, which is evident in the processing of both language dependent and language independent information (Bialystok et al., 2009).

A body of literature has indeed reported that bilingual children display advantages on a number of measures of executive function. In early work, Bialystok (1999) demonstrated switching advantages in Chinese-English bilingual children, relative to monolingual peers, on a card sorting task. In this task children had to sort cards into two piles by following a rule which concerned the perceptual features of the cards, such as the colour or shape, and then re-sort the same cards using a different rule. While both monolingual and bilingual children performed comparably well on the first sort, bilingual children made fewer errors on the second sort. Thus, the bilingual children appeared to be better at switching between the different sorting rules. Carlson and Meltzoff (2008) replicated this finding using a more advanced version of the same task, whereby children had to sort most cards using one rule, but sort cards which displayed a star using a different rule. Spanish-English bilingual children made fewer errors on the star trials compared to monolingual peers, demonstrating enhanced ability to switch between the rules. Similarly, other studies have reported that bilingual children display advantages on switching tasks relative to monolingual peers (Barac & Bialystok, 2012; Bialystok & Martin, 2004).

A considerable number of studies have investigated the performance of bilingual children on measures of inhibitory control. Bialystok, Martin and Viswanathan (2005) explored inhibitory control in French-English bilingual children, and monolinguals peers, using the Simon task. Within this task, a square was presented on either the left or right side of a computer screen and children were asked to press a button on either the left or right side of a keyboard to indicate the colour of the square. For each trial, the square was either on the same (congruent trails) or opposite side (incongruent trails) as the correct response key. Bialystok et al. found that bilingual children responded faster than monolingual peers on both the incongruent and congruent trails. Comparable results have also been found using a flanker task, which involved pressing one of two response buttons to report the direction a target fish was facing (Engel de Abreu, Cruz-Santos, Tourinho, Martin, & Bialystok, 2012). The target fish was presented in a row containing four other fish, which were either facing the same (congruent trials) or opposite direction (incongruent trails) as the target fish. Engel de Abreu et al. (2012) found that Portuguese-Luxembourgish bilingual children responded faster on both the congruent and incongruent trails than monolingual Portuguese-speaking children. Since the bilingual advantage was not restricted to the incongruent trails, which involve inhibiting the irrelevant information provided by one of the cues, Bialystok and colleagues concluded that the cognitive advantages demonstrated by bilinguals are not limited to enhanced inhibition (Bialystok et al., 2005; Martin-Rhee & Bialystok, 2008).

In subsequent research, Martin-Rhee and Bialystok (2008) also reported that bilingual children demonstrated reaction time advantages, over monolingual peers, on both the congruent and incongruent trials of an adapted version of the Simon task. However, the same bilingual children demonstrated no advantages on a task requiring response inhibition. Specifically, within this task children had to initially press a button on the same side as the direction of an arrow, which was presented in the middle of the screen, and in a subsequent block they had to press a button on the opposite side of the direction of the arrow. Martin-Rhee and Bialystok concluded that bilingual children do not have an advantage in response inhibition, which refers to simply overriding a dominant response to a single cue. Instead they concluded that bilingual children have an advantage in maintaining attention to one cue in the presence of two potentially conflicting cues. This is because performing well on the Simon task, or the flanker task, involves maintaining focus on the response rule, in the presence of cues which are potentially conflicting as a result of the mixture of congruent and incongruent trails (Bialystok et al., 2009; Martin-Rhee & Bialystok, 2008).

Other research has supported the suggestion that bilingual children do not display advantages on response inhibition tasks (Bialystok & Martin, 2004;

Bonifacci, Giombini, Bellocchi, & Contento, 2011; Carlson & Meltzoff, 2008; Nicolay & Poncelet, 2013). Some studies have, however, demonstrated response inhibition advantages in bilingual children, specifically among very young (ages 2-4 years) bilingual children (Bialystok, Barac, Blaye, & Poulin-Dubois, 2010; Verhagen, Mulder, & Leseman, 2015) or when a more demanding response inhibition task is used (Bialystok & Viswanathan, 2009). Indeed, Bialystok and Viswanathan (2009) found that bilingual children showed no reaction time advantage, relative to monolingual peers, on assessment blocks requiring response inhibition on all trials, but showed a reaction time advantage on blocks containing a mixture of trials which either required or did not require response inhibition. There is a need for more research to explore response inhibition in bilingual children using more complex response inhibition tasks. As such, this gap in the literature is addressed in Chapter 3.

It should be noted that the bilingual executive function advantage theory is highly controversial, as many studies have failed to replicate bilingual advantages on a number of measures of executive function, including on switching tasks, the Simon task, and flanker tasks, despite investigating bilingual children who had received a roughly even balance of exposure to two languages since an early age (Antón et al., 2014; Duñabeitia et al., 2014; Gathercole et al., 2014; Ladas, Carroll, & Vivas, 2015; Namazi & Thordardottir, 2010). Furthermore, while most of the literature on the bilingual executive function advantage theory has focused on inhibitory control and switching, investigation of potential advantages among bilingual children on measures of working memory and selective attention has received less research focus and has yielded mixed results. This research is reviewed in Chapter 3, which considers potential advantages associated with learning EAL on measures of response inhibition, working memory, and selective attention. Furthermore, since the majority of the exciting literature in the field considers specific bilingual groups, such as Spanish-English, French English, or Chinese-English bilinguals, Chapter 3 builds on the existing literature, by exploring executive function in children with EAL from diverse first language backgrounds.

In light of the conflicting findings in the literature, Chapter 3 also considers the extent to which bilingual executive function advantages are dependent upon levels of English language proficiency. Indeed, as will be reviewed in Chapter 3, a number of studies have indicated that bilingual advantages in executive function may be dependent upon having sufficient experience and proficiency using both languages (Bialystok & Barac, 2012; Carlson & Meltzoff, 2008; Iluz-Cohen & Armon-Lotem, 2013; Poarch & Bialystok, 2015; Poarch & van Hell, 2012b), though this line of enquiry has received relatively little investigation.

Social, Emotional, and Behavioural Functioning

On the basis of the bilingual executive function advantage theory (Bialystok et al., 2009), children with EAL may be expected to display advantages in behavioural control (Goldfeld et al., 2014). Indeed, greater executive function is associated with greater behavioural functioning in monolingual children (Ciairano, Visu-Petra, & Settanni, 2007; Hughes & Ensor, 2011). Data from the 2015 Early Years Foundation Stage Profile, completed for all reception year children attending state-maintained schools in England, indicate that a slightly lower proportion of children with EAL achieve the expected level of development in personal, social, and emotional development at the end of reception year relative to monolingual peers (Department for Education, 2015a). Nevertheless, a number of studies have demonstrated that the social, emotional, and behavioural functioning of children with EAL, relative to monolingual peers, is dependent upon their levels of English language proficiency (Goldfeld et al., 2014; Halle et al., 2012; McLeod et al., 2016; Winsler, Kim, & Richard, 2014), a finding which is comparable to research on executive function and academic attainment. Specifically, most of these studies have reported that children with EAL, who have good English proficiency, demonstrated advantages in social, emotional, and behavioural functioning relative to monolingual children (Goldfeld et al., 2014; Halle et al., 2012; Winsler et al., 2014). These studies will be outlined in detail in Chapter 2. Since only two of these previous studies, Goldfeld et al. (2014) and McLeod et al. (2016), considered the language proficiency of the monolingual comparison children, there is a need for research to compare the social, emotional, and behavioural functioning of children with EAL to monolingual peers, who have comparable levels of English proficiency. This research question is addressed within Chapter 2.

Language Development and Assessment

As previously noted, data from national curriculum assessments in England show that children with EAL, as a group, display poorer language and communication skills relative to monolingual peers over the early school years (Department for Education, 2015a, 2015c). Furthermore, children with EAL typically perform more poorly on standardised English language measures relative to monolingual peers (Babayiğit, 2014; Bialystok, Luk, Peets, & Yang, 2010; Burgoyne, Whiteley, & Hutchinson, 2011; Geva & Farnia, 2012). Determining whether language difficulties displayed by children with EAL, and bilingual children generally, reflect a lack of language exposure, or an underlying language impairment, is a key challenge faced by practitioners (Bedore & Peña, 2008; De Lamo White & Jin, 2011; Kohnert, 2010). The main research aim motivating this thesis was to help overcome this challenge and identify measures which can be administered in English and may help identify language impairment in children with EAL. In order to address this aim, it is important to first understand language impairment in monolingual children. As such, this section begins with an overview of the characteristics and diagnosis of language impairment in monolingual children, as well as theories regarding the aetiology of language impairment. Following this, the difficulties faced when assessing the language competence of bilingual children, focusing specifically on children learning EAL, will be outlined in depth and potential assessment resources for the identification of language impairment in these children will be considered.

Language Impairment in Monolingual Children

Terminology. Broadly speaking, language impairment is a developmental disorder characterised by language difficulties which have a functional impact on everyday communication or academic attainment (Reilly, Tomblin, et al. 2014). The appropriate terminology and specific diagnostic criteria for language impairment are, however, under debate (Bishop, 2014; Reilly, Tomblin, et al., 2014; Reilly, Bishop, & Tomblin, 2014). Many other terms have been used to describe this disorder, including primary language impairment, language learning impairment, language disorder, and, most commonly, specific language impairment (Reilly, Bishop, et al., 2014). An international panel of practitioners and researchers very recently achieved consensus on the term developmental language disorder to refer to language difficulties which have a functional impact and occur in the absence of a known differentiating condition, such as a sensory impairment, Down syndrome, intellectual disability, or autism spectrum disorder (Bishop, Snowling, Thompson, Greenhalgh,

& the CATALISE-2 consortium, 2016). This panel also agreed upon the term language disorder to refer language difficulties experienced alongside a differentiating condition. Throughout this thesis, however, the term language impairment will be used, rather than developmental language disorder, as recommended by literature published at the outset of this PhD research (Reilly, Tomblin, et al. 2014).

Language profiles and development. Children with language impairment typically, but not always, experience late language emergence, characterised by delayed onset of producing first words (over 18 months) and first two-word combinations (over 24 months), and limited expressive vocabulary at 18-24 months (below 10th or 15th percentile; Bishop et al., 2012; Tuller, 2015). It should be noted, however, that while late language emergence is considered a key risk factor for language impairment, many children with late language emergence do resolve their initial difficulties (Bishop et al., 2012; Reilly et al., 2010; Rice, Taylor, & Zubrick, 2008).

While language ability, relative to same age peers, can change considerably prior to 5 years of age (Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016), longitudinal research has demonstrated that monolingual children with language impairment at 5-6 years of age are likely to experience persistent language difficulties throughout childhood (Bishop & Adams, 1990; Tomblin, Xuyang Zhang, Buckwalter, & O'Brien, 2003) and adolescence (Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). Similarly, other longitudinal studies have also demonstrated high stability of language difficulties, across childhood, among monolingual children initially identified with language impairment at 7 years of age (Conti-Ramsden et al., 2012; Law, Tomblin, & Xuyang Zhang, 2008).

Children with language impairment are a heterogeneous group in terms of their language profiles, though such children typically experience difficulties in a number of areas of language (Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE-2 consortium, 2016; Conti-Ramsden & Crutchley, 1997). Monolingual children with language impairment tend to have smaller vocabularies relative to typically developing age-matched peers, a gap which persists throughout childhood and adolescence (Rice & Hoffman, 2015). Children with language impairment also often experience word-findings difficulties, where they struggle to produce specific words for which they have previously demonstrated receptive knowledge for (Dockrell, Messer, George, & Wilson, 1998). Related to this, children with language impairment are more likely to make word substitution errors relative to typically developing peers (e.g., using a semantically similar word in the place of a target word, such as saying 'dog' for 'pig'; Lahey & Edwards, 1999; Sheng & McGregor, 2010).

Grammar, including both syntax and morphology, is a key area of difficulty for children with language impairment (Rice, 2000; van der Lely, 2005). Syntax concerns how to structure words into sentences, whereas morphology concerns the structure of morphemes within words (van der Lely, 2005). English-speaking children with language impairment have particular difficulty with inflectional morphology, specifically with inflectional morphemes (e.g., *-ed, -s)* to mark verb tense (e.g., walk*ed*) and third-person singular (e.g., she walk*s*; Conti-Ramsden, Botting, & Faragher, 2001; Rice, Wexler, & Cleave, 1995). It should be noted that the grammatical difficulties experienced by monolingual children with language impairment vary depending on the language they speak and the features which are particularly difficult in that language (Leonard, 2014). For example, while English-speaking children with language impermanent often omit tense and agreement inflections, in languages, such as Italian, in which these markers are more salient, and transparent, they are not an area of particular difficulty for children with language impairment (Bortolini, Caselli, & Leonard, 1997; Leonard, 2014).

As well as expressive grammatical difficulties, children with language impairment also often experience receptive difficulties deciphering grammar, which effects sentence comprehension (Hsu & Bishop, 2014; van der Lely, 1996). In particular, children with language impairment often have difficulty comprehending sentences in which word order is not a reliable cue for interpretation, such as reversible passives (van der Lely, 1996). For example, in tasks where children hear a sentence (e.g., "the cow is chased by the girl") and have to point to the corresponding picture from an array, which contains grammatical foils (e.g., a picture depicting "the girl is chased by the cow"), children with language impairment select these foils more often than typically developing peers (van der Lely, 1996).

Another common area of difficulty for children with language impairment is with narrative discourse. Indeed, within narrative production tasks, which involve either producing or retelling a previously presented story using a series of pictures, children with language impairment often produce narratives with poorer macrostructure relative to typically developing peers, characterised by the inclusion of fewer key story elements (Blom & Boerma, 2016; Duinmeijer, de Jong, & Scheper, 2012; Reilly, Losh, Bellugi, & Wulfeck 2004). Children with language impairment can also experience difficulties with narrative comprehension, where they struggle to recall literal details about the story or make inferences about elements of the story which have not been directly stated (Bishop & Adams, 1992; Blom & Boerma, 2016).

Diagnosis. Until recently, a key exclusionary criteria for the diagnosis of language impairment was non-verbal ability falling outside of the normal range (Reilly, Tomblin, et al., 2014). However, while it is recommended that children who have non-verbal ability scores falling 2 *SD* or more below the mean receive a primary diagnosis of intellectual disability, the requirement for normal non-verbal ability (within 1 *SD* of the mean) for a diagnose of language impairment is no longer recommended by researchers and practitioners (Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE-2 consortium, 2016; Reilly, Tomblin, et al., 2014). This is because epidemiological research has demonstrated that children with average (-1 *SD* or greater) and low-average (between -1 *SD* and -2 *SD*) non-verbal ability, who meet criteria for language impairment, do not differ in the functional impact of their difficulties, in terms of academic attainment and social, emotional, and behavioural functioning (Norbury et al., 2016). Furthermore, non-verbal ability is not related to progress following intervention among children with language impairment (Bishop, Adams, & Rosen, 2006; Bowyer-Crane, 2011; Ebbels, Marić, Murphy, & Turner, 2014).

It is recommended that language impairment in monolingual children is diagnosed on the basis of impaired performance on standardised language measures, which tap a variety of language domains and modalities, together with evidence of functional impact from observations or from parent and teacher interviews or questionnaires (Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016). An influential system for the diagnosis of language impairment is the EpiSLI system (Tomblin, Records, & Zhang, 1996), which was used in the most widely cited prevalence study of language impairment (Tomblin et al., 1997). Within this study, monolingual children completed receptive and expressive measures of vocabulary, grammar, and narrative and composite scores were calculated for each modality (receptive and expressive language) and language domain (vocabulary, grammar, and narrative). Children were regarded as having language impairment if they scored -1.25 *SD* below the mean on two or more of the five language composites.

As advocated by Tomblin et al. (1996), a cut-off of -1.25 *SD* on a comprehensive, standardised language battery remains widely used and recommended for the diagnosis of language impairment in monolingual children (Reilly, Tomblin, et al. 2014). However, as language ability is considered to be a continuous construct, rather than categorical, any cut-off for language impairment is arbitrary and up for debate (Bishop, 2014; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016). Norbury et al. (2016) recently found that a -1.5 *SD* cut-off, on two or more out of five language composites, yielded a group of children with language impairment who experienced greater functional academic impact, relative to those identified by the -1.25 *SD* cut.

Prevalence. Prevalence estimates for language impairment are reliant upon the diagnostic criteria utilized. Using the -1.25 *SD* cut-off, as well as the requirement for non-verbal ability to be within the normal range, Tomblin et al. (1997) reported a language impairment prevalence estimate of 7.4% among monolingual kindergarten children. Furthermore, using a stricter -1.5 *SD* cut-off, and following updated recommendations to drop the requirement for a discrepancy between language and non-verbal ability, Norbury et al. (2016) reported a comparable prevalence estimate for language impairment of unknown origin among monolingual children (ages 5-6 years) of 7.58%.

Academic attainment. Monolingual children with language impairment experience functional impairment in terms of academic attainment. Indeed, Norbury et al. (2016) reported that monolingual children who were identified as having language impairment at age 5-6 years were more likely to experience academic underachievement in the first year of school (ages 4-5 years) relative to typically developing peers. Furthermore, a UK-based cross-sectional study reported that monolingual children with language impairment perform substantially below national averages in Key Stage 1 and Key Stage 2 assessments, completed during Year 2 and Year 6, respectively (Dockrell et al., 2012). In terms of long-term outcomes, Snowling, Adams, Bishop, and Stothard (2001) reported that monolingual children with language impairment at age 5 years experienced academic underachievement in Year 11 assessments (ages 15-16 years) relative to typically developing peers. Similarly, more recent studies have also reported that adolescents with a history of language impairment during childhood experience academic underachievement in Year 11 assessments relative to national averages (Conti-Ramsden, Durkin, Simkin, & Knox, 2009; Dockrell, Lindsay, & Palikara, 2011).

Behavioural functioning. Monolingual children with language impairment also experience functional impairment in terms of social, emotional, and behavioural development. Two recent population studies reported that children with language impairment at age 4 years (Bretherton et al., 2014) or age 5-6 years (Norbury et al., 2016) are at a greater risk of experiencing clinically significant social, emotional, and behavioural difficulties relative to their typically developing peers from the very start of school. Furthermore, a meta-analysis of follow-up studies, evaluating behavioural outcomes for children with language impairment, concluded that such children are also at an increased risk for experiencing clinically significant emotional and behavioural difficulties later on in childhood and adolescence (Yew & O'Kearney, 2013).

Aetiology of Language Impairment

In line with Morton and Frith's (1995) framework for understanding developmental disorders, the behavioural symptoms of language impairment can be considered in terms of cognitive, biological, and environmental levels of explanation. Each of these levels of explanation will be considered in this section, with a specific focus on the cognitive level.

Cognitive. Both linguists and cognitive psychologists have proposed theories concerning the aetiology of language impairment, which can be considered to be at the cognitive level of explanation, in terms of Morton and Frith's (1995) framework. Linguistic theories centre on the idea that children with language impairment have a deficit in a modular language system, which renders them unable to develop and apply specific grammatical rules in the same way as their typically developing peers (e.g., Gopnik & Crago, 1991; Rice et al., 1995). However, such linguistic theories have been criticised for not accounting for the inconsistent adherence to grammatical rules which is typically demonstrated by children with language impairment (Bishop et al., 2006). Furthermore, such linguistic theories have been criticised for failing to account for why deficits in the language system occur (Hulme & Snowling, 2009). While linguistic theories consider language as a modular domain-specific system, such theories are not consistent with what we know about the developing brain and the multiple brain systems which are involved in language processing (Duffau, Moritz-Gasser, & Mandonnet, 2014). Consistent with the non-modular view of language, a number of cognitive theories have been proposed which consider language impairment as deriving from processing deficits. Key cognitive processing theories of language impairment are outlined in this section.

Auditory processing deficit. Tallal and Piercy (1973, 1974) theorised that language impairment is caused by a deficit in perceiving brief and rapidly changing auditory information. This deficit is proposed to lead to difficulties perceiving speech sounds, which in turn impairs language learning and processing. In support of this theory, Tallal and Piercy (1973) reported that children with language impairment performed more poorly than typically developing peers on computerised tasks requiring the repetition of auditory, but not visual, sequences, specifically when the stimuli were brief in duration and had short inter-stimulus intervals. However, later studies reported that not all children with language impairment display auditory processing deficits, demonstrating that such deficits are not necessary for language impairment (Bishop, Carlyon, Deeks, & Bishop, 1999; McArthur, Ellis, Atkinson, & Coltheart, 2008). Further research against this theory comes from intervention studies, which have demonstrated that training in auditory processing does not lead to improvements in oral language (for a meta-analysis, see Strong, Torgerson, Torgerson, & Hulme, 2011).

Procedural deficit hypothesis. Ullman and Pierpoint (2005) proposed that the difficulties experienced by children with language impairment can be explained by a disordered procedural memory system, which governs sequence or rule-based learning, together with an intact declarative memory system, which governs fact-based learning. This pattern of deficits is proposed to lead to impairments in the learning of grammatical rules, whilst allowing for rote learning of vocabulary and specific grammatically correct forms. In support of this theory, a meta-analysis concluded that children with language impairment display deficits in implicit sequence learning tasks, which tap procedural memory (Lum, Conti-Ramsden, Morgan, & Ullman, 2014). However, other studies have highlighted that deficits on such tasks are limited to children with language impairment who display grammatical deficits, rather than all children with language impairment (Hedenius et al., 2011; Tomblin, Mainela-Arnold, & Zhang, 2007). Furthermore, deficits experienced by children with language impairment are not limited to the procedural memory system, as deficits in declarative memory have also been reported (Lum, Gelgic, & Conti-Ramsden, 2010)

Phonological short-term memory deficit. A deficit in phonological short-term memory has also been hypothesised to underlie language impairment (Gathercole & Baddeley, 1990). This theory proposes that the ability to retain verbal information in short term memory is important in word learning and for other linguistic processes, such as narrative comprehension, and thus a deficit in this process would lead to language learning and processing difficulties (Baddeley, Gathercole, & Papagno, 1998; Gathercole & Baddeley, 1990). In support of this theory, children with language impairment display deficits on nonword repetition tasks (for a meta-analysis, see Estes, Evans, & Else-Quest, 2007), which are considered to tap phonological short term memory (Baddeley et al., 1998; Gathercole & Baddeley, 1990). These findings have led to the suggestion that nonword repetition deficits may be a clinical marker for language impairment (e.g., Conti-Ramsden et al., 2001). However, nonword repetition deficits are not specific to language impairment (Gathercole, 2006) and nonword repetition tasks do not have sufficiently acceptable diagnostic accuracy to identify language impairment (for a meta-analysis, see Pawłowska, 2014). Furthermore, the causal relationship between nonword repetition and language has been questioned by longitudinal research demonstrating that nonword repetition performance does not predict vocabulary growth in children (Melby-Lervåg et al., 2012).

Executive function deficit. It has been hypothesised that executive functions may have a causal role in language learning and processing and, as such, domain-general executive function deficits may in part underlie language impairment

(Bishop, Nation, & Patterson, 2014; Im-Bolter, Johnson, & Pascual-Leone, 2006). Consistent with this hypothesis, monolingual children with language impairment display domain-general executive function deficits, relative to typically developing peers, including impaired response inhibition (Henry, Messer, & Nash, 2012a; Spaulding, 2010) interference suppression (Im-Bolter et al., 2006), selective attention (Gooch, Hulme, Nash, & Snowling, 2014), verbal working memory (Henry et al., 2012a; Vugs, Hendriks, Cuperus, & Verhoeven, 2014), and visuospatial working memory (Henry et al., 2012a; Im-Bolter et al., 2006; Vugs et al., 2014). The working memory performance of children with language impairment has, in particular, received considerable research attention and some of this research has indicated that working memory deficits may be limited to the verbal domain (Archibald & Gathercole, 2006, 2007; Lum, Conti-Ramsden, Page, & Ullman, 2012). However, a meta-analysis concluded that visuospatial working memory deficits are associated with language impairment, though the size of the deficit varies widely between studies and is typically two to three times smaller than reported deficits in verbal working memory (Vugs, Cuperus, Hendriks, & Verhoeven, 2013).

The nature of the relationship between executive function and language impairment is, however, unclear. Executive function deficits are not specific to children with language impairment (e.g., see Craig et al., 2016), nor do all monolingual children with language impairment display such deficits (Henry et al., 2012a). Furthermore, recent longitudinal research has questioned the causal relationship between executive function and language by demonstrating that neither construct predicts growth in the other longitudinally (Gooch, Thompson, Nash, Snowling, & Hulme, 2016), though this may be due to the strong longitudinal stability of both constructs and hence the little unexplained variance remaining once prior skills are taken into account. While the theory that an executive function deficit may underlie language impairment is one possibility, children with language impairment may display executive function deficits as language supports performance on executive function tasks (i.e., verbal mediation) or the relationship between language and executive function may simply reflect the influence of common underlying factors (Bishop et al., 2014; Gooch et al., 2016).

Summary. In sum, there is no leading theory for the cognitive underpinnings of language impairment. While many cognitive deficits have been associated with language impairment, causal relationships are unclear. Indeed, no individual deficit has been identified as necessary and sufficient for a diagnosis of language impairment and there is limited longitudinal research available to demonstrate primacy of deficits, or contribution of cognitive factors to language growth. Bishop (2006) has suggested that a single deficit is unlikely to underlie language impairment, given the huge heterogeneity of the disorder. Instead, Bishop (2006) advocates a multiple risk model, whereby numerous cognitive, biological, and environmental factors increase risk for language impairment and the combination and interaction of these factors determines language profiles. Such a theory can therefore account for the wide variety of patterns of impairment demonstrated by children with language impairment. In the following subsections, biological and environmental factors associated with language impairment will be very briefly outlined.

Biological. Twin studies have demonstrated that language impairment is heritable, as genetically identical, monozygotic, twins have higher concordance rates for language impairment relative to non-identical, dizygotic, twins (Bishop, North, & Donlan, 1995; DeThorne et al., 2006; Tomblin & Buckwalter, 1998). Researchers have highlighted specific candidate genes which are associated with language impairment, such as the KIAA0319, CNTNAP2, and the FOXP2 gene (for a review, see Rice, 2012). Furthermore, a number of structural brain anatomy variables have been associated with language impairment (Leonard, Eckert, Given, Virginia, & Eden, 2006). Consistent with Bishop’s (2006) multiple risk model, researchers typically agree that the aetiology of language impairment reflects a complex interaction between genetic, neurobiological, and environmental risk factors (e.g., Conti-Ramsden, Falcaro, Simkin, & Pickles, 2007; Leonard et al., 2006; Newbury & Monaco, 2010).

Environmental. Low maternal education and family socio-economic status are key risk factors for language impairment (Nelson, Nygren, Walker, & Panoscha, 2006; Reilly et al., 2010). The association between these variables and language development is complex and not fully understood, however one hypothesis is that these variables are associated with the richness of a child’s linguistic environment, which in turn influences language development (Hoff, Laursen, & Bridges, 2012; Miser & Hupp, 2012; Noble, Houston, Kan, & Sowell, 2012). However, maternal education and family socio-economic status may also reflect a genetic risk for language impairment, given the academic and employment consequences of low levels of language and literacy proficiency (Hoff et al., 2012). Other environmental factors which have also been associated with an increased risk for language impairment include being a younger sibling and being part of a large family (Nelson et al., 2006). It should be noted, however, that environmental risk factors only explain a small amount of variation in language impairment status (Reilly et al., 2010).

Language Assessment of Children With EAL

Assessment issues. Children with EAL frequently occur on the caseloads of speech and language therapists in the UK. A recent survey of 516 speech and language therapists, who practice throughout the UK, revealed that 89% had at least one child with EAL on their caseload (Pring, Flood, Dodd, & Joffe, 2012). Moreover, 12% of respondents reported that children with EAL made up at least 70% of their caseloads. Thus, research on language assessment measures for children learning EAL is of high relevance to practitioners.

There is also evidence that children with EAL are both under-represented and over-represented on the caseloads of speech and language therapists in areas around the UK (Broomfield & Dodd, 2004; Mennen & Stansfield, 2006; Winter, 1999, 2001) and in the US (Bedore & Peña, 2008). Since it is presumed that the prevalence of language impairment should be comparable in both monolingual and bilingual children (Kohnert, 2010), the misrepresentation of children with EAL on clinical caseloads highlights uncertainty concerning when to refer children with EAL (Broomfield & Dodd, 2004) and how to identify those with language impairment (Bedore & Peña, 2008). These sentiments have been echoed in interviews and questionnaires completed by speech and language therapists from the UK, the US, and Australia (Caesar & Kohler, 2007; Mennen & Stansfield, 2006; Williams & McLeod, 2012). Within these studies, speech and language therapists have indicated that they have limited resources to appropriately assess children learning EAL and identify those who have an underlying language impairment (Caesar & Kohler, 2007; Mennen & Stansfield, 2006; Williams & McLeod, 2012). As such, children with EAL are at high risk for misdiagnosis of language impairment (Bedore & Peña, 2008; Kohnert, Windsor, & Ebert, 2009; Paradis, 2010).

Language impairment may be under-identified in children learning EAL, as practitioners may attribute poor language to the process of acquiring an additional language and thus may wait for children to become proficient in English before language impairment is diagnosed (Bedore & Peña, 2008; Paradis, Schneider, & Duncan, 2013). Therefore, learning an additional language may effectively mask an underlying language impairment (Hasson, Camilleri, Jones, Smith, & Dodd, 2013). As noted by Paradis, Schneider, and Duncan (2013), this delay in diagnosis will mean that children with EAL, who have an underlying language impairment, will not receive the support they need until they are older, if at all. Indeed, Demie (2013) estimated that it takes five to seven years for a child with EAL to become fully fluent in English, to the extent that they can engage with a curriculum delivered in English without any additional support. Furthermore, Paradis and Jia (2016) estimated that it takes typically developing children with EAL between four to six years of English exposure to perform within monolingual norms on English language measures (within 1 *SD* of the mean).

Language impairment may also be over-identified in children with EAL, as typically developing children who are in the process of learning EAL often make errors characteristic of monolingual, English-speaking children with language impairment, particularly with inflectional morphology to mark tense (Paradis, 2005; Paradis, Rice, Crago, & Marquis, 2008). Moreover, given the time it takes to perform within monolingual norms on English language measures (Paradis & Jia, 2016), using such measures for the assessment of children learning EAL carries the risk of incorrectly identifying language impairment in children who simply have not received enough exposure to English (Bedore & Peña, 2008; Paradis, 2010). Over-identification is an issue as it puts unnecessary further strain on speech and language services (Hasson et al., 2013), and may cause undue worry in parents about their child's development.

Norms derived from monolingual children on standardised language measures are considered an inappropriate reference for the typical language development of children with EAL, as such children have different linguistic backgrounds (Bedore & Peña, 2008; De Lamo White & Jin, 2011). Bialystok et al. (2010) reported that children with EAL who are fluent in English typically perform more poorly than monolingual peers on standardised tests of receptive vocabulary, a gap which persists throughout childhood. Furthermore, UK-based studies have reported that even after five years of exposure to English from school entry, children with EAL typically perform more poorly than monolingual, English-speaking peers on measures of expressive and receptive vocabulary, receptive grammar, and narrative comprehension (Burgoyne et al., 2011; Hutchinson, Whiteley, Smith, & Connors, 2003). It should be noted, however, that the discrepancy in performance on language measures between monolingual and bilingual children is dependent upon language exposure, both in terms of length of exposure and quantity of current exposure (Bedore et al., 2012; Thordardottir, 2011). Indeed, Bedore et al. (2012) demonstrated that Spanish-English bilingual children who were exposed to English for at least 75% of the time performed comparably to children exposed to English 100% of the time on measures of English vocabulary and grammar.

It is recommended that language impairment is only diagnosed in bilingual children following assessment in both of their languages, preferably using measures which are normed on bilingual children (Bedore & Peña, 2008; Kohnert, 2010; Paradis, Emmerzael, & Duncan, 2010; RCSLT Specific Interest Group in Bilingualism, 2007). Research has revealed that language knowledge is distributed across the languages children speak (Kan & Kohnert, 2005; Pena, Bedore, & Zlatic-Giunta, 2002), thus assessment of both languages leads to a better understanding of a bilingual child's overall language ability than assessment of only one of the child's languages (Paradis et al., 2010). Moreover, since an underlying language impairment should manifest in both languages of a bilingual child, dual language assessment helps practitioners to distinguish whether language difficulties experienced in one language likely go beyond limited exposure to a more fundamental deficit in language learning (Bedore & Peña, 2008; Paradis et al., 2010).

Due to a lack of alternative resources, speech and language therapists tend to rely on standardised, monolingual-normed English languages measures when assessing children with EAL, despite recommendations against this approach (Caesar & Kohler, 2007; Williams & McLeod, 2012). In populations with a high proportion of children from specific bilingual groups, such as Spanish-English bilinguals in the US, dual language assessment is more feasible for such children. Indeed, appropriately normed assessment measures have recently been developed for use with Spanish-English bilingual children (e.g., Bedore, Pena, Gillam, & Ho, 2010;

Lugo-Neris, Peña, Bedore, & Gillam, 2015; Peña, Bedore, & Kester, 2016). However, dual language assessment is not feasible for all bilingual children in highly diverse populations such as the UK, where over 300 different languages are represented by children (NALDIC, 2012a). Firstly, language assessment measures are simply not available for all the languages represented in the UK (De Lamo White & Jin, 2011). Moreover, the assessment measures available in different languages are almost always normed on monolingual children (Bedore & Peña, 2008). Directly translating tests to create assessment tools in numerous languages is not advised, as such tests were developed in light of the original language's structure, and linguistic markers of language impairment in the original language, both of which are likely to differ from the translated language (Bedore & Peña, 2008). Furthermore, creating and appropriately norming assessment measures for all of the languages spoken in the UK is just not practically viable (De Lamo White & Jin, 2011). Even if language measures were widely available for many minority languages, they would be problematic to administer and score, given that almost all speech and language therapists in the UK are white, monolingual, English-speaking females (Parity, 2013).

Overall, the difficulties faced by practitioners when assessing children with EAL, for the identification of language impairment, reflect a lack of appropriate assessment resources and data regarding the typical language development of children with EAL (Bedore & Peña, 2008; Paradis, 2010). This problem has led to a recent surge in research aiming to develop such resources, however research on assessment measures for use with children from diverse first language backgrounds is still in it's infancy (Paradis et al., 2013). Due to the challenges surrounding first language assessment, measures are required which can identify language impairment when administered in English (Gillam, Peña, Bedore, Bohman, & Mendez-Perez, 2013; Paradis et al., 2013). Research which addresses this aim has centred around three main approaches. One approach is to consider whether any English language measures can be informative in the assessment of children with EAL. The second approach is to move the focus away from directly assessing a child's language skills, which is currently the most commonly used approach, and explore whether language impairment can be identified in children with EAL using processing-based measures (Kohnert et al., 2009). Finally, while direct assessment of children's first language competence is typically not feasible, another approach is to gather data on first language development from parental interviews or questionnaires and also take into account information concerning length of language exposure and the home language environment (Paradis et al., 2010; Tuller, 2015). These approaches will each be considered in the following subsections.

English language measures. Firstly, it should be noted that while monolingual-normed English language measures are not recommended to diagnose language impairment in children with EAL (Bedore & Peña, 2008; Paradis, 2010), such measures can be used to rule out language impairment, in instances where children with EAL do indeed perform within monolingual norms (Kohnert, 2010). Nevertheless, in light of findings that children with EAL typically perform more poorly than monolingual peers on many individual English language measures, including assessments of receptive vocabulary, expressive vocabulary, receptive grammar, and narrative comprehension (Babayiğit, 2014; Bialystok, Luk, et al., 2010; Burgoyne et al., 2011; Geva & Farnia, 2012), a growing body of literature has considered whether any individual language measures are less biased against bilingual children.

Narrative production tasks, specifically measures of narrative macrostructure, have received particular research interest as potentially less biased measures for the language assessment of bilingual children (Boerma, Leseman, Timmermeister, Wijnen, & Blom, 2016; Cleave, Girolametto, Chen, & Johnson, 2010; Rezzonico et al., 2015). This is because the abilities assessed in these tasks are not specific to one language (Gagarina et al., 2015; Paradis et al., 2013). Indeed, rather than assessing language specific knowledge, measures of narrative macrostructure assess the extent to which children include key story elements within their narratives (Gagarina et al., 2015). In support of the use of such measures, typically developing children with EAL who are educated in English classrooms (Hipfner-Boucher et al., 2014; Rezzonico et al., 2015), as well as other bilingual children (Boerma et al., 2016; Rodina, 2016), have been reported to produce narratives with comparably detailed macrostructure relative to their monolingual peers. Furthermore, children with EAL and language impairment have been reported to perform comparably to monolingual peers with language impairment (Cleave et al., 2010; Rezzonico et al., 2015) and more poorly than typically developing bilingual peers on measures of narrative macrostructure (Paradis et al., 2013; Squires et al., 2014). Thus, measures of macrostructure on narrative production tasks may help identify language impairment in children with EAL, as well as other bilingual children, though it is recommended that they are used in combination with other measures (Boerma et al., 2016; Paradis et al., 2013). It should be noted that narratives can also be scored in terms of microstructure, which includes measures of grammaticality, lexical diversity, and utterance length (Hipfner-Boucher et al., 2014). While narrative tasks provide a more ecologically valid way of assessing these abilities, children with EAL have been reported to score more poorly than monolingual peers on narrative microstructure, particularly on grammaticality (Hipfner-Boucher et al., 2014; Rezzonico et al., 2015).

Sentence repetition tasks have also been identified as potentially useful language assessment measures for bilingual children (Chiat et al., 2013; Marinis & Armon-Lotem, 2015). Sentence repetition tasks involve repeating sentences of varying complexity, as accurately as possible. Such tasks are included in most language diagnostic batteries, including the EpiSLI system (Tomblin et al., 1996), as measures of expressive grammar. This is because children are considered to use grammatical knowledge, as well as other linguistic knowledge, in order to correctly reproduce the sentences (Lust, Flynn, & Foley, 1996; Polišenská, Chiat, & Roy, 2015). Indeed, sentence repetition performance is negatively affected when the target sentences are grammatically incorrect (Polišenská et al., 2015). Sentence repetition tasks are sensitive to language impairment in monolingual children (Conti-Ramsden et al., 2001; Riches, 2012), which has led researchers to consider the use of such tasks for the assessment of bilingual children (Chiat et al., 2013; Marinis & Armon-Lotem, 2015). Furthermore, sentence repetition tasks have the advantage that they are quick to administer and can be used to gain data on children's ability to produce a large number of sentence structures (Chiat et al., 2013; Marinis & Armon-Lotem, 2015). Studies have demonstrated that monolingual and bilingual children with language impairment show comparably deficient sentence repetition accuracy scores (Thordardottir & Brandeker, 2013; Tsimpli, Peristeri, & Andreou, 2016). However, typically developing bilingual children also often show deficits in sentence repetition accuracy relative to typically developing monolingual peers (Chiat et al., 2013; Thordardottir & Brandeker, 2013; Tsimpli et al., 2016). Thus, sentence repetition tasks are not recommended to be used alone to identify language impairment in bilingual children, unless they are normed on such children, due to the risk that they may identify many false-positives, whose poor performance simply reflects limited language exposure (Chiat et al., 2013).

While many studies have explored the performance of children with EAL or other bilingual children on individual language measures, only one study, to the author's knowledge, has evaluated the use of a comprehensive, monolingual-normed, English language battery for use with such children. This study was carried out by Gillam, Peña, Bedore, Bohman, and Mendez-Perez (2013) and is outlined in detail in Chapter 4, which also aims to address this gap in the literature. Briefly, however, this study found that the original EpiSLI diagnostic system for language impairment in monolingual English-speaking children (Tomblin et al., 1996) over-identified language impairment in Spanish-English bilingual children, who had been exposed to English regularly for at least one year. However, combining all five English language composite scores within a predictive model yielded acceptable diagnostic accuracy, highlighting the potential of assessment in English.

Since Gillam et al. (2013) focused on Spanish-English bilingual children, there is a need to evaluate the use of English language diagnostic batteries for use with children with diverse first languages. Moreover, there is a need for longitudinal research to evaluate the long-term utility of such assessment batteries, in terms of the language development and functional attainment of those identified with language difficulties. These gaps in the literature are all addressed in Chapter 4. Furthermore, the performance of children with EAL on each of the six individual language measures from the battery, which includes measures of narrative production and sentence repetition, is considered in Chapter 4. As such, Chapter 4 builds on the existing literature, with an evaluation of which English language measures are particularly challenging for children with EAL.

Processing-based measures. An alternative approach to the challenge of distinguishing language impairment from limited language exposure in children with EAL is to use processing-based measures, which can be administered in English and may be sensitive to language impairment (Kohnert et al., 2009). Since monolingual children with language impairment display deficits in nonword repetition (Estes et al., 2007), and such tasks have been proposed to tap a construct which has a causal role in language learning (Baddeley et al., 1998; Gathercole & Baddeley, 1990), nonword repetition has received particular research attention for the language assessment of bilingual children. Nonword repetition tasks require children to repeat nonsense words which conform to the phonological structure of a specific language, thus such tasks do involve some language-specific knowledge (Coady & Evans, 2008). However, nonword repetition tasks are less dependent on language-specific knowledge and exposure than typical language measures, such as measures of vocabulary (Chiat, 2015; Thordardottir & Brandeker, 2013). Language impairment is associated with deficits in nonword repetition in bilingual children, however nonword repetition tasks do not have acceptable diagnostic accuracy to identify language impairment in bilingual children when used alone (Armon-Lotem & Meir, 2016; Gutiérrez-Clellen & Simon-Cereijido, 2010; Paradis et al., 2013; Thordardottir & Brandeker, 2013; Windsor, Kohnert, Lobitz, & Pham, 2010).

When used in combination with other monolingual-normed measures, specifically measures of sentence repetition and receptive vocabulary, nonword repetition tasks still do not have acceptable diagnostic accuracy for identifying language impairment in bilingual children (Thordardottir & Brandeker, 2013). However, Armon-Lotem and Meir (2016) reported that the combination of measures of nonword repetition and sentence repetition could acceptably identify language impairment in bilingual children, when using norms generated for the Russian-Hebrew bilingual children under investigation. However, diagnostic accuracy may have been inflated within this study, as the children with language impairment were recruited from clinically referred samples, a recruitment method which is used within the vast majority of studies on language impairment in bilingual children. As such, the ability of these measures to accurately diagnose bilingual children with language impairment from the population is currently unknown.

As yet, research has not considered the use of nonword repetition tasks in combination with a comprehensive, monolingual-normed language assessment battery for the identification of language impairment in bilingual children, nor the use of nonword repetition tasks in combination with other cognitive processing measures. Such an investigation may be informative as it has been proposed that the aetiology of language impairment is likely multifactorial, reflecting a number of cognitive deficits, as well as genetic and environment factors (Bishop, 2006). As previously noted, monolingual children with language impairment display domain-general executive function deficits (e.g., Henry et al., 2012a) and it has been hypothesised that executive functions may have a causal role in language learning (Bishop et al., 2014; Im-Bolter et al., 2006). As such, measures of executive function may be useful in combination with nonword repetition and English language measures in order to identify language impairment in children with EAL. Executive function tasks have indeed been identified as potentially informative of language competence in bilingual children (Jensen de López & Baker, 2015), however very few studies have investigated this line of enquiry.

Research on executive function in bilingual children with language impairment will be reviewed in Chapter 3 and will also be considered in Chapter 5. In accordance with the bilingual executive function advantage theory (Bialystok et al., 2009), executive function deficits associated with language impairment may be attenuated in bilingual children (Engel de Abreu, Cruz-Santos, & Puglisi, 2014). As noted by Jensen de López and Baker (2015), for a measure of executive function to be informative in the language assessment of bilingual children, such measures would ideally not show an effect of bilingualism. As such, Chapter 3 evaluates whether children with EAL display advantages relative to monolingual peers on a range of executive function measures, and whether this varies as a function of English language proficiency.

Chapter 5 takes a longitudinal approach to consider whether measures of nonword repetition and executive function can help predict later language ability in children with EAL, over and above performance on an English language battery at the outset. As such, Chapter 5 evaluates whether such measures may aid the early identification of children with EAL who will likely experience persistent English language learning difficulties, which may go beyond limited exposure. Moreover, the longitudinal nature of the research presented in Chapter 5 enables an evaluation of the potential causal relationships between executive function and language, as well as between nonword repetition and language. Indeed, as previously noted, and as will be reviewed in detail in Chapter 5, the causal relationships between these constructs are as yet unclear in both monolingual and bilingual children.

Parent report. Since directly assessing the first language skills of children with EAL is fraught with challenges, Paradis et al. (2010, 2013) and Tuller (2015) advocate using parent report of first language development in instances where direct first language assessment is not possible. If parents report that their child has good proficiency in their first language, then language impairment can be ruled out, as bilingual children with language impairment experience difficulties in each language they speak (Paradis et al., 2010; Tuller, 2015). However, if parents report that their child is also struggling in their first language, then their English language difficulties may more likely reflect an underlying language impairment, rather than limited exposure and experience using English. However, it should be noted that low first language competence is not always indicative of an underlying language impairment (Anderson, 2012; Paradis et al., 2010; Tuller, 2015). Indeed, it is common for children with EAL, with a minority first language, to experience first language attrition, which refers to a loss, or halt in growth, of first language competence (Anderson, 2012; Montrul, 2016; Paradis et al., 2010). As such, in order to help disentangle language impairment from limited language exposure, one approach is to additionally consider the presence of risk factors for language impairment, such as late language emergence and family history of language and academic difficulties, and to also take into account the child’s language exposure (Tuller, 2015).

Paradis et al. (2010) developed a language development questionnaire for use with children with EAL from diverse first language backgrounds. This questionnaire is made up of four sections: early milestones (including age of first word and two-word combination), first language competence, behaviour patterns and activity preferences (including competence and interest in literacy activities), and family history of language difficulties and school attainment. Children with EAL and language impairment, as a group, performed more poorly than typically developing peers on each section. However, neither the full questionnaire, nor the sections on early language milestones and first language competence, had acceptable diagnostic accuracy for discriminating children with language impairment from their typically developing peers. Nevertheless, in subsequent work with children with EAL, from diverse first language backgrounds, Paradis et al. (2013) reported acceptable diagnostic estimates when the total score on the language development questionnaire was entered into a predictive model, alongside English measures of expressive grammar, narrative macrostructure, and nonword repetition. While these findings are promising, it should be noted that Paradis et al. (2010, 2013) recruited children with language impairment from clinical caseloads, where diagnoses were typically based on English language assessment, coupled with parental concern about first language development. Therefore, it is possible that some of the participating children in the language impairment groups may have been misidentified, which may have influenced the reported diagnostic estimates.

In order to further support the consideration of parent report of early language development during the language assessment of children with EAL, there is a need for longitudinal research to consider the relationship between these measures and language development in such children. This gap in the literature is addressed in Chapter 6. In addition, while it is recommended that practitioners take into account bilingual children's language exposure, as well as other home language environment variables (Tuller, 2015), there is a need for more research to evaluate the extent to which such variables are associated with the performance of children with EAL on measures of English language competence. As will be reviewed in Chapter 6, a growing body of literature has investigated associations between a number of exposure variables and English competence, including length of English exposure, current exposure from family members, language and literacy activities at home, and parental education and parental English proficiency (Bedore, Peña, Griffin, & Hixon, 2016; Chondrogianni & Marinis, 2011; Gathercole & Thomas, 2009; Gutierrez-Clellen & Kreiter, 2003; Hammer et al., 2012; Paradis, 2011; Paradis & Jia, 2016). However, these studies typically recruited specific bilingual groups, such as Spanish-English bilinguals, rather than children from diverse first language backgrounds. Moreover, this research has focused on individual language measures, rather than overall performance on comprehensive language batteries. Finally, there is little longitudinal research available, which has considered associations between language exposure and performance on English language measures throughout the school years. As such, these gaps in the literature will be addressed in Chapter 6.

Summary of Research Aims

This thesis presents five experimental chapters which, broadly speaking, explore the language and cognitive development of children learning EAL over the early school years. This thesis considers the bilingual executive function advantage theory, as well as the academic attainment and social, emotional, and behavioural functioning of children with EAL. However, the main focus of the research was to understand individual differences in English language proficiency among children with EAL, and identify assessment resources which may help to determine when English language difficulties experienced by children with EAL may go beyond limited exposure and may reflect an underlying language impairment.

This research was part of the Surrey Communication and Language in Education study (SCALES), which is a longitudinal, UK-based, population study of risk for language impairment from school entry. This project involved a population screening phase where reception year teachers from schools across Surrey submitted questionnaire data on the language competence, social, emotional, and behavioural functioning, and academic attainment of children within their classes. Following this, subsamples of children with EAL and monolingual children completed in-depth assessment sessions in school in Year 1 and Year 3. While the main SCALES study focused on monolingual children, this thesis focuses on children with EAL.

The samples within each chapter of this thesis include children from diverse first language backgrounds and are therefore representative of the current educational and clinical situation in the UK. This research was, however, limited by the same obstacles that are faced by most practitioners in the field, namely a lack of appropriate language assessment resources for use with children with EAL. As such, resources were not available to identify language impairment in the children with EAL. Instead, this thesis takes a number of alternative approaches in order to produce informative research concerning the language assessment of such children. The specific research aims addressed in each chapter, and the approaches taken, are briefly outlined in the following paragraphs.

Chapter 2 explores the impact of learning EAL and levels of English language proficiency at school entry on concurrent social, emotional, and behavioural functioning, and on academic attainment over the early school years. English language proficiency is assessed using a teacher-completed checklist of communication strengths and errors in everyday contexts (the Children's Communication Checklist-Short [CCC-S]; Norbury et al., 2015). Since this checklist yields a continuous score, using this measure enabled this research to build on previous research on the impact of English language proficiency levels on academic and behavioural profiles of children with EAL relative to monolingual peers, which is limited by binary measures of language proficiency. However, this checklist was originally chosen because the main focus of this thesis, and indeed the SCALES project as a whole, was to explore risk for language impairment. Specifically, the CCC-S was designed to contain items which best discriminated children with language impairment from typically developing peers, with the aim of identifying children at high-risk for language impairment (Norbury et al., 2015). While performance on this checklist was analysed in Chapter 2 in relation to academic and behavioural outcomes, this checklist was also used to select children to be seen for in-depth assessment, specifically targeting children who are at high-risk for language impairment, as well as low-risk peers.

Chapters 3-6 present data collected for subsamples of children with EAL and monolingual peers who were seen in school for in-depth assessment. Within these chapters English language proficiency is assessed using a battery of six language measures. The battery contained expressive and receptive measures of vocabulary, narrative, and grammar and was based on the EpiSLI diagnostic battery for language impairment in monolingual children (Tomblin et al., 1996). This battery provides a good overview of receptive and expressive English language skills across a number of language domains, but was specifically chosen to diagnose language impairment in monolingual children. For the purposes of the research presented within this thesis, the use of this battery enables an evaluation of the performance of children with EAL on measures of English language competence that are used by speech and language therapists within language assessments.

Chapter 3 explores concurrent associations between learning EAL, English language proficiency, and executive function. As such, Chapter 3 considers the controversial theory that bilingualism is associated with advantages in executive function, as well as the extent to which such advantages are dependent upon second language proficiency. Language proficiency is considered categorically within Chapter 3 to enable an investigation of whether measures of executive function are sensitive to differences between children with EAL and monolingual peers who meet monolingual criteria for language impairment or typical language development. Chapter 4 takes a longitudinal approach to evaluate the utility of assessing children with EAL using a comprehensive, monolingual-normed, English language battery. More specifically, Chapter 4 compares the language development and functional academic attainment of children learning EAL, and monolingual peers, who meet criteria for language impairment on the monolingual-normed battery.

Chapter 5 explores whether measures of executive function and nonword repetition improve prediction of English language proficiency two years later in children with EAL, over and above performance on an English language battery at the outset. As such, this chapter considers whether processing-based measures can aid the early identification of children with EAL who will likely experience English language difficulties over the early school years, which may go beyond limited exposure. Furthermore, the longitudinal nature of the research presented within Chapter 5 enabled an evaluation of whether measures of executive function and nonword repetition tap constructs which have a causal role in language learning. Finally, Chapter 6 explores associations between language exposure, parent report of first language competence and early development, and English language proficiency over the early school years among children with EAL. This chapter therefore considers potential risk factors for persistent English language difficulties, as well as the extent to which performance on English language measures is influenced by language exposure.

All experimental chapters have been prepared as independent papers for publication. As such, some of the literature outlined within this thesis introduction will be replicated within the chapter introductions. Moreover, there is also some repetition of methodological information between the individual experimental chapters.

Chapter 2: English Language Proficiency and Early School Attainment Among Children Learning English as an Additional Language

Abstract

Children learning English as an additional language (EAL) often experience lower academic attainment relative to monolingual peers. In this study, teachers provided ratings of English language proficiency and social, emotional, and behavioural functioning for 782 children with EAL and 6,485 monolingual children in reception year (ages 4-5 years). Academic attainment was assessed in reception year and Year 2 (ages 6-7 years). Relative to monolingual peers with comparable levels of English language proficiency in reception year, children with EAL displayed fewer social, emotional, and behavioural difficulties in reception year, were equally likely to meet curriculum targets in reception year, and were more likely to meet curriculum targets in Year 2. Academic attainment and social, emotional, and behavioural functioning in children with EAL are associated with English language proficiency at school entry.

Introduction

As a result of greater international mobility, an increasing proportion of children around the world are growing up learning multiple languages. For example, it has been estimated that 21.9% of young people, aged between 5-17 years, in the United States speak a language other than English in their home (U. S. Census Bureau, 2014). Additionally, 20.1% of children attending state-funded primary schools in England speak English as an additional language (EAL; Department for Education, 2016). Such children are educated in English, however they have been exposed to a language other than English at home since infancy (Department for Education, 2015e; Strand et al., 2015). The proportion of children who speak EAL in England has been rising quite dramatically, from 8.7% in 2000, 11.6% in 2005 and 16% in 2010 (NALDIC, 2013). Since children are regarded as having EAL on the basis of language exposure in their home, the EAL label gives no indication of English language proficiency (Strand et al., 2015). Children with EAL are a heterogeneous group, with English language skills spanning the full continuum of proficiency (Strand et al., 2015). Bilingual speakers are frequently reported to display cognitive advantages, particularly in executive function, relative to monolingual speakers (Bialystok et al., 2009). However, these advantages are not always realised in functional academic performance. For both children with EAL and their monolingual English-speaking peers, English language proficiency may be a more prominent associate of academic and social, emotional, and behavioural profiles, rather than EAL status.

In England, children with EAL, as a group, display poorer attainment throughout primary school than monolingual children. This trend is revealed in data from the 2014 national education assessments, which measured the attainment of all state-funded primary school pupils who were at the end of their first year of school (reception year; age 4-5), Year 2 (age 6-7) and Year 6 (age 10-11; Department for Education, 2014a, 2014b, 2014c). These assessments revealed that the attainment gap between children with EAL and monolingual peers is widest in the curriculum area of speaking in reception year, speaking and listening in Year 2 and in reading in Year 6, though the attainment gap is not limited to language related subjects. Strand et al. (2015) analysed national assessment data collected in 2013 and concluded that the attainment gap between children with EAL and monolingual peers narrows, but is maintained, across primary school. Strand et al. also reported that the attainment gap is eliminated by Year 11 (age 15-16), where students with EAL actually show better attainment in some areas of the curriculum relative to monolingual peers.

Strand et al. (2015) noted that there is considerable variation in academic attainment among children with EAL and sought to explore risk factors for low attainment. Male sex, younger relative age, low family and neighbourhood socioeconomic status (SES), special education needs (SEN) and arriving in the UK part way through primary school were all associated with low academic attainment in Year 6 assessments in children with EAL. However, Strand et al. noted that English language proficiency is likely to be the most important predictor of attainment. A recent meta-analysis reported moderate to strong positive associations between proficiency in the language of education and early literacy, reading, spelling, mathematics and general academic attainment among bilingual children (Prevoo, Malda, Mesman, & van IJzendoorn, 2016). This is not surprising as proficiency in the language of education is required to understand the teacher, and language proficiency is a precursor for reading (Hoff, 2013; Prevoo et al., 2016).

Relatively little research has investigated how English language proficiency levels among children with EAL can influence the academic attainment gap between children with EAL and monolingual peers. In an analysis of attainment in Year 6 assessments, Strand and Demie (2005) reported that children with EAL who were fully fluent in English showed better attainment in all Year 6 assessment areas relative to monolingual children, though this difference was not significant after controlling for child characteristics including age, sex, SES, ethnicity and SEN. In contrast, children with EAL who were not fully fluent in English performed poorer than monolingual children, even after controlling for child characteristics. Demie and Strand (2006) also found the same pattern of results when analysing attainment by monolingual and EAL students in Year 11. These studies suggest that English language proficiency is an important factor in predicting how well children with EAL perform relative to monolingual peers in assessments at the end of primary and secondary school.

While previous studies have focused on older children, Halle et al. (2012) found that English language proficiency also predicts how children with EAL perform relative to monolingual peers over the early school years. Specifically, when controlling for child, family, and school characteristics, Halle et al. found that children with EAL who were not proficient in English until first grade (age 6-7), or later, showed lower reading and maths attainment in kindergarten (age 5-6) than monolingual children. In contrast, children with EAL who were proficient in English at school entry showed comparable attainment in reading and maths in kindergarten to monolingual children. These children also displayed greater growth in reading and maths between kindergarten and eighth grade (age 13-14), relative to monolingual children. This highlights potential academic advantages of having EAL, when coupled with good English language proficiency.

English language proficiency is also associated with social, emotional, and behavioural functioning in children with EAL. After controlling for child, family, and school characteristics, Halle et al. (2012) found that children with EAL who were proficient in English at school entry typically showed better behaviour, attention, eagerness to learn, and organisation between kindergarten (age 5-6) and fifth grade (age 10-11) than monolingual children. In contrast, children with EAL who were not proficient in English by first grade showed comparable behaviour, but poorer attention, eagerness to learn, and organisation between kindergarten and fifth grade, relative to monolingual children. Similarly, Winsler et al. (2014) found that Latino children with EAL and high English language proficiency showed greater social, emotional, and behavioural functioning at age four compared to monolingual English-speaking children. In contrast, Latino children with EAL and low English language proficiency typically showed comparable social, emotional, and behavioural functioning to monolingual children. Other studies of primarily Latino children with EAL have similarly found that high English language proficiency is associated with greater social, emotional, and behavioural functioning (Dowdy, Dever, DiStefano, & Chin, 2011; Oades-Sese, Esquivel, Kaliski, & Maniatis, 2011).

These findings are somewhat consistent with literature suggesting that bilingualism is associated with a range of cognitive advantages. For example, research has found that bilingual children display enhanced executive function relative to monolingual children, including enhanced inhibition (Calvo & Bialystok, 2014; Engel de Abreu et al., 2012; Poarch & van Hell, 2012b), working memory (Calvo & Bialystok, 2014), and task switching (Barac & Bialystok, 2012). However, many studies have not replicated the bilingual executive function advantage

(Duñabeitia et al., 2014; Gathercole et al., 2014) and other studies have found that it is dependent upon factors such as language use at home (Gathercole et al., 2010). Moreover, other research has suggested that enhanced executive function in bilingual children is dependent upon having good proficiency in both languages (Engel de Abreu et al., 2014). Thus, previous findings of enhanced academic attainment and social, emotional, and behavioural functioning in children with EAL, who demonstrate good English language proficiency, may reflect enhanced executive function in these children. Indeed, greater executive function is associated with greater academic attainment (St Clair-Thompson & Gathercole, 2006; Stevenson, Bergwerff, Heiser, & Resing, 2014; Yeniad, Malda, Mesman, van IJzendoorn, & Pieper, 2013) and behavioural functioning (Ciairano et al., 2007; Hughes & Ensor, 2011) in monolingual children.

Previous findings concerning the relation between English language proficiency and academic attainment and social, emotional, and behavioural functioning among children with EAL are difficult to interpret, as studies have not consistently considered the language proficiency of the monolingual comparison children. In order to make meaningful comparisons, children with EAL should be compared to monolingual children with comparable English language proficiency. This is because language proficiency among monolingual children is also associated with academic attainment and social, emotional, and behavioural functioning. For example, monolingual children with language impairment show poorer academic attainment (Dockrell et al., 2012; Tomblin, 2014) and greater social, emotional, and behavioural difficulties (Bretherton et al., 2014; McCabe, 2005; Yew & O'Kearney, 2013) relative to typically developing monolingual peers.

To our knowledge, only two studies have compared academic and social, emotional, and behavioural outcomes of children with EAL against monolingual peers with comparable language proficiency. One such study was carried out in Australia by Goldfeld et al. (2014). Goldfeld et al. analysed population data from a teacher-completed checklist, which measured development in the following areas in the first year of school: physical health and wellbeing, social competence, emotional maturity, and language and cognition (including literacy, maths and memory). Each child's English proficiency was determined on the basis of teacher ratings of their ability to use English (*very poor* or *poor* = not English proficient*; average, good* or *very good* = English proficient). When controlling for demographic variables, English proficient children with EAL were equally likely to show vulnerable social competence, language and cognition, and were less likely to show vulnerable emotional maturity and physical health and wellbeing, compared to English proficient monolingual children. On the other hand, children with EAL who were not English proficient were more likely to show vulnerable development in all areas compared to English proficient monolingual children. However, monolingual children who were not English proficient were at the greatest risk of displaying vulnerable development in all areas. It is likely that the language difficulties experienced by the children with EAL and the monolingual children, who were deemed not English proficient, reflected different origins (Goldfeld et al., 2014), which may explain why these groups displayed different levels of developmental vulnerability. The language difficulties experienced by the monolingual children were perhaps more likely to reflect an underlying language impairment, whereas the English language difficulties experienced by the children with EAL may have reflected a lack of language exposure, an underlying language impairment, or both.

A similar study was recently carried out by McLeod et al. (2016), who explored longitudinal academic and social, emotional, and behavioural outcomes of Australian children with EAL, and monolingual peers, whose parents reported that they either had concerns, or no concerns, about their child's speech and language at age 4-5. At ages 4-5, 6-7 and 8-9, children with EAL showed comparable social, emotional, and behavioural functioning and academic attainment to monolingual peers with comparable speech and language concern, after controlling for demographic variables. Noticeably, in contrast to Goldfeld et al.'s (2014) findings, children with EAL did not show advantages in social, emotional, and behavioural functioning relative to monolingual peers with comparable speech and language concern. Children with EAL and speech and language concern typically did not differ significantly in academic attainment from both monolingual and EAL peers with no speech and language concern. In contrast, monolingual children with speech and language concern typically showed significantly poorer academic attainment relative to both monolingual and EAL peers with no speech and language concern. Thus, comparable to Goldfeld et al.'s (2014) findings, monolingual children with speech and language concern were at the greatest risk of low academic attainment.

In sum, research suggests that academic attainment and social, emotional, and behavioural functioning in children with EAL is dependent upon English language proficiency. However, there is a need for more research to compare the academic and social, emotional, and behavioural profiles of children with EAL against monolingual peers with comparable English language proficiency. Additionally, previous research has reduced language proficiency to a binary variable (Goldfeld et al., 2014; McLeod et al., 2016) or used parent-reported speech and language concern as a proxy for language proficiency (McLeod et al., 2016). The current study builds on previous research by using a continuous, psychometrically strong, measure of English language proficiency. This is advantageous as it allows children with EAL and monolingual peers to be compared across the continuum of language proficiency, rather than just at low and typical levels of language proficiency.

The current study reports data from a UK-based longitudinal population study of language development. The aim of the current study was to compare children with EAL to monolingual peers, with comparable English language proficiency in the first year of school (reception year; age 4-5), on social, emotional, and behavioural functioning in reception year and on academic attainment in reception year and Year 2 (age 6-7). This study has strong ecological validity as data from national assessments were analysed to measure academic attainment. In order to investigate the functional impact of EAL status and English language proficiency levels, children were compared against curriculum targets which are used in the classroom. On the basis of previous findings, it was predicted that lower English language proficiency in reception year, among both children with EAL and monolingual peers, would be associated with greater social, emotional, and behavioural difficulties and a lower likelihood of meeting curriculum targets both concurrently and in Year 2. Additionally, on the basis of previous findings, children with EAL were predicted to show comparable or fewer social, emotional, and behavioural difficulties in reception year relative to monolingual peers with comparable English language proficiency. In terms of academic attainment, children with EAL were predicted to be equally likely to meet curriculum targets in reception year, but more likely to meet and exceed curriculum targets in Year 2, relative to monolingual peers with comparable English language proficiency. Finally, children with EAL were predicted to be more likely to show progress in meeting curriculum targets between reception year and Year 2, relative to monolingual peers with comparable English language proficiency.

Method

Participants

This study reports data collected for 7,267 reception year children during the population survey phase of the Surrey Communication and Language in Education Study (SCALES). Additionally, this study incorporates data from national curriculum assessments, provided by Surrey County Council, which were completed by the same children two years later. All children who started reception year in a state-maintained school in Surrey, England, in September 2011 were eligible to take part in the study (N = 12,398). Out of the 263 eligible schools who were invited to participate, 161 schools participated (61% of all eligible schools). Between May and July 2012, teachers completed an online questionnaire for 7,267 children (59% of all eligible children) who were in the last term of reception year. The research team covered the costs of supply teaching for a day to allow teachers time to complete the questionnaire for each child in their class who was taking part in the study. As data were anonymous to the research team and direct assessment of individual children was not required, an opt-out consent procedure was adopted. Parents received an information sheet via schools and had the opportunity to opt out of allowing anonymised teacher ratings of their child's academic attainment, language and behaviour to be submitted to the study. Twenty families opted out at this stage. The study protocol was developed in collaboration with Surrey County Council education officials and was granted ethical approval by the Ethics Committee at Royal Holloway, University of London.

Of the final sample of 7,267 children, 6,485 (89%) children were monolingual English-speaking and 782 (11%) children spoke EAL. Children were regarded as speaking EAL if teachers reported that the main language spoken in the child's home was not English. The 2016 School Census found that 20.1% of children in state-funded primary schools in England spoke EAL and 12.7% of children in state-funded primary schools in Surrey spoke EAL (Department for Education, 2016). Therefore, the proportion of children with EAL in this sample is somewhat lower than the national proportion, but comparable to the proportion in Surrey.

Over 64 different languages were represented in the sample of children with EAL. The most frequently reported first language was Urdu (*n* = 83, 11% of EAL sample), followed by Polish (*n* = 76, 10%), Portuguese (*n* = 47, 6%), Bengali (*n* = 43, 5%) and Panjabi (*n* = 40, 5%). The first language was unknown for 44 children (6%). The top languages reported in this sample are consistent with the 2012 School Census, which revealed that Urdu, Polish, Panjabi, Bengali and Portuguese were, respectively, the most frequently reported first languages, other than English, for children in state-funded schools in Surrey (NALDIC, 2012a). The top languages spoken in this sample are also comparable to the most frequently reported first languages, other than English, for children in state-funded schools in England: Urdu, Panjabi, Bengali, Polish and Somali (NALDIC, 2012a).

The children with EAL were from 122 state-maintained schools across Surrey and the monolingual children were from 161 state-maintained schools across Surrey. The EAL sample consisted of 402 boys (51%) and 380 girls (49%) and the monolingual sample consisted of 3,312 boys (51%) and 3,173 girls (49%). All children were aged between 4 years 9 months (57 months) and 5 years 10 months (70 months) when teachers completed the questionnaires. As shown in Table 2.1, the children with EAL and monolingual children did not significantly differ in age. Income Deprivation Affecting Children Index (IDACI; McLennan et al., 2011) rank scores were obtained using the children's home postcodes to provide a measure of neighbourhood deprivation. England has been divided up into small geographical areas and all areas have been ranked according to the proportion of children resident in each area who live in families deemed to be income deprived, due to being in receipt of certain means tested benefits (McLennan et al., 2011). IDACI rank scores can range from 1 to 32,482, with lower scores assigned to areas with proportionally more children living in income deprived families. IDACI rank scores for the EAL sample ranged from 1,730 to 32,459 and IDACI rank scores for the monolingual sample ranged from 731 to 32,474. As shown in Table 2.1, the monolingual children had significantly higher IDACI rank scores, and thus were from less deprived neighbourhoods, than the children with EAL.

Table 2.1

Descriptive Statistics for Continuous Variables for Monolingual Children and Children with EAL

Variable	Monolingual		EAL				
	M (*SD*)	*Mdn* (*IQR*)	*M* (*SD*)	*Mdn* (*IQR*)	*U*	*p*	*r*
Age in months	64.16 (3.55)	64.00 (6.00)	64.20 (3.51)	64.00 (6.00)	2,516,452.00	.728	< .01
IDACI rank score[a]	21,963.52 (7,670.95)	22,748.00 (12,768.00)	18,512.54 (8,439.69)	18,384.50 (14,928.75)	1,937,300.00	< .001	-.13
CCC-S score[b]	8.64 (8.64)	7.00 (12.00)	15.13 (10.51)	14.00 (15.00)	1,573,021.00	< .001	-.20
SDQ total difficulties[c]	5.42 (5.20)	4.00 (6.00)	6.01 (5.29)	5.00 (7.00)	2,342,472.00	< .001	-.04

[a]Greater IDACI rank scores indicate lower neighbourhood deprivation. [b]Greater CCC-S scores indicate lower English language proficiency.
[c]Greater SDQ total difficulties scores indicate greater social, emotional, and behavioural difficulties.

Measures and Procedures

The teacher questionnaire was completed when the children were at the end of reception year (age 4-5) and consisted of a short version of the Children's Communication Checklist-2 (Bishop, 2003a), the Strengths and Difficulties Questionnaire (Goodman, 1997), and the Early Years Foundation Stage Profile (Standards and Testing Agency, 2012). Additionally, Surrey County Council provided data from national curriculum assessments, which were completed when the children were in Year 2 (age 6-7).

Children's Communication Checklist – Short (CCC-S). The CCC-S is a short version of the Children's Communications Checklist-2 (CCC-2; Bishop, 2003a), which is a well-validated language screening measure that can discriminate between children with language impairment and typically developing children (Norbury, Nash, Baird, & Bishop, 2004). The CCC-S contains items that best discriminated children with language impairment from typically developing peers in Norbury et al.'s (2004) validation study. The CCC-S has good internal consistency and excellent agreement with the full CCC-2 (Norbury et al., 2015). The respondent firstly provides a range of background information about the child, including sex, date of birth, home postcode and first language. The next part of the CCC-S contains six items describing communicative errors and seven items describing communicative strengths (e.g. "you can have an enjoyable, interesting conversation with him/her"). The respondent rates how often the child displays each communicative error or strength using a 4-point scale: *rarely or never (less than once a week), occasionally (once a week), regularly (once or twice a day),* or *frequently or always (several times a day).* The six items regarding communicative errors were scored from 0 (*rarely or never)* to 3 (*frequently or always)*, while the seven items regarding communicative strengths were reverse scored (3 = *rarely or never*, 0 = *frequently or always)*. All 13 items were summed to create a total CCC-S score (maximum = 39), with high scores reflecting lower English language proficiency.

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The SDQ is a screening measure of social, emotional, and behavioural functioning developed for use with 4-16 year olds. A review of 48 studies concluded that the SDQ has strong psychometric properties, including satisfactory reliability, good construct validity and a good capacity to identify children who have a disorder

(Stone, Otten, Engels, Vermulst, & Janssens, 2010). The SDQ is made up of 25 items, with five items for each of the five subscales: emotional symptoms, conduct problems, hyperactivity, peer problems, and pro-social behaviour. The respondent rates the extent each item applies to the child on a 3-point scale (*not true, somewhat true,* or *certainly tru*e; scored from 0-2). Scores on the first four subscales were summed to provide a total difficulties score (maximum = 40), with high scores reflecting greater social, emotional, and behavioural difficulties.

Early Years Foundation Stage Profile (EYFSP; Standards and Testing Agency, 2012). The EYFSP is a measure of attainment completed by teachers during the last term of reception year for children attending state-maintained schools in England. Using a 3-point scale (*emerging, expected,* or *exceeding*), teachers rate the extent to which each child has met the expected level of development across 17 early learning goals. Children were regarded as achieving a 'good level of development' if they achieved at least the expected level of development across 12 key early learning goals (Department for Education, 2014a). These 12 goals relate to the following areas of learning: communication and language; physical development; personal, social and emotional development; literacy; and mathematics.

Year 2 assessments. Children attending state-maintained schools in England complete national curriculum assessments, known as Key Stage 1 assessments, in Year 2 (age 6-7; Department for Education, 2014c). Teachers determine each child's level of attainment in the following five subjects: mathematics, science, reading, writing, and speaking and listening. Since the expected level of attainment is level 2 (Department for Education, 2014c), for the purposes of this study, children were regarded as performing on target if they achieved level 2 or above in all five subjects and were regarded as performing below target if they achieved level 1 or below in one or more subject. Children were regarded as performing above target if they achieved level 3 or above in three or more subjects and level 2 in any remaining subjects.

Missing Data

Home postcodes were unavailable for 148 monolingual children and 26 children with EAL and were replaced with the postcode for the child's school. SDQ and EYFSP data were missing for one child and EYFSP data were missing for a further six children. Year 2 assessment results were missing for 870 (12%) children.

Missing SDQ, EYFSP and Year 2 assessment data were not imputed: Children with missing data were simply excluded from relevant analyses. A greater proportion of children with EAL (*n* = 134, 17%) had missing Year 2 assessment results relative to monolingual children (*n* = 736, 11%; $\chi^2(1) = 22.17$, *p* < .001, Phi = *.06*). A Mann-Whitney U test revealed that CCC-S scores did not significantly differ between children whose Year 2 assessment results were missing (median [*Mdn*] = 7.00; interquartile range [*IQR*] = 12) and children whose results were available (*Mdn* = 7.00, *IQR* = 12.00; *U* = 2,758,380.00, *Z* = -0.42, *p* = .674, *r* < .01), which indicates that these groups did not differ in English language proficiency. Additionally, IDACI rank scores did not significantly differ between children whose Year 2 assessment results were missing (*Mdn* = 22,358.00, *IQR* = 13,401.25) and children whose results were available (*Mdn* = 22,378.00, *IQR* = 13,229.00; *U* = 2,730,023.50, *Z* = -0.91, *p* = .364, *r* = .01), which indicates that these groups also did not differ in neighbourhood deprivation.

Data Analysis

Firstly, Mann-Whitney U tests were run to explore whether children with EAL and monolingual children differed on CCC-S scores (English language proficiency) and SDQ total difficulties scores. Chi square tests were then run to explore whether children with EAL and monolingual children differed in their likelihood to achieve the following academic attainment outcomes, before language proficiency was considered: perform at a good level of development in reception year, perform on target in Year 2 assessments, perform above target in Year 2 assessments, and progress from a performing below a good level of development in reception year to performing on target in Year 2. The latter analysis only used data from children who performed below a good level of development in reception year and explored whether children with EAL were more likely to show progress in meeting curriculum targets, between reception year and Year 2, than monolingual peers. Following this, hierarchical binary logistic regression and hierarchical multiple regression were used to explore how children with EAL compared to monolingual peers on each binary academic attainment outcome, and on SDQ total difficulties scores, after first controlling for language proficiency (unadjusted model) and then after additionally controlling for demographic variables (adjusted model).

EAL status, CCC-S scores and the CCC-S by EAL status interaction term were entered into the first, unadjusted, model of each regression. Within each unadjusted model, regression coefficients and odds ratios for EAL status reveal how children with EAL compare to monolingual peers on each attainment outcome when CCC-S scores are 0 (i.e. when English language proficiency is high). Likewise, regression coefficients and odds ratios for CCC-S scores reveal the association between CCC-S scores and each attainment outcome when EAL status is 0 (i.e. statistics for monolingual children). The CCC-S by EAL status interaction term reveals whether the association between CCC-S scores and each attainment outcome differs for children with EAL relative to monolingual peers. In other words, the interaction term reveals whether the association between EAL status and each attainment outcome differs across the continuum of CCC-S scores. Sex, age in months and IDACI rank scores (neighbourhood deprivation) were additionally entered into the second, adjusted, model of each regression to examine whether the associations revealed in the unadjusted model held after these variables, which are known to be associated with behavioural functioning and academic attainment, were held constant.

Results

Figure 2.1 displays the distribution of scores on the CCC-S for monolingual children and children with EAL. Most monolingual children received low CCC-S scores, indicating high teacher-rated English language proficiency, and fewer children are represented as CCC-S scores increase. In contrast, the distribution of scores for children with EAL is more evenly spread across the entire range. As shown in Table 2.1, children with EAL, as a group, had significantly higher CCC-S scores, and thus lower English language proficiency, than monolingual children. Children with EAL also had significantly higher SDQ total difficulties scores than monolingual children (see Table 2.1), which implies that they had greater social, emotional, and behavioural difficulties. Additionally, as shown in Table 2.2, children with EAL were significantly less likely than monolingual children to achieve a good level of development in reception year and perform on target, or above target, in Year 2 assessments. However, all effects were small. Furthermore, children with EAL and monolingual children were equally likely to progress from a performing below a good level of development in reception year to performing on target in Year 2 (see Table 2.2).

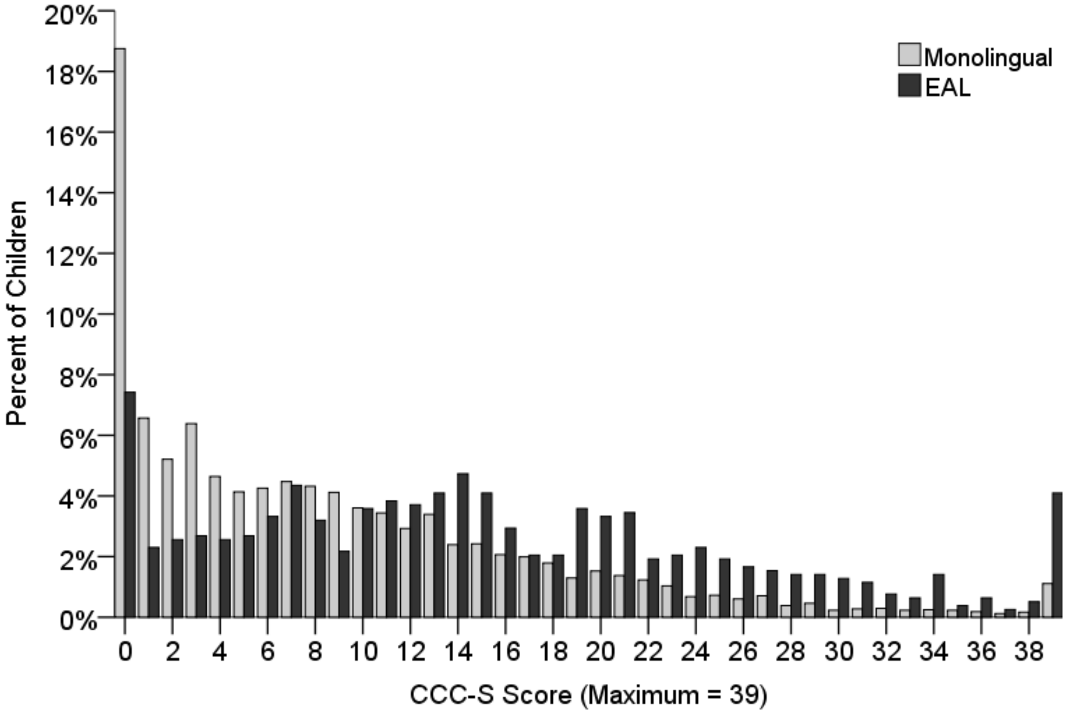

Figure 2.1. The percentage of monolingual children and children with EAL who received each score on the CCC-S. Greater CCC-S scores indicate lower English language proficiency.

Table 2.2

The Percentage of Monolingual Children and Children with EAL who Achieved Each Attainment Outcome

Attainment outcome	Monolingual	EAL	$\chi^2(df)$	*p*	Phi
GLD in reception	59%	45%	54.46 (1)	< .001	.09
On target in Year 2	86%	82%	5.72 (1)	.017	.03
Above target in Year 2	31%	23%	18.83 (1)	< .001	.05
Below GLD in reception but on target in Year 2	69%	70%	0.06 (1)	.806	< .01

Note. GLD = good level of development.

Hierarchical multiple regression examined the association between EAL status and total difficulties scores on the SDQ, after controlling for language proficiency in the unadjusted model and additionally controlling for demographic variables in the adjusted model. The unadjusted model significantly predicted total difficulties scores, $F(3, 7262) = 1{,}047.84$, $p < .001$, and explained 30% of the variance. As shown in Table 2.3, higher CCC-S scores (i.e. lower English language proficiency) significantly predicted greater total difficulties scores and EAL status significantly predicted lower total difficulties scores. Moreover, there was a significant CCC-S by EAL status interaction; compared to monolingual children, an increase in CCC-S scores among children with EAL was associated with a smaller increase in total difficulties scores (see Figure 2.2). These results imply that children with EAL experience fewer social, emotional, and behavioural difficulties than monolingual peers with comparable English language proficiency and this EAL advantage is greater among children with lower English language proficiency. Controlling for demographic variables in the adjusted model did not change the associations revealed in the unadjusted model (see Table 2.3), though prediction was significantly improved, $F(3, 7259) = 47.54$, $p < .001$, and a further 1% of the variance was explained. In total, the adjusted model explained 32% of the variance and significantly predicted total difficulties scores, $F(6, 7259) = 557.76$, $p < .001$.

Table 2.3

Hierarchical Multiple Regression Predicting Total Difficulties Scores on the SDQ in Reception Year (n = 7266)

Variable	*b*	*SE*	β	*t*	*p*
Unadjusted model					
EAL	-0.63	0.28	-.04	-2.23	.026
CCC-S score	0.33	0.01	.58	52.91	< .001
CCC-S x EAL	-0.06	0.02	-.07	-3.81	< .001
Constant	2.56	0.08		33.41	< .001
Adjusted model					
EAL	-0.63	0.28	-.04	-2.23	.026
CCC-S score	0.32	0.01	.55	48.89	< .001
CCC-S x EAL	-0.06	0.02	-.07	-3.78	< .001
Male sex	1.16	0.10	.11	11.29	< .001
Age in months	-0.03	0.01	-.02	-2.22	.027
IDACI rank score	< -0.01	< 0.01	-.04	-3.67	< .001
Constant	4.71	0.96		4.90	< .001

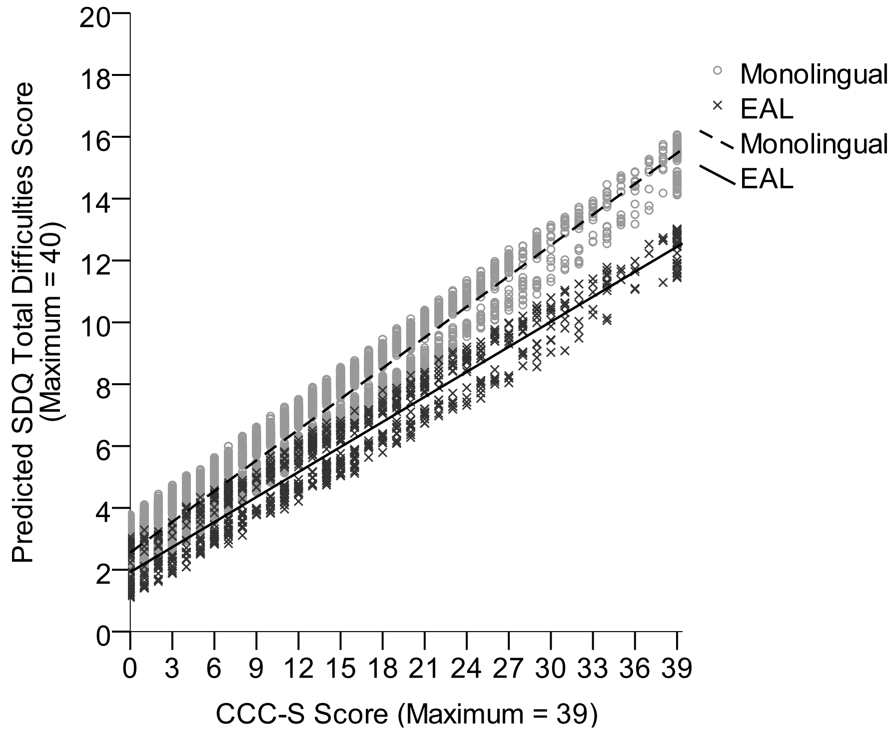

Figure 2.2. Predicted SDQ total difficulties scores by CCC-S scores for monolingual children and children with EAL, after controlling for demographic variables. Greater CCC-S scores indicate lower English language proficiency and greater SDQ total difficulties scores indicate greater social, emotional, and behavioural difficulties.

Hierarchical logistic regression was then run to predict which children achieved a good level of development in reception year. The unadjusted model was significant, $\chi^2(3) = 2{,}799.63$, $p < .001$, and explained between 32% (Cox & Snell R^2) and 43% (Nagelkerke R^2) of the variance. As shown in Table 2.4, higher CCC-S scores, reflecting lower English language proficiency, were associated with significantly lower odds of achieving a good level of development. EAL status was not a significant predictor of good level of development status and there was no significant CCC-S by EAL status interaction. This implies that, across the continuum of English language proficiency, children with EAL and monolingual peers with comparable language proficiency were equally likely to achieve a good level of development in reception year. Controlling for demographic variables in the adjusted model did not change the associations revealed in the unadjusted model (see Table 2.4), though prediction was significantly improved, $\chi^2(3) = 153.86$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 2{,}953.49$, $p < .001$, and explained between 33% (Cox & Snell R^2) and 45% (Nagelkerke R^2) of the variance.

Table 2.4

Hierarchical Logistic Regression Predicting Which Children Achieved a Good Level of Development on the EYFSP in Reception Year (n = 7260)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	0.25	0.20	1.59	.207	1.28 [0.87, 1.89]
CCC-S score	-0.20	0.01	1420.33	< .001	0.82 [0.81, 0.83]
CCC-S x EAL	0.02	0.01	1.28	.258	1.02 [0.99, 1.04]
Constant	2.01	0.05	1508.96	< .001	
Adjusted model					
EAL	0.24	0.20	1.48	.223	1.28 [0.86, 1.89]
CCC-S score	-0.19	0.01	1256.44	< .001	0.83 [0.82, 0.84]
CCC-S x EAL	0.01	0.01	0.77	.381	1.01 [0.98, 1.04]
Male sex	-0.56	0.06	89.58	< .001	0.57 [0.51, 0.64]
Age in months	0.07	0.01	68.00	< .001	1.07 [1.06, 1.09]
IDACI rank score	< 0.01	< 0.01	4.84	.028	1.00 [1.00, 1.00]
Constant	-2.46	0.56	19.45	< .001	

The next analyses focused on academic attainment two years later. Firstly, hierarchical logistic regression was run to predict on target performance in Year 2 assessments. The unadjusted model was significant, $\chi^2(3) = 1{,}265.86$, $p < .001$, and explained between 18% (Cox & Snell R^2) and 32% (Nagelkerke R^2) of the variance. As shown in Table 2.5, higher CCC-S scores, reflecting lower English language proficiency in reception year, were associated with significantly lower odds of performing on target in Year 2. There was no significant CCC-S by EAL status interaction, however EAL status was associated with significantly higher odds of performing on target in Year 2. This indicates that children with EAL were more likely to meet academic targets in Year 2 relative to monolingual peers with comparable English language proficiency in reception year. When demographic variables were controlled in the adjusted model, this EAL advantage remained (see Table 2.5) and prediction was significantly improved, $\chi^2(3) = 110.89$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 1,376.75$, $p < .001$, and explained between 19% (Cox & Snell R^2) and 34% (Nagelkerke R^2) of the variance.

Table 2.5

Hierarchical Logistic Regression Predicting On Target Performance in Year 2 Assessments (n = 6397)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	0.64	0.32	4.02	.045	1.90 [1.01, 3.56]
CCC-S score	-0.14	< 0.01	826.48	< .001	0.87 [0.86, 0.88]
CCC-S x EAL	0.01	0.01	0.32	.570	1.01 [0.98, 1.03]
Constant	3.49	0.08	1788.76	< .001	
Adjusted model					
EAL	0.81	0.32	6.26	.012	2.25 [1.19, 4.26]
CCC-S score	-0.13	0.01	711.69	< .001	0.87 [0.87, 0.88]
CCC-S x EAL	0.01	0.01	0.18	.670	1.01 [0.98, 1.03]
Male sex	-0.21	0.09	6.23	.013	0.81 [0.68, 0.96]
Age in months	0.04	0.01	10.87	.001	1.04 [1.02, 1.07]
IDACI rank score	< 0.01	< 0.01	93.95	< .001	1.00 [1.00, 1.00]
Constant	-0.06	0.79	0.01	.934	

The next hierarchical logistic regression predicted above target performance in Year 2 assessments. The unadjusted model was significant, $\chi^2(3) = 1,266.80$, $p < .001$, and explained between 18% (Cox & Snell R^2) and 25% (Nagelkerke R^2) of the variance. As shown in Table 2.6, higher CCC-S scores, reflecting lower English language proficiency in reception year, were associated with significantly lower odds of performing above target in Year 2. EAL status did not significantly predict above target performance. Thus, when CCC-S scores were 0, which indicates high English language proficiency, children with EAL and monolingual peers were equally likely to exceed Year 2 targets. However, there was a significant CCC-S by EAL status interaction; as CCC-S scores increased, reflecting lower English language proficiency in reception year, children with EAL were more likely to perform above target in Year 2 assessments relative to monolingual peers with equivalent CCC-S scores (see Figure 2.3). Controlling for demographic variables in the adjusted model did not change these associations (see Table 2.6), though prediction was significantly improved, $\chi^2(3) = 248.39$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 1{,}515.19$, $p < .001$, and explained between 21% (Cox & Snell R^2) and 30% (Nagelkerke R^2) of the variance.

Table 2.6

Hierarchical Logistic Regression Predicting Above Target Performance in Year 2 Assessments (n = 6397)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	-0.14	0.17	0.70	.404	0.87 [0.62, 1.21]
CCC-S score	-0.16	0.01	718.37	< .001	0.85 [0.84, 0.86]
CCC-S x EAL	0.05	0.01	13.97	< .001	1.05 [1.03, 1.08]
Constant	0.27	0.04	38.11	< .001	
Adjusted model					
EAL	-0.01	0.17	< 0.01	.965	0.99 [0.71, 1.39]
CCC-S score	-0.15	0.01	613.39	< .001	0.86 [0.85, 0.87]
CCC-S x EAL	0.05	0.01	13.35	< .001	1.05 [1.02, 1.08]
Male sex	0.09	0.06	2.17	.140	1.10 [0.97, 1.24]
Age in months	0.08	0.01	87.19	< .001	1.09 [1.07, 1.10]
IDACI rank score	< 0.01	< 0.01	150.76	< .001	1.00 [1.00, 1.00]
Constant	-6.31	0.59	115.61	< .001	

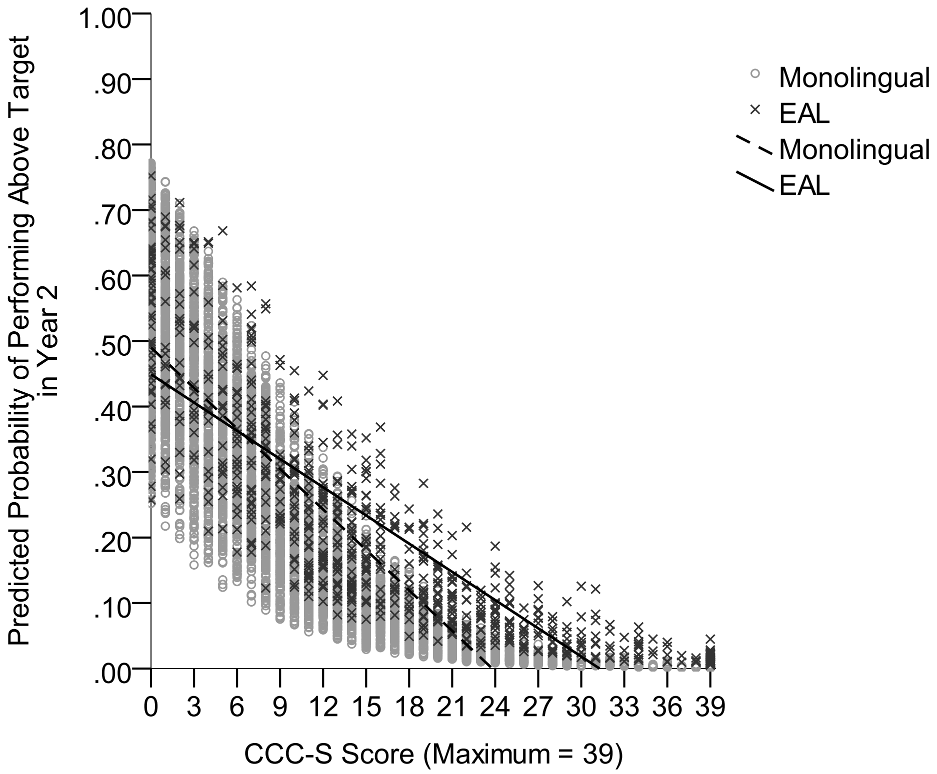

Figure 2.3. Predicted probability of performing above target in Year 2 assessments by CCC-S scores for monolingual children and children with EAL, after controlling for demographic variables. Greater CCC-S scores indicate lower English language proficiency.

The final hierarchical logistic regression predicted progression from performing below a good level of development in reception year to performing on target in Year 2. The unadjusted model was significant, $\chi^2(3) = 442.95$, $p < .001$, and explained between 15% (Cox & Snell R^2) and 21% (Nagelkerke R^2) of the variance. As shown in Table 2.7, higher CCC-S scores, reflecting lower English language proficiency in reception year, were associated with significantly lower odds of performing on target in Year 2. There was no significant CCC-S by EAL status interaction, however EAL status was associated with significantly higher odds of performing on target in Year 2. This indicates that children with EAL, who were academically underachieving in reception year, were more likely to go on and meet academic targets in Year 2 relative to monolingual peers with comparable language proficiency and academic attainment in reception year. When demographic variables were controlled in the adjusted model, this EAL advantage remained (see Table 2.7) and prediction was significantly improved, $\chi^2(3) = 60.14$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 503.09$, $p < .001$, and explained between 17% (Cox & Snell R^2) and 24% (Nagelkerke R^2) of the variance.

Table 2.7

Hierarchical Logistic Regression Predicting Progression From Performing Below a Good Level of Development in Reception Year to Performing On Target in Year 2 (n = 2723)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	0.91	0.39	5.32	.021	2.48 [1.15, 5.36]
CCC-S score	-0.10	0.01	306.32	< .001	0.91 [0.90, 0.92]
CCC-S x EAL	-0.01	0.02	0.25	.618	0.99 [0.96, 1.02]
Constant	2.38	0.11	504.56	< .001	
Adjusted model					
EAL	1.08	0.40	7.33	.007	2.94 [1.35, 6.42]
CCC-S score	-0.10	0.01	277.66	< .001	0.91 [0.90, 0.92]
CCC-S x EAL	-0.01	0.02	0.34	.557	0.99 [0.96, 1.02]
Male sex	-0.09	0.10	0.89	.346	0.91 [0.76, 1.10]
Age in months	0.02	0.01	2.08	.150	1.02 [0.99, 1.05]
IDACI rank score	< 0.01	< 0.01	57.09	< .001	1.00 [1.00, 1.00]
Constant	0.24	0.88	0.07	.789	

Discussion

This study explored associations between teacher-rated English language proficiency in the first year of school (reception year) and concurrent social, emotional, and behavioural functioning and academic attainment, and academic attainment two years later, in children with EAL and monolingual peers. As predicted, lower English language proficiency, in both children with EAL and monolingual peers, was associated with greater social, emotional, and behavioural difficulties in reception year and a lower likelihood of meeting curriculum targets in reception year and meeting or exceeding curriculum targets in Year 2. Lower English language proficiency, in both groups, was also associated with a lower likelihood of progressing from performing below target in reception year to performing on target in Year 2. Thus, low levels of English language proficiency at school entry represent a key risk factor for social, emotional, and behavioural difficulties and persistent academic difficulties among both children with EAL and their monolingual peers.

Before English language proficiency was considered, children with EAL showed greater social, emotional, and behavioural difficulties than monolingual children and were less likely to achieve curriculum targets in reception year and achieve, or exceed, curriculum targets in Year 2. Nevertheless, children with EAL and monolingual children were equally likely to progress from performing below target in reception year to performing on target in Year 2. However, results were different when language proficiency was considered. Relative to monolingual peers with comparable English language proficiency, children with EAL displayed fewer social, emotional, and behavioural difficulties in reception year. Moreover, this EAL behavioural advantage became greater as English language proficiency decreased. Additionally, consistent with expectations, children with EAL were equally likely to meet curriculum targets in reception year, and were more likely to meet curriculum targets in Year 2, relative to monolingual peers with comparable levels of English language proficiency in reception. While children with EAL and monolingual peers with high English language proficiency were equally likely to exceed Year 2 targets, children with EAL became more likely to exceed Year 2 targets than monolingual peers as English language proficiency decreased. Finally, children with EAL were more likely to progress from a performing below target in reception to performing on target in Year 2, relative to monolingual peers with comparable English language proficiency in reception. These associations all held both before and after demographic variables were taken into account.

As noted in a previous study by Strand and Demie (2005), the current study highlights that caution is needed when interpreting data from national assessments for children with EAL as a group. Data from the national assessments in England indicate that children with EAL show poorer attainment throughout primary school compared to monolingual children (Strand et al., 2015). However, results from the current study, as well as from previous research (Demie & Strand, 2006; Goldfeld et al., 2014; Halle et al., 2012; Prevoo et al., 2016; Strand & Demie, 2005), suggest that academic attainment among children with EAL is dependent upon English language proficiency. Indeed, the current study found that children with EAL show comparable, or better, academic attainment relative to monolingual peers with comparable English language proficiency. As noted by Strand et al. (2015), children with EAL are a heterogeneous group, with English language skills spanning the full continuum of proficiency. Findings from the current study support Strand and colleagues' (Strand & Demie, 2005; Strand et al., 2015) recommendation that in order to determine the required support for individual children with EAL, it is important to consider their English language proficiency, rather than just their EAL status.

This study is consistent with research reporting that greater English language proficiency in children with EAL is associated with greater academic attainment (Demie & Strand, 2006; Goldfeld et al., 2014; Halle et al., 2012; Prevoo et al., 2016; Strand & Demie, 2005) and greater social, emotional, and behavioural functioning (Dowdy et al., 2011; Goldfeld et al., 2014; Halle et al., 2012; Oades-Sese et al., 2011; Winsler et al., 2014). However, there are some inconsistencies between this study and previous research concerning how children with EAL compare to monolingual peers on academic and social, emotional, and behavioural outcomes. These inconsistencies likely reflect methodological differences in the way English language proficiency was determined and the use of different measures of social, emotional, and behavioural functioning and academic attainment. Additionally, few previous studies have considered the language proficiency of the monolingual comparison children (e.g. Halle et al., 2012; Strand & Demie, 2005; Winsler et al., 2014), though Goldfeld et al. (2014) and McLeod et al. (2016) are notable exceptions. Nevertheless, results from this study are consistent with previous findings that children with EAL, who have good English language proficiency, show comparable academic attainment (Goldfeld et al., 2014; Halle et al., 2012; McLeod et al., 2016) and fewer social, emotional, and behavioural difficulties (Goldfeld et al., 2014; Halle et al., 2012; Winsler et al., 2014) at school entry, relative to monolingual peers, and show greater academic progress over the early school years (Halle et al., 2012).

Bilingual children are often reported to have cognitive advantages, in particular enhanced executive function, compared to monolingual children (Barac &

Bialystok, 2012; Bialystok et al., 2009; Calvo & Bialystok, 2014; Engel de Abreu et al., 2012; Poarch & van Hell, 2012b). Additionally, research has suggested that enhanced executive function in bilingual children is dependent upon having good proficiency in both languages (Engel de Abreu et al., 2014). Greater executive function is also associated with greater academic attainment (St Clair-Thompson & Gathercole, 2006; Stevenson et al., 2014; Yeniad et al., 2013) and behavioural functioning (Ciairano et al., 2007; Hughes & Ensor, 2011) generally, leading to the expectation that children with EAL, particularly those with good English language proficiency, would show behavioural and academic advantages relative to monolingual peers. The results from the current study gave a more mixed picture. While children with EAL demonstrated no advantages in meeting curriculum targets in reception year, children with EAL did demonstrate advantages in social, emotional, and behavioural functioning in reception year, in meeting curriculum targets in Year 2 and in showing progress in meeting targets between reception year and Year 2. However, these advantages only appeared when children with EAL were compared against monolingual peers with comparable English language proficiency in reception year. Moreover, academic advantages for most children with EAL were limited to meeting curriculum targets. Only children with EAL and low English language proficiency displayed advantages in exceeding curriculum targets in Year 2, relative to monolingual peers with comparable language proficiency in reception year. As executive function was not measured in this study, it is uncertain whether these advantages in academic attainment and social, emotional, and behavioural functioning reflected enhanced executive function among children with EAL. Indeed, these advantages may reflect other factors, such as cultural or home environment differences. The relation between EAL status, English language proficiency, executive function, and academic and behavioural outcomes are a fruitful avenue for future research.

In the current study, discrepancies between children with EAL and monolingual peers in social, emotional, and behavioural functioning in reception year and in academic attainment in Year 2 became greater as language proficiency decreased. This may indicate that bilingualism may be a protective factor against some of the difficulties associated with low language proficiency or language impairment (Engel de Abreu et al., 2014). However, these findings may also reflect the different or multifaceted origins of the language difficulties in these two groups. For many children with EAL, low English language proficiency in reception year reflects a lack of language exposure, whereas it may be more indicative of an underlying language impairment in monolingual children. Indeed, although all children should have received nearly a full academic year of exposure to English by the time teachers rated their language proficiency, exposure to English prior to school entry is likely to have been variable among the children with EAL, with some children experiencing little to no exposure to English prior to school entry (NALDIC, 2012b). Given the assessment methods, the nature of the population sample and the number of different languages represented within the population, it was not possible to screen for language proficiency in the child's first or home language. Future studies should quantify both exposure to English prior to school entry and level of language proficiency in the home language in order to better understand unexplained variance in the academic attainment and social, emotional, and behavioural functioning of children with EAL.

Since language impairment is associated with social, emotional, and behavioural difficulties (Bretherton et al., 2014; Yew & O'Kearney, 2013) and poor academic attainment (Dockrell et al., 2012) in monolingual children, future research should further consider how to distinguish language impairment from limited language exposure in children with EAL, in order to identify those who will likely overcome their initial English language difficulties and to target support more effectively for those children who may struggle to catch up. Indeed, identifying language impairment in children learning EAL is a key challenge faced by practitioners (De Lamo White & Jin, 2011; Hasson et al., 2013). Although this is a growing area of research, there is still a lack of appropriate measures to identify language impairment in bilingual children, particularly in children from diverse first language backgrounds (Kohnert, 2010; Paradis, 2010; Paradis et al., 2013). A further challenge for practitioners is in determining how best to intervene. While it is important to support development of both languages and encourage families to continue to provide rich interactions and experiences in their first language, for clinicians and educators it may not be practical to offer direct instruction in other languages. This is particularly true in the UK where over 300 different languages are represented by pupils in primary and secondary schools (NALDIC, 2012a). The findings of the current study suggest that increasing proficiency in English, or the main language of instruction, during the early school years or prior to school entry will improve social, emotional, and behavioural functioning and academic performance. The impact of such interventions should be evaluated using randomised controlled trials.

A strength of this study is that it used a population cohort of children, who were all in the same school year and had been exposed to academic English for the same amount of time. Additionally, unlike most previous studies on the association between English language proficiency, academic attainment, and social, emotional, and behavioural functioning in children with EAL, this study considered the language proficiency of the monolingual comparison children. Through the use of national assessments, it was also possible to compare children against attainment targets used in the classroom and thus delineate the functional impact of English language proficiency levels and EAL status. Another strength of this study reflects the use of standard checklists of language and social, emotional, and behavioural functioning, which have strong psychometric properties (Norbury et al., 2015; Stone et al., 2010). Nevertheless, this study is limited through the use of indirect measures of language and social, emotional, and behavioural functioning and a lack of multiple informants. While the brief language screen used was necessary to allow such a large sample size, directly assessing each child with a battery of language tests may have provided a better indication of each child's English language proficiency and would have decreased the reliance on teacher ratings. Indeed, the same teacher provided ratings of language, academic attainment, and social, emotional, and behavioural functioning in reception year for each child, which may have inflated associations between these measures. Nevertheless, teacher ratings of English language proficiency in reception year were predictive of both academic attainment in reception year, as well as independently reported levels of academic attainment in Year 2. A further potential issue concerns the fact that 39 of the 166 participating schools only contributed data from monolingual children. It is possible that variance in the school environment may have contributed to some of the findings. However, after excluding all children from these 39 schools, all effects remained the same in each regression model (see Appendix A).

In summary, English language proficiency in children with EAL at school entry is predictive of concurrent academic attainment and social, emotional, and behavioural functioning, as well as academic attainment two years later. These findings highlight that children with EAL are a heterogeneous group and caution is required when interpreting data from national assessments for children with EAL, without considering English language proficiency. While previous research has highlighted cognitive advantages associated with bilingualism, in this study children with EAL displayed no advantage in academic attainment in reception year. However, children with EAL displayed advantages in social, emotional, and behavioural functioning in reception year and a functional advantage in meeting curriculum targets in Year 2, relative to monolingual peers with comparable levels of English language proficiency. Future research should explore whether these advantages are related to enhanced executive function in children with EAL. Future research should also explore how to distinguish children with EAL at school entry who are likely to have persistent language deficits, from those with more transient difficulties associated with limited exposure to English, in order to provide more targeted support. Findings from this study suggest that a focus on boosting English language proficiency in the early school years, or prior to school entry, among children with EAL will improve social, emotional, and behavioural profiles and attenuate the existing academic attainment gap between children with EAL and monolingual peers.

Chapter 3: The Influence of Language Proficiency and Exposure to English as an Additional Language on Executive Function

Abstract

Bilingualism is reportedly associated with advantages in executive function, while language impairment in monolingual children is associated with deficits in executive function. To date, little research has merged these lines of enquiry. This study explored the influence of language proficiency and exposure to an additional language on executive function in 53 children learning English as an additional language (EAL) and 53 monolingual children (ages 5-6 years). Within each group, children were categorised as displaying either typical or low levels of English language proficiency, using criteria for language impairment for monolingual English-speaking children. Children completed measures of selective attention, response inhibition, and verbal and visuospatial working memory. While children with EAL, regardless of language proficiency, displayed a reaction time advantage on a response inhibition task relative to monolingual peers, no EAL advantages emerged in selective attention and verbal or visuospatial working memory. Children with low English language proficiency, regardless of EAL status, demonstrated impaired verbal working memory relative to peers with typical language proficiency. However, only monolingual children with low English language proficiency demonstrated impaired response inhibition, with a similar trend for selective attention, which suggests that these measures may be particularly sensitive to language impairment rather than limited language experience.

Introduction

Executive functions are a set of separate, but correlated, higher-order cognitive control processes which regulate goal-directed behaviour and cognitions (Gioia et al., 2001; Miyake et al., 2000). Examples include inhibiting a pre-potent response or irrelevant information, shifting attention, and updating and monitoring information held in mind (working memory; Miyake et al., 2000). It follows that greater executive function is associated with greater academic attainment (St Clair-Thompson & Gathercole, 2006; Stevenson et al., 2014; Yeniad et al., 2013) and behavioural functioning (Ciairano et al., 2007; Hughes & Ensor, 2011). An increasingly controversial theory posits that bilingualism in children and adults is associated with executive function advantages (Bialystok et al., 2009). However, such advantages among bilingual children have not always been replicated (Duñabeitia et al., 2014; Gathercole et al., 2014) and may be dependent upon having sufficient experience and proficiency using both languages (Bialystok & Barac, 2012). Executive function and language proficiency are positively related in monolingual children (Gooch et al., 2016) and monolingual children with language impairment display impaired executive function (Henry et al., 2012a; Roello, Ferretti, Colonnello, & Levi, 2015). However, little research has merged these lines of enquiry and investigated the relationship between language proficiency and executive function in both monolingual children and children growing up bilingual.

Both languages spoken by bilinguals are activated even when individuals are focusing on just using one language (Martin, Dering, Thomas, & Thierry, 2009; Poarch & van Hell, 2012a). As a result, it has been proposed that bilinguals constantly use executive functions to control the competing languages, which in turn enhances executive function over time (Bialystok et al., 2009). Indeed, bilingual children have shown advantages over monolingual peers in speed or accuracy on a number of measures of executive function, including switching tasks (Barac & Bialystok, 2012; Bialystok, 1999; Bialystok & Martin, 2004; Carlson & Meltzoff, 2008), the Simon task (Bialystok et al., 2005; Martin-Rhee & Bialystok, 2008), flanker tasks (Calvo & Bialystok, 2014; Engel de Abreu et al., 2012), and the Attention Network Test (Barac, Moreno, & Bialystok, 2016; Yang, Yang, & Lust, 2011). These tasks all involve controlling attention in the presence of competing, potentially conflicting, cues (Calvo & Bialystok, 2014). The bilingual advantage on these tasks has been interpreted as an advantage in interference suppression (Martin-Rhee & Bialystok, 2008) or in monitoring (Costa, Hernández, Costa-Faidella, & Sebastián-Gallés, 2009). However, other researchers have failed to replicate a bilingual advantage on these types of tasks, despite investigating bilingual children who had received a roughly even balance of exposure to two languages since an early age (Antón et al., 2014; Duñabeitia et al., 2014; Gathercole et al., 2014; Ladas et al., 2015; Namazi & Thordardottir, 2010).

In early work, Bialystok and colleagues demonstrated that bilingual children display no advantages in response inhibition, which involves overriding a pre-potent response, and as a result concluded that the bilingual advantage is task specific (Bialystok & Martin, 2004; Martin-Rhee & Bialystok, 2008). Martin-Rhee and Bialystok (2008) argued that this is because bilingualism does not involve inhibiting pre-potent responses, but instead involves focusing attention in the presence of competing language systems. However, Martin-Rhee and Bialystok (2008) also noted that bilinguals may show response inhibition advantages if the participant's processing resources are low (e.g., due to their age) or if task demands are high. Consistent with this, response inhibition advantages have been reported among very young (ages 2-4 years) bilingual children (Bialystok, Barac, et al., 2010; Verhagen et al., 2015) or when more complex response inhibition tasks are used (Barac et al., 2016; Bialystok & Viswanathan, 2009). Indeed, Bialystok and Viswanathan (2009) found that bilingual children showed no reaction time advantage, relative to monolingual peers, on blocks which required children to override a dominant response on all trials, but they did show an advantage on blocks containing a mixture of trials which either required or did not require children to override a dominant response. Furthermore, Barac et al. (2016) reported that bilingualism was associated with advantages on a Go/No-Go task, which required children to inhibit a response to one type of stimulus, which occurred intermittingly amongst other stimuli. In contrast to these tasks, earlier studies used paradigms where trials requiring response inhibition were presented in separate blocks to trials requiring no response inhibition (Bialystok & Martin, 2004; Martin-Rhee & Bialystok, 2008). Nevertheless, there is a need for more research to investigate response inhibition in bilingual children, as other studies have demonstrated no bilingual advantages on Go/No-Go tasks (Bonifacci et al., 2011; Nicolay & Poncelet, 2013).

Investigation of potential advantages among bilingual children on other aspects of executive function has received less research focus and has also yielded mixed results. For instance, some studies have reported a bilingual advantage on selective attention tasks, which involve identifying target stimuli among distractors (Engel de Abreu et al., 2014, 2012, Nicolay & Poncelet, 2013, 2015), while other studies have reported no advantage on such tasks (Calvo & Bialystok, 2014; Verhagen et al., 2015). Similarly, some studies have reported that bilingual and monolingual children display comparable verbal working memory (Engel de Abreu, 2011; Namazi & Thordardottir, 2010), while other studies have reported verbal working memory advantages for bilingual children (Kaushanskaya, Gross, & Buac, 2014). Regarding visuospatial working memory, Calvo and Bialystok (2014) and Morales et al. (2013) used a paradigm which involved recalling the locations of previously presented frogs on a matrix and found that bilingual children recalled more locations correctly relative to monolingual peers. Moreover, Morales et al. found that the bilingual advantage was greater in conditions with higher working memory demands, though Calvo and Bialystok did not replicate this finding. In contrast, Engel de Abreu et al. (2012) and Namazi and Thordardottir (2010) found that bilingual and monolingual children displayed comparable performance on a similar matrix task, however they used a less sensitive measure of visuospatial working memory (i.e., they measured the number of trials where all stimuli were correctly recalled, rather than the number of stimuli correctly recalled across all trials).

Variation in language proficiency among bilingual children may account for some of the conflicting findings, as executive function advantages may be dependent upon having sufficient experience and proficiency using both languages. Carlson and Meltzoff (2008), Poarch and van Hell (2012b), and Poarch and Bialystok (2015) found that children who had been learning an additional language in an immersion school for a short time (6 months, 1.3 years, or 2 years, respectively) displayed comparable executive function on conflict tasks relative to monolingual children. In contrast, children who had been bilingual from birth (Carlson & Meltzoff, 2008; Poarch & van Hell, 2012b), or had been exposed to an additional, majority, language both within and outside school (Poarch & Bialystok, 2015), showed enhanced executive function relative to monolingual children. Similarly, greater length of exposure to an additional language (Bialystok & Barac, 2012) and greater balance of proficiency between the two languages (Bialystok & Barac, 2012; Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011) is related to greater executive function on conflict tasks among bilingual children.

Executive function and language proficiency are also positively related in monolingual children (Gooch et al., 2014, 2016). Moreover, monolingual children with language impairment display domain-general executive function deficits relative to typically developing peers, including poorer response inhibition (Henry et al., 2012a; Roello et al., 2015; Spaulding, 2010), verbal working memory (Henry et al., 2012a; Vugs et al., 2014), visuospatial working memory (Henry et al., 2012a; Marton, Campanelli, Scheuer, Yoon, & Eichorn, 2012; Vugs et al., 2014), and selective attention (Gooch et al., 2014). There is some debate as to whether working memory deficits in children with language impairment are limited to the verbal domain (Archibald & Gathercole, 2006, 2007; Lum et al., 2012). However, a meta-analysis suggests that children with language impairment do display visuospatial working memory deficits relative to typically developing peers, though the extent of the reported deficit varies widely and is typically two to three times smaller than reported deficits in verbal working memory (Vugs et al., 2013). The discrepancy between deficits in verbal and visuospatial working memory may be taken as support for the proposal that executive function and language are related as performance on executive function tasks benefits from verbal mediation (Bishop et al., 2014; Vugs et al., 2013). Indeed, verbal working memory tasks require greater verbal mediation than visuospatial working memory tasks. Nevertheless, the causal relationship between executive function and language is as yet unclear; it may also be that executive function facilitates language learning and processing and thus language impairment may in part reflect an underlying executive function deficit (Bishop et al., 2014; Gooch et al., 2016).

Little research has explored executive function in bilingual children with language impairment. If language impairment is associated with executive function deficits, bilingual children with language impairment should show impaired executive function relative to typically developing bilingual peers (Jensen de López & Baker, 2015). To date, the limited studies available have produced conflicting findings. Comparable to monolingual peers, bilingual children with language impairment, or low language proficiency in both languages, have shown deficits in verbal working memory (Engel de Abreu et al., 2014), inhibition (Engel de Abreu et al., 2014; Iluz-Cohen & Armon-Lotem, 2013), and shifting (Iluz-Cohen & Armon-Lotem, 2013), relative to typically developing bilingual peers. However, in contrast to the majority of research on monolingual children, bilingual children with language impairment have shown comparable visuospatial working memory (Engel de Abreu et al., 2014) and selective attention (Aguilar-Mediavilla, Buil-Legaz, Pérez-Castelló, Rigo-Carratalà, & Adrover-Roig, 2014; Engel de Abreu et al., 2014) to bilingual typically developing peers.

The extent to which executive function deficits are characteristic of bilingual children with language impairment is an important question for research. In order to address this question, it is necessary to compare bilingual children with language impairment to monolingual peers with language impairment. If bilingualism is associated with advantages in executive function, bilingual children with language impairment may show greater executive function relative to monolingual children with language impairment (Jensen de López & Baker, 2015). Engel de Abreu et al. (2014) found that while bilingual children with language impairment showed poorer performance on a flanker task relative to typically developing bilingual children, they performed comparably to typically developing monolingual children. As a result, Engel de Abreu et al. suggested that bilingualism may have a protective effect and may attenuate the expression of executive function difficulties associated with language impairment. This pattern of findings was, however, not apparent for selective attention, or verbal and visuospatial working memory. Critically, Engel de Abreu et al. did not assess monolingual children with language impairment and thus were unable to assess whether executive function deficits are indeed attenuated in bilingual children with language impairment relative to monolingual peers.

To our knowledge, only Sandgren and Holmström (2015) have directly compared bilingual and monolingual children with either language impairment or typical language on executive function. They found that bilingual and monolingual children with language impairment showed comparable verbal working memory and shifting. Moreover, typically developing bilingual and monolingual children also showed comparable performance on these measures, though they performed better than both groups with language impairment. Thus, this study found an effect of language proficiency on executive function, but no advantage, or protective effect, of bilingualism.

In sum, bilingual children are thought to display executive function advantages relative to monolingual peers, though many studies have failed to replicate such advantages and research incorporating measures of working memory and selective attention is particularly limited and inconsistent. A separate literature has consistently documented that monolingual children with language impairment display deficits across a range of executive function tasks. However, there is a need to study the interface of these lines of enquiry and explore executive function in both monolingual and bilingual children at different levels of language proficiency. Such comparisons are not only theoretically informative, they are also practically useful as they allow the investigation of whether measures of executive function tasks can distinguish children with language impairment, regardless of bilingual status (Jensen de López & Baker, 2015). Indeed, identifying language impairment in bilingual children, particularly in children from diverse first language backgrounds, is a key challenge faced by practitioners (De Lamo White & Jin, 2011; Hasson et al., 2013; Kohnert, 2010; Paradis et al., 2013).

The current study explored the relationship between English language proficiency and executive function in children learning English as an additional language (EAL) and English-speaking monolingual peers who were in their second year of school in the UK (Year 1; ages 5-6 years). Within each group, children were regarded as displaying either typical or low levels of English language proficiency using criteria for language impairment for monolingual English-speaking children. Note, however, that we do not imply that the children with EAL who meet these criteria necessarily have an underlying language impairment; their scores on the English language battery fall in the language impairment range for monolingual children, which may reflect limited exposure to English, language impairment, or both. All children completed measures of response inhibition, selective attention, and verbal and visuospatial working memory. Children with low language proficiency (both children with EAL and monolingual children), were predicted to demonstrate poorer performance on all tasks relative to peers with typical language proficiency. A strong version of the bilingual advantage hypothesis would predict that children with EAL will show superior performance on all tasks relative to monolingual peers with comparable language proficiency. However, if bilingual advantages are dependent upon the child having sufficient proficiency in their second language, an interaction between EAL status and language proficiency may be expected, whereby only children with EAL and typical language proficiency will show advantages in executive function relative to monolingual peers. Alternatively, on the basis of the growing literature that has failed to replicate bilingual executive function advantages, and the literature highlighting that executive function deficits are associated with language impairment, EAL executive function advantages may only be apparent among children displaying low English language proficiency. This is because many children with EAL who display low English language proficiency may simply have experienced limited exposure to English. Such an interaction would be consistent with the recent proposal that measures of executive function may help to discriminate language impairment from limited language exposure in bilingual children (Jensen de López & Baker, 2015).

Method

Study Design

All children were participants in the second phase of the Surrey Communication and Language in Education Study (SCALES). All children who started reception year in a state-maintained school in Surrey, England, in September 2011 were eligible to take part in the first phase of SCALES (*N* = 12,398). During this phase, teachers completed an online questionnaire for 7,267 reception year children (ages 4-5 years), who attended a total of 161 state maintained schools across Surrey, England (59% of all eligible children; 61% of all eligible schools). Of this sample, 782 (11%) children were regarded as having EAL. For these children, teachers reported that the main language spoken in the child's home was a language other than English.

Within the online questionnaire, teachers completed the Children's Communication Checklist-Short (CCC-S), by rating the frequency with which each child displayed six communicative errors and seven communicative strengths. These 13 items were from the Children's Communication Checklist-2 (CCC-2; Bishop, 2003a) and best discriminated children with language impairment from typically developing peers in a validation study of the CCC-2 (Norbury et al., 2004). Children scoring 1 *SD* or more above the monolingual population mean (reflecting greater language difficulties) for their age group (autumn, spring, or summer born) and sex were regarded as high-risk for language impairment. The CCC-S was not completed in full for children with *no phrase speech* (NPS; i.e., children who did not produce utterances of at least two to three words, according to teacher report; 62 monolingual children; 27 children with EAL) and these children received the poorest CCC-S score. All remaining children were regarded as low-risk for language impairment.

In the second phase of SCALES, subsamples of monolingual children and children with EAL were selected for an in-depth assessment in Year 1 (ages 5-6 years) using stratified random sampling (see Figure 3.1). All children attending special schools were excluded from selection. Within the monolingual sample, high-risk children were oversampled (40.5% of screened high-risk boys selected, 37.5% of high-risk girls) relative to the low-risk children (4.3% of low-risk boys, 4.2% of low-risk girls). Within the EAL sample, a random sample of 30 high-risk (15 boys, 15 girls) and 30 low-risk (15 boys, 15 girls) children were invited to participate. Additionally, all NPS children were invited to participate (48 monolingual children, 22 children with EAL). Therefore, within the EAL sample, children with particularly low levels of English language proficiency in reception year were oversampled. As shown in Figure 3.1, 529 monolingual children and 61 children with EAL, from a total of 151 state-maintained schools, completed an in-depth assessment in Year 1.

An opt-out consent procedure was adopted for the first phase of SCALES, whereby parents received an information sheet about the study and had the opportunity to opt out of allowing anonymised teacher questionnaire data to be submitted to the study. Parents provided informed, written consent for the second, in-depth assessment, phase of SCALES. The study protocol was developed in collaboration with Surrey County Council education officials and was granted ethical approval by the Ethics Committee at Royal Holloway, University of London.

Participants

This study reports data for 53 children with EAL and 53 monolingual children who were individually matched in Year 1 on: sex, age at assessment (within 2 months), date of birth (within 2 months), and language proficiency status (typical or low English language proficiency). Language proficiency status was determined using language composite scores from the English language battery (detailed below). This matching yielded four language groups. Specifically, 24 children with EAL and

24 monolingual children had low English language proficiency in Year 1 (EAL-LL; Mon-LL) and 29 children with EAL and 29 monolingual children had typical English language proficiency in Year 1 (EAL-TL; Mon-TL). While grouping was based on English language proficiency in Year 1, Figure 3.1 provides details of group membership by risk status in reception year. Of the original sample of 61 children with EAL, who were assessed in Year 1, children were excluded due to having an intellectual disability (i.e., those scoring 2 *SD* or more below the monolingual population mean on a nonverbal ability composite, outlined below), a reported medical diagnosis, or for having missing data which made their language proficiency status unclassifiable (eight children with EAL excluded; see Figure 3.1).

All children started school at the compulsory age in the UK and thus all had received the same amount of exposure to English in a school context. Within this sample of children with EAL, 24 different first languages were represented. The most frequently reported first languages were: Polish (7 children), Bengali (7 children), Urdu (6 children) and Portuguese (4 children). All other languages had three speakers or less.

The children with EAL were from 40 state-maintained schools across Surrey and the monolingual children were from 43 state-maintained schools across Surrey. All children were aged between 5 years 3 months (63 months) and 6 years 8 months (80 months) at the time of assessment. The four language groups did not significantly differ in age, $F(3, 102) = 0.25$, $p = .858$, $\eta_p^2 = .04$, and there was no significant association between sex and language group, $\chi^2(3) = 1.07$, $p = .785$, Cramer's $V = .10$ (see Table 3.1 for descriptive statistics). Income Deprivation Affecting Children Index (IDACI; McLennan et al., 2011) rank scores were retrieved using the children's home postcodes to provide a measure of neighbourhood deprivation. IDACI rank scores can range from 1 to 32,482, with lower scores assigned to areas in England with proportionally more children living in income deprived families (defined by receiving certain means tested benefits). IDACI rank scores within this sample ranged from 4686 to 32416, which indicates that the children came from a wide range of socioeconomic status backgrounds. The four language groups did not significantly differ in IDACI rank scores, $F(3, 102) = 1.96$, $p = .124$, $\eta_p^2 = .14$ (see Table 3.1 for group means).

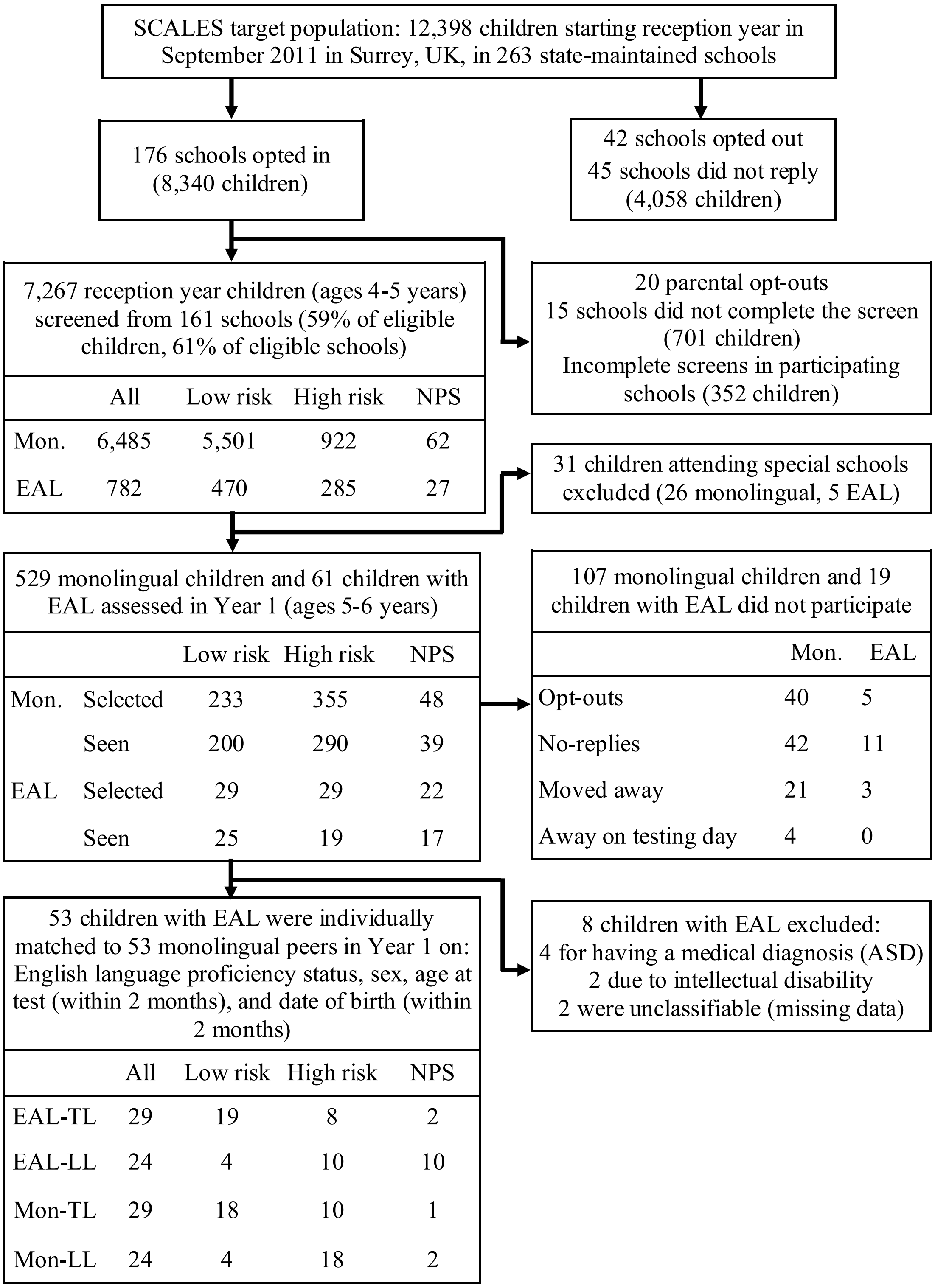

Figure 3.1. Recruitment flow chart. NPS = no phrase speech; ASD = autism spectrum disorder; Mon. = monolingual; EAL = English as an additional language; TL = typical language; LL = low language.

Table 3.1

Mean (SD) Age and IDACI Rank Scores, and the Number (%) of Boys, Within Each Language Group

Variable	Mon-TL (n = 29)	Mon-LL (n = 24)	EAL-TL (n = 29)	EAL-LL (n = 24)
Boys	14 (48%)	14 (58%)	14 (48%)	14 (58%)
Age in months	71.21 (4.16)	71.92 (3.73)	71.21 (4.08)	71.88 (4.17)
IDACI rank	21726.66 (6467.82)	18955.17 (7602.35)	18848.14 (8311.24)	16618.88 (8412.14)

Measures and Procedures

Each child completed an individual two hour assessment session with a trained member of the research team. Assessment sessions took place in a quiet area in each child's school and were broken up with breaks. All tasks were administered in English. The measures relevant to this study included assessments of nonverbal ability, language, and executive function.

Nonverbal ability. Children completed the Block Design and Matrix Reasoning subtests of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III; Wechsler, 2003b) according to instructions outlined in the test manual. Each child's raw scores on these tasks were converted into an age standardised nonverbal ability composite z-score, based on norms derived from the monolingual population sample.

Language. Children completed the Receptive and Expressive One-Word Picture Vocabulary Tests, Fourth Edition (ROWPVT-4, EOWPVT-4; Martin & Brownell, 2011a, 2011b), and a short form of the Test for Reception of Grammar (TROG-2; Bishop, 2003b) to measure receptive and expressive vocabulary and receptive grammar, respectfully. Children also completed the School Age Sentence Imitation Task - English 32 (SASIT-E32; Marinis, Chiat, Armon-Lotem, Piper, & Roy, 2011) to measure expressive grammar, and measures of narrative recall (expressive) and comprehension (receptive), which were based on the Narrative subtest of the Assessment of Comprehension and Expression (ACE 6-11; Adams, Cooke, Crutchley, Hesketh, & Reeves, 2001).

Raw scores on these six tasks were converted into age standardised z-scores based on norms derived from the monolingual population sample. Following Tomblin et al. (1996), five composite scores were calculated: vocabulary, grammar, narrative, and expressive and receptive totals of the relevant vocabulary, grammar and narrative measures. Low language proficiency was defined as scores falling -1.5 *SD* or more below the monolingual population mean on two out of the five language composites, in the absence of existing medical diagnoses and intellectual disability (defined as nonverbal ability composite scores of -2 *SD* or more below the monolingual population mean). These criteria have been used to identify language impairment in monolingual English-speaking children (Norbury et al., 2016). Scores on all six language measures were also used to calculate a total language composite *z*-score which was used in the current analyses.

Receptive One-Word Picture Vocabulary Test, Fourth Edition (ROWPVT-4; Martin & Brownell, 2011b). The examiner read individual words and children were asked to select a picture, from an array of four, which depicted each word. Start points and discontinuation rules outlined in the instruction manual were adhered to.

Expressive One-Word Picture Vocabulary Test, Fourth Edition (EOWPVT-4; Martin & Brownell, 2011a). Children were presented with a series of individual pictures and were asked to name the object, action or concept which was depicted in each picture. Start points and discontinuation rules outlined in the instruction manual were adhered to.

Test for Reception of Grammar - Short Form (TROG-S). This is a short version of the Test for Reception of Grammar-Version 2 (TROG-2; Bishop, 2003b). Children heard up to 40 sentences and were asked to select a picture, from an array of four, which depicted each sentence. The task was discontinued if a child answered incorrectly on six consecutive items. One point was allocated for each correct response (maximum = 40).

School Age Sentence Imitation Task - English 32 (SASIT-E32; Marinis et al., 2011). Children listened to 32 pre-recorded sentences which were played over headphones. Following each sentence, each child repeated the sentence out loud. All repetitions were audio-recorded and 1 point was allocated for every sentence that was repeated correctly (word for word; maximum = 32).

Narrative recall (Adams et al., 2001). Children listened to a pre-recorded story about a monkey in a forest, which was played over headphones and accompanied by a series of eight pictures. After listening to the story, children were shown the eight pictures again and were asked to tell the story in their own words. Each child's narrative was audio-recorded and 1 point was awarded for each of 35 key elements of the story which were correctly recalled.

Narrative comprehension. Following the narrative recall task, children were asked to answer 12 comprehension questions about the story (six literal and six inference questions). Children received 0 points for an incorrect response, 1 point for a partially correct response, and 2 points for a correct response (maximum = 24).

Executive function. Children completed a Visual Search task (Apples Task; Breckenridge, 2008) to assess selective attention, a computerised Go/No-Go task (Gooch et al., 2016) to assess response inhibition, and two computerised self-ordered pointing tasks to assess verbal and visuospatial working memory (Cragg & Nation, 2007).

Visual Search (Apples Task; Breckenridge, 2008). Children were presented with an array of targets (30 red apples) and distracters (81 red strawberries and 81 white apples), on a laminated A4 sheet, and were given one minute to identify as many targets as possible by marking them with a wipe-board pen. The number of targets correctly marked (hits; maximum = 30) and the number of distracters incorrectly marked (commission errors) were recorded. A visual search efficiency score was calculated ((hits - commission errors)/60 seconds) for each child. A high visual search efficiency score indicates better selective attention (maximum = 0.5).

Go/No-Go (Gooch et al., 2016). Children initially completed a block of 30 Go trials, in which they were asked to press a response key as quickly as they could when the Go stimulus (a bug) appeared on the screen. This was followed by a block containing 60 (75%) Go trials and 20 (25%) No-Go trials, which were presented in a random order. Children were asked to press the response key as quickly as they could when the Go stimulus (a bug) appeared, but not respond when the NoGo stimulus (a ladybird) appeared. Thus, in the No-Go trials, children had to inhibit the automatic response, which had been established in the first block of Go trials. Each child was given three practice trials with feedback prior to the first block and eight practice trials with feedback prior to the second block. In both blocks, the stimuli were presented in the centre of the screen and were preceded by a fixation cross, also presented centrally, and a varied lag of 300ms, 600ms, or 900ms. Responses made within 2000ms of stimuli presentation were recorded. Responses made within 100ms were considered to be anticipatory errors (Luce, 1986) and were subsequently excluded. The number of omission errors (missing a Go stimulus; maximum = 60) and commission errors (responding to a No-Go stimulus; maximum = 20), as well as mean reaction time to accurate Go trials, were recorded for each child.

Self-Ordered Pointing Task (SOPT). Children completed two adapted versions of Cragg and Nation's (2007) computerised *object SOPT* and *abstract SOPT*. Both tasks had the same structure and required children to generate responses while simultaneously monitoring and updating a sequence held in mind. The object SOPT used easy-to-verbalise black and white line drawings of everyday objects as the stimuli, while the abstract SOPT used hard-to-verbalise black and white abstract patterns (see Figure 3.2). Cragg and Nation found that children performed better in the object SOPT, relative to the abstract SOPT, and suggested that this reflects the use of a verbal strategy in the object SOPT. The object SOPT can therefore be considered a measure of verbal working memory, while the abstract SOPT can be considered a measure of visuospatial working memory. Each task was made up of a block of three practice trials, followed by three blocks of three trials. Within each trial, pictures were presented in an array on a computer screen and children were instructed to try to click on each picture once, using the mouse, and avoid selecting the same picture twice. The same pictures were presented in a different array after each response was made and the trial was over when a response had been made for the number of pictures presented. The practice block contained three pictures, while block one had four pictures, block two had five pictures, and block three had six pictures. Unique sets of pictures were used within each block and all pictures were presented in equally sized boxes. Text appeared on the screen at the start of each block to label the block as Level 1, 2 or 3. Additionally, text appeared at the start of each trial, labelling each as Game 1, 2 or 3. There were no time limits for selecting each picture and reaction time was not recorded. The number of errors made within each trial was recorded and the total number of errors made across blocks one, two, and three on each task was calculated (maximum = 36).

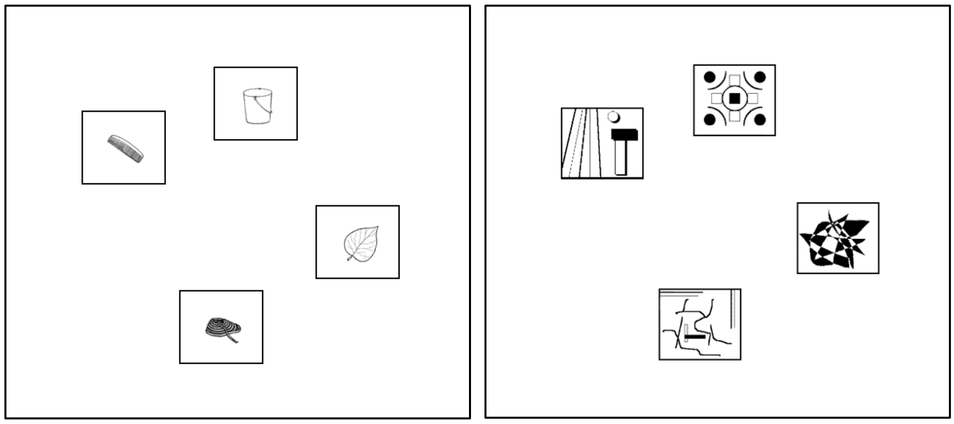

Figure 3.2. Examples of the stimuli used in the object SOPT and abstract SOPT.

Missing and Excluded Data

Total language composite scores were missing for three children from the EAL-LL group, who did not complete the full language battery. Visual Search data were excluded for one child (Mon-LL) for failure to understand task instructions, as determined by behavioural notes and outlying visual search efficiency data (outliers were defined as scores 3 *SD* or more from the mean for each language group: Mon-TL, Mon-LL, EAL-TL, & EAL-LL). Go/No-Go data were missing for one child (EAL-LL) who did not complete the task and data were excluded for five children for failure to understand task instructions, as determined by behavioural notes and excessive errors of omission (20 or more out of 60; 1 Mon-TL, 2 EAL-LL) or commission (18 or more out of 20; 1 Mon-LL, 1 EAL-LL). Object and abstract SOPT data were missing for one child (Mon-LL) and object SOPT data were missing for two further children (1 EAL-LL, 1 EAL-TL). One outlier was identified within the abstract SOPT total error data for the EAL-TL group and was subsequently excluded from the SOPT analysis. No outliers were identified in any language group within the object SOPT total errors data or in the Go/No-Go omission error data, commission error data, or reaction time data for Go trials.

Data Analysis

A series of two-way ANOVAs, with EAL status (monolingual or EAL) and language proficiency (typical or low language proficiency) as independent factors, were run to explore performance on the following measures: language composite *z*-scores, nonverbal ability composite *z*-scores, visual search efficiency scores, Go/No-Go omission error scores, commission error scores, and reaction times to Go trials.

In order to directly compare total errors scores on the object and abstract SOPTs, a three-way mixed ANOVA, with EAL status and language proficiency as independent factors and SOPT task type as a repeated factor, was performed.

After making the exclusions previously outlined, data were normally distributed within each language group for all measures, bar the Go/No-Go omission error scores for the Mon-TL and EAL-TL groups, the language composite *z*-scores for the EAL-TL group, and the nonverbal composite *z*-scores for the EAL-LL group. Levene's test revealed that object SOPT total error data did not have homogeneity of variance between the four language groups, $F(3, 98) = 2.76$, $p = .046$, therefore 'equal variances not assumed' statistics are reported for the t-test comparing children with low and typical language proficiency on the object SOPT, when breaking down the SOPT task by language proficiency interaction. Language composite data also violated assumptions of homogeneity of variance between the four language groups, $F(3, 99) = 6.30$, $p < .001$, however data from all other measures had homogeneity of variance.

Results

Language and Nonverbal Ability

There was a significant main effect of language proficiency on language composite *z*-scores, $F(1, 99) = 155.74$, $p < .001$, $\eta_p^2 = .61$, and nonverbal ability composite *z*-scores, $F(1, 102) = 9.43$, $p = .003$, $\eta_p^2 = .08$, whereby children with typical language proficiency had higher scores relative to children with low language proficiency (see Table 3.2). In contrast, there was no significant main effect of EAL status on either language composite *z*-scores, $F(1, 99) = 1.49$, $p = .226$, $\eta_p^2 = .01$, or nonverbal ability composite *z*-scores, $F(1, 102) = 0.09$, $p = .763$, $\eta_p^2 < .01$. Moreover, there was no significant EAL status by language proficiency interaction for language composite *z*-scores, $F(1, 99) = 0.02$, $p = .884$, $\eta_p^2 < .01$, or nonverbal ability composite *z*-scores, $F(1, 102) < 0.01$, $p = .965$, $\eta_p^2 < .01$. Thus, within language proficiency groups, children with EAL did not differ from monolingual peers on standard measures of English language proficiency or nonverbal ability.

Table 3.2

Mean (SD) Scores on Measures of Language, Nonverbal Ability, Selective Attention, Response Inhibition, and Verbal and Visuospatial Working Memory for Each Language Group

Variable	Mon-TL	Mon-LL	EAL-TL	EAL-LL
Language comp. *z*-score	-0.07 (0.91)	-1.83 (0.51)	-0.23 (0.80)	-2.02 (0.41)
Nonverbal ability *z*-score	-0.11 (1.17)	-0.70 (0.80)	-0.06 (1.02)	-0.64 (0.84)
Visual search efficiency	0.23 (0.06)	0.17 (0.08)	0.22 (0.06)	0.21 (0.06)
Go/No-Go com. errors	5.57 (3.72)	8.57 (4.40)	6.93 (3.13)	5.55 (2.70)
Go/No-Go omission errors	5.79 (4.65)	5.87 (3.75)	5.34 (4.23)	5.70 (4.08)
Go/No-Go reaction time (ms)	606.14 (58.30)	599.60 (96.05)	563.27 (73.05)	573.37 (76.04)
Object SOPT errors	6.41 (2.23)	8.30 (3.01)	6.15 (2.44)	8.30 (3.87)
Abstract SOPT errors	8.76 (2.34)	9.70 (3.32)	8.59 (2.06)	8.83 (2.39)

Note. Language comp. *z*-score = Language composite *z*-score; Go/No-Go com. errors = Go/No-Go commission errors.

Visual Search

There was no significant main effect of EAL status on visual search efficiency scores, $F(1, 101) = 2.38$, $p = .126$, $\eta_p^2 = .02$, thus monolingual children and children with EAL showed comparable selective attention (see Table 3.2). However, there was a significant main effect of language proficiency, $F(1, 101) = 6.96$, $p = .010$, $\eta_p^2 = .06$, whereby children with low language proficiency had lower visual search efficiency scores, and thus poorer selective attention, than children with typical language proficiency. While the EAL status by language proficiency interaction was not significant, $F(1, 101) = 3.14$, $p = .079$, $\eta_p^2 = .03$, there was a tendency for EAL groups to perform more similarly to one another, relative to monolingual groups, which indicates that the main effect of language proficiency is driven mainly by the monolingual children (see Table 3.2 and Figure 3.3).

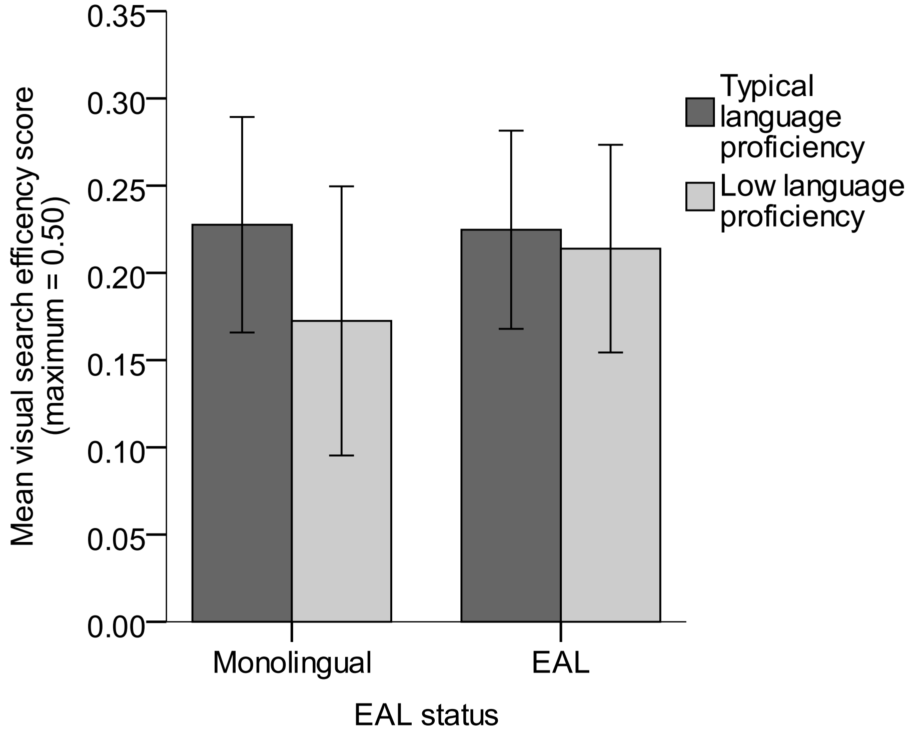

Figure 3.3. Mean visual search efficiency scores by EAL status and language proficiency status. Error bars represent 1 *SD* above and below the mean.

Go/No-Go

There was no significant main effect of EAL status, $F(1, 96) = 1.33$, $p = .252$, $\eta_p^2 = .01$, or language proficiency, $F(1, 96) = 1.26$, $p = .265$, $\eta_p^2 = .01$, on commission error scores. There was, however, a significant EAL status by language proficiency interaction, $F(1, 96) = 9.27$, $p = .003$, $\eta_p^2 = .09$. Bonferroni corrected independent t-tests, using an adjusted alpha level of .013, revealed that while the Mon-LL group made significantly more commission errors than the Mon-TL group, $t(49) = 2.64$, $p = .011$, $d = .74$, there was no significant difference in the number of commission errors made between the EAL-TL and EAL-LL groups, $t(47) = 1.60$, $p = .116$, $d = .47$, demonstrating an effect of language proficiency only among monolingual children (see Table 3.2 and Figure 3.4). Moreover, while the Mon-TL and EAL-TL groups did not significant differ in commission error scores, $t(47) = 1.50$, $p = .140$, $d = .40$, the Mon-LL group made significantly more commission errors than the EAL-LL group, $t(49) = 2.66$, $p = .011$, $d = .81$ (see Table 3.2 and Figure 3.4), demonstrating an EAL advantage only among children with low language proficiency.

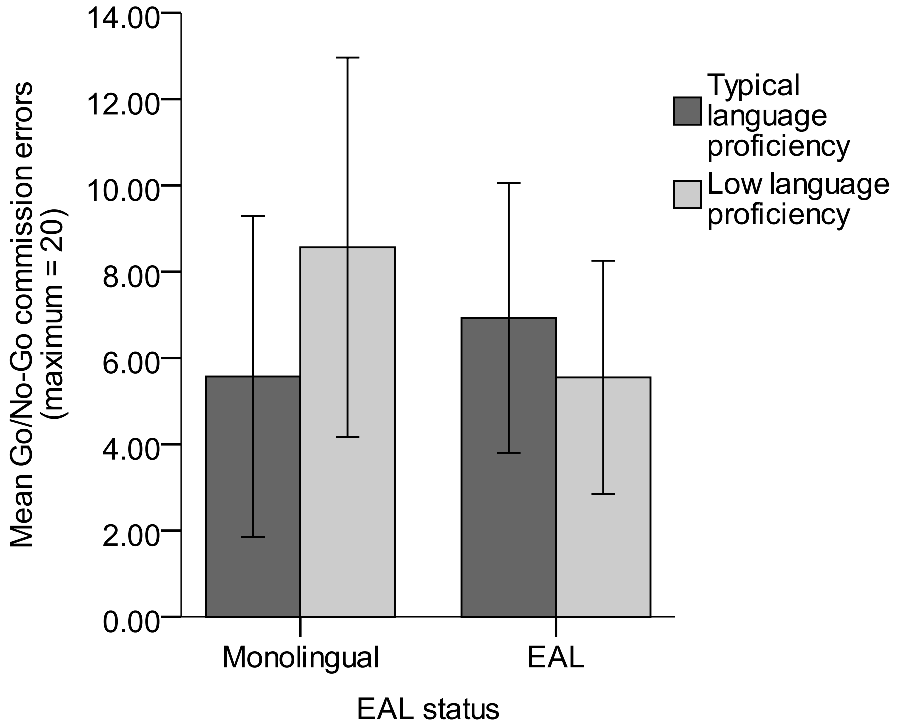

Figure 3.4. Mean Go/No-Go commission errors by EAL status and language proficiency status. Error bars represent 1 *SD* above and below the mean.

In contrast to commission errors, all language groups made a comparable number of omission errors (see Table 3.2). Indeed, there was no significant main effect of EAL status, $F(1, 96) = 0.13$, $p = .721$, $\eta_p^2 < .01$, or language proficiency, $F(1, 96) = 0.07$, $p = .798$, $\eta_p^2 < .01$, on omission errors scores, nor was there a significant EAL status by language proficiency interaction, $F(1, 96) = 0.03$, $p = .874$, $\eta_p^2 < .01$.

With regard to reaction times for Go trials, there was no significant main effect of language proficiency, $F(1, 96) = 0.01$, $p = .908$, $\eta_p^2 < .01$. However, there was a significant main effect of EAL status, $F(1, 96) = 5.06$, $p = .027$, $\eta_p^2 = .05$, and no significant EAL status by language proficiency interaction, $F(1, 96) = 0.29$, $p = .590$, $\eta_p^2 < .01$, as within both language proficiency groups, children with EAL responded faster than monolingual peers (see Table 3.2).

SOPT

Figure 3.5 shows performance on the two SOPT tasks and illustrates that children with EAL, within both language proficiency groups, demonstrated comparable levels of verbal and visuospatial working memory to monolingual peers (see Table 3.2 for descriptive statistics). There was no significant main effect of EAL status, $F(1, 98) = 0.54$, $p = .463$, $\eta_p^2 = .01$, nor were there any significant interactions involving EAL status (all *F*s < 1). As depicted in Figure 3.5, there was a significant main effect of task, $F(1, 98) = 28.28$, $p < .001$, $\eta_p^2 = .22$, whereby children made more errors on the abstract SOPT than on the object SOPT, and a significant main effect of language proficiency, $F(1, 98) = 8.74$, $p = .004$, $\eta_p^2 = .08$, as children with low language proficiency made more errors than children with typical language proficiency. However, these effects were qualified by a significant interaction between language proficiency and task, $F(1, 98) = 5.21$, $p = .025$, $\eta_p^2 = .05$. Bonferroni corrected independent measures t-tests, using an adjusted alpha level of .025, indicated that while children with low language proficiency made more errors than children with typical language proficiency on the object SOPT, $t(76.38) = 3.41$, $p = .001$, $d = .69$, both groups made a comparable number of errors on the abstract SOPT, $t(100) = 1.16$, $p = .251$, $d = .23$. Thus, there was an effect of language proficiency, regardless of EAL status, on verbal, but not on visuospatial, working memory.

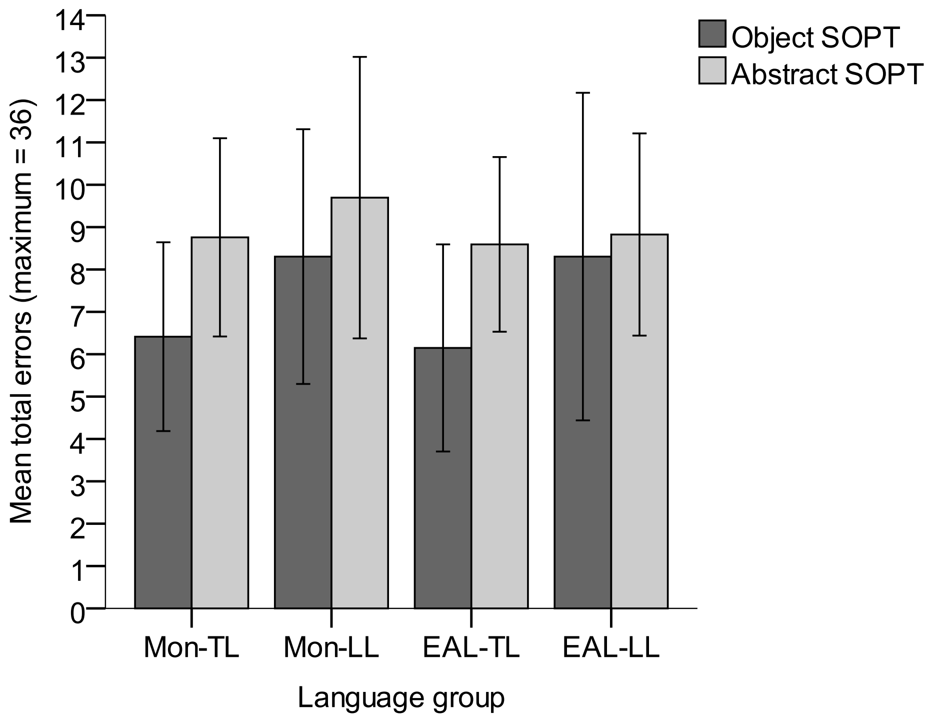

Figure 3.5. Mean total errors made by each language group on the object SOPT and abstract SOPT. Error bars represent 1 *SD* above and below the mean.

Discussion

This study addressed an under-researched issue by exploring the influence of language proficiency and exposure to an additional language on executive function. Language proficiency was a key driver in performance on measures of executive function. Children with low English language proficiency, regardless of EAL status, exhibited poorer verbal working memory relative to peers with typical language proficiency. Impaired selective attention was also associated with low language proficiency, though this effect seemed to be mainly driven by the monolingual children. Similarly, only monolingual children with low language proficiency demonstrated impaired response inhibition. Children with EAL, regardless of English language proficiency, demonstrated no advantages in selective attention, or verbal and visuospatial working memory, relative to monolingual peers. However, on the response inhibition task, children with EAL demonstrated a reaction time advantage relative to monolingual peers at both levels of language proficiency.

The EAL reaction time advantage on the response inhibition task is consistent with the theory that bilingualism is associated with executive function advantages (Bialystok et al., 2009). However, many previous studies have reported that bilingual children do not display response inhibition advantages (Bialystok & Martin, 2004; Bonifacci et al., 2011; Martin-Rhee & Bialystok, 2008; Nicolay & Poncelet, 2013). Inconsistencies between findings from this study and these previous studies may reflect task differences. For example, both Bialystok and Martin (2004) and Martin-Rhee and Bialystok (2008) used a paradigm in which trials requiring response inhibition were presented in separate blocks to trials requiring no response inhibition. In contrast, in the current study, as well as in studies by Bialystok and Viswanathan (2009) and Barac et al. (2016), who also demonstrated a bilingual response inhibition advantage, trials requiring response inhibition were intermixed with others requiring no response inhibition. It may be that a bilingual advantage occurs on these tasks as children are required to continuously monitor each trial to determine whether or not response inhibition is required. Indeed, bilingual advantages on the Simon task, Attention Network Test, and flanker tasks, have been interpreted as a bilingual advantage in monitoring trials, which contain potentially conflicting cues, for the type of processing required (Costa et al., 2009).

Differences between the response inhibition task used in this study and those used in previous research cannot, however, explain all discrepant findings. Using a Go/No-Go response inhibition task, which included an intermixed presentation of trials which either required or did not require response inhibition, both Nicolay and Poncelet (2013) and Bonifacci et al. (2011) failed to find a significant reaction time advantage among bilingual children. However, age may be an influential factor; while the children in the current study were aged 5-6 years, children participating in the studies by Nicolay and Poncelet (2013) and Bonifacci et al. (2011) were older, with mean ages of 8 and 9 years, respectively. Martin-Rhee and Bialystok (2008) proposed that bilinguals may show response inhibition advantages if the participant's processing resources are low or if the task demands are high. Consistent with this, Bialystok et al. (2010) and Verhagen et al. (2015) found a response inhibition advantage in very young (ages 2-4 years) bilingual children who were likely to have low processing resources due to their age. A developmental perspective, using longitudinal data from bilingual and monolingual children of varying ages is an important next step in determining whether, and crucially when, bilingual children display advantages on response inhibition tasks.

In the current study, there were no EAL advantages on measures of selective attention and verbal or visuospatial working memory, which is inconsistent with the theory that a bilingual experience leads to executive function advantages. These findings are, however, consistent with a growing literature that has failed to replicate advantages among bilingual children in selective attention (Calvo & Bialystok, 2014; Verhagen et al., 2015), verbal working memory (Engel de Abreu, 2011; Namazi & Thordardottir, 2010), and visuospatial working memory (Engel de Abreu et al., 2014, 2012; Namazi & Thordardottir, 2010). Importantly, as we considered levels of proficiency in English, our findings suggest that good proficiency in the additional language is not necessarily enough to yield bilingual advantages on these tasks.

A limitation of the current study is the lack of information regarding each child's proficiency and experience using their first language, as well as their history of English language exposure. Previous research indicates that executive function advantages in bilingual children are dependent upon having sufficient proficiency and experience using both languages (Carlson & Meltzoff, 2008; Poarch & Bialystok, 2015; Poarch & van Hell, 2012b). Moreover, language use at home (Gathercole et al., 2010; Verhagen et al., 2015), length of language exposure

(Bialystok & Barac, 2012) and balance of proficiency between the two languages (Bialystok & Barac, 2012; Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011) have been linked to executive function in bilingual children. As children in the current study were recruited at school entry and assessed during the second year of primary school, all children had received at least a full academic year of exposure to English. However, exposure to English prior to school entry is likely to have been variable among the children with EAL, with some children experiencing little to no prior exposure to English (NALDIC, 2012b), while others may have used English every day since infancy (Strand et al., 2015). Additionally, each child's experience and proficiency using their first language is likely to vary widely. Given the school-based nature of our study, and the number of languages represented in the sample, we were unable to obtain information from families regarding first language proficiency and language use within the home. It is important for future research to quantify these variables in order to investigate their role in determining whether children with EAL display advantages in executive function relative to monolingual peers, particularly in tasks assessing selective attention and working memory.

Children within the Mon-LL group in the current study met criteria for language impairment. Findings from this study are consistent with previous reports of executive function deficits among monolingual children with language impairment in selective attention (Gooch et al., 2014), response inhibition (Henry et al., 2012a; Roello et al., 2015; Spaulding, 2010), and verbal working memory (Henry et al., 2012a; Vugs et al., 2014). While some studies have reported visuospatial working memory deficits in monolingual children with language impairment (Henry et al., 2012a; Marton et al., 2012; Vugs et al., 2013, 2014), the current findings are more consistent with studies reporting that working memory deficits in these children are limited to the verbal domain (Archibald & Gathercole, 2006, 2007; Lum et al., 2012). A strength of this study is the use of comparable verbal and visuospatial working memory tasks which differed only in the extent to which the stimuli were easy (object SOPT) or hard (abstract SOPT) to verbalise. Since the Mon-LL group were only impaired relative to the Mon-TL group on the object SOPT, and greater performance on this task is indicative of using verbal mediation (Cragg & Nation, 2007), these findings suggest that children with language impairment are less likely to use effective verbal strategies to support working memory, relative to typical peers.

Few studies have explored language impairment and executive function in bilingual children and, to our knowledge, only one study has utilised the four group design, assessing bilingual and monolingual children who displayed either typical or impaired language (Sandgren & Holmström, 2015). Comparable to this study, we found an effect of language proficiency on verbal working memory, yet no effect of EAL status. It is somewhat surprising that children within the EAL-LL and Mon-LL groups showed comparable verbal working memory on the object SOPT, as the design of this task was such that children with EAL could have utilized either English or their first language to complete the task. If many children from the EAL-LL group actually had good proficiency in their first language, and their English language difficulties simply reflected limited English language exposure, we would expect superior performance by the EAL-LL group relative to the Mon-LL group on this task. However, if impaired verbal working memory is a marker for language impairment, the comparable performance of the EAL-LL and Mon-LL groups on the object SOPT in the current study suggests that these groups may have comparable underlying language difficulties. One caveat may be that children within the EAL-LL group in the current study may not have recruited their first language to help them complete the object SOPT, perhaps because the assessment session was administered in English and in an English-speaking school environment, and thus their poor performance may simply reflect their low English language proficiency. Nevertheless, given the design of the object SOPT, future research should further explore whether this task can help distinguish language impairment from limited language exposure in bilingual children.

Compared to Sandgren and Holmström (2015), who only explored verbal working memory and shifting, we explored performance on a larger range of executitive function tasks. We found no EAL advantages, or effect of language proficiency, in visuospatial working memory. Similarly, Engel de Abreu et al. (2014) compared bilingual children with language impairment against typically developing bilingual and monolingual peers and found that all groups showed comparable visuospatial working memory. Engel de Abreu et al. did, however, find a potential protective effect of bilingualism among children with language impairment on performance on a flanker task. In the current study, the EAL-LL group outperformed Mon-LL peers, and did not differ from EAL-TL peers, on a measure of response inhibition accuracy. Additionally, there was a similar trend for selective attention. This hints at bilingualism as a protective factor against response inhibition and selective attention difficulties associated with language impairment. However, as the EAL-TL group displayed no advantages on these measures relative to Mon-TL peers, these findings more likely reflect the different or multifaceted origins of the language difficulties in the two low language proficiency groups.

For many children with EAL, low English language proficiency may just reflect a lack of English language exposure and not necessarily an underlying language impairment. Since an underlying language impairment should manifest in both languages (Paradis et al., 2010), ideally children would be assessed in both languages to determine language impairment. However, given the number of different languages represented in this sample, this was not feasible. Identifying language impairment in bilingual children, particularly in children from diverse first language backgrounds, is a key challenge faced by practitioners generally (De Lamo White & Jin, 2011; Hasson et al., 2013; Kohnert, 2010; Paradis et al., 2013). This challenge reflects the bias associated with measures of language proficiency normed on monolingual children (Peña, Gillam, Bedore, & Bohman, 2011), as well as a lack of tests which have been translated into different languages and normed on bilingual children (Bedore & Peña, 2008). This is especially pertinent in the UK given that over 300 different first languages are spoken by school pupils (NALDIC, 2012a). The difference between EAL and monolingual peers with low English language proficiency on measures of response inhibition accuracy and selective attention, however, suggests that these measures may help identify children with an underlying language impairment in EAL populations where first language tests are not readily available. This is a priority area for future research.

In conclusion, this study explored the effects of language proficiency and learning EAL on executive function in children in their second year of school. While children with EAL, regardless of language proficiency, displayed a reaction time advantage on a response inhibition task relative to monolingual peers, no EAL advantages emerged in selective attention and verbal or visuospatial working memory. Language proficiency was a key determinant of executive function in monolingual children, as those with low language proficiency tended to have poorer executive function relative to peers with typical language proficiency. A measure of response inhibition accuracy distinguished children with EAL from monolingual peers who displayed comparably low English language proficiency, with a similar trend for selective attention, indicating that these measures may be sensitive to language impairment, rather than low language proficiency due to limited language experience. Future research should assess children with EAL and language impairment to explore the potential diagnostic use of these measures. Longitudinal designs are also necessary to determine whether these measures can distinguish children with EAL who will overcome their initial English language difficulties from those who experience persistent difficulties.

Chapter 4: The Persistence and Functional Impact of English Language Difficulties Experienced by Children Learning English as an Additional Language and Monolingual Peers

Abstract

This study explored whether a monolingual-normed English language battery could identify children with English as an additional language (EAL) who have persistent English language learning difficulties that impact on functional academic attainment. Children with EAL (n = 43) and monolingual English-speaking children (n = 46) completed a comprehensive monolingual-normed English language battery in Year 1 (ages 5-6 years) and Year 3 (ages 7-8 years). Children with EAL and monolingual peers, who either met monolingual criteria for language impairment or typical development on the language battery in Year 1, were compared on language growth between Year 1 and Year 3 and on attainment in national curriculum assessments in Year 2 (ages 6-7 years). Children with EAL and monolingual peers who met monolingual criteria for language impairment in Year 1 continued to display comparably impaired overall language ability two years later in Year 3. Moreover, these groups displayed comparably low levels of academic attainment in Year 2, demonstrating comparable functional impact of their language difficulties. Monolingual-normed language batteries in the majority language may have some practical value for identifying bilingual children who need support with language learning, regardless of the origin of their language difficulties.

Introduction

Language impairment is a developmental disorder characterised by persistent language difficulties which have a functional impact (Reilly, Tomblin, et al. 2014). Approximately 7.58% of monolingual children experience language impairment in the absence of an existing medical diagnosis or intellectual impairment (Norbury et al., 2016) and the prevalence is thought to be comparable in bilingual children (Kohnert, 2010). However, identifying language impairment in bilingual children is a challenge (Bedore & Peña, 2008; De Lamo White & Jin, 2011; Paradis et al., 2013). It is recommended that language impairment is only diagnosed in bilingual children following assessment in both languages, ideally using measures which are normed on bilingual children (Bedore & Peña, 2008; RCSLT Specific Interest Group in Bilingualism, 2007). However, such measures are not available for all bilingual children, nor are they feasible to develop or administer, particularly in populations containing a high proportion of children with diverse first languages (De Lamo White & Jin, 2011). For example, in England 20.1% of state-funded primary school pupils speak English as an additional language (EAL; Department for Education, 2016), with over 300 different first languages spoken by these children (NALDIC, 2012a). Due to a lack of alternative resources, practitioners generally use monolingual-normed language measures when assessing bilingual children (Caesar & Kohler, 2007; Williams & McLeod, 2012). While such methods may not accurately identify language impairment in bilingual children, it is possible that a comprehensive language battery in the majority language may identify bilingual children who experience difficulties with language learning which negatively impact academic life. To date, no research has followed the language development of bilingual children who meet criteria for language impairment on such assessment batteries or considered the functional academic attainment of those identified.

Monolingual children with language impairment vary in their language profiles (Conti-Ramsden & Crutchley, 1997). Thus, it is recommended that receptive and expressive language skills are assessed in a variety of language domains when diagnosing language impairment (Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016). Precise cut-offs and exclusionary criteria for language impairment are, however, under debate (Bishop, 2014; Reilly, Tomblin, et al. 2014). Tomblin et al. (1996) developed the EpiSLI diagnostic system for language impairment in an epidemiological study of monolingual children. Children completed receptive and expressive measures of vocabulary, grammar, and narrative and composite scores were calculated for each modality and language domain. Children scoring -1.25 *SD* or more below the standardised mean on two out of five language composites were regarded as having language impairment. However, Norbury et al. (2016) found that a -1.5 *SD* cut on two or more composites yielded a group of children with language impairment who experienced greater functional academic impairment, relative to those identified by the -1.25 *SD* cut. With regard to exclusionary criteria, the original EpiSLI criteria required children to have normal nonverbal ability and no existing medical diagnosis. However, the requirement for a discrepancy between language and nonverbal ability is no longer endorsed by the majority of researchers and practitioners (Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016), nor is it supported by epidemiological evidence (Norbury et al., 2016; Reilly, Tomblin, et al. 2014).

Standardised monolingual-normed language measures have not been recommended for the assessment of bilingual children (Bedore & Peña, 2008). This is because typically developing bilingual children generally show poorer performance relative to monolingual peers on individual language measures, including on measures of receptive vocabulary, expressive vocabulary, receptive grammar, and narrative comprehension (Babayiğit, 2014; Bialystok, Luk, et al., 2010; Burgoyne, Kelly, Whiteley, & Spooner, 2009; Burgoyne et al., 2011; Hutchinson et al., 2003; Verhoeven, Steenge, van Weerdenburg, & van Balkom, 2011). Furthermore, individual language measures can be poor at identifying bilingual children with language impairment. In a cross-sectional study of children aged 6, 7, and 8 years, Verhoeven et al. (2011) found that measures of receptive vocabulary and narrative comprehension did not discriminate between bilingual children with language impairment and typically developing bilingual peers at ages 6 and 7 years. Moreover, measures of expressive vocabulary and receptive grammar also did not discriminate between these groups at age 6. Furthermore, both Boerma et al. (2016) and Thordardottir and Brandeker (2013) found that while typically developing bilingual children outperformed bilingual peers with language impairment on a measure of receptive vocabulary, they performed comparably to monolingual children with language impairment.

Sentence repetition tasks have been identified as a potential nonbiased measure of language in bilingual children. Sentence repetition is sensitive to language impairment in monolingual children (Conti-Ramsden et al., 2001; Riches, 2012) and is included as a measure of expressive grammar in most diagnostic batteries, including the EpiSLI system (Tomblin et al., 1996). Monolingual and bilingual children with language impairment show comparably impaired sentence repetition accuracy (Thordardottir & Brandeker, 2013; Tsimpli et al., 2016). However, typically developing bilingual children also often show deficits in sentence repetition accuracy relative to typically developing monolingual peers (Chiat et al., 2013; Thordardottir & Brandeker, 2013; Tsimpli et al., 2016). Thus, sentence repetition measures may over-identify language impairment in bilingual children. Nevertheless, typically developing bilingual children differ from both monolingual and bilingual children with language impairment in their sentence repetition error patterns (Komeili & Marshall, 2013; Meir, Walters, & Armon-Lotem, 2015). These studies however used specific bilingual language groups and thus the error patterns characteristic of typical development, or language impairment, in these groups may not generalise to all bilingual children.

Narrative production tasks, which require children to generate a story or retell a previously presented story using a series of pictures, are generally considered a less-biased measure of language in bilingual children (Boerma et al., 2016; Cleave et al., 2010). Specifically, typically developing bilingual children do not differ from monolingual peers in narrative macrostructure, which concerns the inclusion of key story elements within the narrative (Boerma et al., 2016; Hipfner-Boucher et al., 2014; Rezzonico et al., 2015; Rodina, 2016). Moreover, monolingual and bilingual children with language impairment show comparably impaired narrative macrostructure (Boerma et al., 2016; Cleave et al., 2010; Rezzonico et al., 2015). Other studies have found that bilingual children with language impairment show poorer narrative macrostructure than typically developing bilingual peers (Paradis et al., 2013; Squires et al., 2014), though there are notable exceptions (Iluz-Cohen & Walters, 2012; Tsimpli et al., 2016). Narrative production tasks may therefore help identify language impairment in bilingual children, though it is recommended that they are used in combination with other measures (Boerma et al., 2016; Paradis et al., 2013).

While many studies have explored bilingual children's performance on individual language measures, little research has explored their performance on comprehensive diagnostic batteries. Gillam et al. (2013) explored the diagnostic accuracy of assessing Spanish-English bilingual children in English using Tomblin et al.'s (1996) EpSLI system. All children were in first grade and had been exposed to English regularly for at least one year. Language impairment was identified using assessment in both Spanish and English. The original EpiSLI diagnostic criteria, of two or more English language composites falling -1.25 *SD* below the mean, correctly identified 95% of bilingual children with language impairment (sensitivity), though only 45% of unimpaired children were correctly identified (specificity). Adjusting the cut-offs for the individual composites yielded 86% sensitivity and 68% specificity (composite cut-offs ranged from -1.11 *SD* to -1.83 *SD*). Moreover, acceptable sensitivity and specificity levels of 81% were yielded after combining all five composites within a predictive model. Therefore, Gillam et al. concluded that assessment in English can be used to diagnose language impairment in bilingual children who have been exposed to English regularly for at least a year. Of note, all children scored below the 30th percentile on two out of four subtests on a Spanish-English screener completed two years before the diagnostic assessment. Although Gillam et al. reported that English and Spanish skills within the sample spanned the full continua of proficiency at the time of the diagnostic assessment, the recruitment method may have biased the results.

The current study is the first to explore the persistence and functional impact of the English language difficulties experienced by children learning EAL who meet criteria for language impairment on a comprehensive monolingual-normed English language battery. Note that we do not imply that these children necessarily have an underlying language impairment; their scores on the English language battery fall in the range obtained by monolingual children with language impairment, which may reflect limited exposure to English, language impairment, or both. Children learning EAL were compared to monolingual peers, who either met criteria for language impairment or typical development on the language battery in Year 1 (ages 5-6 years). Language growth was assessed in all four groups between Year 1 and Year 3 (ages 7-8 years) and academic attainment was measured in Year 2 (ages 6-7 years). Growth is reported for a total language composite score and for the six individual language measures which make up the battery. The diagnostic battery followed the EpiSLI system, however we used a stricter cut for language impairment of two or more language composite scores falling -1.5 *SD* below the monolingual population mean. All children entered school at the same time and had received at least one year of exposure to English in school prior to the Year 1 assessment.

In contrast to Gillam et al.'s (2013) study, the children learning EAL in our population sample had diverse first languages, representing 19 languages in total. It was therefore not possible to compare the diagnostic accuracy of the language battery against language impairment diagnoses derived from dual language assessment. This is because there are no normed first language measures in most of these languages, nor would such measures be feasible to develop or administer (De Lamo White & Jin, 2011). As such, our sample represents the current educational and clinical situation in richly diverse communities and motivates our investigation to determine the use of an English language battery to assess children with EAL. To acknowledge that our English language measures are not sufficient to diagnose language impairment in children with EAL, we use the term *low language proficiency* to refer to children who met the monolingual criteria for language impairment.

Gillam et al. (2013) hypothesized that children with EAL who are typical language learners should learn English faster than those with an underlying language impairment. Following this rationale, if our language battery identified many children with EAL who do not have an underlying language impairment, we expected the EAL low language proficiency group (EAL-LL) to show greater language growth relative to the monolingual low language proficiency group (Mon-LL), and potentially greater academic attainment. Reduced persistence and functional impact of the English language difficulties experienced by the EAL-LL group, relative to the Mon-LL group, would indicate that using a monolingual-normed language battery to assess children with EAL in Year 1 may be of limited value. Alternatively, if the EAL-LL and EAL typical language proficiency (EAL-TL) groups show comparable language growth and academic attainment to their respective monolingual peers, this would indicate that the language battery may have value in identifying children with EAL who experience persistent English language learning difficulties which have functional impact. Furthermore, comparable persistence and functional impact of the English language difficulties experienced by the EAL-LL and Mon-LL groups would indicate a need for both groups to receive additional support, regardless of the origin of their difficulties.

Method

Study Design

All children were participants in the Surrey Communication and Language in Education Study (SCALES). All children who started reception year (kindergarten) in a state-maintained school in Surrey, UK, in September 2011 were eligible to take part in the first phase of SCALES (*N* = 12,398). Teachers completed an online questionnaire for 7,267 reception year children (ages 4-5 years), who attended a total of 161 state maintained schools across Surrey (59% of all eligible children; 61% of all eligible schools; see Figure 4.1 for recruitment details). Teachers reported that the main language spoken in the homes of 782 children (11%) was a language other than English; these children were regarded as speaking EAL.

The online questionnaire included the Children's Communication Checklist-Short (CCC-S). The CCC-S is comprised of 13 items from the Children's Communication Checklist-2 (CCC-2; Bishop, 2003a) which best discriminated children with language impairment from typically developing peers in a validation study (Norbury et al., 2004). Within the CCC-S, the respondent rates the frequency with which each child displays six communicative errors and seven communicative strengths. High CCC-S scores reflect greater language difficulties. Monolingual children and children with EAL scoring 1 *SD* or more above the monolingual population mean for their age group (autumn, spring, or summer born) and sex were regarded as high-risk for language impairment. All remaining children were regarded as low-risk for language impairment. Children were regarded as having *no phrase speech* (NPS) if teachers reported that the child did not produce utterances of at least two to three words. These children (62 monolingual children, 27 children with EAL) received the maximum CCC-S score of 39. A higher proportion of children with EAL (3.45%) were reported as having NPS relative to monolingual children (0.96%; $\chi^2(1) = 35.96$, $p < .001$, Cramér's $V = .07$).

In the second phase of SCALES, subsamples of monolingual children and children with EAL were selected for in-depth assessment in Year 1 (ages 5-6 years) and Year 3 (ages 7-8 years) using stratified random sampling (see Figure 4.1). All children attending special schools were excluded from selection. Within the monolingual sample, high-risk children were oversampled (40.5% of screened high-risk boys selected, 37.5% of high-risk girls) relative to the low-risk children (4.3% of low-risk boys, 4.2% of low-risk girls). Within the EAL sample, a random sample of 30 high-risk (15 boys, 15 girls) and 30 low-risk (15 boys, 15 girls) children were invited to participate. Additionally, all NPS children were invited to participate (48 monolingual children, 22 children with EAL). Therefore, within the EAL sample, children with particularly low levels of English language proficiency in reception year were oversampled.

As shown in Figure 4.1, 529 monolingual children and 61 children with EAL, from a total of 151 state-maintained schools, completed an in-depth assessment in Year 1. Of these children, 499 monolingual children and 51 children with EAL were also assessed in Year 3. In Year 1, children were randomly assigned to one of six assessment blocks, which mapped onto the six half terms of the UK school year. In Year 3, children remained in their original assessment block, however the order of the blocks was reversed. Therefore, a child who was assessed in the first half term of Year 1 was re-assessed in the last half term of Year 3. Consequently, the lag between Year 1 and Year 3 assessments for each child varied between 14 and 34 months. This novel design maximised the longitudinal component of the study.

An opt-out consent procedure was adopted for the first phase of SCALES, in which anonymised teacher questionnaire data were submitted to the study unless parents opted out. Parents provided informed, written consent for the second phase of SCLAES, which involved in-depth, individual assessment. The study protocol was developed in collaboration with Surrey County Council and was granted ethical approval by the Ethics Committee at Royal Holloway, University of London.

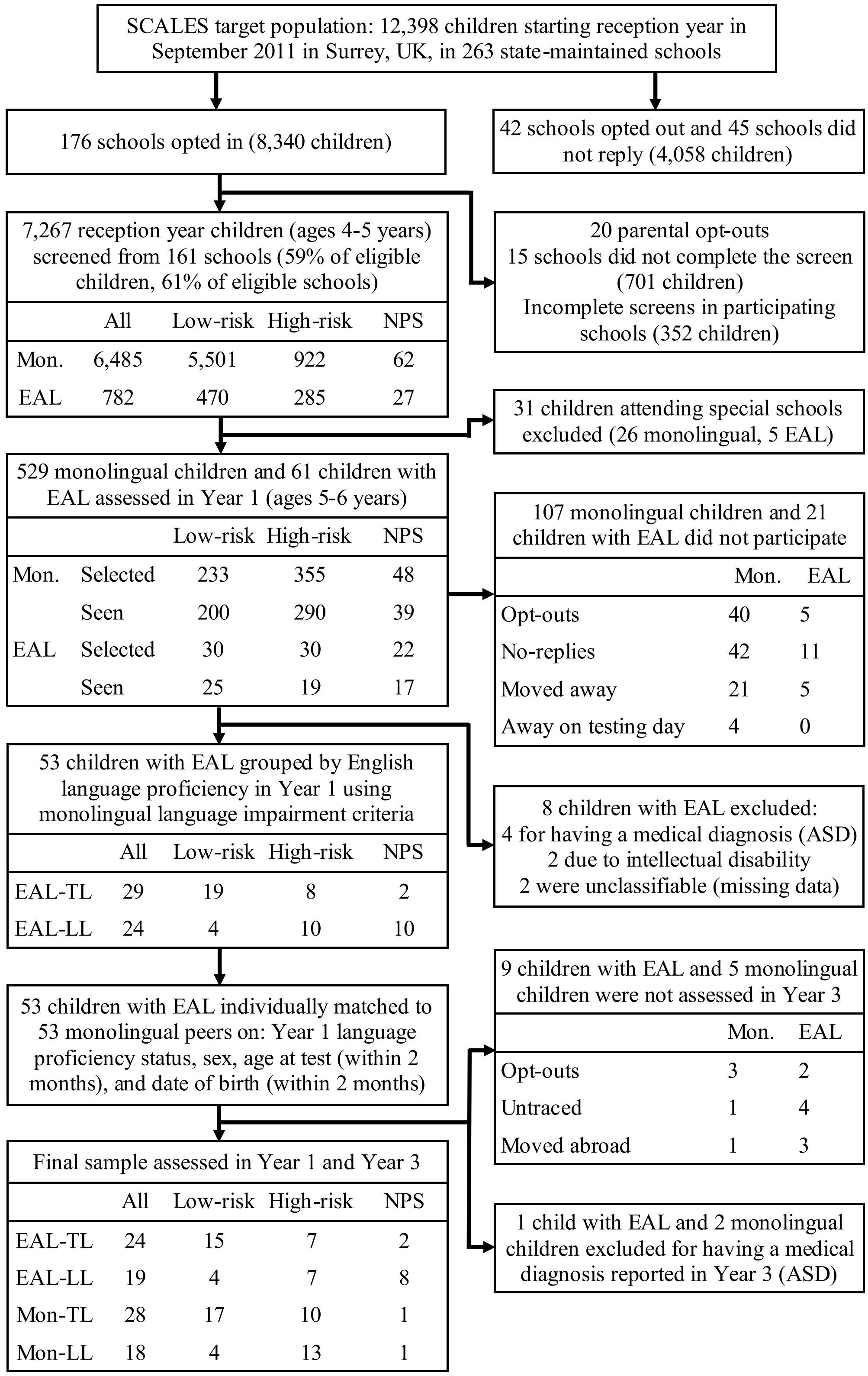

Figure 4.1. Recruitment for the population survey phase, Year 1 school assessment, and the selection and retention of participants in the current study. NPS = no phrase speech; ASD = autism spectrum disorder; Mon. = monolingual; EAL = English as an additional language; TL = typical language; LL = low language.

Participants

Figure 4.1 details the selection process for the current study. Children with EAL (*n* = 53) were individually matched with monolingual children (*n* = 53) after the Year 1 assessment on sex, age at assessment (within 2 months), date of birth (within 2 months), and language proficiency status in Year 1 (typical or low English language proficiency). Language proficiency status was determined using language composite scores from the English language battery (outlined below). Children with intellectual disability (i.e., those scoring 2 *SD* or more below the monolingual population mean on a nonverbal composite, outlined below), a reported medical diagnosis, and children whose language proficiency status was unclassifiable due to missing data were excluded from this matching (eight children with EAL excluded; see Figure 4.1). Of the matched children, nine children with EAL and five monolingual children were not assessed in Year 3 and two monolingual children and one child with EAL were excluded due to having a medical diagnosis reported in Year 3 (see Figure 4.1 for details).

The final sample for this study includes 43 children with EAL and 46 monolingual children who were assessed in both Year 1 and Year 3. Of this sample, 19 children with EAL (12 boys, 7 girls) and 18 monolingual children (10 boys, 8 girls) had low English language proficiency (EAL-LL; Mon-LL) in Year 1 and 24 children with EAL (11 boys, 13 girls) and 28 monolingual children (13 boys, 15 girls) had typical English language proficiency (EAL-TL; Mon-TL) in Year 1. There was no significant association between sex and language group ($\chi^2(3) = 1.75$, $p = .626$, Cramér's $V = .14$). All children started school at the compulsory age in the UK and thus had all received at least one year of exposure to English in school by the Year 1 assessment. The children with EAL had one of 19 different first languages. The most frequently reported first languages were Polish (7 children), Bengali (6 children), and Urdu (5 children). All other languages had three speakers or less. All children attended one of 63 state-maintained primary or infant schools in Surrey in Year 1 (children with EAL = 35 schools; monolingual children = 38 schools) and one of 61 state-maintained primary or junior schools in Surrey in Year 3 (children with EAL = 36 schools; monolingual children = 37 schools).

During assessment in Year 1, all children were aged between 5 years 3 months (63 months) and 6 years 8 months (80 months). During assessment in Year

3, all children were aged between 7 years 1 month (85 months) and 8 years 8 months (104 months). The four groups did not significantly differ in age at assessment in Year 1 or Year 3 and the lag between Year 1 and Year 3 assessments did not significantly differ between the groups (see Table 4.1). Income Deprivation Affecting Children Index (IDACI; McLennan et al., 2011) rank scores were retrieved using the children's home postcodes to provide a measure of neighbourhood deprivation. IDACI rank scores can range from 1 to 32,482, with lower scores assigned to areas in England with proportionally more children living in income deprived families (defined by receiving certain means tested benefits). IDACI rank scores ranged from 5,293 to 31,962 for the children with EAL and from 4,686 to 32,416 for the monolingual children, thus both groups varied widely in socioeconomic backgrounds. The four groups did not significantly differ in IDACI rank scores (see Table 4.1).

Table 4.1

Mean (SD) IDACI Rank Scores, Age at Both Time Points, and Lag Between Assessments for Each Language Group

Measure	Mon-TL (*n* = 28)	Mon-LL (*n* = 18)	EAL-TL (*n* = 24)	EAL-LL (*n* = 19)	*F (df)*	*p*	η_p^2
IDACI rank	21445.29 (6403.21)	18943.17 (8211.84)	18938.54 (8394.40)	16061.84 (9048.24)	1.75 (3, 85)	.163	.06
Age in Year 1 in months	70.96 (4.02)	72.17 (4.15)	70.83 (4.30)	71.74 (4.25)	0.49 (3, 85)	.693	.02
Age in Year 3 in months	95.54 (4.24)	94.83 (4.09)	95.67 (4.45)	95.11 (5.27)	0.15 (3, 85)	.928	.01
Assessment lag in months	24.57 (5.09)	22.67 (5.20)	24.83 (5.36)	23.37 (6.24)	0.73 (3, 85)	.534	.03

Measures and Procedures

Each child completed an individual two hour assessment session with a trained researcher when they were in Year 1 and Year 3. Assessment sessions took place in a quiet area in each child's school and were broken up with breaks. All tasks were administered in English. The measures relevant to this study included assessments of nonverbal ability and language. This study also incorporates data from national curriculum assessments, provided by Surrey County Council, which were completed when the children were in Year 2.

Nonverbal ability. In Year 1, children completed the Block Design and Matrix Reasoning subtests of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III; Wechsler, 2003b). In Year 3, children completed the Block Design and Matrix Reasoning subtests of the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003a). At each time point, raw scores on these tasks were converted into age standardised nonverbal ability composite *z*-scores, based on norms derived from the monolingual population sample.

Language. In Year 1 and Year 3, children completed the Receptive and Expressive One-Word Picture Vocabulary Tests, Fourth Edition (ROWPVT-4, EOWPVT-4; Martin & Brownell, 2011a, 2011b). Children also completed measures of narrative recall (expressive) and comprehension (receptive), which were based on the Narrative subtest of the Assessment of Comprehension and Expression (ACE 6-11; Adams et al., 2001). Moreover, children completed the Test for Reception of Grammar - Short (TROG-S), which is a short form of the Test for Reception of Grammar-2 (TROG-2; Bishop, 2003b), and the School Age Sentence Imitation Task - English 32 (SASIT-E32; Marinis et al., 2011) to assess receptive and expressive grammar, respectively.

Raw scores on the six language measures from the Year 1 and Year 3 assessments were converted into age standardised *z*-scores based on norms derived from the monolingual population sample. Following Tomblin et al. (1996), five composite scores were calculated: vocabulary, grammar, narrative, expressive language, and receptive language. Low language proficiency in Year 1 was defined as two or more language composite scores falling -1.5 *SD* or more below the monolingual population mean, in the absence of existing medical diagnoses or intellectual disability (defined as a nonverbal ability composite score of -2 *SD* or more below the monolingual population mean). These criteria have been used to identify language impairment in monolingual English-speaking children (Norbury et al., 2016). For both time points, z-scores on all six language measures were averaged to produce a total language composite *z*-score.

Receptive vocabulary (ROWPVT-4; Martin & Brownell, 2011b). The examiner read individual words and children were asked to select a picture, from an array of four, which depicted each word. Scores ranged from 0-190, with higher scores indicating greater receptive vocabulary.

Expressive vocabulary (EOWPVT-4; Martin & Brownell, 2011a). Children were presented with a series of individual pictures and were asked to name the object, action, or concept which was depicted in each picture. Scores ranged from 0-190, with higher scores indicating greater expressive vocabulary.

Narrative recall (ACE 6-11; Adams et al., 2001). Children listened to a story about a monkey in a forest, which was played over headphones and accompanied by eight pictures. After listening to the story, children were shown the pictures again and were asked to tell the story in their own words. Each child's narrative was audio-recorded and 1 point was awarded for each of 35 key elements of the story which were correctly recalled (maximum = 35).

Narrative comprehension. Following the narrative recall task, children were asked 12 comprehension questions about the story (six literal and six inference questions). Children received 0 points for an incorrect response, 1 point for a partially correct response, and 2 points for a correct response (maximum = 24).

Receptive grammar (TROG-S). This is a short form of the TROG-2 (Bishop, 2003b). Children heard up to 40 sentences and were asked to select a picture, from an array of four, which depicted each sentence. The task was discontinued if a child answered incorrectly on six consecutive items. One point was allocated for each correct response (maximum = 40).

Sentence repetition (SASIT-E32; Marinis et al., 2011). Children listened to 32 pre-recorded sentences over headphones and were asked to repeat each sentence out loud. All repetitions were audio-recorded and 1 point was allocated for every sentence that was repeated correctly (word for word; maximum = 32).

Year 2 assessments. Children attending state-maintained schools in England complete national curriculum assessments, known as Key Stage 1 assessments, in the last term of Year 2 (ages 6-7 years; Department for Education, 2014c). Teachers determine each child's level of attainment in the following five subjects: mathematics, science, reading, writing, and speaking and listening. Since the expected level of attainment is level 2 (Department for Education, 2014c), children were regarded as performing on target in each subject if they achieved level 2 or above.

Data Analysis

All analyses were conducted using Stata IC 14 (StataCorp, 2015). Two-way independent measures ANOVAs, with EAL status and language proficiency status as independent variables, tested whether nonverbal ability composite z-scores significantly differed between the language groups in Year 1 and Year 3. Pearson's correlations between raw scores achieved in Year 1 and Year 3 on each language measure, as well as correlations between Year 1 and Year 3 total language composite z-scores, are provided separately for children with EAL and monolingual children. Chi-square tests indicated whether children from the EAL-TL and EAL-LL groups differed from monolingual peers in their likelihood to perform on target in all five subjects in Year 2 assessments (versus performing below target in one or more subject) and perform on target in each individual subject.

A series of linear mixed effects models, with robust standard errors, were run to explore the relationship between language group membership and growth, or stability, between Year 1 and Year 3 in total language composite z-scores and raw scores on each language measure. While models using raw scores show the change in actual scores over time, models using z-scores show whether the groups differ in their performance relative to the monolingual population sample over time. Linear mixed effects modelling was appropriate as this analysis allows unequal testing intervals. Moreover, linear models allow an estimate of language growth despite only two testing observations. Child ID was entered into each model as a random effect to account for individual variation at initial assessment (the intercept). EAL status (EAL, monolingual), language proficiency (typical language proficiency, low language proficiency), and age in months (continuous) were entered into each model as fixed effects. The following interaction terms were also entered into each model: Language Proficiency x EAL, Language Proficiency x Age, EAL x Age, and Language Proficiency x EAL x Age.

Within each model, coefficients reveal the relationship between each variable and the outcome when all other variables are at 0. Age was centred at the mean age for all participants during testing in Year 1 (71.34 months). Thus, for age, 0 reflects the mean age in Year 1. For language proficiency, 0 reflects typical language proficiency and for EAL status, 0 reflects being monolingual. Coefficients for language proficiency therefore reveal how the Mon-LL group compares to the Mon-TL group in Year 1 and coefficients for EAL status reveal how the EAL-TL group compares to the Mon-TL group in Year 1. The Language Proficiency x EAL interaction reveals whether the relationship between learning EAL and the outcome in Year 1 differs for children with low language proficiency relative to children with typical language proficiency (i.e., the extent the difference between EAL-LL and Mon-LL groups is comparable to the difference between EAL-TL and Mon-TL groups). Coefficients for age reveal the relationship between age in months and the outcome variable (i.e. growth in the outcome, or the slope) for the Mon-TL group. The Language Proficiency x Age interaction reveals whether growth is different for the Mon-LL group relative to the Mon-TL group. The EAL x Age interaction reveals whether growth is different for the EAL-TL group relative to the Mon-TL group. Finally, the Language Proficiency x EAL x Age interaction reveals whether the difference in growth between EAL-LL and Mon-LL groups is comparable to the difference in growth between EAL-TL and Mon-TL groups.

For linear mixed models which demonstrated a significant interaction involving EAL status and age, a second linear mixed model considered performance in Year 3, with age centred at the mean age at assessment in Year 3 (95.34 months). The models were built in the same way as the original models in all other respects. For these models, coefficients are only reported for language proficiency, EAL status, and the Language Proficiency x EAL interaction. Coefficients for age and the interactions involving age are identical to the original models. For models which had no significant interactions involving EAL status and age, no further analyses were undertaken. Such a result indicates that the disparity between children with EAL and monolingual peers that was evident in Year 1 remained over time.

Missing Data

Two children (both EAL-LL) did not complete the SASIT-E32 in Year 1 and one child (EAL-TL) did not complete the SASIT-E32 in Year 3. As these children did not complete the full language battery, they were excluded from the models predicting total language composite z-scores, as well as the models predicting sentence repetition. Two children (1 EAL-LL, 1 EAL-TL) did not complete the WISC-IV Matrix Reasoning subtest in Year 3 and were excluded from the nonverbal ability analysis in Year 3.

Results

For both children with EAL and monolingual children, Year 1 and Year 3 total language composite z-scores, and raw scores on each language measure, were significantly positively correlated (see Table 4.2). Means and *SDs* for Year 1 and Year 3 nonverbal ability z-scores, total language composite z-scores, and raw scores on each language measure are displayed in Table 4.3 for each group. A two-way ANOVA demonstrated a significant main effect of language proficiency on nonverbal ability composite *z*-scores in Year 1, $F(1, 85) = 4.97$, $p = .028$, $\eta_p^2 = .06$, and Year 3, $F(1, 83) = 30.57$, $p < .001$, $\eta_p^2 = .27$, whereby children with typical language proficiency had higher scores relative to children with low language proficiency. However, there was no significant main effect of EAL status in Year 1, $F(1, 85) = 0.20$, $p = .655$, $\eta_p^2 < .01$, or Year 3, $F(1, 83) = 1.51$, $p = .223$, $\eta_p^2 = .02$, nor was there a significant EAL x Language Proficiency interaction in Year 1, $F(1, 85) = 0.07$, $p = .786$, $\eta_p^2 < .01$, or Year 3, $F(1, 83) = 0.42$, $p = .520$, $\eta_p^2 = .01$. Thus, within language proficiency groups, children with EAL did not differ from monolingual peers in nonverbal ability in Year 1 or Year 3.

Table 4.2

Longitudinal Correlations Between Year 1 and Year 3 Total Language Composite Z-Scores and Raw Scores on Each Language Measure for Children with EAL and Monolingual Peers

	Monolingual		EAL	
Measure	*r*	*p*	*r*	*p*
Language composite	.84	< .001	.84	< .001
Receptive vocabulary	.74	< .001	.60	< .001
Expressive vocabulary	.75	< .001	.77	< .001
Narrative comprehension	.57	< .001	.70	< .001
Narrative recall	.44	.002	.51	.001
Receptive grammar	.52	< .001	.69	< .001
Sentence repetition	.85	< .001	.75	< .001

Table 4.3

Mean (SD) Nonverbal Ability and Total Language Composite Z-Scores, and Raw Scores on Each Language Measure, for Each Language Group in Year 1 and Year 3

	Mon-TL		Mon-LL		EAL-TL		EAL-LL	
Measure	Year 1	Year 3	Year 1	Year 3	Year 1	Year 3	Year 1	Year 3
Nonverbal composite	-0.12 (1.19)	0.17 (0.90)	-0.66 (0.82)	-0.90 (0.86)	-0.08 (0.97)	0.27 (0.77)	-0.50 (0.89)	-0.57 (0.54)
Language composite	-0.09 (0.93)	-0.09 (0.83)	-1.77 (0.45)	-1.46 (0.63)	-0.20 (0.77)	0.10 (1.00)	-1.99 (0.42)	-1.58 (0.66)
Receptive vocabulary	84.50 (12.99)	103.54 (11.55)	68.56 (14.50)	90.22 (11.72)	80.42 (9.52)	105.83 (9.92)	59.89 (8.29)	87.89 (12.36)
Expressive vocabulary	77.86 (13.49)	96.43 (11.78)	62.00 (9.91)	82.67 (10.13)	77.50 (14.05)	99.38 (10.68)	48.05 (16.02)	71.53 (16.36)
Narrative comprehension	12.82 (4.07)	16.93 (2.83)	8.33 (3.20)	14.56 (3.05)	13.92 (4.21)	18.38 (2.99)	5.79 (4.01)	12.53 (5.46)
Narrative recall	12.18 (4.12)	17.25 (3.38)	6.72 (2.74)	12.50 (4.12)	12.79 (4.11)	18.17 (3.24)	6.16 (3.62)	12.84 (4.80)
Receptive grammar	25.64 (6.14)	30.61 (5.40)	18.00 (4.95)	25.33 (3.74)	26.58 (5.06)	30.83 (4.42)	17.37 (5.92)	22.11 (7.04)
Sentence repetition	17.71 (6.96)	23.39 (5.72)	5.22 (3.44)	12.78 (5.11)	13.48 (8.00)	21.57 (5.51)	2.18 (3.30)	10.47 (6.65)

Growth in Total Language Composite Z-Scores

As displayed in Table 4.4 and Figure 4.2, when age was mean centred in Year 1, language proficiency status significantly predicted total language composite z-scores. Furthermore, EAL status did not significantly predict total language composite z-scores, and there was no significant Language Proficiency x EAL interaction. Thus, as expected, both Mon-LL and EAL-LL groups obtained lower total language composite z-scores relative to Mon-TL and EAL-TL groups in Year 1. Moreover, EAL-TL and EAL-LL groups achieved comparable total language composite z-scores in Year 1 to their respective monolingual peer groups. Age in months did not significantly predict total language composite z-scores, which indicates that total language composite z-scores remained constant for the Mon-TL group as age increased. There was a significant Language Proficiency x Age interaction, a marginally significant EAL x Age interaction, but no significant Language Proficiency x EAL x Age interaction. Thus, Mon-LL and EAL-LL groups made greater growth in total language composite z-scores relative to Mon-TL and EAL-TL groups, respectively (see Figure 4.2). Moreover, EAL-TL and EAL-LL groups made slightly greater growth in total language composite z-scores relative to their respective monolingual peer groups.

Table 4.4

Linear Mixed Model Predicting Growth in Total Language Composite Z-Scores

	Language composite z-score	
Fixed factor	β [95% CI]	*p*
LP	-1.70 [-2.08, -1.32]	< .001
EAL	-0.10 [-0.56, 0.36]	.657
LP x EAL	-0.15 [-0.69, 0.39]	.589
Age	< -0.01 [-0.01, 0.01]	.605
LP x Age	0.01 [< -0.01, 0.03]	.016
EAL x Age	0.01 [< -0.01, 0.02]	.051
LP x EAL x Age	-0.01 [-0.03, 0.02]	.647

Note. LP = language proficiency. Age is measured in months and was centred at the mean age at assessment in Year 1 (71.34 months).

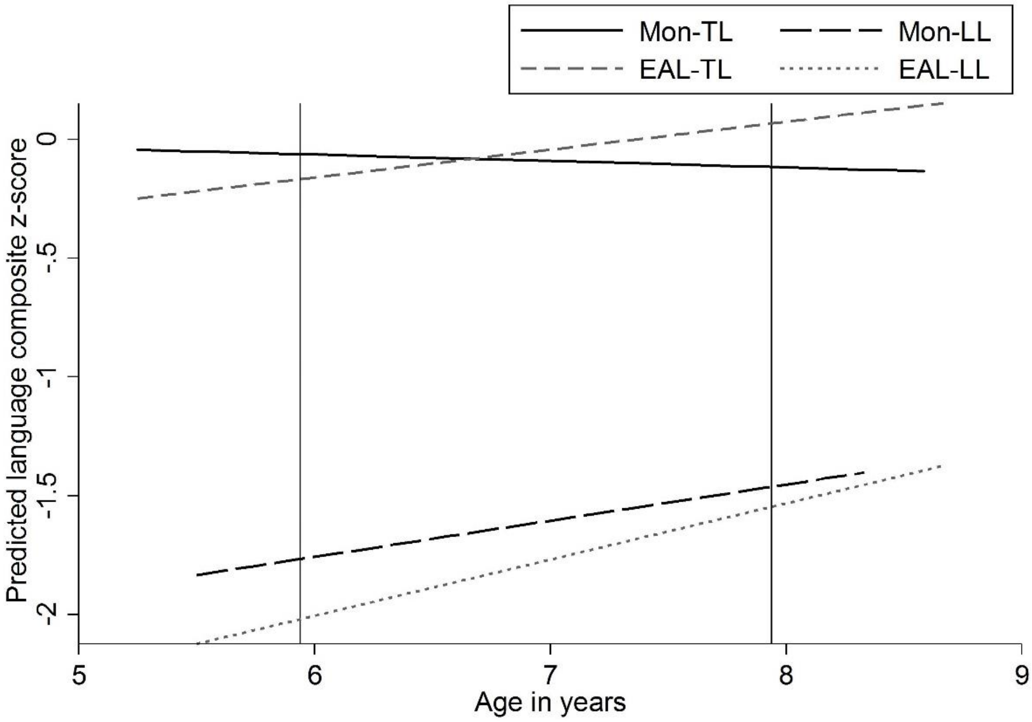

Figure 4.2. Predicted total language composite z-scores for each language group. The reference lines indicate the mean ages during testing in Year 1 and Year 3.

A separate mixed linear model, with age mean centred in Year 3, demonstrated that language proficiency status in Year 1 continued to significantly predict total language composite z-scores in Year 3, $\beta = -1.34$, $p < .001$, 95% CI [-1.76, -0.93]. Additionally, EAL status did not significantly predict total language composite z-scores, $\beta = 0.18$, $p = .462$, 95% CI [-0.31, 0.68], and there was no significant Language Proficiency x EAL interaction, $\beta = -0.27$, $p = .415$, 95% CI [-0.91, 0.38]. Thus, despite greater growth, both Mon-LL and EAL-LL groups continued to display lower total language composite z-scores relative to Mon-TL and EAL-TL groups in Year 3. Furthermore, EAL-TL and EAL-LL groups continued to demonstrate comparable total language composite z-scores to their respective monolingual peer groups in Year 3. Both EAL-LL and Mon-LL groups performed on average at least 1.5 *SD* below the monolingual population mean in Year 1 and Year 3 (see Figure 4.2).

Growth in Raw Scores on Each Language Measure

Tables 4.5 and 4.6 display linear mixed models predicting raw scores on each language measure when age was mean centred in Year 1. Language proficiency status significantly predicted scores on each language measure. Thus, the Mon-LL group obtained significantly poorer scores on all measures relative to the Mon-TL group in Year 1 (see Figure 4.3). EAL status did not significantly predict receptive vocabulary, narrative recall, and receptive grammar and there were no significant Language Proficiency x EAL interactions for any of these measures. Therefore, EAL-TL and EAL-LL groups displayed comparable receptive vocabulary, narrative recall, and receptive grammar in Year 1 to their respective monolingual peer groups. EAL status also did not significantly predict expressive vocabulary and narrative comprehension, however there was a significant Language Proficiency x EAL interaction for both of these measures. Thus, while EAL-TL and Mon-TL groups displayed comparable expressive vocabulary and narrative comprehension in Year 1, the EAL-LL group performed more poorly on these measures relative to the Mon-LL group (see Figure 4.3). Finally, EAL status significantly predicted sentence repetition, with no significant Language Proficiency x EAL interaction. Thus, both EAL-TL and EAL-LL groups displayed poorer sentence repetition relative to their respective monolingual peer groups in Year 1.

Age significantly predicted scores on each measure, which indicates that the Mon-TL group displayed growth in all measures over time. For expressive vocabulary, narrative recall, and receptive grammar, there were no significant interactions involving age. Thus, all groups displayed comparable growth in expressive vocabulary, narrative recall, and receptive grammar and the rank order of the performance by the groups in Year 1, on these measures, remained in Year 3 (see Figure 4.3). Specifically, EAL-TL and EAL-LL groups continued to display comparable narrative recall and receptive grammar to their respective monolingual peer groups. EAL-TL and Mon-TL groups also continued to display comparable expressive vocabulary and the EAL-LL group continued to display lower expressive vocabulary than the Mon-LL group.

Table 4.5

Linear Mixed Models Predicting Growth in Receptive Vocabulary, Expressive Vocabulary, and Narrative Comprehension

	Receptive vocabulary		Expressive vocabulary		Narrative comprehension	
Fixed factor	β [95% CI]	p	β [95% CI]	P	β [95% CI]	p
LP	-17.79 [-24.63, -10.96]	< .001	-17.13 [-23.15, -11.10]	< .001	-4.57 [-6.50, -2.63]	< .001
EAL	-3.77 [-9.26, 1.72]	.178	-0.30 [-7.24, 6.63]	.932	1.29 [-0.90, 3.48]	.247
LP x EAL	-4.17 [-12.93, 4.59]	.351	-13.73 [-24.46, -2.99]	.012	-3.99 [-7.05, -0.93]	.011
Age	0.73 [0.57, 0.90]	< .001	0.73 [0.58, 0.89]	< .001	0.16 [0.11, 0.21]	< .001
LP x Age	0.25 [-0.01, 0.50]	.056	0.18 [-0.03, 0.38]	.091	0.09 [0.01, 0.17]	.028
EAL x Age	0.24 [0.02, 0.46]	.029	0.13 [-0.08, 0.35]	.225	< -0.01 [-0.08, 0.08]	.965
LP x EAL x Age	-0.03 [-0.41, 0.34]	.865	-0.01 [-0.37, 0.36]	.978	0.04 [-0.10, 0.17]	.586

Note. LP = language proficiency. Age is measured in months and was centred at the mean age at assessment in Year 1 (71.34 months).

Table 4.6

Linear Mixed Models Predicting Growth in Narrative Recall, Receptive Grammar, and Sentence Repetition

	Narrative recall		Receptive grammar		Sentence repetition	
Fixed factor	β [95% CI]	*p*	β [95% CI]	*p*	β [95% CI]	*p*
LP	-5.77 [-7.69, -3.85]	< .001	-7.99 [-10.93, -5.06]	< .001	-12.99 [-15.76, -10.21]	< .001
EAL	0.65 [-1.39, 2.68]	.534	0.94 [-1.94, 3.82]	.521	-4.42 [-8.39, -0.44]	.030
LP x EAL	-1.16 [-4.00, 1.68]	.425	-1.39 [-5.69, 2.91]	.526	1.32 [-3.11, 5.74]	.560
Age	0.19 [0.14, 0.25]	< .001	0.20 [0.10, 0.30]	< .001	0.22 [0.15, 0.29]	< .001
LP x Age	0.05 [-0.06, 0.16]	.351	0.12 [-0.02, 0.26]	.089	0.11 [0.01, 0.21]	.027
EAL x Age	0.01 [-0.07, 0.09]	.818	-0.03 [-0.13, 0.07]	.569	0.11 [0.01, 0.21]	.029
LP x EAL x Age	0.02 [-0.13, 0.18]	.754	-0.09 [-0.29, 0.11]	.381	-0.07 [-0.23, 0.09]	.407

Note. LP = language proficiency. Age is measured in months and was centred at the mean age at assessment in Year 1 (71.34 months).

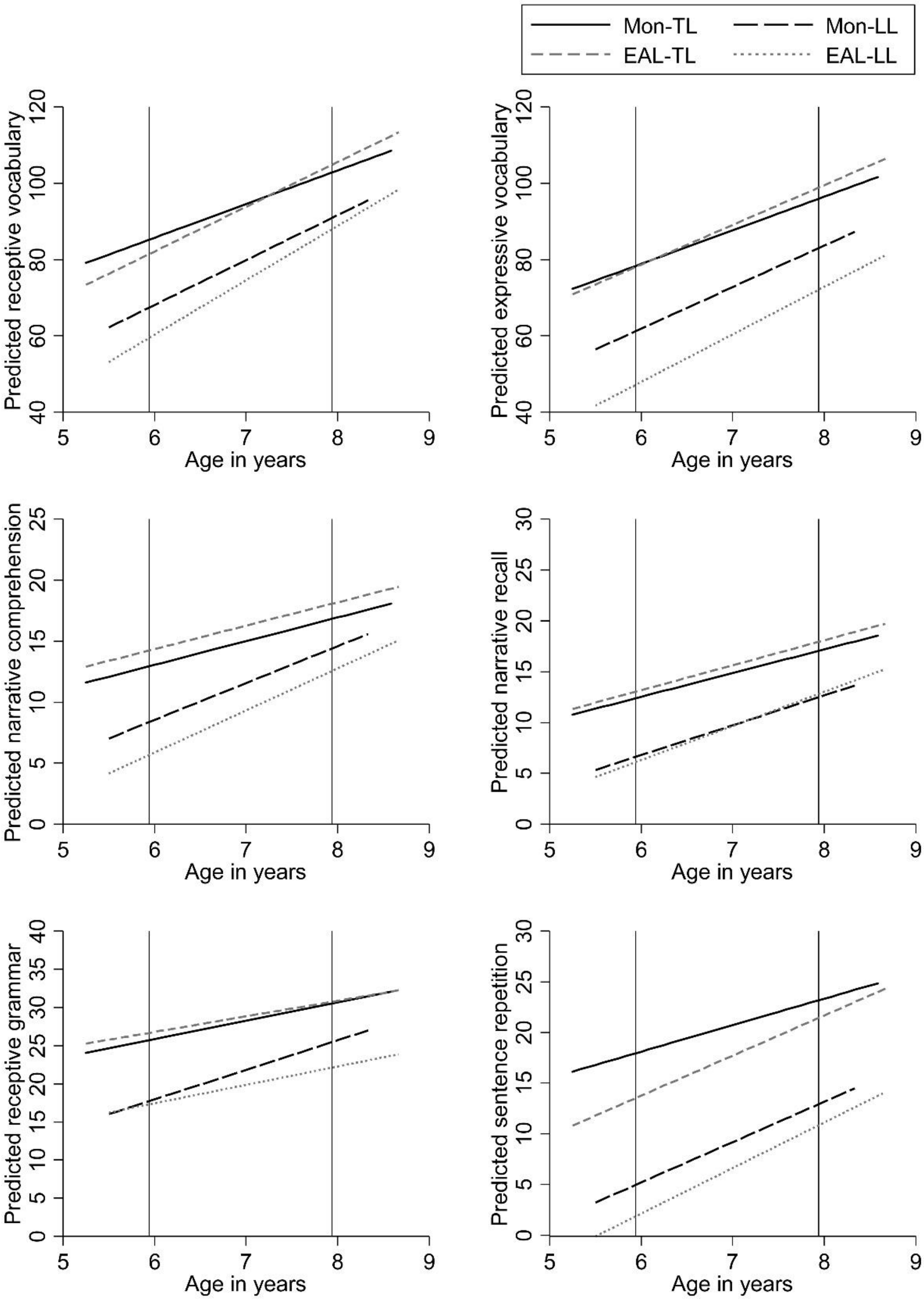

Figure 4.3. Predicted raw scores on measures of receptive and expressive vocabulary, narrative, and grammar for each language group. The reference lines indicate the mean ages during testing in Year 1 and Year 3.

For narrative comprehension, there was a significant Language Proficiency x Age interaction, but no significant EAL x Age or Language Proficiency x EAL x Age interaction. Therefore, both Mon-LL and EAL-LL groups demonstrated greater growth in narrative comprehension relative to Mon-TL and EAL-TL groups (see Figure 4.3). Furthermore, both EAL-TL and EAL-LL groups demonstrated comparable growth relative to their respective monolingual peer groups. Consequently, as evident in Year 1, EAL-TL and Mon-TL groups continued to display comparable narrative comprehension in Year 3, while the EAL-LL group continued to display poorer narrative comprehension relative to the Mon-LL group.

The Language Proficiency x Age interaction term was marginally significant for receptive vocabulary and significant for sentence repetition. Additionally, for both receptive vocabulary and sentence repetition, there was a significant EAL x Age interaction, but no significant Language Proficiency x EAL x Age interaction. Therefore, both Mon-LL and EAL-LL groups made greater growth in receptive vocabulary and sentence repetition relative to Mon-TL and EAL-TL groups, respectively (see Figure 4.3). Furthermore, both EAL-TL and EAL-LL groups made greater growth in receptive vocabulary and sentence repetition relative to their respective monolingual peer groups.

To investigate the EAL x Age interaction for receptive vocabulary, age was mean centred in Year 3. Language proficiency status significantly predicted receptive vocabulary, $\beta = -11.91$, $p < .001$, 95% CI [-18.74, -5.08]. Additionally, EAL status did not significantly predict receptive vocabulary, $\beta = 2.03$, $p = .509$, 95% CI [-3.99, 8.05], and there was no significant Language Proficiency x EAL interaction, $\beta = -4.95$, $p = .265$, 95% CI [-13.67, 3.76]. Therefore, Mon-LL and EAL-LL groups continued to display poorer receptive vocabulary relative to Mon-TL and EAL-TL peer groups in Year 3 (see Figure 4.3). Furthermore, despite greater growth, EAL-TL and EAL-LL groups continued to demonstrate comparable receptive vocabulary to their respective monolingual peer groups in Year 3.

Similarly, language proficiency status significantly predicted sentence repetition in Year 3, $\beta = -10.26$, $p < .001$, 95% CI [-13.49, -7.03]. However, EAL status did not significantly predict sentence repetition, $\beta = -1.73$, $p = .293$, 95% CI [-4.96, 1.50], nor was there a significant Language Proficiency x EAL interaction, $\beta = -0.34$, $p = .892$, 95% CI [-5.20, 4.53]. Therefore, Mon-LL and EAL-LL groups continued to display poorer sentence repetition relative to Mon-TL and EAL-TL peer groups in Year 3 (see Figure 4.3). However, in contrast to Year 1, EAL-TL and EAL-LL groups showed comparable sentence repetition to their respective monolingual peer groups in Year 4.3 (see Figure 4.3).

Academic Attainment

As shown in Table 4.7, a greater proportion of children within the Mon-TL and EAL-TL groups performed on target in all five subjects in Year 2 assessments, as well as on target in each individual subject, relative to EAL-LL and Mon-LL groups. Moreover, as shown in Table 4.7, for both language proficiency groups, there was no significant association between EAL status and overall attainment, or attainment in specific subjects. Therefore, EAL-TL and EAL-LL groups showed comparable attainment in Year 2 assessments relative to their respective monolingual peer groups.

Table 4.7

The Number (Percentage) of Children Within Each Language Group Who Performed on Target in Each Subject in Year 2 Assessments. Chi-Square Tests Explored Attainment by EAL Status Separately For Groups With Typical Language Proficiency And Groups With Low Language Proficiency

Subject	Mon-TL (n = 28)	EAL-TL (n = 24)	χ^2 (df = 1)	*P*	*V*	Mon-LL (n = 18)	EAL-LL (n = 19)	χ^2 (df = 1)	*P*	*V*
All subjects	23 (82%)	22 (92%)	1.01	.316	.14	9 (50%)	9 (47%)	0.03	.873	.03
Science	26 (93%)	24 (100%)	1.78	.182	.19	12 (67%)	12 (63%)	0.05	.823	.04
Maths	25 (89%)	24 (100%)	2.73	.099	.23	12 (67%)	15 (79%)	0.71	.401	.14
Writing	25 (89%)	23 (96%)	0.78	.377	.12	11 (61%)	10 (53%)	0.27	.603	.09
Reading	26 (93%)	24 (100%)	1.78	.182	.19	11 (61%)	14 (74%)	0.67	.414	.13
Speaking and listening	24 (86%)	23 (96%)	1.52	.217	.17	11 (61%)	12 (63%)	0.02	.898	.02

Discussion

The current UK-based longitudinal study explored whether a monolingual-normed English language battery, administered in Year 1 (ages 5-6 years), could identify children with EAL who had persistent English language learning difficulties that impact on functional academic attainment. Comparisons were made between the language development and academic attainment of children with EAL and monolingual peers, who either had typical language development or met criteria for language impairment on the English language battery in Year 1. Despite showing moderately greater growth between Year 1 and Year 3, EAL-TL and EAL-LL groups did not significantly differ in overall language ability in Year 1 or Year 3 from their respective monolingual peer groups. Both EAL-LL and Mon-LL groups showed persistent language difficulties, performing on average at least 1.5 *SD* below the monolingual population mean on the full language battery at each time point. Furthermore, the EAL-LL group did not outperform the Mon-LL group on any individual language measure and indeed they showed particular difficulty relative to Mon-LL peers in expressive vocabulary, narrative comprehension (both Years 1 and 3), and in sentence repetition (Year 1 only). With regard to functional impact, EAL-TL and EAL-LL groups showed comparable attainment in national curriculum assessments in Year 2 relative to their respective monolingual peer groups. Therefore, monolingual criteria for language impairment on an English language battery identified children with EAL and monolingual peers who showed persistent English language learning difficulties, which were accompanied by comparable academic underachievement.

It is typically recommended that bilingual children with suspected language impairment are assessed in both of their languages, ideally using bilingual-normed measures (Bedore & Peña, 2008; RCSLT Specific Interest Group in Bilingualism, 2007). However, in populations containing a high proportion of children with diverse first languages, such as the UK, standardised first language measures are simply not available for all bilingual children, nor are they feasible to develop or administer (De Lamo White & Jin, 2011). Therefore, practitioners generally use monolingual-normed language measures when assessing bilingual children (Caesar & Kohler, 2007; Williams & McLeod, 2012). While many studies have indicated that bilingual children are often disadvantaged relative to monolingual peers on individual language measures (Babayiğit, 2014; Bialystok, Luk, et al., 2010; Burgoyne et al., 2009, 2011; Hutchinson et al., 2003; Verhoeven et al., 2011), there is limited evidence to support the accuracy of diagnostic decisions based on comprehensive language diagnostic batteries. Findings from the current study suggest that a comprehensive, monolingual-normed English language battery may have some practical value for identifying children with EAL who require targeted support to develop English language proficiency.

This work extends early investigation by Gillam et al. (2013), who explored the diagnostic accuracy of assessment in English, using Tomblin et al.'s (1996) EpSLI model, to identify language impairment in Spanish-English bilingual children, who had been exposed to English daily for at least a year. Gillam et al. found that combining all five English language composites in a predictive model yielded more acceptable diagnostic accuracy (81% sensitivity, 81% specificity) than the original EpiSLI criteria, of two or more composites falling -1.25 *SD* below the mean, which yielded many false-positives (95% sensitivity, 45% specificity). In the current study a stricter cut-off of -1.5 *SD* below the monolingual population mean on two or more composites was used and we took a novel, longitudinal approach to assessing the long-term utility of this cut-off. Since the EAL-LL group had marginally greater growth in overall language ability relative to the Mon-LL group, a proportion of children in the EAL-LL group may be false-positives. This is because children with EAL who are typical language learners should learn English faster than those with language impairment (Gillam et al., 2013). However, despite greater growth, EAL-LL and Mon-LL groups did not differ significantly in overall language ability in Year 1 or Year 3 and both groups performed on average at least 1.5 *SD* below the monolingual population mean at each time point. Thus, while we cannot be sure of the origins of the language difficulties experienced by the children in the EAL-LL group, these children experienced persistent English language difficulties over the early school years at a level comparable to their monolingual peers. Furthermore, children within the EAL-LL and Mon-LL groups achieved comparable attainment in Year 2 national curriculum assessments. These findings suggest that the English language battery has some practical value for identifying children with EAL who may benefit from targeted support, regardless of the origin of their language difficulties.

In the current study, the EAL-TL group had comparable receptive and expressive vocabulary, narrative comprehension, and receptive grammar to the Mon-TL group in Year 1 and Year 3. These findings appear to contradict research which found that typically developing bilingual children tend to achieve lower scores than monolingual peers on measures of these abilities (Babayiğit, 2014; Bialystok, Luk, et al., 2010; Burgoyne et al., 2009, 2011; Hutchinson et al., 2003; Verhoeven et al., 2011). While findings from this study could be interpreted as suggesting that these measures are not biased against typically developing children with EAL, the findings may reflect that the children were compared on the same tasks which were used to form the language groups. The EAL-TL group may have thus included children with particularly high levels of English language proficiency. Nevertheless, the findings highlight that many children with EAL perform comparably to monolingual peers on standardised language measures.

The EAL-LL group in the current study had comparable receptive vocabulary and receptive grammar to the Mon-LL group in Year 1 and Year 3. In contrast, the EAL-LL group performed more poorly relative to the Mon-LL group on measures of narrative comprehension and expressive vocabulary at both time points, suggesting that these are areas of particular difficulty for children learning EAL who start school with limited English proficiency. Both EAL-TL and EAL-LL groups had poorer sentence repetition accuracy relative to their respective monolingual peer groups in Year 1. However, both EAL-TL and EAL-LL groups displayed greater growth in sentence repetition accuracy relative to the monolingual groups and by Year 3, they did not significantly differ from their respective monolingual peer groups. These findings indicate that measures of sentence repetition accuracy may be biased against children with EAL, particularly in the early school years. Thus, assessment at school entry using a measure of sentence repetition accuracy may identify many false-positives, whose poor scores reflect lack of facility with English grammar, rather than a fundamental deficit in language learning. These results are somewhat consistent with studies reporting that typically developing bilingual children show impaired sentence repetition accuracy relative to typically developing monolingual peers (Thordardottir & Brandeker, 2013; Tsimpli et al., 2016). The greater growth in sentence repetition accuracy among children with EAL, relative to monolingual peers, may reflect increased exposure to English as the children progress through school, as sentence repetition accuracy is positively associated with language exposure (Thordardottir & Brandeker, 2013).

In the current study, there was no effect of EAL status within either language proficiency group on narrative recall. There was, however, an effect of language proficiency, whereby both EAL-LL and Mon-LL groups included fewer key story elements in their narratives relative to EAL-TL and Mon-TL groups. This is consistent with studies that have reported no effects of bilingualism on narrative macrostructure among children with typical development (Boerma et al., 2016; Hipfner-Boucher et al., 2014; Rezzonico et al., 2015; Rodina, 2016) or language impairment (Boerma et al., 2016; Cleave et al., 2010; Rezzonico et al., 2015). Findings are also consistent with reports that language impairment is associated with impaired narrative macrostructure in monolingual and bilingual children (Boerma et al., 2016; Cleave et al., 2010; Paradis et al., 2013; Rezzonico et al., 2015; Squires et al., 2014). Thus, findings from this study support the assertion that narrative recall tasks are a nonbiased measure of language ability in bilingual children (Boerma et al., 2016; Cleave et al., 2010).

The study has a number of strengths relative to previous investigations. The children were recruited from a population sample, therefore the sample is not biased towards particular language or cultural communities and is representative of children learning EAL in the UK. In contrast, previous studies on language impairment in bilingual children have typically recruited children from specific language communities (e.g. Spanish or French) and have selected children from clinical caseloads or specialist schools, which introduces bias. Another major strength of this study is the longitudinal design. This allowed the persistence of language difficulties experienced by children with EAL, and monolingual peers, to be compared over the early school years. Moreover, the unique design of this study, which resulted in the lag between the Year 1 and Year 3 assessments varying between 14 and 34 months, maximized the longitudinal element of the study. Finally, the incorporation of data from national curriculum assessments provided an ecologically valid measure of functional impact at school. While an increasing body of literature has explored how to distinguish language impairment from limited language experience in bilingual children, none of this research, to the authors knowledge, has considered functional impact.

However, our conclusions are tempered by limitations of the study. Assessing the children at more time points would have further strengthened this study by enabling us to determine whether the EAL-LL and Mon-LL groups continue to show comparable language ability and academic attainment, or whether the EAL-LL group do eventually catch up to the EAL-TL group. Moreover, as there were only two time points, the current analyses were limited to linear growth models. Additional time points would allow the investigation of potential non-linear growth trajectories. Such designs also allow for analysis of latent growth profiles, which may provide a complementary assessment by identifying children who demonstrate sustained improvement, versus those with more stable patterns of language deficit. The long term implications of using such English (or majority) language assessment could therefore be evaluated. These are important avenues for future research.

This study is also limited by the lack of data on exposure to English. Nevertheless, since all children in the current study started school at the mandatory age, we know that all children had been exposed to English for at least one year in school by the Year 1 assessment and for at least three years by the Year 3 assessment. We also know that 98% of children in the local area take advantage of government-funded nursery provision (15 hours per week from age three; Surrey County Council, Early Years Team, personal communication, 2015), suggesting that the majority of children had received regular exposure to English from age three. It should also be noted that since the children with EAL in the current study were recruited at school entry, they have only ever experienced an English school environment. As a result, the findings from the current study concerning comparisons with monolingual peers, and the predictive ability of the English language battery, may not be applicable to children with EAL with more variable backgrounds, such as children who join an English school during a later stage in their education.

Another point of consideration is that 10 children within the current study, eight of whom were within the EAL-LL group, were reported to have no phrase speech (NPS) in reception year, whereas only two children from the monolingual sample were reported to have NPS in reception year. This is consistent with the higher proportion of children with EAL, relative to monolingual children, who were reported to have NPS in the population survey phase. Our study is unable to determine whether NPS status in reception year in the EAL sample reflects more limited exposure to English prior to school entry, or is indicative of an underlying language disorder. More detailed information about home language environment and family history of language learning impairment is needed to distinguish these possibilities. Oversampling children with NPS in the EAL sample may have yielded an EAL-LL group with more persistent language learning challenges. Nevertheless, the EAL and monolingual groups in the current study were matched according to English language performance in Year 1.

The lack of assessment of first language proficiency is also a limitation. This would have allowed an investigation of the proportion of the EAL-LL group who also experienced difficulties in their first language, giving an indication of the specificity of the diagnostic criteria used in the study. Nevertheless, we argue that this is not a practical goal. In this study, 19 different first languages were represented and over 300 different first languages are represented by school children in the UK (NALDIC, 2012a). It is unlikely that robust diagnostic instruments will be available at any point in the near future for all of these languages. Thus, the investigation of English language tools that aid identification of children who need support with language learning and academic achievement, remains an important endeavour.

While the current study used a language battery comprised of six language measures from multiple publishers, practitioners may consider whether findings will hold if alternative language measures are used or, indeed, if a language battery such as the Clinical Evaluation of Language Fundamentals (CELF-4; Semel, Wiig, & Secord, 2003) is used. To the extent the language assessment taps receptive and expressive skills in multiple language domains, has demonstrated long-term stability in monolingual cohorts, and uses comparable cut-offs to the current study, one would expect the findings to hold. Nevertheless, it is important for future research to explore the long-term utility of other language batteries for the assessment of bilingual children.

In conclusion, the current UK-based longitudinal study found that criteria for language impairment on a monolingual-normed English language battery, administered in Year 1, identified children with EAL and monolingual children who showed persistent English language difficulties over the early school years, which were accompanied by a comparable academic impact. We cannot be certain that the children with EAL who were identified using the battery have an underlying language impairment. However, the findings indicate that these children may require additional targeted support, regardless of their origins of their language difficulties. Therefore, monolingual-normed language batteries in the majority language may have some practical value for assessing bilingual children in populations where first language measures are not available.

Chapter 5: Can Executive Function and Nonword Repetition Help Predict English Language Proficiency Over the Early School Years in Children Learning English as an Additional Language?

Abstract

Determining whether English language difficulties experienced by children learning English as an additional language (EAL) reflect an underlying language impairment or a lack of English language experience is a challenge. This study investigated whether measures of nonword repetition, executive function, and non-verbal ability can help predict English language proficiency over the early school years in children with EAL. Forty children with EAL (21 high-risk and 19 low-risk for language impairment at school entry) were assessed in Year 1 (ages 5-6 years) and Year 3 (ages 7-8 years) on a comprehensive English language battery and on measures of non-verbal ability, nonword repetition, and executive function. Year 1 selective attention, response inhibition, and visuospatial working memory scores did not significantly correlate with Year 3 English language proficiency. Year 1 nonword repetition, however, significantly predicted Year 3 English language proficiency, while verbal working memory and non-verbal ability were marginally significant predictors. Nevertheless, these measures did not improve the prediction of Year 3 English language proficiency over and above Year 1 measures of English language proficiency. The comprehensive English language battery administered in Year 1 was highly predictive of English language proficiency two years later and thus may help identify children with EAL who will likely experience persistent English language learning difficulties over the early school years.

Introduction

Countries around the world are increasingly multicultural and linguistically diverse. Approximately 21.9% of children and adolescents in the United States speak a language other than English at home (U. S. Census Bureau, 2014). Furthermore, in England, 20.1% of state-funded primary school pupils speak English as an additional language (EAL; Department for Education, 2016) and over 300 different first languages are represented by school pupils (NALDIC, 2012a). Relative to monolingual peers, children with EAL typically show poorer attainment during the early school years, especially in communication and language development (Department for Education, 2015a, 2015c), and typically perform more poorly on standardised English language measures (Babayiğit, 2014; Bialystok, Luk, et al., 2010; Burgoyne et al., 2011; Geva & Farnia, 2012). It is difficult to determine whether English language difficulties experienced by children with EAL reflect an underlying language impairment or a lack of English language experience (De Lamo White & Jin, 2011; Paradis et al., 2013). While dual language assessment is recommended (Bedore & Peña, 2008; RCSLT Specific Interest Group in Bilingualism, 2007), standardised first language measures are not available for all bilingual children in highly diverse populations, such as the UK, nor are they feasible to develop or administer (De Lamo White & Jin, 2011). An alternative approach is to use processing-based measures which can be administered in English and may tap language learning competence (Kohnert et al., 2009). Measures of nonword repetition and executive function are prime candidates as deficits in these processes are associated with language impairment in monolingual children (Estes et al., 2007; Henry et al., 2012a). The current study utilised a longitudinal approach to explore the potential use of measures of nonword repetition and executive function to predict English language proficiency over the early school years in children learning EAL.

Nonword repetition tasks require children to repeat nonsense words which conform to the phonological structure of a specific language and vary in length and likeness to real words (Coady & Evans, 2008). Such tasks are thought to tap phonological short-term memory, which has been hypothesised to contribute to language learning (Baddeley et al., 1998; Gathercole, 2006). Nonword repetition has been identified as a potentially useful measure of learning language competence and marker for language impairment in bilingual children, as such tasks are less dependent on language-specific knowledge and exposure than is the case for standardised language measures (Chiat, 2015; Paradis, 2016; Thordardottir & Brandeker, 2013). Language impairment is associated with pronounced deficits in nonword repetition in both monolingual (for a meta-analysis, see Estes et al., 2007) and bilingual children (Armon-Lotem & Meir, 2016; Boerma et al., 2015; Gutiérrez-Clellen & Simon-Cereijido, 2010; Paradis et al., 2013; Thordardottir & Brandeker, 2013; Windsor et al., 2010). However, nonword repetition deficits are not specific to language impairment (Gathercole, 2006), nor do such tasks have sufficiently acceptable diagnostic accuracy to be used alone to identify language impairment in either monolingual (for a meta-analysis, see Pawłowska, 2014) or bilingual children (Armon-Lotem & Meir, 2016; Gutiérrez-Clellen & Simon-Cereijido, 2010; Paradis et al., 2013; Thordardottir & Brandeker, 2013; Windsor et al., 2010). However, Boerma et al. (2015) found that a nonword repetition task, designed to be minimally influenced by knowledge from the specific languages represented in their study, had acceptable diagnostic accuracy (83% sensitivity, 93% specificity) for identifying language impairment in bilingual children.

Paradis (2011) investigated whether processing-based measures, including nonword repetition, can explain individual variation in second language competence in bilingual children. Specifically, Paradis (2011) found that non-verbal ability and phonological short-term memory, assessed using nonword repetition and digit-span subtests, each uniquely predicted concurrent English receptive vocabulary and expressive grammar in children learning EAL (aged 4-7 years). Interestingly, these measures explained more variance in concurrent English language proficiency than environmental factors including months of English exposure and English language richness in the home. Paradis (2011, 2016) concluded that these measures tap language learning aptitude and explain individual variation in second language acquisition. This indicates that such measures may be useful to administer to children learning EAL to help predict later English language proficiency and identify those who may display persistent English language learning difficulties. However, this research was cross-sectional and longitudinal studies are needed to help elucidate causal relationships.

Early longitudinal research on monolingual children concluded that nonword repetition predicts early vocabulary development (Gathercole, Willis, Emslie, &

Baddeley, 1992). However, this view has been criticised by Melby-Lervåg et al. (2012), who found that while there were moderate concurrent correlations between receptive vocabulary and nonword repetition in typically developing monolingual children, between ages 4-7 years, neither predicted the other longitudinally, after controlling for prior measures of each construct (i.e., the autoregressive effect). Similarly, Farnia and Geva (2011) found that nonword repetition in Grade 1 (ages 6-7 years) predicted receptive vocabulary in both Grade 1 and Grade 6 (ages 11-12 years), for both monolingual children and children learning EAL. However, nonword repetition in Grade 1 did not predict vocabulary growth. These studies do not support the theory that nonword repetition taps a construct which has a causal influence on language learning. There is, however, a need for more longitudinal research to explore the relationship between nonword repetition and language learning in bilingual children, particularly research that considers language development across a variety of domains, rather than just vocabulary development.

Measures of executive function have also been identified as potentially informative of language competence in bilingual children (Jensen de López & Baker, 2015). Executive functions are higher-order cognitive control processes which regulate goal-directed behaviour and cognitions (Gioia et al., 2001; Miyake et al., 2000). Monolingual children with language impairment display deficits relative to typically developing peers on a range of executive function measures, including response inhibition (Henry et al., 2012a; Spaulding, 2010), selective attention (Gooch et al., 2014), verbal working memory (Henry et al., 2012a; Vugs et al., 2014), and visuospatial working memory (Henry et al., 2012a; for a meta-analysis, see Vugs et al., 2013). Such findings indicate that executive function deficits may have a causal role in language learning and processing and may in part underlie language impairment (Bishop et al., 2014; Im-Bolter et al., 2006). If this were the case, measures of executive function could help distinguish language impairment from limited language experience in children with EAL. However, executive function deficits are not specific to children with language impairment (e.g., see Craig et al., 2016), nor do all monolingual children with language impairment display such deficits (Henry et al., 2012a).

While the theory that executive function exerts a casual influence on language is one possibility, executive function and language may also be related as language is utilised in executive function tasks (i.e., verbal mediation) or the relationship may reflect the influence of common underlying factors (Bishop et al., 2014; Gooch et al., 2016). Further still, there may be a reciprocal relationship between executive function and language (Gooch et al., 2016). In a recent longitudinal study of monolingual children, Gooch et al. (2016) found that language and executive function (assessed using measures of response inhibition, selective attention, and visuospatial memory) were strongly concurrently related during the first three years of school (ages 4-7 years), however neither predicted the other longitudinally after controlling for autoregressive effects. Gooch et al. noted that their findings were most in line with the theory that the relationship between executive function and language reflects the influence of common underlying factors.

In bilingual children, the relationship between language and executive function is further complicated, as it has been hypothesised that bilingualism enhances executive function (Bialystok et al., 2009). Specifically, bilinguals are hypothesised to utilise executive functions to control their competing languages, which strengthens executive function over time and leads to advantages in such processes relative to monolingual peers (Bialystok et al., 2009). Many cross-sectional studies on bilingual children have indeed reported bilingual executive function advantages on specific tasks (e.g., Calvo & Bialystok, 2014; Carlson & Meltzoff, 2008; Martin-Rhee & Bialystok, 2008). However, many studies have failed to replicate such advantages, making this theory highly controversial (e.g., Antón et al., 2014; Gathercole et al., 2014; Namazi & Thordardottir, 2010).

Little research has considered executive function in bilingual children with language impairment. Engel de Abreu et al. (2014) proposed that bilingualism may attenuate executive function deficits associated with language impairment on specific measures. However, Engel de Abreu et al. also suggested that while this attenuation may be evident when bilingual children with language impairment are compared to monolingual peers with language impairment, executive function deficits may still be apparent when such children are compared to typically developing bilingual peers. In support of this theory, Engel de Abreu et al. found that bilingual children with language impairment showed comparable interference suppression relative to typically developing monolingual children, yet such children performed more poorly relative to typically developing bilingual peers. Within this study, bilingual children with language impairment also showed impaired verbal working memory relative to typically developing bilingual peers, but were not impaired on visuospatial working memory or selective attention. Other research has found that bilingual children with language impairment, or low proficiency in both languages, show impaired verbal working memory (Sandgren & Holmström, 2015) and shifting (Iluz-Cohen & Armon-Lotem, 2013; Sandgren & Holmström, 2015) relative to bilingual peers with typical proficiency in both languages. Therefore, the limited research in this area has indicated that language impairment in bilingual children is associated with deficits on specific executive function tasks, highlighting the possibility that such tasks may be potentially informative of language learning competence in bilingual children.

To the author's knowledge, only one study has considered whether executive function predicts later language competence in bilingual children. In a cohort-sequential study of Spanish-speaking children learning EAL in the United States, who were in grades one, two, and three during the first wave of testing, Swanson, Orosco, and Lussier (2015) found that English verbal working memory, but not visuospatial working memory or inhibition, predicted greater performance on an English language battery two years later. However, Swanson et al. did not control for the autoregressive effect of Wave 1 language and thus it is not clear whether Wave 1 executive function predicted growth in English language proficiency.

The current UK-based longitudinal study investigated whether Year 1 (ages 5-6 years) measures of nonword repetition, non-verbal ability, and executive function (inhibition, selective attention, and verbal and visuospatial working memory) could predict English language proficiency in Year 3 (ages 7-8 years), after controlling for Year 1 English language proficiency. Thus, the study investigated whether these measures could predict growth in English language proficiency. Furthermore, concurrent relationships between English language proficiency and nonword repetition, executive function, and non-verbal ability in Year 1 and Year 3 were also investigated. While this study mainly focused on nonword repetition and executive function, non-verbal ability was included as previous research has indicated that non-verbal ability explains unique variance in second language competence (Paradis, 2011).

Theories that measures of nonword repetition (Baddeley et al., 1998; Gathercole, 2006), executive function (Bishop et al., 2014; Im-Bolter et al., 2006) and nonverbal-ability (Paradis, 2011) tap abilities which have a causal role in language learning would predict that such measures will indeed predict growth in English language proficiency. Such findings would further indicate that these measures may be useful to use in combination with an English language battery to predict later English language proficiency in children with EAL. In turn, this may help identify children with EAL who will show persistent English language learning difficulties over the early school years, informing decisions about allocation of early targeted interventions. Nevertheless, previous longitudinal research on nonword repetition and vocabulary development in monolingual (Melby-Lervåg et al., 2012) and bilingual children (Farnia & Geva, 2011), as well as longitudinal research on language and executive function in monolingual children (Gooch et al., 2016), indicates that such measures may not improve prediction of later English language proficiency in children with EAL, once earlier English language proficiency is taken into account.

Method

Study Design

All children were participants in the Surrey Communication and Language in Education Study (SCALES). All children who started reception year (kindergarten) in a state-maintained school in Surrey, UK, in September 2011 were eligible to take part in the first phase of SCALES (*N* = 12,398). Teachers completed an online questionnaire for 7,267 reception year children (ages 4-5 years), who attended a total of 161 state maintained schools across Surrey (59% of all eligible children; 61% of all eligible schools). Teachers reported that the main language spoken in the homes of 782 children (11%) was a language other than English; these children were regarded as speaking EAL.

The online questionnaire included the Children’s Communication Checklist-Short (CCC-S). The CCC-S is comprised of 13 items from the Children’s Communication Checklist-2 (CCC-2; Bishop, 2003a) which best discriminated children with language impairment from typically developing peers in a validation study (Norbury et al., 2004). Within the CCC-S, the respondent rates the frequency with which each child displays six communicative errors and seven communicative strengths. High CCC-S scores reflect greater language difficulties. Monolingual children and children with EAL scoring 1 *SD* or more above the monolingual population mean for their age group (autumn, spring, or summer born) and sex were regarded as high-risk for language impairment. The CCC-S was not completed in full for children with *no phrase speech* (NPS; i.e., children who did not produce utterances of at least two to three words, according to teacher report). These children (62 monolingual children, 27 children with EAL) received the maximum CCC-S score and were regarded as high-risk for language impairment. All remaining children were regarded as low-risk for language impairment.

In the second phase of SCALES, 529 monolingual children (329 high-risk, 200 low-risk) and 61 children with EAL (36 high-risk, 25 low-risk), from a total of 151 state-maintained schools, completed an in-depth assessment in Year 1 (ages 5-6 years; See Chapter 4 for more details about the recruitment process). Of these children, 499 monolingual children (307 high-risk, 192 low-risk) and 51 children with EAL (30 high-risk, 21 low-risk) were also assessed in Year 3 (ages 7-8 years). Within the EAL sample, the parents of three children opted their child out of the study prior to the Year 3 assessment, three children moved abroad between the Year 1 and Year 3 assessment, and four children were untraceable. In Year 1, children were randomly assigned to one of six assessment blocks, which mapped onto the six half terms of the UK school year. In Year 3, children remained in their original assessment block, however the order of the blocks was reversed. Therefore, a child who was assessed in the first half term of Year 1 was re-assessed in the last half term of Year 3. Consequently, the lag between Year 1 and Year 3 assessments for each child intentionally varied between 14 and 34 months.

An opt-out consent procedure was adopted for the first phase of SCALES, in which anonymised teacher questionnaire data were submitted to the study unless parents opted out. Parents provided informed, written consent for the second phase of SCALES, which involved in-depth, individual assessment. The study protocol was developed in collaboration with Surrey County Council and was granted ethical approval by the Ethics Committee at Royal Holloway, University of London.

Participants

This study reports data for 40 children with EAL (22 boys, 18 girls) who were assessed in Year 1 and Year 3. Twenty-one of these children were high-risk for language impairment in reception year (ages 4-5 years; including eight children who were reported to have NPS in reception year) and 19 children were low-risk for language impairment in reception year. Of the 51 children with EAL who were assessed in Year 1 and Year 3, four were excluded for having a medical diagnosis reported in Year 1 or Year 3 (autism spectrum disorder in all four cases) and two were excluded for scoring 2 *SD* or more below the monolingual population mean on a non-verbal ability composite in Year 1 (outlined below). Four children were excluded for not completing the full language battery in Year 1 and one further child was excluded for not completing the full language battery in Year 3.

All children started school at the compulsory age in the UK and thus had all received at least one year of exposure to English in school prior to the Year 1 assessment. Of the current sample, 19 different first languages were represented. The most frequently reported first languages were Polish (6 children), Bengali (5 children), and Urdu (5 children). All other languages had three speakers or fewer. Each child attended one of 33 state-maintained primary or infant schools in Surrey in Year 1 and one of 34 state-maintained primary or junior schools in Surrey in Year 3.

The children within the current sample were aged between 5 years 3 months (63 months) and 6 years 8 months (80 months; M = 71.30 months, SD = 4.26) during the Year 1 assessment and between 7 years 1 month (85 months) and 8 years 8 months (104 months; M = 95.38 months, SD = 4.82) during the Year 3 assessment. The mean lag between assessments was 24.07 months (SD = 5.90). Income Deprivation Affecting Children Index (IDACI; McLennan et al., 2011) rank scores were retrieved using the children's home postcodes to provide a measure of neighbourhood deprivation. IDACI rank scores range from 1 to 32,482, with lower scores assigned to areas in England with proportionally more children living in income deprived families (defined by receiving certain means tested benefits). IDACI rank scores ranged from 5,293 to 31,962 within the sample (M = 18,184.25, SD = 8,766.28), which indicates that the children came from a wide range of socioeconomic backgrounds.

Measures and Procedures

Each child completed an individual two hour assessment session with a trained researcher in Year 1 and Year 3. Assessment sessions took place in a quiet area in each child's school and included frequent breaks. All tasks were administered in English. The measures relevant to this study included assessments of language, non-verbal ability, nonword repetition, and executive function.

Language. In Year 1 and Year 3, children completed a comprehensive English language battery, which was comprised of expressive and receptive measures of vocabulary, grammar, and narrative. Raw scores on the six language measures from the Year 1 and Year 3 assessments were converted into age-adjusted *z*-scores and were subsequently used to produce a total language composite *z*-score for each time point, based on norms derived from the monolingual population sample.

Expressive One-Word Picture Vocabulary Test, Fourth Edition (EOWPVT-4; Martin & Brownell, 2011a). Children were presented with a series of individual pictures and were asked to name the object, action, or concept which was depicted in each picture. Scores ranged from 0-190, with higher scores indicating greater expressive vocabulary.

Receptive One-Word Picture Vocabulary Test, Fourth Edition (ROWPVT-4; Martin & Brownell, 2011b). The examiner read individual words and children were asked to select a picture, from an array of four, which depicted each word. Scores ranged from 0-190, with higher scores indicating greater receptive vocabulary.

School Age Sentence Imitation Task - English 32 (SASIT-E32; Marinis et al., 2011). Children listened to 32 pre-recorded sentences over headphones and were asked to repeat each sentence out loud. All repetitions were audio-recorded and 1 point was allocated for every sentence that was repeated correctly (word for word; maximum = 32). Sentence repetition tasks are considered a measure of expressive grammar (Lust et al., 1996; Polišenská et al., 2015).

Test for Reception of Grammar - Short (TROG-S). This is a short form of the TROG-2 (Bishop, 2003b). Children heard up to 40 sentences and were asked to select a picture, from an array of four, which depicted each sentence. The task was discontinued if a child answered incorrectly on six consecutive items. One point was allocated for each correct response (maximum = 40).

Narrative recall (ACE 6-11; Adams et al., 2001). Children listened to a story about a monkey in a forest, which was played over headphones and accompanied by eight pictures. After listening to the story, children were shown the pictures again and were asked to tell the story in their own words. Each child’s narrative was audio-recorded and 1 point was awarded for each of 35 key elements of the story which were correctly recalled (maximum = 35).

Narrative comprehension. Following the narrative recall task, children were asked 12 comprehension questions about the story (six literal and six inference questions). Children received 0 points for an incorrect response, 1 point for a partially correct response, and 2 points for a correct response (maximum = 24).

Non-verbal ability. In Year 1, children completed the Block Design and Matrix Reasoning subtests of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III; Wechsler, 2003b). In Year 3, children completed the Block Design and Matrix Reasoning subtests of the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003a). At each time point, raw scores on the two tasks were converted into an age-standardised non-verbal ability composite *z*-score, based on norms derived from the monolingual population sample.

Nonword repetition. Children completed a nonword repetition task (Nash, 2012) in Year 1 and Year 3. Children were asked to repeat 30 nonwords which were pre-recorded and played over headphones. Children were introduced to the nonwords as being from an alien language and they were asked to copy each word the alien said. Fifteen of the nonwords were high in likeness to English words (e.g. ‘bisurt’) and 15 were low in likeness to English words (e.g. ‘gowyibeeg’). Within each likeness group, five nonwords had two syllables, five had three syllables, and five had four syllables. Each repetition was audio-recorded and scored as correct or incorrect (maximum = 30).

Executive function. In Year 1 and Year 3 children completed a Visual Search task (Apples Task; Breckenridge, 2008) to assess selective attention, a computerised Go/No-Go task (Gooch et al., 2016) to assess response inhibition, and two computerised self-ordered pointing tasks to assess verbal and visuospatial working memory (Cragg & Nation, 2007).

Visual Search (Apples Task; Breckenridge, 2008). Children were presented with an array of targets (30 red apples) and distracters (81 red strawberries and 81 white apples), on a laminated A4 sheet, and were given one minute to identify as many targets as possible by marking them with a wipe-board pen. The number of targets correctly marked (hits; maximum = 30) and the number of distracters incorrectly marked (commission errors) were recorded. A visual search efficiency score was calculated ((hits - commission errors)/60 seconds) for each child. A high visual search efficiency score indicates better selective attention (maximum = 0.5).

Go/No-Go (Gooch et al., 2016). Children initially completed a block of 30 Go trials, in which they were asked to press a response key as quickly as they could when the Go stimulus (a bug) appeared on the screen. This was followed by a block containing 60 (75%) Go trials and 20 (25%) No-Go trials, which were presented in a random order. Children were asked to press the response key as quickly as they could when the Go stimulus (a bug) appeared, but not respond when the NoGo stimulus (a ladybird) appeared. Thus, in the No-Go trials, children had to inhibit the response which had been established in the first block of Go trials. Each child was given three practice trials with feedback prior to the first block and eight practice trials with feedback prior to the second block. In both blocks, the stimuli were presented in the centre of the screen and were preceded by a centrally-presented fixation cross and a varied lag of 300ms, 600ms, or 900ms. Responses made within 2000ms of stimuli presentation were recorded. Responses made within 100ms were considered to be anticipatory errors (Luce, 1986) and were subsequently excluded. The number of commission errors each child made was calculated and used as a measure of behavioural inhibition (responses to a No-Go stimulus; maximum = 20).

Self-Ordered Pointing Task (SOPT). Children completed two adapted versions of Cragg and Nation's (2007) computerised object SOPT and abstract SOPT. Both tasks had the same structure and required children to generate responses while simultaneously monitoring and updating a sequence held in mind. The object SOPT used easy-to-verbalise black and white line drawings of everyday objects as the stimuli, while the abstract SOPT used hard-to-verbalise black and white abstract patterns. The abstract SOPT is a measure of visuospatial working memory. In contrast, the object SOPT is considered a measure of verbal working memory, as children can use the verbal label of each image to help them complete the task. The nature of the object SOPT stimuli meant that children could use either English or their first language to support their performance. Each task was made up of a block of three practice trials, followed by three blocks of three trials. Within each trial, pictures were presented in an array on a computer screen and children were instructed to try to click on each picture once, using the mouse, and avoid selecting the same picture twice. The same pictures were presented in a different array after each response was made and the trial was over when a response had been made for the number of pictures presented. The practice block contained three pictures, while block one had four pictures, block two had five pictures, and block three had six pictures. Unique sets of pictures were used within each block and all pictures were presented in equally sized boxes. Text appeared on the screen at the start of each block to label the block as Level 1, 2 or 3. Additionally, text appeared at the start of each trial, labelling each as Game 1, 2 or 3. There were no time limits for selecting each picture and reaction time was not recorded. The number of errors made within each trial was recorded and the total number of errors made across blocks one, two, and three on each task was calculated (maximum = 36).

Data Analysis

Repeated measures t-tests assessed whether the children with EAL as a group demonstrated growth between Year 1 and Year 3 in language composite z-scores, non-verbal ability composite z-scores, and raw scores on measures of nonword repetition and executive function. Improvements in z-scores would indicate that the children demonstrated growth between Year 1 and Year 3 in terms of their performance relative to the monolingual population sample.

Pearson's correlations between Year 1 and Year 3 language composite z-scores, non-verbal ability composite z-scores, and raw scores on measures of nonword repetition and executive function are reported. Simultaneous linear regression models investigated concurrent predictors of language composite z-scores in Year 1 and Year 3. Predictor variables were entered into each model if they significantly correlated with the outcome variable. Linear regression models also investigated longitudinal (i.e., Year 1) predictors of Year 3 language composite z-scores. Firstly, a simultaneous regression model was run using Year 1 measures of nonword repetition, executive function, and non-verbal ability, which significantly correlated with Year 3 language composite z-scores, as predictor variables. Secondly, a hierarchical linear regression model was run to investigate whether these variables predict Year 3 language composite z-scores after controlling for the autoregressive effect of Year 1 language composite z-scores (i.e., investigate whether these variables can predict growth in English language proficiency). Year 1 language composite z-scores were entered into the first block of the model and the remaining Year 1 measures, which significantly correlated with Year 3 language composite z-scores, were simultaneously entered into the second block.

Since the lag in months between Year 1 and Year 3 assessments varied between 14 and 32 months within the sample, the two longitudinal linear regression models (i.e., before and after controlling for Year 1 language composite z-scores) are additionally presented with assessment lag entered as a predictor variable. Thus, the influence of varying assessment lag was controlled for within the models.

Missing Data

Year 1 Go/No-Go data were missing for one child and Year 1 object SOPT data were missing for two children. Furthermore, Year 3 non-verbal ability z-scores were missing for two children who did not complete the WISC-IV Matrix Reasoning subtest in Year 3. Missing data were not imputed.

Results

Descriptive statistics for English language composite z-scores, non-verbal ability composite z-scores, and raw scores on measures of nonword repetition and executive function from the Year 1 and Year 3 assessments are presented in Table 5.1. The children with EAL as a group had significantly higher language composite z-scores in Year 3 than in Year 1 (see Table 5.1). Thus, the group demonstrated growth in English language proficiency between Year 1 and Year 3 in terms of their performance relative to the monolingual population sample. There was no significant difference between non-verbal ability composite z-scores in Year 1 and Year 3 (see Table 5.1), thus the group's non-verbal ability in Year 1 and Year 3 was constant relative to the monolingual population sample. The children's raw scores on measures of nonword repetition and executive function were significantly better in Year 3 than in Year 1 (see Table 5.1).

Concurrent Predictors of English Language Proficiency

Year 1 non-verbal ability composite z-scores and Year 1 selective attention (visual search efficiency), response inhibition (Go/No-Go commission errors), and verbal and visuospatial working memory (object and abstract SOPT errors) raw scores were not significantly correlated with Year 1 language composite z-scores (see Table 5.2). In contrast, Year 1 nonword repetition raw scores were significantly correlated with Year 1 language composite z-scores (see Table 5.2). Nonword repetition was subsequently entered into a linear regression model as the only predictor of Year 1 language composite z-scores. The model was significant, $F(1, 38) = 18.63$, $p < .001$, and explained 33% of the variance. Greater nonword repetition accuracy significantly predicted greater Year 1 language composite z-scores, *b* = 0.10, 95% CI [0.05, 0.15], β = 0.57, *t* = 4.32, *p* < .001.

Table 5.1

Means and Standard Deviations for Language Composite Z-Scores, Non-Verbal Ability Composite Z-Scores, and Raw Scores on Measures of Nonword Repetition and Executive Function in Year 1 and Year 3

	Year 1			*Year 3*					
Variable	*n*	*M*	*SD*	*n*	*M*	*SD*	*t*	*p*	*d*
Language	40	-0.96	1.10	40	-0.62	1.20	3.29	.002	.30
Non-verbal ability	40	-0.23	0.95	38	-0.09	0.82	1.29	.204	.15
Nonword repetition	40	19.32	6.28	40	21.88	4.26	4.03	< .001	.48
Visual search	40	0.22	0.05	40	0.28	0.08	4.62	< .001	.87
Go/No-Go errors	39	6.56	3.02	40	5.22	3.04	2.42	.021	.44
O-SOPT errors	38	6.84	3.05	40	4.90	2.55	3.82	.001	.69
A-SOPT errors	40	8.85	2.46	40	7.63	3.02	2.25	.030	.45

Note. O-SOPT = object SOPT; A-SOPT = abstract SOPT.

Table 5.2

Concurrent and Longitudinal Pearson's Correlations Between Year 1 and Year 3 Language Composite Z-Scores, Non-Verbal Ability Composite Z-Scores, and Raw Scores on Measures of Nonword Repetition and Executive Function

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Language Y1	1												
2. Language Y3	.84***	1											
3. Non-verbal ability Y1	.28	.40*	1										
4. Non-verbal ability Y3	.60***	.63***	.64***	1									
5. Nonword rep. Y1	.57***	.56***	.26	.55***	1								
6. Nonword rep. Y3	.53***	.58***	.24	.51**	.78***	1							
7. Visual search Y1	-.02	-.03	.01	.17	.20	.22	1						
8. Visual search Y3	.24	.34*	.58***	.46**	.20	.27	.32*	1					
9. Go/No-Go errors Y1	-.01	-.02	-.13	-.11	-.06	.01	-.05	-.23	1				
10. Go/No-Go errors Y3	-.24	-.21	-.15	-.19	-.21	-.14	-.05	.03	.21	1			
11. O-SOPT errors Y1	-.27	-.33*	-.11	-.26	-.11	-.25	-.14	-.17	.14	.13	1		
12. O-SOPT errors Y3	-.51***	-.48**	-.20	-.31	-.11	-.23	-.22	-.36*	.08	.15	.26	1	
13. A-SOPT errors Y1	-.17	-.20	-.33*	-.21	-.04	-.03	-.04	-.18	.23	.26	.29	.17	1
14. A-SOPT errors Y3	-.22	-.14	-.29	-.41*	-.02	-.05	-.10	-.19	.15	-.09	-.20	.21	.22

Note. Y1 = Year 1; Y3 = Year 3; Nonword rep. = nonword repetition; O-SOPT = object SOPT; A-SOPT = abstract SOPT.

*$p < .05$, **$p < .01$, ***$p < .001$

Year 3 response inhibition (Go/No-Go commission errors) and visuospatial working memory (abstract SOPT) raw scores were not significantly correlated with Year 3 language composite z-scores (see Table 5.2). However, Year 3 non-verbal ability composite z-scores and nonword repetition, selective attention (visual search efficiency), and verbal working memory (object SOPT errors) raw scores were each significantly correlated with Year 3 language composite z-scores (see Table 5.2). These significant variables were entered simultaneously into a linear regression model predicting Year 3 language composite z-scores (see Table 5.3). The model was significant, $F(4, 33) = 10.57$, $p < .001$, and explained 56% of the variance. After controlling for the other variables within the model, Year 3 selective attention (visual search efficiency) did not significantly predict Year 3 language composite z-scores. However, Year 3 non-verbal ability, nonword repetition, and verbal working memory (object SOPT errors) each significantly predicted Year 3 language composite z-scores. Specifically, greater non-verbal ability, nonword repetition accuracy, and verbal working memory (i.e., fewer object SOPT errors) in Year 3 predicted greater Year 3 language composite z-scores.

Table 5.3

Linear Regression Predicting Year 3 Language Composite Z-Scores from Year 3 Non-Verbal Ability Composite Z-Scores, and Year 3 Raw Scores on Measures of Nonword Repetition, Selective Attention, and Verbal Working Memory

Variable	*b* [95% CI]	β	*t*	*p*
Non-verbal ability Y3	0.59 [0.14, 1.04]	0.39	2.69	.011
Nonword repetition Y3	0.09 [0.01, 0.17]	0.32	2.35	.025
Visual search efficiency Y3	-0.35 [-4.45, 3.76]	-0.02	-0.17	.865
Object SOPT errors Y3	-0.14 [-0.26, -0.02]	-0.29	-2.32	.027
Constant	-1.72 [-3.97, 0.53]		-1.56	.129

Longitudinal Predictors of English Language Proficiency

There was a large significant correlation between language composite z-scores in Year 1 and Year 3 (see Table 5.2 and Figure 5.1), indicating good stability of individual differences in English language proficiency within the EAL group. Year 1 selective attention (visual search efficiency), response inhibition (Go/No-Go commission errors), and visuospatial working memory (abstract SOPT errors) raw scores were not significantly correlated with Year 3 language composite z-scores (see Table 5.2). However, Year 1 non-verbal ability composite z-scores and Year 1 nonword repetition and verbal working memory (object SOPT errors) raw scores were each significantly correlated with Year 3 language composite z-scores (see Table 5.2, Figure 5.2, Figure 5.3, and Figure 5.4).

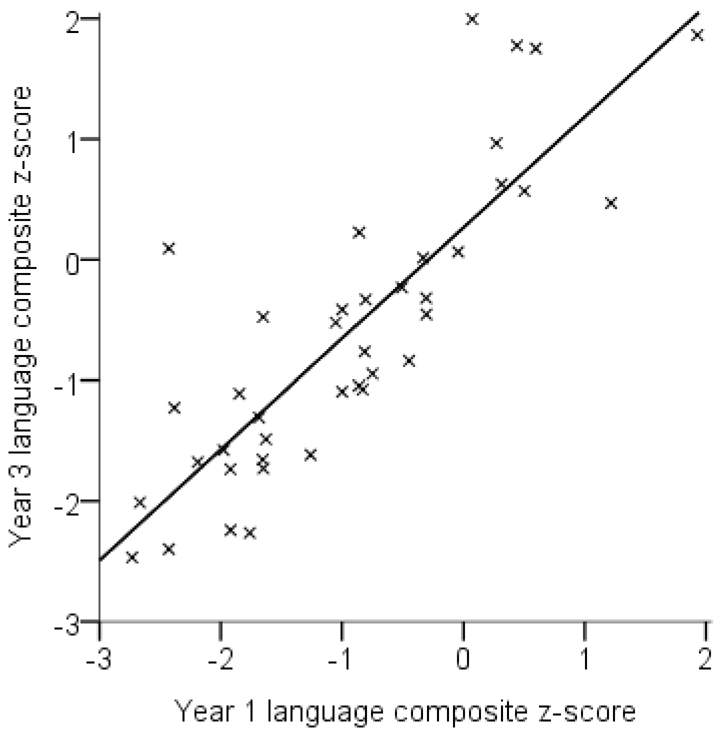

Figure 5.1. The relationship between language composite z-scores in Year 1 and Year 3.

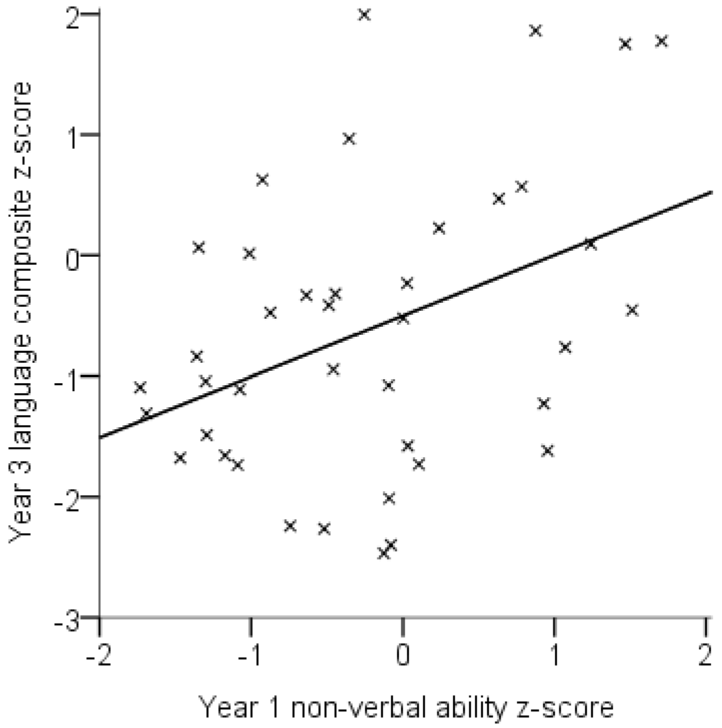

Figure 5.2. The relationship between Year 1 non-verbal ability composite z-scores and Year 3 language composite z-scores.

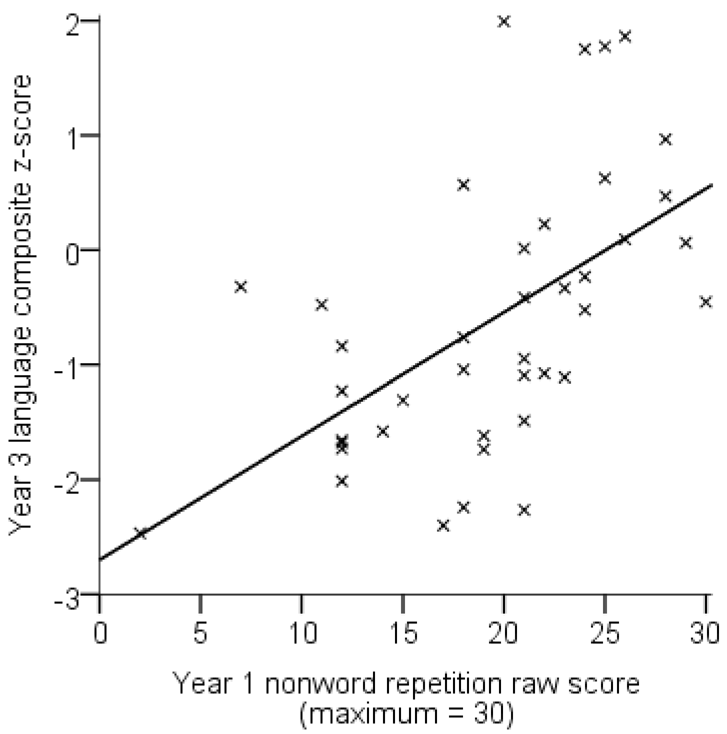

Figure 5.3. The relationship between Year 1 nonword repetition raw scores and Year 3 language composite z-scores.

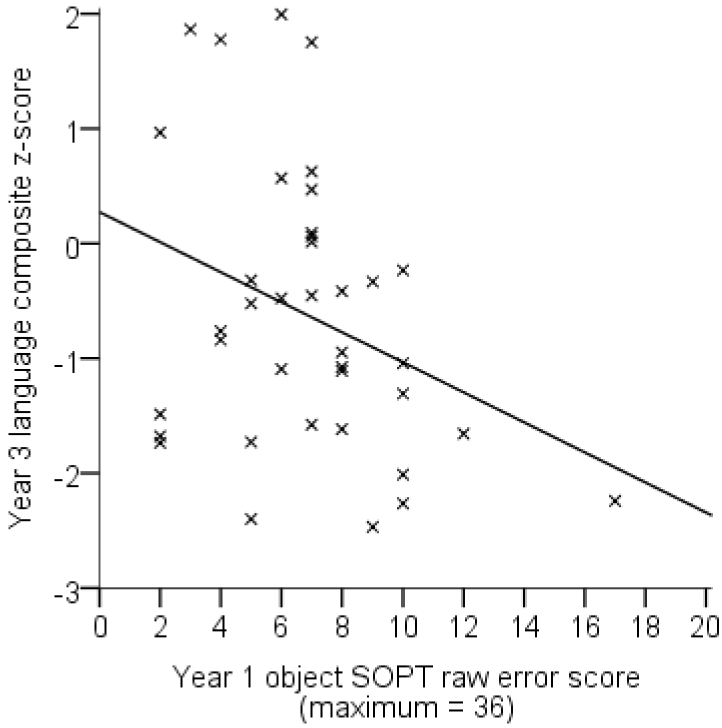

Figure 5.4. The relationship between Year 1 object SOPT raw scores and Year 3 language composite z-scores.

Year 1 non-verbal ability composite z-scores and Year 1 nonword repetition and verbal working memory (object SOPT errors) raw scores were entered simultaneously into a linear regression model predicting Year 3 language composite z-scores (see Table 5.4, Model 1). The model was significant, $F(3, 34) = 8.81$, $p < .001$, and explained 44% of the variance. Year 1 nonword repetition significantly predicted Year 3 language composite z-scores, while Year 1 non-verbal ability and verbal working memory (object SOPT errors) were marginally significant predictors. Standardised beta coefficients in Table 5.4 indicate that greater nonword repetition accuracy in Year 1 predicted greater Year 3 language composite z-scores. Furthermore, greater non-verbal ability and verbal working memory (i.e., fewer object SOPT errors) in Year 1 predicted marginally greater Year 3 language composite z-scores. When lag in months between Year 1 and Year 3 assessments was controlled in Model 2, $R^2 = .45$, $F(4, 33) = 6.68$, $p < .001$, all effects remained the same and assessment lag did not significantly predict Year 3 language composite z-scores (see Table 5.4, Model 2).

Hierarchical linear regression then investigated whether Year 1 non-verbal ability, nonword repetition, and verbal working memory (object SOPT errors) predicted Year 3 language composite z-scores, after controlling for the autoregressive effect. Year 1 language composite z-scores were entered into the first block of the model (see Table 5.5, Model 1). The first block was significant, $F(1, 36) = 92.26$, $p < .001$, and explained 72% of the variance in Year 3 language composite z-scores. Year 1 non-verbal ability composite z-scores and Year 1 nonword repetition and verbal working memory (object SOPT errors) raw scores were additionally entered into the second block. These variables did not significantly improve the model, $F(3, 33) = 1.70$, $p = .187$, and only explained an additional 4% of the variance. The final model was significant, $F(4, 33) = 25.68$, $p < .001$, and explained 76% of the variance. In the final model, Year 1 language composite z-scores were the only significant predictor of Year 3 language composite z-scores (see Table 5.5, Model 1). Thus, Year 1 non-verbal ability, nonword repetition, and verbal working memory did not predict Year 3 language composite z-scores after controlling for the variance explained by Year 1 language composite z-scores. Lag in months between Year 1 and Year 3 assessments was controlled for in an additional hierarchical linear regression model (see Table 5.5, Model 2). Assessment lag did not significantly predict Year 3 language composite z-scores. Moreover, no additional variance was explained and all effects remained the same ($R^2_{Block\ 1} = .72$, $F(2, 35) = 45.17$, $p < .001$; $R^2_{Block\ 2} = .76$, $F(5, 32) = 20.32$, $p < .001$; $\Delta R^2 = .04$, $F(3, 32) = 1.77$, $p = .173$).

Table 5.4

Linear Regression Predicting Year 3 Language Composite Z-Scores from Year 1 Non-Verbal Ability Composite Z-Scores, and Year 1 Raw Scores on Measures of Nonword Repetition and Verbal Working Memory (Model 1). Model 2 Additionally Controls for the Lag in Months Between Year 1 and Year 3 Assessments

	Model 1				Model 2			
Variable	*b* [95% CI]	β	*t*	*p*	*b* [95% CI]	β	*t*	*p*
Non-verbal ability Y1	0.32 [-0.03, 0.68]	0.25	1.84	.074	0.33 [-0.02, 0.69]	0.26	1.90	.067
Nonword repetition Y1	0.09 [0.03, 0.14]	0.45	3.34	.002	0.09 [0.03, 0.14]	0.45	3.27	.003
Object SOPT errors Y1	-0.10 [-0.21, 0.01]	-0.25	-1.92	.063	-0.10 [-0.21, < 0.01]	-0.26	-1.96	.059
Assessment lag					0.02 [-0.03, 0.07]	0.10	0.77	.446
Constant	-1.56 [-2.93, -0.19]		-2.31	.027	-2.00 [-3.81, -0.19]		-2.25	.031

Table 5.5

Hierarchical Linear Regression Predicting Year 3 Language Composite Z-Scores from Year 1 Language Composite Z-scores, Non-Verbal Ability Composite Z-Scores, and Year 1 Raw Scores on Measures of Nonword Repetition and Verbal Working Memory (Model 1). Model 2 Additionally Controls for the Lag in Months Between Year 1 and Year 3 Assessments

	Model 1				Model 2			
Variable	*b* [95% CI]	β	*t*	*p*	*b* [95% CI]	β	*t*	*p*
Block 1								
Language Y1	0.94 [0.74, 1.14]	0.85	9.61	< .001	0.94 [0.74, 1.14]	0.85	9.47	< .001
Assessment lag					0.01 [-0.03, 0.04]	0.04	0.42	.675
Constant	0.25 [-0.04, 0.53]		1.77	.085	0.06 [-0.88, 1.00]		0.13	.894
Block 2								
Language Y1	0.79 [0.55, 1.04]	0.72	6.59	< .001	0.79 [0.54, 1.04]	0.71	6.47	< .001
Non-verbal ability Y1	0.17 [-0.07, 0.41]	0.13	1.44	.159	0.18 [-0.07, 0.42]	0.14	1.49	.145
Nonword repetition Y1	0.02 [-0.02, 0.06]	0.10	1.00	.324	0.02 [-0.02, 0.06]	0.10	0.98	.334
Object SOPT errors Y1	-0.04 [-0.12, 0.03]	-0.11	-1.23	.229	-0.05 [-0.12, 0.03]	-0.11	-1.27	.213
Assessment lag					0.01 [-0.02, 0.05]	0.06	0.70	.492
Constant	0.06 [-0.98, 1.11]		0.12	.901	-0.22 [-1.55, 1.12]		-0.33	.743

Discussion

The current study investigated whether measures of nonword repetition, executive function, and non-verbal ability can help predict English language proficiency over the early school years in children learning EAL. Selective attention, response inhibition, and visuospatial working memory were not uniquely associated with performance on an English language battery concurrently, in Year 1 or Year 3, or longitudinally. In contrast, nonword repetition predicted concurrent English language proficiency in Year 1 and Year 3, while verbal working memory and non-verbal ability each additionally predicted concurrent proficiency in Year 3. In terms of longitudinal associations, in unadjusted models, nonword repetition in Year 1 significantly predicted Year 3 English language proficiency, while verbal working memory and non-verbal ability were marginally significant longitudinal predictors. Importantly, however, these measures did not explain additional variance in Year 3 English language proficiency after controlling for the autoregressive effect of Year 1 English language proficiency, thus these measures did not predict language growth. These results suggest that assessment of nonword repetition, executive function, and non-verbal ability does not improve prediction of later English language competence over and above performance on an English language battery at the outset, at least during the early school years. Instead, performance on the comprehensive English language battery, administered one year after school entry, was highly predictive of English language proficiency two years later.

Findings from the current study are consistent with research by Paradis (2011), who found that a phonological short-term memory composite, comprising of nonword repetition and digit-span subtests, predicted concurrent English receptive vocabulary and expressive grammar in children learning EAL. However, while Paradis (2011) found that non-verbal ability explained additional variance in concurrent English outcomes in children learning EAL, aged 4-7 years, non-verbal ability was only uniquely associated with concurrent language proficiency in Year 3 (ages 7-8 years) in the current study. Furthermore, Paradis's (2011, 2016) conclusion that measures of phonological short-term memory and non-verbal ability account for individual variation in second language acquisition is not supported. In contrast, the results are consistent with studies reporting that nonword repetition is positively correlated with receptive vocabulary in both monolingual and bilingual children, yet does not predict vocabulary growth after controlling for the autoregressive effect of prior vocabulary (Farnia & Geva, 2011; Melby-Lervåg et al., 2012). The current study extends this research by demonstrating that, among children with EAL, nonword repetition does not predict growth on a comprehensive English language battery, which includes measures of grammar and narrative competence as well as vocabulary.

Language impairment is associated with nonword repetition deficits in both monolingual (for a meta-analysis, see Estes et al., 2007) and bilingual children (Armon-Lotem & Meir, 2016; Boerma et al., 2015; Gutiérrez-Clellen & Simon-Cereijido, 2010; Paradis et al., 2013; Thordardottir & Brandeker, 2013; Windsor et al., 2010). This has been taken as support for the theory that nonword repetition taps a construct which has a causal role in language learning (Baddeley et al., 1998; Gathercole, 2006). Findings from the current study, however, support the conclusion made by Melby-Lervåg et al. (2012) that nonword repetition and language may not be causally related. Instead, the relationship may reflect the influence of additional variables. Indeed, longitudinal research on monolingual children has demonstrated that reading uniquely predicts growth in nonword repetition (Nation & Hulme, 2011).

With regard to the relationship between executive function and language, the current findings are consistent with research by Swanson et al. (2015), who found that verbal working memory in Grade 1, but not visuospatial working memory or inhibition, was associated with greater performance on an English language battery two years later in Spanish-speaking children learning EAL. The current study extended this work by controlling for the autoregressive effect and demonstrating that once prior English language skills are taken into account, verbal working memory does not explain additional variance in later English language proficiency. These results are therefore more consistent with research on monolingual children by Gooch et al. (2016), who reported that neither language nor executive function predicted the other longitudinally, once autoregressive effects were taken into account. The current study extends this work by demonstrating similar effects in children with EAL and supports the inference made by Gooch et al. that executive function and language may not be causally related.

Gooch et al. (2016) found a strong concurrent relationship between latent variables assessing language and executive function (calculated using measures of response inhibition, selective attention, and visuospatial memory). In the current study, measures of executive function were considered individually. Of the four measures of executive function, only verbal working memory and selective attention were significantly concurrently correlated with language proficiency and this was only the case in Year 3. Differences between these findings and those by Gooch et al. may reflect the measures used, but the discrepancies may also reflect a different pattern of association between language and executive function in monolingual children versus children learning EAL.

Noticeably, concurrent correlations between English language proficiency and selective attention, response inhibition, and verbal working memory were stronger in Year 3 than in Year 1. On the basis of the theory that language and executive function are related as language supports performance on executive function tasks (i.e., verbal mediation; Bishop et al., 2014), this pattern of findings could reflect that the children may have been more likely to recruit their first language, rather than English, to support their performance on these tasks in Year 1 than in Year 3. Thus, the children's first language competence may have been more strongly correlated with their task performance, particularly in Year 1. Findings could also be considered in terms of the theory that language and executive function are related as they are influenced by common underlying factors, such as shared generic risk factors (Bishop et al., 2014; Gooch et al., 2016). As such, the findings could reflect that the children's English language proficiency in Year 3 may more closely reflect their underlying language learning potential, due to the additional exposure they have had to English by this time point. Indeed, as a group the children with EAL demonstrated significant growth in English language proficiency over the course of the study, in terms of their performance relative to the monolingual population sample.

Visuospatial working memory was weakly associated with language proficiency at both time points. The relationship between visuospatial working memory and language proficiency has most commonly been investigated in studies which compare monolingual children with language impairment to typically developing peers. In a meta-analysis, Vugs et al. (2013) concluded that monolingual children with language impairment show a medium-sized impairment in visuospatial working memory, however the reported deficit varied widely between studies, with some studies reporting no deficit. Vugs et al. acknowledged that this variation may partially reflect task characteristics. Noticeably, the verbal (object SOPT) and visuospatial (abstract SOPT) working memory tasks used in the current study differed only in the extent to which the stimuli were easy or hard to verbalise. The finding that performance on the object SOPT was more strongly associated with English language proficiency, relative to performance on the abstract SOPT, supports the theory that the relationship between language and executive function reflects verbal mediation (Bishop et al., 2014). As such, the weak association between visuospatial working memory and language proficiency in the current study may reflect that verbal mediation is more difficult to implement in the abstract SOPT, relative to visuospatial working memory measures used in previous studies.

Measures of nonword repetition and executive function have been identified as potentially useful in the assessment of bilingual children, particularly in resolving the challenge of disentangling language impairment from limited language experience (Chiat, 2015; Jensen de López & Baker, 2015; Thordardottir & Brandeker, 2013). The current study investigated whether these measures could help predict English language proficiency among children with EAL over the early school years and therefore help identify those who will likely experience persistent English language learning difficulties, which may go beyond limited exposure. However, these measures did not improve prediction of Year 3 English language competence, over and above the variance explained by Year 1 English language competence. Instead, performance on the English language battery in Year 1 was highly predictive of performance two years later, accounting for 72% of the variance in Year 3 English language proficiency. Furthermore, the lag between Year 1 and Year 3 assessments, which varied between 14 and 32 months, did not account for variance in Year 3 English language proficiency. Since children with a greater assessment lag would have experienced more exposure to English in school between assessments, the lack of influence of assessment lag further highlights the stability of individual differences in English language proficiency. Of note, the sample included children with EAL whose English skills spanned the full continuum of proficiency. Of the 40 children in the sample, 18 scored 1 *SD* below the monolingual population mean on the English language battery in Year 1 and 15 of these children continued to score 1

SD below the monolingual population mean in Year 3. Taken together the findings indicate that a comprehensive English language battery, administered one year after school entry, is a useful resource to help identify children with EAL who will likely experience persistent English language learning difficulties over the early school years.

The current study has high ecological validity. The children with EAL were recruited from a population sample and thus were representative of children learning EAL in the UK. Furthermore, the children were recruited at school entry and had all received at least one year of exposure to English in school by the Year 1 assessment. The study is, however, limited as it only included two testing points and only followed language development over the early school years. Assessing children at more time points would have enabled an investigation of the predictive ability of the English language battery, and measures of nonword repetition, executive function, and non-verbal ability, over a longer period. Indeed, due to the strong longitudinal association between English language proficiency in Year 1 and Year 3, there was little variance left over for measures of nonword repetition, executive function, and non-verbal ability to account for. In addition, more assessment points would allow identification of non-linear patterns of growth. These are important avenues for future longitudinal research.

Another limitation of this study is that the only executive functions investigated were response inhibition, selective attention, and verbal and visuospatial working memory. Executive functions are considered to be correlated, but separate, constructs (Miyake et al., 2000), thus it is possible that certain executive functions not measured here do have a causal role in language learning. For example, in a study of vocabulary-based artificial language learning among monolingual 4-5 year old children, Kapa and Colombo (2014) found that while verbal working memory and inhibition did not uniquely predict language learning, shifting and attentional monitoring did. Future research should investigate whether these measures can predict growth in second language competence in bilingual children.

Finally, it is possible that nonword repetition, executive function, and non-verbal ability may predict growth in some, but not all, language domains. Nevertheless, the six individual language measures were all strongly concurrently correlated with one another and with the language composite z-score at each time point (see Appendix B). Furthermore, the main aim of this study was not to explore whether these measures predict growth in particular language domains, but rather to see whether these measures can help predict overall English language competence over the early school years.

In conclusion, this study demonstrated that nonword repetition, executive function, and non-verbal ability do not improve prediction of later English language proficiency over the early school years, over and above prior measures of English language proficiency. As such, the results suggest that these constructs may not be causally related to second language learning and further demonstrate the importance of controlling for the autoregressive effect in longitudinal research. Performance on a comprehensive English language battery, administered after one year of school, was highly predictive of English language proficiency two academic years later in children with EAL. While it is important for future research to follow language development over a longer period of time, and explore additional measures of executive function, the current findings have practical implications for the early identification of children with EAL who will likely experience persistent English language learning difficulties over the early school years.

Chapter 6: Associations Between Language Exposure, Early Language Development, and English Language Proficiency In Children Learning English as an Additional Language Over the Early School Years

Abstract

There is little longitudinal research on associations between language exposure, early language development, and overall English language proficiency among children learning English as an additional language (EAL) with diverse first languages. The current chapter investigated associations between responses on a parent-completed language environment and language development questionnaire and teacher ratings of child English language competence at the end of reception year (ages 4-5 years, $n = 51$; Study 1) and performance on a comprehensive English language battery in Year 3 (ages 7-8 years, $n = 38$; Study 2) among children learning EAL. English exposure prior to school entry was only very weakly associated with teacher ratings of English competence in reception year. In contrast, English exposure prior to school entry, and maternal English proficiency and education, were each moderately associated with English competence in Year 3. Furthermore, these variables were weakly associated with meeting monolingual criteria for language impairment in Year 3. However, late onset of producing two-word combinations was strongly associated with poorer English language proficiency at both time points and was moderately associated with meeting monolingual criteria for language impairment in Year 3. Parent report of early language milestones may help the early identification of children with EAL who will likely experience persistent English language difficulties, which may go beyond limited exposure.

Introduction

Approximately 20.1% of primary school children in England, and 21.9% of children and adolescents in the United States, speak English as an additional language (EAL; Department for Education, 2016; U. S. Census Bureau, 2014). Given that proficiency in English, or the language of instruction, is a critical determinant of academic success (Norbury et al., 2015; Prevoo et al., 2016), it is important to understand the relationship between language exposure and proficiency in the language of instruction. In highly diverse populations, such as the UK, where standardised first language measures are not available, or feasible to develop and administer, for the 300 different languages spoken by school children (NALDIC, 2012a), it is difficult to disentangle language impairment from limited language exposure (De Lamo White & Jin, 2011; Paradis et al., 2013). An understanding of the relationship between language exposure and English language proficiency among children with EAL is important not only for advising practitioners, and in turn parents, on the impact of language exposure at home on child language development (Bedore et al., 2016; Paradis, 2011), but also to help determine the suitability of assessing children with EAL using English language measures. Furthermore, an understanding of associations between English language proficiency among children with EAL and parent-reported variables such as language exposure, parental education, child first language proficiency, and early language development would highlight potential risk factors for children who may struggle to develop English language proficiency and may benefit from early targeted intervention.

An increasing body of literature has investigated associations between language exposure and second language competence among bilingual children. Such research has considered the influence of a range of factors which may influence the quantity or quality of language input, such as length of language exposure, language input from family members, the frequency of language and literacy activities, and parental self-rated language proficiency (Armon-Lotem, Joffe, Abutbul-Oz, Altman, & Walters, 2014). However, research focusing on children learning EAL has typically recruited specific bilingual groups, such as Spanish-English bilinguals, rather than children with diverse first languages. Moreover, this research has focused on individual language measures, rather than overall performance on comprehensive language batteries, and there is little longitudinal research available.

In one of the few studies on children with EAL with diverse first languages, Paradis (2011) found that months of English exposure was positively associated with English receptive vocabulary and expressive grammar. This association was also reported in a study on Turkish-English bilingual children, using measures of receptive vocabulary, and receptive and expressive grammar (Chondrogianni & Marinis, 2011). These studies, however, included children who varied widely in age (ages 4-7 years and 6-9 years, respectively). It is important to consider the relation between language exposure and performance on English language measures at different stages of a child's education in an English school. In a recent longitudinal study, following 21 Chinese children learning EAL over two years (ages 7-9 years at time one), Paradis and Jia (2016) found that length of English exposure was positively associated with performance on measures of English receptive and expressive vocabulary, expressive grammar, and narrative comprehension. Moreover, Paradis and Jia estimated that is takes typically developing children with EAL between four to six years of English exposure to perform within monolingual norms (within 1 *SD*) on each individual language measure.

In a cross-sectional study of Spanish-English bilingual children in Grade 1 (ages 6-7 years) and Grade 3 (ages 8-9 years), Bedore et al. (2016) found that earlier onset of English exposure, and thus greater length of exposure, was associated with greater performance in both grades on a composite measure of English language proficiency, which tapped receptive and expressive vocabulary and grammar. However, age of English exposure accounted for more variance in English language competence in Grade 1 (23.1%) than Grade 3 (10.7%). An advantage of this study is that it utilised a broad English language composite, which provided an indication of overall English language proficiency. It is important to investigate whether similar finding can be replicated in longitudinal studies of children learning EAL with diverse first languages.

Research is mixed with regard to whether English exposure in the home is associated with English language competence in children with EAL. Current English use with family members was positively associated with English receptive and expressive grammar, but not receptive vocabulary, in a study on Turkish-English bilingual children (Chondrogianni & Marinis, 2011), but did not predict English receptive vocabulary and expressive grammar in Paradis' (2011) study on children learning EAL with diverse first languages. Similarly, Paradis and Jia (2016) found that English exposure from family members did not predict performance on measures of English receptive and expressive vocabulary, expressive grammar, and narrative comprehension among Chinese children learning EAL. Paradis (2011) and Paradis and Jia (2016) suggested that the lack of influence of English exposure from family members may reflect the quality of English input, such that English exposure from family members with low English proficiency themselves may not be beneficial to the child's English language development. However, maternal and paternal self-rated English proficiency did not predict child English vocabulary and grammar in these studies, though associations were only reported after controlling for additional exposure variables (Paradis, 2011; Paradis & Jia, 2016). Nevertheless, maternal, but not paternal, self-rated English proficiency predicted greater narrative comprehension in Paradis and Jia's (2016) study and greater English vocabulary and grammar in other studies on children with EAL (Chondrogianni & Marinis, 2011; Hammer et al., 2012).

Research on Spanish-English bilinguals has found that current English exposure from family members was positively associated with English vocabulary and narrative recall in pre-school children (Hammer et al., 2012), but not with English expressive grammar in children aged 7-8 years (Gutierrez-Clellen & Kreiter, 2003). Similarly, in cross-sectional study, Gathercole and Thomas (2009) found that language exposure at home was associated with English competence among Welsh-English bilinguals, aged 3-5 years, whereby children from Welsh-only homes showed poorer English receptive vocabulary than children from English-only homes, or homes where both English and Welsh were spoken. However, Gathercole and Thomas reported no association between language exposure in the home and English receptive vocabulary among children aged 6-8 and 8-11 years. Noticeably, these studies all found that first language exposure from family members was positively associated with first language proficiency, regardless of child age (Gathercole & Thomas, 2009; Gutierrez-Clellen & Kreiter, 2003; Hammer et al., 2012). These studies indicate that continued first language exposure from family members is important to support first language development. Additionally, while exposure to English at home may be important during the pre-school years, exposure to English at school may be sufficient to support English language development after the early school years. Future longitudinal studies, utilising broad measures of English language competence, are needed to address this question.

In contrast to their findings on language exposure from family members, Paradis (2011) and Paradis and Jia (2016) found that English vocabulary and grammar among children with EAL was positively associated with the richness of the child's English exposure in environments outside of school, in terms of the frequency with which the child completed language and literacy activities in English, such as reading, using a computer, watching television, and extra-curricular activities. However, Gutierrez-Clellen and Kreiter (2003) found that the frequency of completing language activities in English, outside of school, did not predict English expressive grammar in Spanish-English bilingual children. Further research is required to address these mixed findings.

Maternal education has been reported to be positively associated with performance by children with EAL on measures of English vocabulary (Bohman, Bedore, Peña, Mendez-Perez, & Gillam, 2010; Hammer et al., 2012; Paradis, 2011), grammar (Bohman et al., 2010; Paradis, 2011; Paradis & Jia, 2016), and narrative (Hammer et al., 2012; Paradis & Jia, 2016). Of these studies, however, only Hammer et al. (2012) reported that paternal education was associated with child English competence. Noticeably, Chondrogianni and Marinis (2011) found that neither maternal nor paternal education was associated with English vocabulary or grammar in Turkish-English bilingual children, though this may reflect the uniformly low levels of parental education reported in their sample. Low maternal and paternal education have been identified as risk factors for speech and language delay (Nelson et al., 2006) and language impairment in monolingual children (Harrison & McLeod, 2010; S. Reilly et al., 2010). While very little research has considered risk factors for language impairment in bilingual children, Peña, Gillam, Bedore, and Bohman (2011) found a small relationship between higher maternal education levels and lower risk for language impairment, an determined using a Spanish-English screener, in Spanish-English bilingual children (ages 4-5 years). These studies indicate that low maternal education may increase risk for persistent low English language proficiency among children with EAL.

Parent report of child early language development and first language competence may also explain variation in English language proficiency among children with EAL and may help identify children whose English language difficulties likely go beyond limited exposure (Paradis et al., 2010; Tuller, 2015). In a study on children with EAL with diverse first languages, Paradis et al. (2010) found large differences between children with language impairment (ages 4-9 years) and typically developing children (ages 4-6 years) on parent-reported early language development and first language competence. Specifically, while first language competence was low in both groups, children with language impairment were rated as having poorer first language competence. Moreover, the average age at which the children with language impairment spoke their first word (22 months) and started making two-word combinations (34 months) was later than typically developing children with EAL (13 months and 21 months, respectively). Paradis et al. noted that these ages were similar to those reported in research on monolingual children with language impairment (first word = 23 months; word combinations = 37 months) or typical development (first word = 10 months; word combinations = 17 months; Trauner, Wulfeck, Tallal, & Hesselink, 2000). Other research on monolingual children has identified that late onset of talking is a risk factor for language impairment, though many late talkers resolve their difficulties (Bishop et al., 2012; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016; S. Reilly et al., 2010; Rice et al., 2008). A question that has not previously been addressed is the extent to which early language milestones are predicative of English language proficiency in children with EAL at different stages of their education in an English school.

The current paper presents longitudinal research on children learning EAL with diverse first languages. Two studies are presented which explored associations between parent-reported language exposure, language development, and maternal education, and teacher ratings of child English language competence in reception year (ages 4-5 years; Study 1) and performance on a comprehensive English language battery in Year 3 (ages 7-8 years; Study 2). At both time points, English language proficiency was considered both continuously, in terms of total scores, and categorically, in terms risk status for language impairment in reception year and meeting monolingual criteria for language impairment in Year 3.

Study 1 Aim

This study explored associations between English exposure before school entry, age of first word and first two-word combination, maternal education, and teacher ratings of English language competence at the end of reception year in children learning EAL with diverse first languages.

Study 1 Method

Participants

This study reports data for 51 children with EAL (29 boys, 22 girls) who were participants in the population survey phase of the Surrey Communication and Language in Education Study (SCALES) when they were in reception year (ages 4 years 11 months to 5 years 10 months: M = 64.75 months, SD = 3.38 months) and whose parents completed a home language environment and language development questionnaire when their child was in Year 3 (ages 7 years 7 months to 8 years 10 months; M = 99.30 months, SD = 3.80 months). During the population survey phase, teachers completed an online questionnaire for 7,267 reception year children, from 161 state-maintained schools across Surrey, UK. Teachers reported that the main language spoken in the homes of 782 children (11%) was a language other than English; these children were regarded as speaking EAL. Over 64 first languages were reported, though the five most frequently reported first languages were: Urdu, Polish, Portuguese, Bengali, and Panjabi. The children in the current sample had one of 11 first languages: Urdu (n = 13), Polish (n = 11), Portuguese (n = 8), Bengali (n = 5), Panjabi (n = 8), Japanese (n = 1), Malayalam (n = 1), Nepali (n = 1), Pashto (n = 1), Swedish (n = 1), and Tamil (n = 1).

During the population survey phase, teachers provided ratings of English language competence, using the Children's Communication Checklist-Short (CCC-S; Norbury et al., 2015; see Materials and Procedure for details). Children scoring 1 *SD* or more above the monolingual population mean (reflecting greater language difficulties) for their age group (autumn, spring, or summer born) and sex were regarded as high-risk for language impairment. The CCC-S was not completed in full for children with *no phrase speech* (NPS; i.e., children who did not produce utterances of at least two to three words, according to teacher report). Of the 782 children with EAL who were screened in reception year, 27 children had NPS. These children received the maximum CCC-S score and were regarded as high-risk for language impairment. All remaining children were regarded as low-risk for language impairment. Of the current sample, 30 children were low-risk and 21 children were high-risk (including five children with NPS in reception).

Eighteen children (8 low-risk, 10 high-risk) from the current sample were from a sample of 51 children with EAL who completed in-depth assessment sessions in school when they were in Year 1 (ages 5-6 years) and Year 3 (ages 7-8 years). As detailed in the recruitment flow chart in Figure 6.1, parents of these children were either posted a language environment and language development questionnaire, or, if they had one of the five most frequently reported first languages in the sample, were invited to complete the questionnaire over the phone by a bilingual support worker who spoke their first language. The bilingual support workers were from the Race Equality and Minority Achievement team at Surrey County Council.

Thirty-three children (22 low-risk, 11 high-risk) from the current sample were recruited in Year 3. Details about the recruitment process are outlined in Figure 6.1. Briefly, parents of these children received a study information pack via their child’s school, as well as a follow-up phone call one week later by a bilingual support worker. These children were all identified in population survey phase as having one of the five most frequently reported first languages in the sample. The information packs contained an information DVD, which featured a bilingual support worker explaining the study in the parents’ first language and inviting them to complete a language environment and language development questionnaire over the phone and to consent for their child to complete an assessment session in school. The information packs also contained an information sheet in English, a consent form, and a freepost envelope. Following written or verbal parental consent, bilingual support workers completed the questionnaire over the phone with parents.

Of the final sample of 51 children with EAL, each child attended a reception class within one of 30 state-maintained primary or infant schools in Surrey. Income Deprivation Affecting Children Index (IDACI; McLennan et al., 2011) rank scores were retrieved using the children’s home postcodes to provide a measure of neighbourhood deprivation. IDACI rank scores range from 1 to 32,482, with lower scores assigned to areas in England with proportionally more children living in income deprived families (defined by receiving certain means tested benefits). IDACI rank scores ranged from 4,686 to 32,183 within the current sample (M = 15,671.90, SD = 8,041.12), which indicates that the children came from a wide range of socioeconomic backgrounds.

Figure 6.1. Recruitment flow chart. HR = high-risk for language impairment, LR = low-risk for language impairment, BSWs = bilingual support workers

An opt-out consent procedure was adopted for the population survey phase of SCALES, in which anonymised teacher-completed questionnaire data were submitted to the study unless parents opted out. Parents provided informed, verbal or written consent to complete the language environment and language development questionnaire and written consent for their child to be assessed in school by a member of the research team. The study protocol was developed in collaboration with Surrey County Council and was granted ethical approval by the Psychology Department Ethics Committee at Royal Holloway, University of London.

Measures and Procedures

Children's Communication Checklist – Short (CCC-S; Norbury et al., 2015). The CCC-S contains 13 items from the Children's Communications Checklist-2 (Bishop, 2003a), which best discriminated children with language impairment from typically developing peers in a validation study (Norbury et al., 2004). Teacher's completed the CCC-S when the children were in the last term of reception year, by rating the frequency with which each child displayed six communicative errors and seven communicative strengths using a 4-point scale: *rarely or never (less than once a week), occasionally (once a week), regularly (once or twice a day),* or *frequently or always (several times a day).* The six items regarding communicative errors were scored from 0 (*rarely or never)* to 3 (*frequently or always)*, while the seven items regarding communicative strengths were reverse scored (3 = *rarely or never*, 0 = *frequently or always)*. All 13 items were summed to create a total CCC-S score (maximum = 39), with higher scores reflecting greater English language difficulties. The five children in the sample who had NPS in reception year were allocated the maximum score of 39.

Home language environment and language development questionnaire. The questionnaire used in the current study (see Appendix C) was written in English and was closely based on the Questionnaire for Parents of Bilingual Children (PaBiQ; COST Action IS0804, 2011), which in turn, as noted by Tuller (2015), was based on the Alberta Language Environment Questionnaire (Paradis, 2011) and the Alberta Language and Development Questionnaire (Paradis et al., 2010). During the development stage for the questionnaire used in the current study, revisions were made to the questionnaire following comments from the Bilingual Support Coordinator, and from bilingual support workers, at the Race Equality and Minority

Achievement team at Surrey County Council. Comments from a bilingual colleague, who had a child with EAL, were also taken into consideration to develop the final version of the questionnaire.

As detailed in Figure 6.1, for the majority of children within this study the questionnaire was administered over the phone to parents by bilingual support workers, who spoke both English and the family's first language. The bilingual support workers were employed by the Race Equality and Minority Achievement team at Surrey County Council and were trained to discuss educational matters with parents with EAL in their first language, as well as work with children with EAL within the classroom. For the current study, the bilingual support workers were given extensive training on how to interpret the questions and complete the questionnaire with parents. Bilingual support workers were asked to either translate the questions into the parents' first language or ask the questions in English when administering the questionnaire, depending on the preference of the parents. The strategy of using bilingual support workers to administer language development and environment questionnaires to parents of bilingual children has been used within previous research (e.g., Gutierrez-Clellen & Kreiter, 2003; Hammer et al., 2012; Paradis, 2011; Paradis et al., 2010). As noted by Tuller (2015), the PaBiQ (COST Action IS0804, 2011), which the current questionnaire was closely based on, was designed to be administered by trained bilingual interviewers, though Tuller also noted that some research groups have asked parents to complete the questionnaire themselves.

The questionnaire included the following sections: background information about the child, child's early language history, current language environment at home, child's current language proficiency, and family information. The questions relevant to this study are from the early language history and family information sections. Parents were asked to report the age, in years and months, at which their child started to receive regular exposure to English. Regular exposure was defined as daily use in the home or exposure through nursery, a child-minder, or school for at least three half day sessions per week. For the current analyses, children were categorised as first receiving regular English exposure *before 2 years of age* or at *2 years of age or older*. Within a question on sources of regular language exposure prior to school entry, parents reported whether their child attended an English nursery. Parents also reported how often their child was exposed to English, their first language, and any additional language between 0 and 2 years of age and between 2 years and school entry. The following options were available for each language: *never, sometimes, half of the time, usually, always* (scored from 0 to 4). The proportion of English exposure received between these time points was calculated ([English exposure score / total exposure score across all language] x 100).

Using 3-point scales, parents reported the age at which their child said their first word (*12 months or younger, 13-18 months,* or *19 months or older*) and started combining two or more words to make short sentences (e.g., more milk; *18 months or younger, 19-24 months,* or *25 months or older*) in any language. Late onset of first word production has been defined as over 18 months and late onset of first two-word combination has been defined as over 24 months (Tuller, 2015). Finally, maternal education was reported in terms of the highest completed level of education. For the current analyses, mothers were grouped according to whether or not they had a university degree.

Missing Data

Data on age of onset of English exposure were missing for three children. For a further eight children, age of onset of regular English exposure was listed as *nursery*. These eight children were grouped as first receiving regular English exposure at *age 2 years or older*. Data on English nursery attendance were missing for two children.

Data Analysis

All analyses were conducted using Stata IC 14 (StataCorp, 2015). T-tests were used to explore the relation between language impairment risk status in reception year and the proportion of English exposure received between 0 and 2 years of age and between 2 years and school entry. Pearson's Chi Square tests assessed the relation between risk status and the following categorical variables: age of onset of English exposure (before 2 years of age, or older), English nursery attendance (did/did not attend nursery), maternal education (university degree, or no university degree), age of first word (12 months or younger, 13-18 months, or 19 months or older), and age of first two-word combination (18 months or younger, 19-24 months, or 25 months or older). The relation between these categorical variables and continuous CCC-S scores were explored using t-tests and one-way ANOVA. Pearson's correlations are reported for the associations between CCC-S scores and the proportion of English exposure received between 0 and 2 years of age and between 2 years and school entry. All data were normally distributed and met the assumption of homogeneity of variance, where applicable.

Study 1 Results

Children with EAL at high-risk or low-risk for language impairment in reception year did not significantly differ in the proportion of English exposure received between 0 and 2 years of age, $t(49) = 0.18$, $p = .855$, $d = 0.05$, or between 2 years and school entry, $t(49) = 0.29$, $p = .773$, $d = 0.08$ (see Table 6.1 for descriptive statistics). Moreover, age of onset of English exposure and English nursery attendance were each very weakly, and not significantly, associated with risk status in reception year (see Table 6.2). Nevertheless, while not significant in this small sample, there was a small effect of maternal education, whereby children whose mothers had a university degree were more likely to be low-risk for language impairment, relative to children whose mothers did not have a university degree (see Table 6.2).

There were large significant associations between risk status and age of first word and first two-word combination (see Table 6.2). All children who said their first word at 19 months or older, and 92% of children who said their first two-word combination at 25 months or older, were identified as high-risk for language impairment. In contrast, the majority of children who said their first word and first two-word combination before these time points, respectively, were rated as low-risk.

Table 6.1

Descriptive Statistics for English CCC-S Scores in Reception Year and the Proportion of English Exposure Received Between 0 and 2 Years of Age and Between 2 Years and School Entry for all Children and for High-Risk and Low-Risk Groups

	All children		Low-risk		High-risk	
Variable	*n*	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*
English CCC-S score in reception year	51	15.84 (11.48)	30	8.07 (5.21)	21	26.95 (8.38)
English exposure 0-2 years (%)	51	35.86 (27.44)	30	36.46 (23.53)	21	35.01 (32.84)
English exposure 2 years to school entry (%)	51	45.99 (24.53)	30	46.83 (22.71)	21	44.79 (27.47)

When considered continuously, ratings of English language competence on the CCC-S in reception year still showed very weak and non-significant associations with the proportion of English exposure received between 0 and 2 years of age (r = .03, p = .810) and between 2 years of age and school entry (r = -.02, p = .909). Furthermore, there were no significant associations between English CCC-S scores in reception year and age of onset of English exposure, nursery attendance, and maternal education (see Table 6.3). Nevertheless, when effect sizes were considered, there was a small to moderate effect of nursery attendance and a small effect of maternal education, whereby CCC-S scores were lower, indicating fewer language difficulties, among children who attended an English nursery and children whose mothers had a university degree (see Table 6.3).

Table 6.2

The Number (Percentage) of High-Risk and Low-Risk Children Within Each Categorical Sub-group

Variable	Low-risk	High-risk	$\chi^2(df)$	*p*	Cramer's V
Age of onset of English exposure			0.28 (1)	.597	.08
Before 2 years	16 (64%)	9 (36%)			
2 years or older	13 (57%)	10 (43%)			
Attended Nursery			0.55 (1)	.456	.11
Yes	23 (62%)	14 (38%)			
No	6 (50%)	6 (50%)			
Maternal education			1.85 (1)	.174	.19
University degree	20 (67%)	10 (33%)			
No university degree	10 (48%)	11 (52%)			
Age of first word			11.93 (2)	.003	.48
12 months or younger	20 (71%)	8 (29%)			
13 – 18 months	10 (63%)	6 (37%)			
19 months or older	0 (0%)	7 (100%)			
Age of first two-word combination			17.33	< .001	.58
18 months or younger	17 (81%)	4 (19%)			
19 – 24 months	12 (67%)	6 (33%)			
25 months or older	1 (8%)	11 (92%)			

Table 6.3

English CCC-S Scores in Reception Year by Age of Onset of English Exposure, English Nursery Attendance, and Maternal Education

	English CCC-S total				
Variable	*n*	*M (SD)*	t*(df)*	*p*	*d*
Age of onset of English exposure			0.42 (46)	.676	0.12
Before 2 years	25	14.88 (12.50)			
2 years or older	23	16.30 (10.82)			
Attended Nursery			1.31 (47)	.196	0.44
Yes	37	14.43 (11.14)			
No	12	19.42 (12.35)			
Maternal education			0.92 (49)	.361	0.26
University degree	30	14.60 (11.87)			
No university degree	21	17.62 (10.95)			

There were large, significant effects of age of first word, $F(2, 48) = 9.07$, $p = .001$, $\eta_p^2 = .27$, and first two-word combination, $F(2, 48) = 7.28$, $p = .002$, $\eta_p^2 = .23$, on CCC-S scores. Simple planned contrasts revealed that children who said their first word at 19 months or older ($M = 30.71$, $SD = 9.48$) had significantly higher CCC-S scores, indicating greater English language difficulties, than children who said their first word at 12 months or younger ($M = 13.04$, $SD = 9.30$; $p < .001$), or between 13 and 18 months ($M = 14.25$, $SD = 11.28$; $p = .001$). Moreover, children who started using two-word combinations at 25 months or older ($M = 25.67$, $SD = 10.75$) had significantly higher CCC-S scores than children who started using two-word combinations at 18 months or younger ($M = 12.14$, $SD = 7.53$; $p = .001$), or between 19 and 24 months ($M = 13.61$, $SD = 12.50$; $p = .003$).

Study 1 Summary

This study explored associations between English exposure before school entry, early language development, maternal education, and teacher ratings of English language competence at the end of reception year in children learning EAL. Late onset of first words (19 months or over) and first two-word combination (25 months or older) were strongly associated with poorer ratings of English language proficiency at the end of reception year, both in terms of continuous scores and in terms of the likelihood of performing in the high-risk range, according to monolingual norms. The proportion of English exposure received prior to school entry, as well as age of onset of regular English exposure, were very weakly associated with ratings of English language proficiency. There was, however, a small to moderate effect of nursery attendance, whereby English nursery attendance was associated with fewer English language difficulties. Similarly, there was a small effect of maternal education, whereby higher maternal education, as indicated by having a university degree, was associated with fewer English language difficulties and an increased likelihood of low-risk status.

This study shows impact of exposure and age of early language milestones on English language performance at school entry. A question that has not previously been addressed is the extent these measures are predicative of English language proficiency over the longer term in children learning EAL with diverse first languages, after children have experienced regular, sustained exposure to English in school.

Study 2 Aim

This study explored associations between English exposure, both prior to school entry and concurrently, parent ratings of child early language development and first language proficiency, maternal education, parental English language proficiency, and performance on a comprehensive monolingual-normed English language battery in Year 3 (ages 7-8 years) among children learning EAL.

Study 2 Method

Participants

This study reports data for 38 children with EAL (21 boys, 17 girls) who participated in Study 1. These children all participated in the population survey phase of SCALES when they were in reception year (ages 4 years 11 months to 5 years 10 months: M = 64.92 months, SD = 3.32 months) and their parents completed a home language environment and language development questionnaire when their child was in Year 3 (ages 7 years 7 months to 8 years 10 months; M = 99.22 months, SD = 3.85 months). Additionally, these children all completed an in-depth assessment session in school in Year 3 (ages 7 years 1 month to 8 years 9 months; M = 98.26 months, SD = 4.99 months). Of the current sample, 21 children were low-risk for language impairment in reception year and 17 children were high-risk (including five children with NPS in reception). Details about the recruitment process are outlined in Figure 6.1. Of the children in Study 1, 10 children did not participate in this study as their parents did not provide written consent for the assessment in school. Furthermore, assessment sessions were not completed for two children, despite their parents providing written consent, due to one child being ill on the assessment day and another child breaking up for the summer holiday early to go abroad. One child completed the Year 3 assessment, however was excluded from the current paper as they did not complete the full English language battery.

The 38 children in the current study attended one of 27 state-maintained primary or junior schools across Surrey in Year 3 and had one of 11 first languages: Urdu (n = 10), Polish (n = 11), Portuguese (n = 6), Bengali (n = 2), Panjabi (n = 3), Japanese (n = 1), Malayalam (n = 1), Nepali (n = 1), Pashto (n = 1), Swedish (n = 1), and Tamil (n = 1). IDACI rank scores (McLennan et al., 2011), retrieved using home postcodes, ranged from 4,686 to 31,744 within the sample (M = 16,952.00, SD = 8,072.60), which indicates that the children came from a wide range of socioeconomic backgrounds. The 38 children in the current study had significantly higher IDACI rank scores (Mdn = 15,082.00, IQR = 12,180), indicating lower neighbourhood deprivation, than the 13 children who participated in Study 1 but did not participate in the current study (Mdn = 9,997.00, IQR = 6,650.00; U = 147.00, Z = -2.16, p = .031, r = -.30).

As noted in Study 1, parents provided informed, verbal or written consent to complete the home language environment and language development questionnaire and written consent for their child to be assessed in school. The study protocol was developed in collaboration with Surrey County Council and was granted ethical approval by the Psychology Department Ethics Committee at Royal Holloway, University of London.

Measures and Procedures

Home language environment and language development questionnaire. The questionnaire was completed either via post or over the phone by trained bilingual support worker, from the Race Equality and Minority Achievement Team at Surrey County Council, who spoke the family's first language. All questionnaire variables used in Study 1 were also used in the current study. Additionally, to assess current language exposure in the home, parents were asked how often the child's mother, father, older siblings, and younger siblings, if applicable, used English, their first language, and any additional language with the child. The following response options were available for each language: *never, sometimes, half of the time, usually, always* (scored from 0 to 4). The proportion of English exposure received from each family member was subsequently calculated ([English exposure score / total exposure score across all language] x 100). For each child, exposure scores from older and younger siblings were averaged for the current analyses. Parents also reported the frequency with which their child completed the following activities outside of school time in each language: read alone or with assistance; listen to others reading; write; use a computer or tablet; watch television, films, or videos; listen to music, songs, or radio. Frequency was measured using a 5-point scale (*never or almost never, 1-2 days per month, 1-2 days per week, 3-5 days per week, daily or almost daily*; scored from 0-4). For the current analyses, scores for the frequency with which the child completed each activity in English were summed to produce a total score.

Parents reported their child's speaking and understanding proficiency in English, their first language, and any additional language using a four-point scale (*little to no proficiency, limited proficiency, moderate proficiency, good proficiency, full proficiency;* scored from 0-4). Each response option was defined to avoid translation issues (see the questionnaire in Appendix C for the response option definitions). Maternal and paternal speaking and understanding proficiency for each language were also reported using the same options. Parents also completed the CCC-S (Norbury et al., 2015) to provide an additional, more comprehensive measure of their child's first language proficiency. The CCC-S was, however, not completed if the parents reported that their child had little to no first language speaking proficiency. As the focus within the CCC-S is on communicative strengths and errors in everyday conversation, the CCC-S can be used to assess language ability in any language, not just in English. The wording of one item ("leaves off past-tense –ed or other word endings") was, however, altered to be language neutral ("uses incorrect language structure to talk about past events"). Details about the CCC-S questions, response options, and scoring procedures are outlined in Study 1. Higher CCC-S scores reflect greater language difficulties (maximum = 39).

Year 3 child assessment. Each child completed an individual two hour assessment session with a trained researcher in a quiet area in their school. Assessment sessions were completed in English and included frequent breaks. The measures relevant to this study included assessments of English language competence and nonverbal ability. To provide background information on nonverbal ability, children were administered the Block Design and Matrix Reasoning subtests of the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003a). Raw scores on these subtests were converted into age-adjusted nonverbal ability composite *z*-scores, based on norms derived from the monolingual population sample.

Children completed a comprehensive English language battery, comprising of expressive and receptive measures of vocabulary, grammar, and narrative (outlined below). Using norms derived from the monolingual population sample, raw scores on the six language measures were converted into age-adjusted *z*-scores, which were subsequently used to produce a total language composite *z*-score. Additionally, following the EpiSLI diagnostic system for language impairment in monolingual children (Tomblin et al., 1996), five composite scores were calculated (vocabulary, grammar, narrative, expressive language, and receptive language) and children were categorized according to whether or not they scored -1.25 *SD* or more below the monolingual population mean on two or more composites. However, while Tomblin et al. required children to have nonverbal ability in the normal range to meet criteria for language impairment, the current study followed more recent recommendations (American Psychiatric Association, 2013; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016; Norbury et al., 2016) and only excluded children with intellectual disability (defined as a nonverbal ability composite z-score of -2 *SD* or more below the monolingual population mean; as shown in Figure 6.1, one child was excluded from the study for meeting these criteria). To acknowledge that our English language measures are not sufficient to diagnose language impairment in children with EAL, the term *low language proficiency* is used to refer to children who met the language impairment criteria.

Expressive One-Word Picture Vocabulary Test, Fourth Edition (EOWPVT-4; Martin & Brownell, 2011a). Children were presented with a series of individual pictures and were asked to name the object, action, or concept which was depicted in each picture. Scores ranged from 0-190, with higher scores indicating greater expressive vocabulary.

Receptive One-Word Picture Vocabulary Test, Fourth Edition (ROWPVT-4; Martin & Brownell, 2011b). The examiner read individual words and children were asked to select a picture, from an array of four, which depicted each word. Scores ranged from 0-190, with higher scores indicating greater receptive vocabulary.

School Age Sentence Imitation Task - English 32 (SASIT-E32; Marinis et al., 2011). Children listened to 32 pre-recorded sentences over headphones and were asked to repeat each sentence out loud. All repetitions were audio-recorded and 1 point was allocated for every sentence that was repeated correctly (word for word; maximum = 32). Sentence repetition tasks are considered a measure of expressive grammar (Lust et al., 1996; Polišenská et al., 2015).

Test for Reception of Grammar - Short (TROG-S). This is a short form of the TROG-2 (Bishop, 2003b). Children heard up to 40 sentences and were asked to select a picture, from an array of four, which depicted each sentence. The task was discontinued if a child answered incorrectly on six consecutive items. One point was allocated for each correct response (maximum = 40).

Narrative recall (ACE 6-11; Adams et al., 2001). Children listened to a story about a monkey in a forest, which was played over headphones and accompanied by eight pictures. After listening to the story, children were shown the pictures again and were asked to tell the story in their own words. Each child's narrative was audio-recorded and 1 point was awarded for each of 35 key elements of the story which were correctly recalled (maximum = 35).

Narrative comprehension. Following the narrative recall task, children were asked 12 comprehension questions about the story (six literal and six inference questions). Children received 0 points for an incorrect response, 1 point for a partially correct response, and 2 points for a correct response (maximum = 24).

Missing Data

Data on age of onset of English exposure were missing for two children. For a further three children age of onset of English exposure was listed as *nursery*. These three children were grouped as first receiving regular English exposure at *age 2 years or older*. Data on English nursery attendance were missing for one child.

Four children did not have any siblings, thus the questions concerning English exposure from siblings were not applicable for these children. Similarly, one child did not have contact with their father, thus the question concerning English exposure from the father was not applicable for this child. English language activity total scores are missing for two children, as their parents did not report the frequency with which their child completed one or more of the six language activities in English.

Nine children were listed as having little to no first language speaking proficiency. As instructed, parents did not complete the CCC-S for these children to assess their first language proficiency. Instead, these children were allocated the poorest CCC-S score (39). For two children, one CCC-S item was not completed. For these children, the missing score was replaced with their mean score on the 12 completed items. CCC-S data were missing entirely for five children, who were reported to have at least limited first language speaking proficiency. These five children were therefore excluded from analyses involving first language CCC-S scores. Finally, one child did not complete the WISC-IV Matrix Reasoning subtest and thus background statistics on nonverbal ability composite z-score are only provided for 37 children. This child's performance on the Block Design WISC-IV subtest was within the normal range.

Data Analysis

All analyses were conducted using Stata IC 14 (StataCorp, 2015). Nonparametric tests were used as all data were not normally distributed. A Wilcoxon signed-rank test was used to explore whether the children differed in their proficiency speaking their first language, in relation to their first language comprehension. Spearman's correlations explored relations between English language composite z-scores in Year 3 and the following continuous questionnaire variables: ratings of child first language speaking and understanding proficiency; first language CCC-S scores; maternal and paternal English speaking proficiency; the proportion of English exposure received between 0 and 2 years of age and between 2 years and school entry; the proportion of English exposure currently received from the child's mother, father, and siblings; and the frequency of English language activities completed by the child outside of school time.

Mann-Whitney *U* tests explored associations between English language composite z-scores and the following binary variables: age of onset of regular

English exposure (before 2 years of age, or older), English nursery attendance (did/did not attend nursery), maternal education (university degree, or no university degree). Kruskal-Wallis tests explored associations between English language composite z-scores and age of first word (12 months or younger, 13-18 months, or 19 months or older) and age of first two-word combination (18 months or younger, 19-24 months, or 25 months or older). Mann-Whitney *U* tests were used to break down any significant effects, using a Bonferroni-adjusted *p*-value of .025. Variables which were significantly associated with English language composite z-scores were entered into a stepwise linear regression model, with robust standard errors, to determine which variables explain unique variance in Year 3 English language composite z-scores. Stepwise regression was chosen due to the small sample size and the number of predictors in the study.

Mann-Whitney *U* tests explored associations between each continuous questionnaire variable and English language proficiency status in Year 3 (typical or low language), as determined using monolingual criteria for language impairment. Finally, Pearson's Chi Square tests explored associations between Year 3 English language proficiency status and each categorical questionnaire variable.

Study 2 Results

Continuous Analysis of English Language Proficiency

Descriptive statistics for Year 3 English language and nonverbal ability composite z-scores and for each continuous questionnaire variable are presented in Table 6.4. Noticeably, the median first language speaking and understanding proficiency ratings were 2 (moderate proficiency) and 3 (good proficiency), respectively, thus the children typically had better comprehension of their first language than proficiency in speaking the language ($z = 3.64$, $p < .001$, $r = .59$). Table 6.5 displays Spearman's correlations between all continuous variables. Maternal English speaking proficiency and the proportion of English exposure received between 2 years of age and school entry were significantly and positively correlated with Year 3 English language composite z-scores and these correlations were of moderate size. While not statistically significant, there was also a moderate negative correlation between first language CCC-S scores and English language composite z-scores, whereby greater first language difficulties were associated with lower English language proficiency. Furthermore, there were small to moderate positive correlations between English language composite z-scores and the following variables: the proportion of English exposure received between 0 and 2 years of age, current English exposure from the child's father, the frequency of English language activities, and ratings of child first language speaking proficiency (see Table 6.5).

Table 6.4

Descriptive Statistics for English Language Composite Z-Scores and Nonverbal Ability Composite Z-Scores in Year 3 and Continuous Questionnaire Variables

Variable	*n*	*Mdn (IQR)*
English language composite z-score	38	-0.86 (1.78)
Nonverbal ability composite z-score	37	-0.32 (1.03)
First language proficiency - speaking	38	2.00 (2.00)
First language proficiency - understanding	38	3.00 (2.00)
First language CCC-S	33	21.00 (31.00)
Maternal English proficiency	38	3.50 (1.00)
Paternal English proficiency	38	4.00 (1.00)
English exposure - 0-2 years (%)	38	25.00 (50.00)
English exposure - 2 years to school entry (%)	38	43.65 (25.00)
English exposure - mother (%)	38	25.00 (50.00)
English exposure - father (%)	37	42.86 (60.00)
English exposure - siblings (%)	34	77.50 (50.00)
English language activities	36	17.50 (5.50)

Ratings of child first language proficiency, in terms of both speaking and understanding, were negatively correlated, to medium to large degrees, with English exposure between 0 and 2 years and between 2 years and school entry, as well as with current English exposure from all family members (see Table 6.5). Similarly, higher first language CCC-S scores, indicating greater first language difficulties, were associated, to medium to large degrees, with greater English exposure between 0 and 2 years and greater current English exposure from the child's mother and siblings (see Table 6.5). Thus, children who received proportionally more exposure to their first language, rather than English, displayed greater first language proficiency.

Table 6.5

Spearman's Correlations Between English Language Composite Z-Scores in Year 3 and Continuous Questionnaire Variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. English language z-score	1										
2. First language proficiency - speaking	.20	1									
3. First language proficiency - understanding	-.15	.74***	1								
4. First language CCC-S	-.30	-.93***	-.69***	1							
5. Maternal English proficiency	.32*	-.09	-.24	-.09	1						
6. Paternal English proficiency	.09	.10	.20	-.17	.28	1					
7. English exposure - 0-2 years	.27	-.47**	-.62***	.39*	.57***	.17	1				
8. English exposure - 2 years to school entry	.35*	-.33*	-.51**	.23	.60***	.31	.86***	1			
9. English exposure - Mother	-.06	-.58***	-.70***	.56***	.33*	-.07	.63***	.61***	1		
10. English exposure - Father	.25	-.33*	-.55***	.18	.42*	.20	.65***	.70***	.57***	1	
11. English exposure - Siblings	.13	-.60***	-.51**	.50**	.31	.02	.49**	.46**	.40*	.56***	1
12. English language activities	.22	-.06	-.19	.12	.21	.20	.22	.27	.21	.08	.24

$*p < .05$, $**p < .01$, $***p < .001$

As shown in Table 6.6, there was a significant, moderately-sized effect of age of onset of English exposure on Year 3 English language composite z-scores, whereby those who started receiving regular English exposure prior to age 2 years had higher English language z-scores relative to those who started receiving regular English exposure at age 2 years or older. There was also a significant, moderately-sized effect of maternal education, whereby English language z-scores were higher amongst children whose mothers had a university degree (see Table 6.6). There was, however, no significant effect of English nursery attendance and indeed the effect size for this association was very weak.

Table 6.6

English Language Composite Z-Scores in Year 3 by Age of Onset of English Exposure, English Nursery Attendance, and Maternal Education

	English lang. z-score					
Variable	*n*	*Mdn (IQR)*	*U*	*z*	*p*	*r*
Age of onset of English exposure			91.00	-2.20	.028	-.37
Before 2 years	20	-0.20 (2.30)				
2 years or older	16	-1.17 (0.81)				
Attended Nursery			133.00	-0.33	.740	-.05
Yes	26	-0.96 (2.35)				
No	11	-0.76 (1.14)				
Maternal education			89.00	-2.10	.035	-.34
University degree	26	-0.42 (2.32)				
No university degree	12	-1.17 (0.59)				

There was a bordering significant effect of age of first word, $H(2) = 5.60$, $p = .061$, on language composite z-scores. Specifically, there was a trend for children who said their first word at 19 months or older (*Mdn* = -1.57, *IQR* = 1.39, *n* = 6) to have poorer English language composite z-scores than children who said their first word at 12 months or younger (*Mdn* = -0.69, *IQR* = 1.82, *n* = 20, *U* = 24.00, *z* = 2.19, *p* = .028, *r* = .43) or between 13 and 18 months (*Mdn* = -0.42, *IQR* = 2.09, *n* = 12, *U* = 13.00, *z* = 2.15, *p* = .031, *r* = .51). While these trends were not statistically significant at the Bonferroni-adjusted *p*-value of .025, the effect sizes indicated that they were moderate to large in size. In contrast, there was a significant effect of age of first two-word combination, $H(2) = 8.29$, $p = .016$. Children who said their first two-word combination at 25 months or older (*Mdn* = -1.48, *IQR* = 0.61, $n = 9$) had significantly poorer English language composite z-scores than children who said their first two-word combination 18 months or younger (*Mdn* = -0.47, *IQR* = 2.26, $n = 12$; $U = 22.00$, $z = 2.27$, $p = .023$, $r = .50$) or between 19 and 24 months (*Mdn* = -0.52, *IQR* = 1.69, $n = 17$; $U = 25.00$, $z = 2.78$, $p = .006$, $r = .54$). The effect sizes for both of these comparisons were large.

The following variables, which were each significantly associated with Year 3 English language composite z-scores in the previous analyses, were entered into a stepwise linear regression model predicting English language composite z-scores: age of onset of English exposure, maternal education, maternal English speaking proficiency, English exposure received between 2 years of age and school entry, and age of first two-word combination. Backward-selection was used, whereby all predictors were initially entered into the model and variables which were not significant predictors ($p > .050$) were removed in a stepwise fashion. The final model was significant and accounted for 43% of the variance in language composite z-scores, $F(3, 32) = 8.95$, $p < .001$. The final model included age of onset of English exposure, maternal education, and age of first two-word combination, which each explained significant unique variance (see Table 6.7). Earlier onset of regular English exposure and higher maternal education were associated with greater English language composite z-scores. In contrast, later onset of first two-word combination was associated with poorer English language composite z-scores.

Table 6.7

Final Stepwise Linear Regression Model Predicting Year 3 Language Composite Z-Scores (n = 36)

Variable	*b* [95% CI]	*t*	*p*
Age of onset of English exposure	0.91 [0.31, 1.51]	3.10	.004
Maternal education	0.93 [0.35, 1.52]	3.26	.003
Age of first two-word combination	-0.57 [-1.01, -0.13]	-2.64	.013
Constant	-1.11 [-1.78, -0.45]	-3.41	.002

Categorical Analysis of English Language Proficiency

Of the 38 children within the sample, 15 children (10 boys, 5 girls) met monolingual criteria for language impairment in Year 3 (-1.25 *SD* or more on 2/5 language composites) and 23 children (11 boys, 12 girls) met criteria for typical language development. There were no significant associations between Year 3 language proficiency status and any of the continuous questionnaire variables (see Table 6.8). However, there were small to moderate associations between low language proficiency status and lower first language speaking proficiency, lower maternal English speaking proficiency, and lower English language activity scores.

There were also no significant associations between Year 3 language proficiency status and any of the categorical questionnaire variables (see Table 6.9). However, there was a small association between earlier age of onset of English exposure and an increased likelihood of typical language proficiency status. Moreover, there was a moderate effect of age of first two-word combination and a small to moderate effect of age of first word. Late onset of first two-word combination (25 months or older) and first word (19 months or older) were associated with an increased likelihood of low language proficiency status.

Table 6.8

Descriptive Statistics for Each Continuous Questionnaire Variable by English Language Proficiency Status in Year 3

	Typical language		Low language					
Variable	*n*	*Mdn (IQR)*	*n*	*Mdn (IQR)*	*U*	*z*	*p*	*r*
English language z-score	23	0.14 (1.92)	15	-1.48 (0.46)	5.00	5.00	< .001	.81
First language proficiency - speaking	23	3.00 (1.00)	15	2.00 (3.00)	128.50	1.36	.175	.22
First language proficiency - understanding	23	3.00 (2.00)	15	3.00 (2.00)	157.50	0.47	.639	.08
First language CCC-S	21	19.00 (23.00)	12	26.83 (28.50)	98.00	1.06	.290	.18
Maternal English proficiency	23	4.00 (1.00)	15	3.00 (1.00)	126.50	1.51	.132	.24
Paternal English proficiency	23	4.00 (1.00)	15	4.00 (1.00)	171.00	0.05	.959	.01
English exposure - 0-2 years (%)	23	25.00 (50.00)	15	25.00 (31.75)	147.50	0.76	.448	.12
English exposure - 2 years to school entry (%)	23	50.00 (25.00)	15	33.33 (19.44)	142.50	0.91	.362	.15
English exposure - mother (%)	23	25.00 (50.00)	15	33.33 (30.00)	139.50	1.01	.314	.16
English exposure - father (%)	22	50.00 (100.00)	15	40.00 (55.00)	150.00	0.47	.637	.08
English exposure - siblings (%)	20	77.50 (50.00)	14	77.50 (57.14)	124.50	0.56	.578	.10
English language activities	21	19.00 (5.00)	15	16.00 (4.00)	107.50	1.61	.107	.27

Table 6.9

The Number (Percentage) of Children Within Each Categorical Sub-group By English Language Proficiency Status in Year 3

Variable	Typical language	Low language	$\chi^2(df)$	*p*	Cramer's V
Age of onset of English exposure			1.50	.221	.20
Before 2 years	14 (70%)	6 (30%)			
2 years or older	8 (50%)	8 (50%)			
Attended Nursery			0.11	.736	.06
Yes	15 (58%)	11 (42%)			
No	7 (64%)	4 (36%)			
Maternal education			0.81	.367	.15
University degree	17 (65%)	9 (35%)			
No university degree	6 (50%)	6 (50%)			
Age of first word			2.91	.233	.28
12 months or younger	12 (60%)	8 (40%)			
13 – 18 months	9 (75%)	3 (25%)			
19 months or older	2 (33%)	4 (67%)			
Age of first two-word combination			4.62	.099	.35
18 months or younger	7 (58%)	5 (42%)			
19 – 24 months	13 (76%)	4 (24%)			
25 months or older	3 (33%)	6 (67%)			

Study 2 Summary

This study explored associations between English exposure, parent-report of early language milestones and first language proficiency, maternal education, and performance on a monolingual-normed English language battery in Year 3, among children learning EAL. Early onset of regular English exposure (before 2 years of age), higher maternal education, higher maternal English speaking proficiency, and greater English exposure between 2 years of age and school entry, were each moderately and significantly associated with greater performance on the English language battery. In contrast, late onset of producing two-word combinations (25 months or older) was strongly associated with poorer performance on the battery. Nevertheless, when considered together, only age of onset of English exposure, maternal education, and age of first two-word combination explained unique variance in English language proficiency in Year 3. While these variables were significantly associated with continuous scores, none of these variables were significantly associated with meeting monolingual criteria for language impairment on the English language battery. The only variable which was moderately associated with meeting these criteria was age of onset of producing two-word combinations.

Discussion

This chapter investigated associations between responses on a parent-completed language environment and language development questionnaire and teacher ratings of English language competence at the end of reception year (ages 4-5 years; Study 1), and performance on an English language battery in Year 3 (ages 7-8 years; Study 2), among children learning EAL with diverse first languages. In reception year, age of early language milestones were the only variables significantly associated with ratings of English competence. Specifically, late onset of producing a first word (19 months or older) and first two-word combination (25 months or older) were strongly associated with poorer ratings of communication competence, including performance in the high-risk range. In Year 3, earlier onset of English exposure, greater English exposure between age 2 years and school entry, and greater maternal English proficiency and education, were each significantly associated with greater English language proficiency, to a moderate degree. These variables, however, only showed small associations with meeting monolingual criteria for language impairment in Year 3. In contrast, late onset of producing two-word combinations was strongly associated with poorer English language proficiency in Year 3 and was moderately associated with meeting monolingual criteria for language impairment.

Findings from this study are novel in demonstrating that parent report of early language milestones, particularly age of first two-word combination, are predictive of English language proficiency over the long-term in children learning EAL. The findings are consistent with research demonstrating that late talker status is a risk factor for language impairment in monolingual children (Bishop et al., 2012; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016; S. Reilly et al., 2010; Rice et al., 2008) and later onset of producing first words and two-word combinations are associated with language impairment in children with EAL (Paradis et al., 2010). Findings from this study imply that parent report of early language milestones may help identify children with EAL who experience English language difficulties which likely go beyond limited exposure and may reflect an underlying language impairment.

Parent report of first language proficiency has also been identified as potentially useful in distinguishing language impairment from limited language exposure in children with EAL (Paradis et al., 2010; Tuller, 2015). Paradis et al. (2010) found that lower parent-reported first language proficiency was associated with language impairment in children learning EAL with diverse first languages. In the current study, greater parent-reported first language difficulties in Year 3 were moderately associated with lower English language competence. Similarly, there was a small to moderate, but non-significant, association between lower first language speaking proficiency and an increased likelihood of meeting monolingual criteria for language impairment in Year 3. Noticeably, consistent with Paradis et al. (2010), first language speaking proficiency was low in this sample, though it varied widely between children. Nevertheless, the children typically had good first language comprehension. It is common for children learning EAL, with a minority first language, to become more dominant in the majority language and experience first language attrition, which refers to a loss, or halt in growth, of first language competence (Anderson, 2012; Montrul, 2016; Paradis et al., 2010). This occurs due to a number of reasons, including minimal support for the minority language and perceived lower status of the minority language (Anderson, 2012). Parent report is useful to give an indication of a child’s first language competence in diverse populations (Paradis et al., 2010; Tuller, 2015). However, findings from the current study support previous recommendations to take caution in interpreting low first language competence in children with EAL, with a minority first language, in terms of whether it is indicative of an underlying language impairment (Anderson, 2012; Paradis et al., 2010).

In the current study, higher maternal education was associated to a small degree with fewer reported English language difficulties and an increased likelihood of low-risk status in reception year. Furthermore, higher maternal education was moderately associated with greater performance on an English language battery in Year 3. This is consistent with previous research reporting that maternal education is positively associated with performance by children with EAL on a range of individual English language measures (Bohman et al., 2010; Hammer et al., 2012; Paradis, 2011; Paradis & Jia, 2016). This study builds on previous research by demonstrating that the association remains when assessing overall English language competence, using a comprehensive English language battery.

Lower maternal education has been identified as a risk factor for language impairment in monolingual children, though this finding is typically small in magnitude and has not always been replicated (Harrison & McLeod, 2010; Nelson et al., 2006; Reilly et al., 2010). Similarly, Peña et al. (2011) reported a small relationship between higher maternal education levels and lower risk for language impairment in Spanish-English bilingual children. To the author’s knowledge, no previous research has considered the relationship between maternal education and the likelihood of meeting monolingual criteria for language impairment on a comprehensive English language battery among children with EAL. In the current research, higher maternal education was weakly and not significantly associated with a lower likelihood of meeting monolingual criteria for language impairment in Year 3. It is important to note that this research was limited by a lack of statistical power and by reducing maternal education to a binary variable, both of which were due to the small sample size. Nevertheless, while not significant, the magnitude of this finding seems consistent with previous research on risk for language impairment in monolingual and bilingual children.

The finding that earlier onset of English exposure, and thus greater length of English exposure, was moderately associated with greater English language proficiency in Year 3 is consistent with previous studies (Chondrogianni & Marinis, 2011; Paradis, 2011; Paradis & Jia, 2016). However, the finding that age of onset of English exposure was very weakly associated with English language competence in reception year is inconsistent with these studies. Furthermore, this is inconsistent with cross-sectional research by Bedore et al. (2016), who found that age of onset of English exposure explained more variance in English competence in Grade 1 than Grade 3 in Spanish-English bilinguals. This discrepancy is difficult to explain, though it may reflect that English proficiency in reception year was assessed using a teacher-completed checklist of communication competence in everyday situations, while competence in Year 3 was assessed using a comprehensive language battery. Children with EAL who are still developing English proficiency have been reported to show lower social competence, and increased shyness, relative to typically developing monolingual children (Goldfeld et al., 2014; Guhn, Milbrath, & Hertzman, 2016) Thus, since the reception year assessment was based on everyday interactions, teachers may have underestimated the English competence of some children with EAL.

The proportion of English exposure received between 0 and 2 years of age and between 2 years and school entry was also considered in the current paper. Comparable to the analysis on age of onset of English exposure, these variables were very weakly associated with teacher ratings of English competence in reception year. However, greater English exposure between age 2 years and school entry was moderately associated with greater English language competence in Year 3. These questionnaire variables concerned language exposure generally, rather than from specific sources. English nursery attendance was, however, considered as a specific source of exposure. English nursery attendance was very weakly associated with English proficiency in Year 3, though there was a small to moderate association between English nursery attendance and fewer English language difficulties in reception year. The low associations between English nursery attendance and English competence could reflect that the majority of children attended nursery. An interesting avenue for future research would be to additionally consider the influence of frequency of nursery attendance.

The frequency with which children completed English language and literacy activities at home in Year 3 was positively associated, to a small to moderate but non-significant degree, with English language proficiency in Year 3. This finding sits somewhere between previous reports of very weak associations between the frequency of English language and literacy activities and English competence (Gutierrez-Clellen & Kreiter, 2003) and reports that such activities are significantly associated with English competence among children with EAL (Paradis, 2011; Paradis & Jia, 2016). Similarly, current English exposure received by the children from their mother, father and siblings was weakly and not significantly associated with Year 3 English language competence. While previous research is mixed regarding the influence of English exposure in the home, these results are consistent with previous studies on children with EAL, who are of comparable age to the children in the current study, which have reported no significant association between language exposure from family members and English componence (Gathercole & Thomas, 2009; Gutierrez-Clellen & Kreiter, 2003; Paradis & Jia, 2016). Noticeably, however, there were moderate to large associations between language exposure from family members and parent-reported first language proficiency. Specifically, children who received proportionally more exposure to their first language at home, rather than English, were rated by their parents as displaying greater first language proficiency in Year 3. This is consistent with previous research (Gathercole & Thomas, 2009; Gutierrez-Clellen & Kreiter, 2003; Hammer et al., 2012) and highlights that exposure to the children's first language from family members is important to support first language development.

Taken together, findings from Study 2 imply that exposure to English prior to school entry is important in determining long-term English language proficiency during primary school. However, the findings also imply that current language exposure from family members does not have a strong influence on English language proficiency during the school years. Paradis (2011) and Paradis and Jia (2016) reported comparable findings and suggested that the weak influence of English exposure in the home may reflect the quality of English language input from family members. Consistent with this, as well as findings from previous studies (Chondrogianni & Marinis, 2011; Hammer et al., 2012; Paradis & Jia, 2016), maternal, but not paternal, self-rated English proficiency was moderately associated with greater child English proficiency in Year 3. Nevertheless, it should be noted that most parents reported that they had good levels of English language proficiency. Findings may also imply that while English exposure prior to school entry is important, most children receive sufficient exposure to English at school to support their English language development. Consistent with this, Gathercole and Thomas (2009) found that language exposure at home was significantly associated with English receptive vocabulary among Welsh-English bilinguals aged 3-5 years, but not among those aged 6-8 years and 8-11 years.

The findings from this research concerning associations between language exposure and performance on measures of English language competence, by children with EAL, are important for advising practitioners, and in turn parents, on the impact of language exposure on child language development (Bedore et al., 2016; Paradis, 2011). Furthermore, this research will also help practitioners to understand the suitability of assessing children with EAL using English language measures and help them to interpret the performance of children with EAL on such measures, in terms of whether poor performance likely goes beyond limited exposure (Paradis, 2011). Indeed, while monolingual-normed language measures are not recommended for the identification of language impairment in bilingual children (Bedore & Peña, 2008; Kohnert, 2010), speech and language therapists tend to rely on such measures when assessing bilingual children, due to a lack of alternative resources (Caesar & Kohler, 2007; Williams & McLeod, 2012).

While previous studies have focused on exploring English competence continuously, this study additionally considered associations between language exposure variables and the likelihood of meeting monolingual criteria for language impairment on a comprehensive English language battery. The proportion of English exposure received prior to school entry, and concurrently from family members, was very weakly associated with meeting monolingual criteria for language impairment in Year 3. There was, however, a small association between earlier onset of English exposure and an increased likelihood of meeting criteria for typical language development. Furthermore, there were small to moderate associations between meeting monolingual criteria for language impairment and lower maternal English speaking proficiency, and a lower frequency of completing English language and literacy activities at home. Consistent with the challenge faced by practitioners (De Lamo White & Jin, 2011; Paradis et al., 2013), we were unable to determine whether children who met the monolingual criteria for language impairment did indeed have an underlying language impairment. Nevertheless, the finding that meeting these criteria was generally weakly associated with exposure variables, but was moderately associated with late onset of early language milestones, suggests that such criteria may have value in identifying children whose difficulties may go beyond exposure. It is important to note, however, that the language battery was administered after all children had received at least three years of exposure to English in school. These findings cannot be generalised to children with more limited English exposure.

In contrast to other studies in the field which have typically recruited specific bilingual groups, such as Spanish-English bilinguals, a major strength of this research is that the sample included children with diverse first languages. Thus, this research is more representative of children learning EAL in the UK, but is also applicable to other highly diverse populations. The use of a comprehensive English language battery in Study 2 is also a strength as previous studies have typically focused on the relation between exposure and competence in specific linguistic domains, rather than overall English language competence. Moreover, the use of a teacher-completed checklist of communication competence in everyday situations, within Study 1, is also novel in the field. However, given the conflicting findings between the influence of exposure on the teacher-completed communication checklist and performance on an English language battery, further research should utilise both measures concurrently and investigate whether the discrepancies hold.

Given the little longitudinal research in the field and the tendency to study children who vary widely in age, a major strength of this research is the longitudinal design and the fact that all children were recruited at school entry. This design enabled an investigation of the influence of language exposure and early language milestones at different stages of a child's education. This research was limited, however, by small sample sizes in both studies and therefore a lack of statistical power. Many effects were small to moderate, but were not statistically significant. Future studies, using larger samples sizes, are important to investigate whether these effects replicate. Despite working with local authorities and bilingual support workers, a relatively small number of parents agreed to complete the language environment and language development questionnaire. This highlights the challenge of conducting research on children and families from minority first language backgrounds.

As noted in the method section of Study 1, for the majority of children who took part in this research, bilingual support workers administered the language environment and language development questionnaire to parents over the phone. While the bilingual support workers were given considerable training in administrating the questionnaire to ensure that they understood the questions, it was not possible to measure whether the bilingual support workers asked the questions in the way we intended them to. Furthermore, it was also not possible to verify whether parents who received the questionnaire in the post fully understood the questions, as the questionnaire was provided only in English. An alternative strategy would have been to provide parents with the English questionnaire, as well as a translated version in their first language. However, translating the questionnaire would have been costly and not feasible for the number of languages represented. Furthermore, the Race Equality and Minority Achievement team at Surry County Council (personal communication, March 2014) advised that many families with EAL are not literate in their first language. The Race Equality and Minority Achievement team also advised that parents often recruit family members or friends to help them complete forms in English if necessary, a strategy which has also been noted by Tuller (2015). However, in the current research, we have no measure of whether any of the parents who received the questionnaire via post used this strategy to support their understanding of the questionnaire.

In conclusion, this paper presents important longitudinal research on associations between language exposure, maternal education, early language development, and performance on measures of English language competence among children learning EAL, at different stages of their education in UK schools. English exposure prior to school entry, and maternal English proficiency and education were each moderately associated with English competence in Year 3. However, age of early language milestones, particularly age of first two-word combination, was mostly strongly associated with English language competence at both time points, including performance in the range of educationally significant low levels of proficiency, by monolingual norms. Thus, parent report of early language milestones may help the early identification of children with EAL who will likely experience persistent English language difficulties, which may go beyond limited exposure.

Chapter 7: General Discussion

This thesis explored the language and cognitive development of children learning EAL over the early school years. The first experimental chapter, Chapter 2, explored associations between learning EAL, English language proficiency at school entry, concurrent social, emotional, and behavioural functioning, and academic attainment over the early schools years. This chapter demonstrated that low levels of English language proficiency at school entry is a key risk factor for social, emotional, behavioural, and academic difficulties. Subsequently, the theme of the remaining experimental chapters was to investigate how to identify children with EAL who will likely experience persistent English language learning difficulties, which may go beyond limited exposure and may reflect an underlying language impairment. Furthermore, Chapters 2 and 3 touched on the controversial theory that bilingualism is associated with cognitive advantages (Bialystok et al., 2009). Potential advantages in academic attainment, behavioural development, and executive function were investigated, as well as the extent to which such advantages are dependent upon English language proficiency.

This chapter begins with summaries of the key findings from each of the five experimental chapters and a discussion of how these findings relate to previous research, as well as to findings from other chapters within the thesis. The educational and clinical implications of the research are then considered followed by strengths, challenges, limitations, and future research directions, and finally conclusions.

Summary of Findings

Chapter 2

Contrary to the theory that growing up learning multiple languages is associated with cognitive advantages (Bialystok et al., 2009), data from national educational assessments in England indicate an attainment gap throughout primary school that favours monolingual children versus children learning EAL (Strand et al., 2015). However, government reports of such assessments do not consider the influence of English language ability, which varies across the full continuum of proficiency among children with EAL (Strand et al., 2015). Limited research has highlighted that English language competence is important in determining the performance of children learning EAL, relative to monolingual children, in terms of academic attainment (Goldfeld et al., 2014; Halle et al., 2012; McLeod et al., 2016; Strand & Demie, 2005) and social, emotional and behavioural functioning (Goldfeld et al., 2014; Halle et al., 2012; McLeod et al., 2016; Winsler et al., 2014). However, of these studies, only Goldfeld et al. (2014) and McLeod et al. (2016) considered the language proficiency of the monolingual comparison children. Moreover, in these studies, language proficiency was reduced to a binary variable and was either based on teacher-responses on one questionnaire item (Goldfeld et al., 2014) or parent-reported speech and language concern (McLeod et al., 2016).

Chapter 2 reported population data which demonstrated that poorer performance on a teacher-completed checklist of English language competence in reception year (ages 4-5 years), in both children with EAL and monolingual peers, was associated with a lower likelihood of meeting curriculum targets in reception year, meeting or exceeding targets in Year 2 (ages 6-7 years), and showing progress in meeting targets between the two time points. Furthermore, lower English language competence was also associated with greater teacher ratings of social, emotional, and behavioural difficulties in reception year. When English language proficiency was not considered, children with EAL displayed greater social, emotional, and behavioural difficulties, and a lower likelihood of meeting academic targets at each time point relative to monolingual peers. However, relative to monolingual peers with comparable levels of English language proficiency in reception year, children with EAL demonstrated advantages in social, emotional, and behavioural functioning in reception year, meeting curriculum targets in Year 2, and showing progress in meeting targets between the two time points. Furthermore, when English language proficiency was controlled, there was no academic attainment gap in reception year between children with EAL and monolingual peers.

These results highlight that caution is needed when interpreting government reports from national educational assessments for children with EAL as a group, without considering levels of English language proficiency. These results are consistent with previous studies reporting that academic attainment and social, emotional, and behavioural functioning among children with EAL are dependent upon English language proficiency (Goldfeld et al., 2014; Halle et al., 2012; McLeod et al., 2016; Strand & Demie, 2005; Winsler et al., 2014). Furthermore, the findings are consistent with other studies demonstrating that once English language proficiency is considered, children with EAL can demonstrate advantages over monolingual peers in social, emotional, and behavioural functioning (Goldfeld et al., 2014; Halle et al., 2012; Winsler et al., 2014) and academic progress over the early school years (Halle et al., 2012).

Chapter 3

Bilingualism is theorised to lead to advantages in executive function (Bialystok et al., 2009), though many studies have failed to replicate such advantages (Antón et al., 2014; Gathercole et al. 2014). The bilingual advantage is reportedly task specific (Carlson & Meltzoff, 2008; Martin-Rhee & Bialystok, 2008) and may be dependent upon having sufficient experience and proficiency using both languages (Bialystok & Barac, 2012; Carlson & Meltzoff, 2008; Poarch & van Hell, 2012b). In monolingual children, language proficiency is positively associated with executive function (Gooch et al., 2016) and children with language impairment display executive function deficits (Henry, Messer, & Nash, 2012b). Little previous research has, however, merged these lines of enquiry and investigated the relationship between language proficiency and executive function in both monolingual children and children growing up bilingual. Chapter 3 addressed this gap in the literature.

Children with EAL and monolingual children completed an English language battery and measures of selective attention, response inhibition, and verbal and visuospatial working memory in Year 1 (ages 5-6 years). Within each group, children were categorised as displaying either typical or low levels of English language proficiency, using criteria for language impairment for monolingual English-speaking children. Consistent with the theory that bilingualism leads to executive function advantages, children with EAL, regardless of language proficiency, displayed a reaction time advantage on the response inhibition task relative to monolingual peers. However, consistent with a growing literature of failures to replicate bilingual executive function advantages, no EAL advantages emerged in selective attention, and verbal or visuospatial working memory. These findings suggest that good levels of English proficiency are not necessarily enough to yield advantages on these tasks among children with EAL. However, this study was limited by a lack of information on first language proficiency. Indeed, previous studies have highlighted that balance of proficiency between the two languages is associated with executive function in bilingual children (Bialystok & Barac, 2012; Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011).

There was no effect of language proficiency on visuospatial working memory among either monolingual children or children with EAL, however children with low language proficiency, regardless of EAL status, demonstrated poorer verbal working memory relative to peers with typical language proficiency. In contrast, children with EAL outperformed monolingual peers with comparably low levels of English language proficiency, and did not differ from peers with EAL and typical English language proficiency, on response inhibition accuracy. Furthermore, there was a similar trend for selective attention. These findings reflect the possibility that the two low language proficiency groups differ in the origins of their language difficulties. More specifically, low language proficiency status for many children with EAL may have reflected a lack of English language experience, rather than an underlying language impairment. Thus, the finding that measures of selective attention and response inhibition were sensitive to differences between these groups supports the recent proposal that measures of executive function may be able to help disentangle language impairment from limited language experience in bilingual children (Jensen de López & Baker, 2015). This chapter was, however, not able to further explore this hypothesis as resources were not available to assess the children in their first language, a challenge which is faced by practitioners generally (De Lamo White & Jin, 2011; Paradis et al., 2013). Nevertheless, this line of enquiry was further explored in Chapter 5, with an investigation of the whether measures of executive function could predict language growth in children learning EAL and thus help identify those whose difficulties may simply reflect limited exposure.

Chapter 4

Dual language assessment is recommended to identify language impairment in bilingual children (Bedore & Peña, 2008; RCSLT Specific Interest Group in Bilingualism, 2007). This is because, with the exception of measures of narrative macrostructure (Boerma et al., 2016; Rezzonico et al., 2015), bilingual children typically perform more poorly than monolingual children on standardised monolingual-normed language measures (Bialystok, Luk, et al., 2010; Burgoyne et al., 2011; Verhoeven et al., 2011) and thus a reliance on such measures is considered to increase risk of misdiagnosis (Bedore & Peña, 2008). However, dual language assessment is not feasible in highly diverse populations such as the UK, where first language measures are not available for all the languages represented, nor feasible to develop and administer (De Lamo White & Jin, 2011). Noticeably, previous research has focused on evaluating the utility of individual monolingual-normed language measures, rather than comprehensive monolingual-normed language batteries. Gillam et al. (2013) found that the EpiSLI diagnostic system for language impairment in monolingual children (Tomblin et al., 1996; in which language impairment is defined as two or more out of five language composite scores falling -1.25 SD or more below the mean) over-identified language impairment in Spanish-English bilingual children, who had been exposed to English regularly for at least one year. However, combining all five language composites in a predictive model yielded acceptable diagnostic accuracy (81% sensitivity, 81% specificity), highlighting the potential of comprehensive English language batteries for the assessment of children with EAL.

Chapter 4 presented the first research which has followed the language development, and considered the functional academic attainment, of children with EAL who meet monolingual criteria for language impairment on an English language battery. Specifically, children with EAL and monolingual children were grouped as displaying low or typical levels of English language proficiency in Year 1, depending on whether or not they scored -1.5 *SD* or more below the monolingual population mean on two or more English language composites. In monolingual children, this cut-off identifies children who experience greater functional academic impairment, relative to those identified by the -1.25 *SD* cut-off (Norbury et al., 2016). Children with EAL and monolingual peers who met this cut-off in Year 1 continued to display comparably impaired overall English language ability two years later in Year 3, despite marginally greater language growth among the EAL group. Moreover, these groups displayed comparably low levels of attainment on national curriculum assessments in Year 2, demonstrating comparable functional impact of their language difficulties. These findings imply that monolingual-normed English language batteries may have some practical value for identifying children with EAL who need support with language learning, regardless of the origin of their language difficulties.

As well as considering overall performance on the English language battery, performance on the six individual language measures (receptive and expressive measures of vocabulary, grammar, and narrative) was also considered. Consistent with previous research, there was an effect of language proficiency, but no effect of EAL status, on narrative macrostructure at each time point (Boerma et al., 2016; Rezzonico et al., 2015). These findings support the assertion that narrative recall tasks are a nonbiased measure of language ability in bilingual children (Boerma et al., 2016; Cleave et al., 2010). Sentence repetition tasks have also been identified as potentially useful in the identification of language impairment in bilingual children (Chiat et al., 2013; Meir et al., 2015). However, Chapter 4 reported that children with EAL, with either typical or low levels of English language proficiency, had poorer sentence repetition accuracy relative to their respective monolingual peer groups in Year 1, though they performed comparably to their monolingual peers in Year 3. These findings indicate that assessment at school entry using only a measure of sentence repetition accuracy may identify many false-positives, whose poor performance reflects a lack of facility with English grammar, rather than a fundamental deficit in language learning. These results are somewhat consistent with studies reporting that typically developing bilingual children often show deficits in sentence repetition accuracy relative to typically developing monolingual peers (Chiat et al., 2013; Thordardottir & Brandeker, 2013; Tsimpli et al., 2016).

Chapter 5

As touched on in Chapter 3, an alternative approach to the challenge of disentangling language impairment from limited language exposure in children with EAL is to use processing-based measures, which can be administered in English and may tap language learning competence (Kohnert et al., 2009). Executive function (Bishop et al., 2014), nonword repetition (Baddeley, Gathercole, & Papagno, 1998; Gathercole 2006), and non-verbal ability (Paradis, 2011) have all been hypothesised to have a causal role in language learning and thus may help to identify children with EAL who will likely experience persistent English language learning difficulties, which may go beyond limited exposure. Little longitudinal research has, however, investigated potential causal relationships between these processes and language competence, particularly in children growing up bilingual.

Taking a continuous approach, Chapter 5 investigated whether Year 1 measures of nonword repetition, non-verbal ability, and executive function (response inhibition, selective attention, and verbal and visuospatial working memory) can help predict English language proficiency two years later in children with EAL. Nonword repetition in Year 1 significantly predicted Year 3 English language proficiency, while verbal working memory and non-verbal ability were marginally significant longitudinal predictors. However, these measures did not improve prediction of Year 3 English language proficiency over and above Year 1 performance on the English language battery. The findings indicate that these measures do not predict language growth and may not have a casual role in language learning, at least over the early school years. As such, the findings support and extend previous research which has demonstrated that, after controlling for autoregressive effects, nonword repetition does not predict later receptive vocabulary in both monolingual and bilingual children (Farnia & Geva, 2011; Melby-Lervåg et al., 2012) and executive function does not predict later overall language competence in monolingual children (Gooch et al., 2016). The results build on this research by demonstrating similar findings among children with EAL using a comprehensive English language battery.

Measures of nonword repetition have been identified as potentially useful in the challenge of distinguishing language impairment from limited language exposure in bilingual children (Chiat, 2015; Jensen de López & Baker, 2015; Thordardottir & Brandeker, 2013). However, previous studies, utilising clinical samples, have reported that while language impairment is associated with nonword repetition deficits in bilingual children, such tasks do not have acceptable diagnostic accuracy to distinguish bilingual children with language impairment from their typically developing peers (Armon-Lotem & Meir, 2016; Gutiérrez-Clellen & Simon-Cereijido, 2010; Paradis et al., 2013; Thordardottir & Brandeker, 2013; Windsor et al., 2010). Similarly, findings from Chapter 5 also demonstrated strong concurrent associations between nonword repetition and language. However, since nonword repetition did not predict language growth over the early school years, the findings indicate that measures of nonword repetition cannot help the early identification of children with EAL who likely experience persistent English language difficulties and may have an underlying language impairment. The findings suggest that nonword repetition may be associated with language due to the influence of additional variables. Indeed, longitudinal research on monolingual children has demonstrated that reading uniquely predicts growth in nonword repetition (Nation & Hulme, 2011).

Measures of executive function have also been identified as potentially able to help discriminate language impairment from limited language exposure in bilingual children (Jensen de López & Baker, 2015), though very limited research has explored this line of enquiry. Consistent with findings from Chapter 3, Chapter 5 reported that selective attention and response inhibition accuracy were very weakly associated with English language proficiency among children with EAL in Year 1. This is inconsistent with research on monolingual children, which has reported that language impairment is associated with large deficits in response inhibition (Henry et al., 2012b; Spaulding, 2010) and selective attention (Gooch et al., 2014). The findings from Chapter 3 were interpreted as indicating that measures of response inhibition accuracy and selective attention may be sensitive to children's underlying language learning competence, as these measures were associated with language proficiency status in monolingual children. Children with EAL may have differed on these measures from monolingual peers, with comparably low levels of English language proficiency, as the difficulties experienced by many of the children with EAL may have simply reflected limited English exposure, rather than an underlying language learning impairment. Such a theory, however, would lead to the prediction that performance on these measures in Year 1 would predict language growth. This follows the assumption that children with EAL who are typical language learners should show greater English language growth relative to peers who have underlying language impairment (Gillam et al., 2013). In contrast, Chapter 5 reported that Year 1 selective attention and response inhibition accuracy did not predict language growth over the early school years among children with EAL and were just as weakly associated with Year 3 English language proficiency, as they were with Year 1 English language proficiency. While it is important for further research to explore the use of measures of executive function for the identification of language impairment in bilingual children, findings from Chapter 5 suggest that such measures cannot help the early identification of children with EAL who likely experience persistent English language difficulties and may have an underlying language impairment.

While findings from Chapter 5 suggest that executive function does not have a causal role in language learning, the relationship between executive function and language is still unclear. Noticeably, concurrent associations between English language proficiency and selective attention, response inhibition, and verbal working memory were stronger in Year 3, than in Year 1. On the basis of the theory that language and executive function are related as language supports performance on executive function tasks (i.e., verbal mediation; Bishop et al., 2014), this pattern of findings could reflect that the children may have been more likely to recruit their first language, rather than English, to support their performance on these tasks in Year 1 than in Year 3. It should also be noted that in both Chapters 3 and 5, visuospatial working memory was weakly concurrently associated with English language proficiency in children with EAL, while verbal working memory was moderately concurrently associated with English language proficiency. Since the verbal and visuospatial working memory tasks differed only in the extent to which the stimuli were easy or hard to verbalise, respectively, these findings are also consistent with the theory that language supports performance on executive function tasks.

Chapter 6

The previous chapters were limited by a lack of data on language exposure and first language development. Therefore, Chapter 6 investigated associations between responses on a home language environment and language development questionnaire, completed by parents of children with EAL in Year 3, and English language proficiency in reception year and Year 3. English language proficiency was considered continuously at each time point and in terms of risk status for language impairment in reception year and meeting monolingual criteria for language impairment in Year 3. This chapter therefore explored potential risk factors for persistent English language difficulties over the early school years. It should be noted, however, that this chapter used more lenient monolingual criteria for language impairment in Year 3 (two or more English language composites failing -1.25 *SD* below the monolingual population mean), than the criteria used in Year 1 in Chapters 3 and 4 (two or more English language composites failing -1.5 *SD* below the monolingual population mean). This was due to the small number of children who met the stricter cut-off in Year 3 and had parent questionnaire data available. Nevertheless, cut-offs for language impairment are arbitrary (Bishop, 2014; S. Reilly, Tomblin, et al., 2014). Furthermore, the -1.25 *SD* cut-off was used in the most widely cited prevalence study of language impairment in monolingual children (Tomblin et al., 1997) and was recently recommended by Reilly et al. (2014). As such, the findings are relevant in terms of the extent to which language exposure and first language development are associated with meeting monolingual norms used in clinical practice.

Previous research on the relation between the home language environment and English language competence, among children with EAL, has focused on performance on individual language measures, rather than on an overall composite of English language ability. Furthermore, there is little longitudinal research which has considered the relationship between the home language environment and English competence at different stages of a child's education in school. Greater length of English exposure (Bedore et al., 2016; Paradis, 2011; Paradis & Jia, 2016) and greater maternal education (Bohman et al., 2010; Hammer et al., 2012; Paradis, 2011; Paradis & Jia, 2016) are associated with greater English language competence in previous research. Similarly, in Chapter 6, early onset of regular English exposure (before 2 years of age), greater English exposure between 2 years of age and school entry, and greater maternal education were all moderately associated with greater English language competence in Year 3. However, these variables only showed small, and non-significant, associations with meeting monolingual criteria for language impairment in Year 3. Furthermore, and somewhat surprisingly, language exposure prior to school entry was only very weakly associated with teacher ratings of English language competence in reception year. However, there was a small to moderate association between English nursery attendance and fewer reported English language difficulties in reception year, as well as a small association between greater maternal education and fewer reported English language difficulties in reception year.

Within Chapter 6 the influence of current language exposure within the home was considered in relation to English language competence in Year 3. Consistent with previous studies (Chondrogianni & Marinis, 2011; Hammer et al., 2012; Paradis & Jia, 2016), maternal, but not paternal, self-rated English proficiency was moderately associated with greater English language proficiency in Year 3. However, consistent with some previous research (Gutierrez-Clellen & Kreiter, 2003), but inconsistent with other research (Paradis, 2011; Paradis & Jia, 2016), the frequency with which children completed English language and literacy activities at home was not significantly associated with English language proficiency, though there was a small to moderate effect. Furthermore, the proportion of English exposure received from family members was only very weakly associated with English language competence. In contrast, there were moderate to large associations between language exposure from family members and first language competence, whereby children who received proportionally more first language exposure from family members were rated by their parents as having greater first language proficiency. These findings are consistent with previous research (Gathercole & Thomas, 2009; Gutierrez-Clellen & Kreiter, 2003; Hammer et al., 2012) and indicate that while children may receive sufficient exposure to English at school to support their English language development, first language exposure at home is important to support first language development. No variables assessing current exposure at home were significantly associated with meeting monolingual criteria for language impairment in Year 3, though there were small to moderate effects of maternal English speaking proficiency and the frequency of English language and literacy home activities.

Lower parent ratings of the children's first language competence were moderately associated with lower English language proficiency in Year 3 and were also associated, to a small to moderate degree, with an increased likelihood of meeting monolingual criteria for language impairment. First language speaking proficiency was, however, generally low in the sample, though it varied widely between children. This demonstrates the heterogeneity of children with EAL. Parent report of early language milestones was most strongly associated with English language competence at both time points. Late onset of first words (19 months or over) and first two-word combination (25 months or older) were strongly associated with poorer English language competence in reception year, including performance in the high-risk range. Moreover, late onset of first two-word combination was strongly associated with poorer English language competence in Year 3 and moderately associated with meeting monolingual criteria for language impairment in Year 3. Thus, consistent with previous reports that late onset of early language milestones are associated with language impairment in monolingual children (Bishop et al., 2012; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016; Rice et al., 2008) and children with EAL (Paradis et al., 2010), these findings demonstrate that late onset of early language milestones are a risk factor for persistent English language difficulties over the early school years among children with EAL.

Summary of Key Associations

Figure 7.1 provides a summary of the key associations between the variables investigated within this thesis for children with EAL. This figure does not summarize comparisons between children with EAL and monolingual peers. Associations between variables are represented by arrows. As illustrated in Figure 7.1, age of early language milestones were associated with English language proficiency in reception year and Year 3. Associations between age of early language milestones and Year 1 English language proficiency were not assessed within this thesis. As shown in Figure 7.1, English language proficiency in reception year was also associated with behavioural functioning and academic attainment in reception year, as well as academic attainment in Year 2. The association between teacher ratings of English language proficiency in reception year and performance on the English language battery in Year 1 was not reported within the results sections of this thesis. However, the recruitment flow chart (Figure 4.1) in Chapter 4 shows that children who scored in the high-risk range on the English language proficiency scale in reception year were more likely to display low English language proficiency in Year 1, relative to those scoring in the low-risk range in reception year.

Figure 7.1 also illustrates that English language proficiency in Year 1 was predictive of English language proficiency in Year 3. Indeed, the strong association between performance on the monolingual-normed English language battery in Year 1 and Year 3 for children with EAL was a key finding from this thesis. For children with EAL, Year 1 performance on measures of response inhibition and selective attention was not associated with English language proficiency in Year 1 or Year 3. This is demonstrated within Figure 7.1 by a lack of arrows between these variables. In contrast, Year 1 measures of nonword repetition, non-verbal ability, and verbal working memory were associated with English language proficiency in Year 1 and Year 3. However, it is important to note that these measures did not predict growth in English language proficiency between Year 1 and Year 3, which indicates that these constructs may not be casually related to language proficiency, at least over the early school years.

Finally, as illustrated in Figure 7.1, data from the parental questionnaire project indicated that language exposure before school entry, maternal English proficiency, and maternal education were each significantly associated with overall performance on the English language battery in Year 3. In contrast, these variables were not significantly associated with teacher ratings of English language proficiency in reception year. As such, there is no arrow between the box representing these questionnaire variables and the box representing reception year English language proficiency in Figure 7.1. Associations between the parental questionnaire data and Year 1 English language proficiency were not assessed within this thesis.

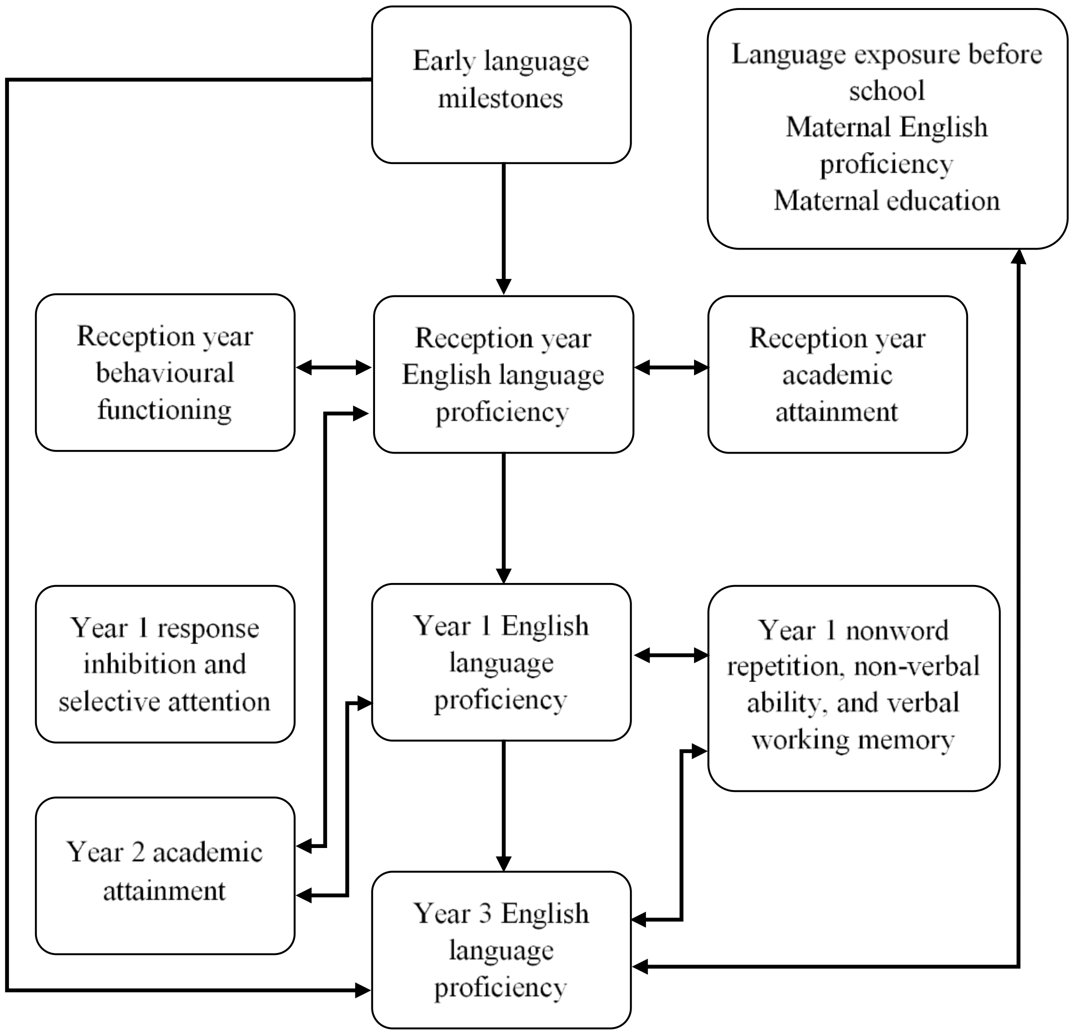

Figure 7.1. Summary of the key associations revealed within this thesis for children with EAL. Arrows represent associations between variables.

Educational and Clinical Implications

Findings from Chapter 2 highlight the importance of taking into account levels of English language competence when reporting and interpreting the attainment of children with EAL, relative to monolingual peers, in national curriculum assessments, and when determining the individual support required by children with EAL. Consistent with these recommendations, the Department for Education (2017) very recently introduced the requirement for schools in England to report levels of English proficiency displayed by children with EAL in the School Census using a new framework. Within the framework, children are rated on a five-point categorical scale that ranges from *new to English* to *fluent.* The descriptions for each level of the scale refer to reading, writing, and spoken English language proficiency and focus on the level of support the children with EAL require to access the curriculum. While this scale is very different to the continuous measure of language competence in everyday contexts that was used in the current research, the approach of considering levels of English proficiency, and not just EAL status, aligns with the conclusions made within this thesis.

Findings from Chapter 2 also highlight that teacher ratings of English language proficiency at school entry are predictive of social, emotional, and behavioural functioning in reception year and academic attainment over the early school years. Similarly, results from Chapter 4 indicate that English language competence in Year 1, as assessed using an English language battery, is associated with functional attainment in Year 2 national curriculum assessments. These findings highlight that in order to access the curriculum in English schools, English language competence at school entry and over the early school years is important. This does not imply that parents of children with EAL should not support first language development in their children. Instead, the findings suggest that it is also important for children with EAL to receive exposure to English prior to school entry to develop English language competence (e.g., through nursery attendance). Indeed, Chapter 6 reported that greater exposure to English prior to school entry is associated with greater English language competence in Year 3. Chapter 6 additionally highlighted that language exposure at home from family members in Year 3 is only weakly associated with English language competence, but is moderately to strongly associated with parent report of first language competence among children with

EAL. Thus, it is important for family members to continue to provide rich interactions in the child's first language to support first language development.

The research presented in Chapter 4 implies that monolingual-normed English language batteries can be informative in the language assessment of children with EAL, in instances where dual language assessment, using appropriately normed measures, is not feasible. Specifically, for children with EAL who have received at least one year of exposure to English from school entry, practitioners can use monolingual criteria for language impairment on a comprehensive English language battery, using the cut-offs outlined in Chapter 4, to identify children who will likely experience persistent English language difficulties over the early school years. While monolingual-normed English language batteries should not be used to diagnose language impairment in children with EAL, this research indicates that such batteries can be used to identify children who require support with language learning, regardless of the underlying origins of their difficulties. The results from Chapter 5 additionally suggest that measures of non-verbal ability, nonword repetition, and executive function are not useful to use in addition to an English language battery to improve prediction of children who will likely have persistent English language difficulties.

This thesis was focused on evaluating resources that can be administered by speech and language therapists during the language assessments of children with EAL. For teachers who wish to know when to refer a child with EAL to a speech and language therapist, it is not feasible to administer the full English language battery. Instead, one approach may be to administer a narrative production task and then refer the child if their macrostructure score is in the impaired range by monolingual norms. Narrative production was highly correlated with the composite score from the full English language battery in the current research. Narrative production was also not biased against children with EAL in Chapter 4, and has been reported in previous literature as a less biased measure of language in bilingual children (Boerma et al., 2016; Cleave et al., 2010; Rezzonico et al., 2015).

Furthermore, the findings from Chapter 6 highlight that another approach for teachers who are concerned about the English language development of a child with EAL is to ask the child's parents about their early language development. Specifically, Chapter 6 highlighted that late onset of producing two-word combinations was the strongest risk factor for meeting monolingual criteria for language impairment in Year 3. Thus, parent report of early language milestones may help to identify children with EAL who are at risk for persistent English language difficulties over the early school years and who may require additional support with language learning. Nevertheless, as outlined later on in this discussion, the predictive ability of parent report of early language milestones should be further explored in future research. Furthermore, this approach may require the help of bilingual support workers if parents do not have sufficient English proficiency to provide this information.

When possible, it is also important for speech and language therapists to try to use parental questionnaires or interviews to gain information about first language development and language exposure to support their assessments of children with EAL. Parent reported information on current first language componence can be informative, as language impairment can be ruled out if parents report that their child has good proficiency in their first language. Furthermore, information on language exposure can help speech and language therapists to interpret the performance of children with EAL on measures of English language competence. For example, Chapter 6 highlighted that age of onset of English exposure is associated with performance on an English language battery in Year 3. Within this PhD research, I was not able to explore the extent to which language exposure prior to school entry impacts on English language growth and the utility of assessing children with EAL using an English language battery in Year 1. As such, this is an important avenue for future research in order to provide further guidance to practitioners.

While this thesis focused on how to identify children with EAL who will likely display persistent English language difficulties over the early school years, a logical next question is how best to intervene. Little research has evaluated intervention approaches for bilingual children and researchers have recognised the need for more research in this area, particularly for UK-based intervention research (Kohnert, 2010; Murphy, 2015; Peña, 2016). It is recommended that bilingual children with language impairment should receive intervention to target both languages (Kohnert, 2010; Pieretti & Roseberry-McKibbin, 2016). In highly diverse populations, such as the UK, is it typically not feasible for speech and language therapists to provide instruction in the child’s first language (Pieretti & Roseberry-

McKibbin, 2016). However, research suggests that intervention approaches which involve parental instruction in the first language, as well as English instruction by a therapist, can support the vocabulary learning of children with EAL in each language (Tsybina & Eriks-Brophy, 2010). In terms of whether a monolingual or bilingual intervention approach is best, Restrepo, Morgan, and Thompson (2013) compared vocabulary-based English-only and Spanish-English bilingual interventions, delivered by trained bilingual intervention teachers, for Spanish-English bilingual children with language impairment. Both groups made comparable gains in English vocabulary, though only the bilingual intervention group made gains in Spanish vocabulary. While there is a need for more intervention research, this research suggests that English language development can be supported through either a monolingual or bilingual intervention approach. Furthermore, a bilingual approach does not impair English learning and has the additional benefit of supporting first language proficiency.

Strengths

A major strength of the research presented within this thesis is that the children were recruited from a population cohort. As a result, the samples within each chapter included children from diverse first language backgrounds and are therefore representative of the current educational and clinical situation in the UK and other highly diverse populations. In contrast, previous studies exploring assessment resources for the identification of language impairment in bilingual children, as well as studies exploring the relation between language exposure and second language competence, have typically recruited children from specific language communities, such as Spanish-English, French-English, and Chinese-English bilinguals. It should be noted, however, that a number of recent studies have also explored language assessment measures for bilingual children with diverse first languages (Boerma et al., 2015, 2016; Cleave et al., 2010; Paradis et al., 2010, 2013; Rezzonico et al., 2015), though there is still a paucity of research on such children. Furthermore, with the exception of Paradis et al. (2013), these studies have focused on evaluating individual assessment measures, rather than the use of assessment batteries.

Furthermore, in contrast to the current research, previous studies exploring assessment measures for the identification of language impairment in bilingual children have almost always selected children from clinical caseloads or specialist schools (e.g., Boerma et al., 2015, 2016; Cleave et al., 2010; Paradis et al., 2010, 2013; Rezzonico et al., 2015; Thordardottir & Brandeker, 2013), though research by Gillam et al. (2013) is a noticeable exception. This approach introduces bias as clinical samples are subject to a number of issues, including misrepresentation of children with EAL (Bedore & Peña, 2008; Broomfield & Dodd, 2004; Mennen & Stansfield, 2006; Winter, 1999, 2001) and misdiagnosis of language impairment among such children (Bedore & Peña, 2008; Paradis et al., 2010). Furthermore, comparing children from clinical samples to typically developing peers can also inflate associations between language and other variables under investigation and can influence estimates of the diagnosis accuracy of assessment resources (Boerma et al., 2016). Indeed, as well as being associated with language impairment, nonword repetition deficits are also associated with dyslexia (Melby-Lervåg & Lervåg, 2012) and deficits in executive function are associated with attention-deficit/hyperactivity-disorder and autism spectrum disorder (Craig et al., 2016). Overall, the recruitment of children from a population sample within this study has a number of advantages over previous studies. This recruitment method enabled a more ecological valid investigation of associations between the language development of children with EAL and the constructs and measures under investigation.

Another key strength is that the children were recruited at school entry and were followed longitudinally over the early school years. While information on language exposure prior to school entry was not available for all children, and thus was not presented in all chapters, the design ensured that length of exposure to English in school was controlled. In Chapter 2, the longitudinal design allowed an investigation of the functional impact of levels of English language proficiency at school entry, among children with EAL and monolingual peers, in terms of academic attainment over the early school years. As such, this research added to the little longitudinal research available in the field. Moreover, in Chapter 4, the longitudinal design enabled a novel way to assess the utility of a monolingual-normed English language battery for use with children with EAL. Specifically, while resources were not available to explore whether monolingual criteria for language impairment in Year 1 identified children with EAL who also experience difficulties in their first language, the design enabled an investigation of the persistence and functional impact of the English language difficulties experienced by children with EAL who met these criteria, relative to their monolingual peers. Similarly, in Chapter 5, the design permitted an evaluation of the utility of measures of executive function, nonword repetition, and nonverbal ability for the assessment of children with EAL, in terms of whether they help predict later English language competence. Finally, in Chapter 6, associations between language exposure, early language development, and English language competence for children with EAL at different stages in school were explored. As such, the research presented within Chapter 6 makes a strong contribution to previous studies in this field, which are typically limited by cross-sectional designs and samples of children who vary widely in age (e.g., Chondrogianni & Marinis, 2011; Paradis, 2011).

Ecologically valid measures of functional impact were used within Chapters 2 and 4, as data on attainment on national curriculum assessments were incorporated into the analyses. The consideration of functional impact within Chapter 4 is novel in the literature on disentangling language impairment from limited language exposure in bilingual children. While it is important to understand how best to identify language impairment in children with EAL, it is also important to quantify the functional impact of English language difficulties generally, regardless of the underlying origins.

Challenges, Limitations, and Future Directions

The Challenge of First Language Assessment

The initial aim of the research presented within this thesis was to help resolve the challenge of identifying language impairment in children with EAL from diverse first language backgrounds, focusing specifically on children attending schools in the UK. This research was, however, limited by the same obstacles which are faced by practitioners in the field, namely a lack of appropriate assessment resources for all of the languages represented in UK schools (De Lamo White & Jin, 2011). The UK is a highly diverse society, with over 300 different first languages represented by school pupils (NALDIC, 2012a). Moreover, unlike counties such as the United States or Canada, where Spanish-English and French-English bilinguals predominate, respectively, there is no one dominant minority language spoken in the UK.

The typical methodological approach for assessing potential diagnostic measures of language impairment in bilingual children is to explore how well the measures discriminate children with diagnosed language impairment from typically developing bilingual peers. Following recommendations to only diagnose language impairment in bilingual children on the basis of assessment in both languages (Bedore & Peña, 2008; RCSLT Specific Interest Group in Bilingualism, 2007), researchers have typically focused on children from specific language communities and have diagnosed children with language impairment if they show impaired performance on standardised assessments in both languages (e.g., Armon-Lotem & Meir, 2016; Engel de Abreu et al., 2014; Gillam et al., 2013; Iluz-Cohen & Walters, 2012; Meir et al., 2015). However, given the number of first languages represented within this thesis, motivated by the desire to represent the current educational situation in the UK, resources simply were not available to directly assess all children in their first language and, subsequently, identify those with language impairment.

Noticeably, previous studies on language impairment among children with diverse first languages have also been unable to follow recommendations regarding standardised assessment of first language competence. Within these studies, children were recruited from clinical caseloads or specialist schools and had received a diagnosis of language impairment from a speech and language therapist (Boerma et al., 2015, 2016; Cleave et al., 2010; Paradis et al., 2010, 2013; Rezzonico et al., 2015). Diagnosis was typically based on impaired performance on monolingual-normed assessments in the majority language, together with parent report of first language concerns (Cleave et al., 2010; Paradis et al., 2010, 2013; Rezzonico et al., 2015), though Boerma et al. (2015, 2016) only reported majority language assessment. Using this approach, Paradis et al. (2010) recognised that some children with diverse first languages may have been misdiagnosed by speech and language therapists as they were not directly assessed in both languages. Indeed, the lack of appropriate resources is what motivates the investigation of assessment measures for the identification of language impairment in such children. As such, the challenges faced within this thesis were consistent with the challenges faced within previous studies and by practitioners in the field.

Recruitment for the Parent Questionnaire Project

As detailed in Chapter 6, we aimed to acquire data on first language development and language exposure through a parent-completed questionnaire when the children were in Year 3. However, there was a low participation rate among parents of children who had participated in the child assessment in Year 1, as well as among the additional families who were invited to participate in Year 3. For the families who participated in Year 1, contact details provided by the families at the time of consent were used to contact the families two years later in Year 3 and invite them to complete the questionnaire. Families who spoke one of the five most frequently reported first languages in the population sample were invited via a phone call from a bilingual support worker, who was a member of the Race Equality and Minority Achievement (REMA) team at Surrey County Council and spoke both English and the families' first language. Unfortunately, many parents could not be contacted, despite numerous attempts, and some phone numbers were no longer correct. Subsequently, questionnaires were posted to these families, as well as to the parents of the remaining children who participated in Year 1 and did not have one of the five most frequently reported first languages. However, few families returned the questionnaire. An alternative approach, which may have been more successful, could have been to send the questionnaire home with each child following the assessment session in school. However, by the time the questionnaire was developed, and methodological details of the study had been confirmed with the REMA team and participating schools, many children had already completed their school assessment session in Year 3.

The questionnaire return rate may have also been influenced as the questionnaires, which were posted to the families, were written in English. However, translating the questionnaire would have been costly and not feasible for the number of languages represented. Furthermore, and most importantly, the REMA team at Surry County Council (personal communication, March 2014) advised that many families are not literate in their first language.

When the population cohort of children were in Year 3, additional families who had one of the five most frequently reported first languages, as determined through teacher-report in reception year, were invited to complete a telephone interview with a bilingual support worker and to consent for their child to be assessed in school. The aim of this was not only to increase the sample size in Year 3 generally, but specifically to increase the number of children who had both assessment data and parent-completed questionnaire data on first language development and language exposure. As detailed in Chapter 6, information packs, which contained an information video in each family's first language, as well as an information sheet and consent form in English, were sent home with children via schools. Moreover, the bilingual support workers made follow-up calls shortly after the information packs were sent. Nevertheless, the participation rate was low. Participation may have been better if these families were invited in Year 1, instead of Year 3. This would have been during the recruitment stage of the large-scale Surrey Communication and Language in Education Study (SCALES), which this research was running alongside, and thus teachers may have been more likely to encourage families to participate. Moreover, the follow-up calls may have been more successful if these families had been invited in Year 1. During the follow-up calls, the bilingual support workers used contact numbers for the families which were on file with Surrey County Council. By Year 3, many of these numbers were no longer correct, though it is likely that more of these numbers may have been correct two years earlier in Year 1. On a general note, inviting these families in Year 1 would have also been advantageous as it would have meant that more children would have been assessed at both time points.

Implications of the Low Parent Questionnaire Completion Rate

While small sample sizes are common in research on the relationship between language exposure and English language competence in children with EAL (e.g., Chondrogianni & Marinis, 2011; Paradis & Jia, 2016), the power of the analyses in Chapter 6 were limited due to the relatively small sample size. Many effects were small to moderate in size, but may have been statistically significant in larger samples. Sample size is especially important for research on risk factors for language impairment, as many variables individually account for a small amount of variance and large sample sizes are required to assess the overall contribution of many variables together (Harrison & McLeod, 2010).

Due to the low completion rate of the parent questionnaires on first language development and language exposure, these data are only presented in Chapter 6. Had more questionnaires been completed for the children who were assessed in Year 1, it would have been interesting to calculate the proportion of children who met the monolingual criteria for language impairment, used in Year 1, who also displayed difficulties in their first language. This would have provided an indication of the specificity of the criteria for identifying language impairment in children with EAL in Year 1. Nevertheless, the association between first language competence and meeting monolingual criteria for language impairment in Year 3 was reported in Chapter 6. However, this chapter used a more lenient cut-off (-1.25 *SD*, instead of -1.5 *SD*, below the mean on two or more English language composites) due to the small number of children who met the strict cut-off in Year 3 and had questionnaire data available. Moreover, an understanding of the diagnostic accuracy of the English language battery, for use with children with EAL, is arguably more useful for children in Year 1, instead of Year 3, in order to allow early identification and targeted intervention. It is important for further research to address this question.

A further consideration, however, is that the data presented in Chapter 6 highlighted that many children in the sample had relatively low proficiency in their first language. It is possible that families with higher first language proficiency, and perhaps lower English language proficiency, were less likely to participate in the study. Nevertheless, low first language proficiency is common among children with a minority first language and typically reflects attrition or incomplete acquisition of the first language, due to minimal exposure and support for the language or perceived lower status of the language (Anderson, 2012; Paradis et al., 2010). Thus, low first language proficiency does not necessarily reflect an underlying language impairment, further complicating the assessment of children with EAL (Anderson, 2012; Paradis et al., 2010). Had more questionnaires been completed for the children who were assessed in both Year 1 and Year 3, it would have been interesting to explore the extent to which first language competence is associated with language growth and functional academic attainment among children with EAL who meet monolingual criteria for language impairment in Year 1. Chapter 4 touched on the idea that children who meet a strict monolingual cut-off for language impartment in Year 1 may benefit from early targeted support, regardless of the underlying origins of their difficulties. This is an avenue for future research.

Chapter 6 demonstrated that that late onset of early language milestones are a risk factor for persistent English language difficulties over the early school years among children with EAL. If this data had been available for more children who were assessed in both Year 1 and Year 3, this would have allowed an investigation of whether age of early language milestones can improve prediction of later language ability over and above performance on an English language battery. As such, this is an interesting question for further research and is important in order to further support the approach of utilising parent-reported data on early language development during the language assessment of children with EAL (Tuller, 2015).

The low parent questionnaire completion rate also had implications for the investigation of potential executive function advantages among children with EAL, which was explored in Chapter 3. Indeed, the lack of data on first language competence and language exposure is a key limitation of Chapter 3. Previous research has indicated that balance of proficiency between the two languages is associated with executive function in bilingual children (Bialystok & Barac, 2012; Iluz-Cohen & Armon-Lotem, 2013; Vega & Fernandez, 2011) and executive function advantages may be dependent upon having sufficient proficiency and experience using both languages (Carlson & Meltzoff, 2008; Poarch & Bialystok, 2015; Poarch & van Hell, 2012b). If questionnaire data and child assessment data were available for more children in Year 3, including more children with good levels of first language proficiency, it would have been interesting to explore the extent to which language exposure and first language competence are associated with executive function. Specifically, it would have been interesting to explore whether executive function advantages are stronger, or only apparent, among children with specific language exposure and proficiency profiles. Furthermore, Chapter 3 touched on the theory that bilingualism may attenuate executive function deficits associated with language impairment in bilingual children (Engel de Abreu et al., 2014). It would have been interesting to explore this theory by creating a language impairment group on the basis of performance on the English language battery and questionnaire data on first language competence. It would be important to also use questionnaire data on language exposure to explore this theory, in order to create a group with EAL who have language impairment, despite adequate exposure to both languages. As such, a large sample size would be necessary to explore this research question. This is an avenue for future research, as only one previously published study has used a four group design and compared monolingual and bilingual children with either language impairment or typical development (Sandgren & Holmström, 2015).

Measures of Executive Function

In Year 1 and Year 3, the children with EAL were assessed on the same assessment battery which was used in the monolingual population sample of children participating in the SCALES study. This strategy allowed comparisons to be made between children with EAL and their monolingual peers. However, in hindsight of the research questions focused on in this thesis, the battery could have been improved by including an additional measure of executive function. Most studies reporting bilingual executive function advantages have used tasks which involve controlling attention in the presence of competing cues, which are potentially conflicting, such as the flanker task or the dimensional card sort task (Calvo & Bialystok, 2014; Morales et al., 2013). It is a strength that Chapter 3 focused on measures of executive function which have received more limited attention in the literature. However, in order to provide stronger evidence in regard to whether children with EAL display executive function advantages, it would have been beneficial to additionally include one of the most commonly used tasks in the literature, such as a flanker task.

The selected measures of executive function also have implications for Chapter 5. This chapter concluded that the measures of executive function used in the study, namely response inhibition, selective attention, and verbal and visuospatial working memory, do not predict language growth among children with EAL, at least over the early school years. However, findings may have been different if other measures of executive function had been administered. Indeed, a study of vocabulary-based artificial language learning among monolingual children reported that while verbal working memory and inhibition did not uniquely predict language learning, performance on an attentional monitoring task and a card sorting task did (Kapa & Colombo, 2014). It is important for future research to systematically investigate whether these measures of executive function can predict growth in English language competence in children learning EAL.

Assessment Points

While the longitudinal nature of the research presented within this thesis is a key strength, this research is also limited as children only completed the assessment battery in school during two time points. As such, the children were only followed over the early school years and the analyses were limited to linear growth models. Additional time points would have allowed an investigation of potential non-linear growth trajectories. This would have further strengthened Chapter 4 by enabling an investigation of whether children with EAL and their monolingual peers, who met monolingual criteria for language impairment in Year 1, continue to show comparable language ability and functional attainment later on in the school years or whether they depart from their monolingual peers at a specific stage. As such, this would have enabled the long-term implications of using the monolingual-normed English language battery for the assessment of children with EAL to be evaluated.

Furthermore, assessing children at more time points would have strengthened Chapter 5, as the ability of measures of nonword repetition, executive function, and non-verbal ability to predict later English language competence could have been evaluated over a longer period. There were strong longitudinal associations between English language proficiency in Year 1 and Year 3, thus there was little variance left over for measures of nonword repetition, executive function, and non-verbal ability to account for.

Sample Characteristics

In Chapters 3-6, children who were reported to have no phrase speech (NPS) in reception year were oversampled. In Chapter 6 this was an advantage as three of the five participating children with NPS had late onset of early language milestones. This was a key variable of interest within Chapter 6, thus the oversampling of children with NPS helped increase the sample size of children with late onset of early language milestones. However, this oversampling has implications for the interpretation of the findings in Chapter 4. While 27 of the 782 children with EAL, who were screened during reception year, were identified as having NPS, 10 of the 46 children with EAL who participated in Chapter 4 had NPS in reception year. Moreover, eight of these children met monolingual criteria for language impairment in Year 1. In contrast, only two children from the monolingual sample in Chapter 4 were reported to have NPS in reception year, and only one of whom met monolingual criteria for language impairment in Year 1. Nevertheless, this discrepancy between the EAL and monolingual samples in Chapter 4 is consistent with the higher proportion of children with EAL, relative to monolingual children, who were reported to have NPS in the population survey phase. NPS status in reception year in the EAL sample may have reflected more limited exposure to English prior to school entry, or it may be indicative of an underlying language disorder. However, data on language exposure were not available for all of the children with NPS in Chapter 4 to help distinguish these possibilities. Oversampling children with NPS in the EAL sample in Chapter 4 may have yielded an EAL group, who met monolingual criteria for language impairment in Year 1, with more persistent language learning challenges. Thus, this may have led to an overestimation of the long-term utility of the monolingual-normed English language battery. Nevertheless, it should be noted that the EAL and monolingual groups in Chapter 4 were matched according to English language performance in Year 1.

Findings from Chapter 4 provide an important insight into the potential use of monolingual-normed English language batteries for the assessment of children with EAL, including the identification of those who will likely display persistent English language difficulties over the early school years, which impact on functional attainment. However, it is important for these findings to be replicated with a larger sample size. Ideally, a large-scale study, utilising sampling weights within the analyses to reflect the population sample, would be carried out to provide an indication of the proportion of children with EAL who meet monolingual criteria for language impairment in Year 1, as well as providing norms for typical performance by children with EAL. The children's language development and functional attainment would then be followed longitudinally to provide stronger evidence for the long-term utility of assessment in English.

Conclusion

Taken together, the research findings presented within this thesis make a number of strong and novel contributions to the existing literature on the language and cognitive development of children learning EAL, and, in particular, have important implications for the language assessment of such children. This thesis demonstrated that levels of English language proficiency are a more prominent associate of behavioural and academic profiles than EAL status. Indeed, English language competence at school entry, in both children with EAL and monolingual English-speaking peers, was predictive of concurrent social, emotional, and behavioural functioning and academic attainment over the early school years. When levels of English language proficiency at school entry were controlled, children with EAL displayed advantages relative to monolingual peers in concurrent social, emotional, and behavioural functioning and in meeting academic targets two years later. This thesis was also able to replicate an EAL advantage in executive function, specifically in reaction time on a response inhibition task, which was not dependent upon levels of English language proficiency. However, this advantage was only small and no EAL advantages emerged in selective attention and verbal or visuospatial working memory.

This research demonstrated that performance on a monolingual-normed English language battery, administered one year after school entry, is a good indicator of English language proficiency over the early school years among children with EAL. Indeed, monolingual criteria for language impairment on the battery identified children with EAL and monolingual peers who continued to display comparably low levels of English language proficiency two years later and also experienced a comparable academic impact of their difficulties. Measures of response inhibition and selective attention were sensitive to differences between children with EAL and monolingual peers, who had comparably low levels of English language proficiency, indicating that such measures may be able to help identify those whose difficulties reflect language impairment, rather than limited English exposure. However, neither measures of executive function, nor measures of nonword repetition and non-verbal ability, were able to improve prediction of later English language proficiency in children with EAL, over and above performance on an English language battery at the outset. Finally, this thesis presented important research on associations between language exposure, first language development, and performance on measures of English language competence over the early school years in children with EAL. Age of early language milestones showed the strongest associations with English language competence at each time point and may therefore help identify children with EAL who will likely display persistent English language difficulties, which may go beyond limited exposure.

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Appendices

Appendix A: Supplementary Analysis for Chapter 2

This section presents the results of the whole analysis for Chapter 2 after excluding 1,252 monolingual children who attended one of the 39 schools which only contributed data from monolingual children. All children within this sample (*N* = 6,015) attended one of 122 state-maintained schools across Surrey. The participants in this sample were 5,233 (87%) English-speaking monolingual children and 782 (13%) children with English as an additional language (EAL). The EAL sample consisted of 402 boys (51%) and 380 girls (49%) and the monolingual sample consisted of 2,673 boys (51%) and 2,560 girls (49%). All children were aged between 4 years 9 months (57 months) and 5 years 10 months (70 months) when reception year data were collected. As shown in Table A.1, the children with EAL and monolingual children did not significantly differ in age. Table A.1 also shows that the monolingual children had significantly higher Income Deprivation Affecting Children Index (IDACI) rank scores, and thus were from less deprived neighbourhoods, than the children with EAL.

Missing Data

Strengths and Difficulties Questionnaire (SDQ) and Early Years Foundation Stage Profile (EYFSP) data were missing for one child and EYFSP data were missing for a further four children. Year 2 assessment results were missing for 708 (12%) children. A greater proportion of children with EAL (n = 134, 17%) had missing Year 2 assessment results relative to monolingual children (n = 574, 11%; $\chi^2(1) = 24.91$, $p < .001$, Phi = *.06*). Children with missing SDQ, EYFSP or Year 2 assessment data were excluded from relevant analyses. The data analysis procedure outlined in the main manuscript was followed in this analysis.

Results

Figure A.1 displays the distribution of scores on the CCC-S for monolingual children and children with EAL. Most monolingual children received low CCC-S scores, indicating high teacher-rated English language proficiency, and fewer children are represented as CCC-S scores increase. In contrast, the distribution of scores for children with EAL is more evenly spread across the entire range. As shown in Table A.1, children with EAL, as a group, had significantly higher CCC-S scores, and thus lower teacher-rated English language proficiency, than monolingual children. Children with EAL also had significantly higher SDQ total difficulties scores than monolingual children (see Table A.1), which implies that they had greater social, emotional, and behavioural difficulties. Additionally, as shown in Table A.2, children with EAL were significantly less likely than monolingual children to achieve a good level of development in reception year and perform above target in Year 2 assessments. However, these effects were small. Furthermore, children with EAL and monolingual children were equally likely to perform on target in Year 2 assessments and progress from a performing below a good level of development in reception year to performing on target in Year 2 (see Table A.2).

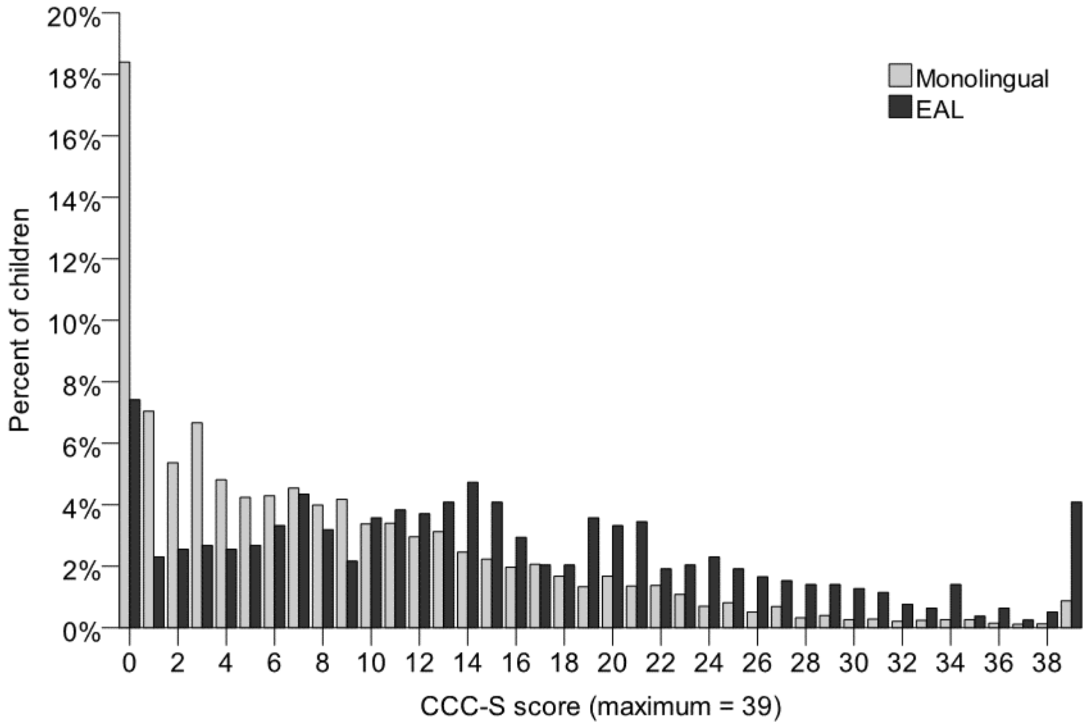

Figure A.1. The percentage of monolingual children and children with EAL who received each score on the CCC-S.

Table A.1

Descriptive Statistics for Continuous Variables for Monolingual Children and Children with EAL

Variable	Monolingual		EAL				
	M (*SD*)	*Mdn* (*IQR*)	*M* (*SD*)	*Mdn* (*IQR*)	*U*	*p*	*r*
Age in months	64.18 (3.56)	64.00 (6.00)	64.20 (3.51)	64.00 (6.00)	2,039,375.50	.882	<.01
IDACI rank score[a]	21,540.08 (7,784.84)	22,316.00 (12,916.00)	18,512.54 (8,439.69)	18,384.50 (14,928.75)	1,622,045.50	< .001	-.12
CCC-S score[b]	8.50 (8.51)	6.00 (12.00)	15.13 (10.51)	14.00 (15.00)	1,255,472.50	< .001	-.23
SDQ total difficulties[c]	5.46 (5.20)	4.00 (6.00)	6.01 (5.29)	5.00 (7.00)	1,902,675.50	.002	-.04

[a]Greater IDACI rank scores indicate lower neighbourhood deprivation. [b]Greater CCC-S scores indicate lower English language proficiency. [c]Greater SDQ total difficulties scores indicate greater social, emotional, and behavioural difficulties.

Table A.2

The Percentage of Monolingual Children and Children with EAL who Achieved Each Attainment Outcome

Attainment outcome	Monolingual	EAL	$\chi^2(df)$	*p*	Phi
GLD in reception	59%	45%	56.93 (1)	< .001	.10
On target in Year 2	85%	82%	3.14 (1)	.077	.02
Above target in Year 2	30%	23%	13.14 (1)	< .001	.05
Below GLD in reception but on target in Year 2	68%	70%	0.75 (1)	.388	.02

Note. GLD = good level of development.

Hierarchical multiple regression was run to examine the association between EAL status and total difficulties scores on the SDQ, after controlling for language proficiency in the unadjusted model and additionally controlling for demographic variables in the adjusted model. The unadjusted model significantly predicted total difficulties scores, $F(3, 6010) = 893.59$, $p < .001$, and explained 31% of the variance. As shown in Table A.3, higher CCC-S scores (i.e. lower English language proficiency) significantly predicted greater total difficulties scores and EAL status significantly predicted lower total difficulties scores. Moreover, there was a significant CCC-S by EAL status interaction; compared to monolingual children, an increase in CCC-S scores among children with EAL was associated with a smaller increase in total difficulties scores (see Figure A.2). These results imply that children with EAL experience fewer social, emotional, and behavioural difficulties than monolingual peers with comparable English language proficiency and this EAL advantage is greater among children with lower English language proficiency. Controlling for demographic variables in the adjusted model did not change the associations revealed in the unadjusted model (see Table A.3), though prediction was significantly improved, $F(3, 6007) = 39.00$, $p < .001$, and a further 1% of the variance was explained. In total, the adjusted model explained 32% of the variance and significantly predicted total difficulties scores, $F(6, 6007) = 474.77$, $p < .001$.

Table A.3

Hierarchical Multiple Regression Predicting Total Difficulties Scores on the SDQ in Reception Year (n= 6014)

Variable	*b*	*SE*	β	*t*	*p*
Unadjusted model					
EAL	-0.64	0.28	-.04	-2.24	.025
CCC-S score	0.34	0.01	.59	48.33	< .001
CCC-S x EAL	-0.07	0.02	-.09	-4.35	< .001
Constant	2.56	0.08		30.19	< .001
Adjusted model					
EAL	-0.63	0.28	-.04	-2.21	.027
CCC-S score	0.33	0.01	.57	45.09	< .001
CCC-S x EAL	-0.07	0.02	-.09	-4.39	< .001
Male sex	1.15	0.11	.11	10.22	< .001
Age in months	-0.02	0.02	-.02	-1.42	.156
IDACI rank score	< -0.01	< 0.01	-.04	-3.68	< .001
Constant	4.11	1.05		3.91	< .001

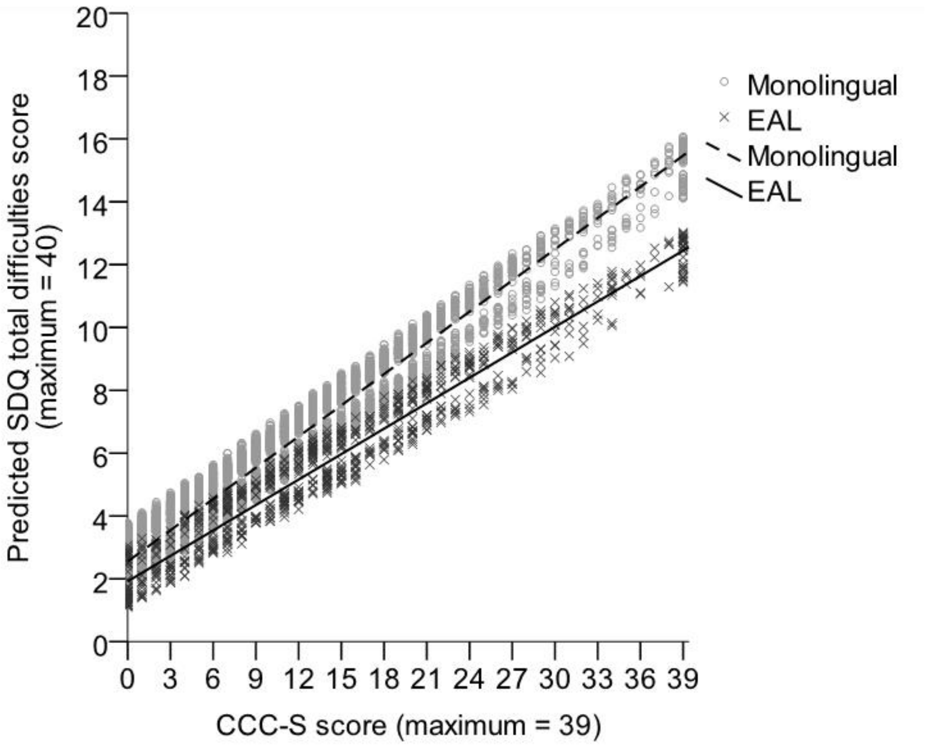

Figure A.2. Predicted SDQ total difficulties scores by CCC-S scores for monolingual children and children with EAL, after controlling for demographic variables. Greater CCC-S scores indicate lower English language proficiency and greater SDQ total difficulties scores indicate greater social, emotional, and behavioural difficulties.

Hierarchical logistic regression was then run to examine the association between EAL status and achieving a good level of development in reception year, after controlling for language proficiency in the unadjusted model and additionally controlling for demographic variables in the adjusted model. The unadjusted model was significant, $\chi^2(3) = 2{,}359.58$, $p < .001$, and explained between 32% (Cox & Snell R^2) and 44% (Nagelkerke R^2) of the variance. As shown in Table A.4, higher CCC-S scores, reflecting lower English language proficiency, were associated with significantly lower odds of achieving a good level of development. EAL status was not a significant predictor of good level of development status and there was no significant CCC-S by EAL status interaction. This implies that, across the continuum of English language proficiency, children with EAL and monolingual children with comparable language proficiency were equally likely to achieve a good level of development in reception year. Controlling for demographic variables in the adjusted model did not change these associations (see Table A.4), though prediction was significantly improved, $\chi^2(3) = 105.64$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 2,465.22$, $p < .001$, and explained between 34% (Cox & Snell R^2) and 45% (Nagelkerke R^2) of the variance.

Table A.4

Hierarchical Logistic Regression Predicting Which Children Achieved a Good Level of Development on the EYFSP in Reception Year (n = 6010)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	0.22	0.20	1.20	.274	1.24 [0.84, 1.83]
CCC-S score	-0.20	0.01	1163.55	< .001	0.82 [0.81, 0.83]
CCC-S x EAL	0.02	0.01	1.74	.187	1.02 [0.99, 1.05]
Constant	2.04	0.06	1248.61	< .001	
Adjusted model					
EAL	0.22	0.20	1.15	.284	1.24 [0.84, 1.85]
CCC-S score	-0.19	0.01	1045.08	< .001	0.83 [0.82, 0.84]
CCC-S x EAL	0.02	0.01	1.31	.253	1.02 [0.99, 1.05]
Male sex	-0.55	0.07	69.24	< .001	0.58 [0.51, 0.66]
Age in months	0.06	0.01	34.96	< .001	1.06 [1.04, 1.08]
IDACI rank score	< 0.01	< .01	7.73	.005	1.00 [1.00, 1.00]
Constant	-1.54	0.61	6.25	.012	

The next analyses focused on academic attainment two years later. Firstly, hierarchical logistic regression was run to predict on target performance in Year 2 assessments. The unadjusted model was significant, $\chi^2(3) = 1,057.27$, $p < .001$, and explained between 18% (Cox & Snell R^2) and 31% (Nagelkerke R^2) of the variance. As shown in Table A.5, higher CCC-S scores, reflecting lower English language proficiency in reception year, were associated with significantly lower odds of performing on target in Year 2. There was no significant CCC-S by EAL status interaction, however EAL status was associated with significantly higher odds of performing on target in Year 2. This shows that children with EAL were more likely to meet academic targets in Year 2 than monolingual peers with comparable language proficiency in reception year. When demographic variables were controlled in the adjusted model, this EAL advantage remained (see Table A.5) and prediction was significantly improved, $\chi^2(3) = 93.25$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 1{,}150.52$, $p < .001$, and explained between 19% (Cox & Snell R^2) and 34% (Nagelkerke R^2) of the variance.

Table A.5

Hierarchical Logistic Regression Predicting On Target Performance in Year 2 Assessments (n = 5307)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	0.76	0.32	5.58	.018	2.14 [1.14, 4.02]
CCC-S score	-0.14	0.01	675.01	< .001	0.87 [0.86, 0.88]
CCC-S x EAL	0.01	0.01	0.27	.606	1.01 [0.98, 1.03]
Constant	3.37	0.09	1456.67	< .001	
Adjusted model					
EAL	0.90	0.33	7.65	.006	2.46 [1.30, 4.67]
CCC-S score	-0.13	0.01	576.50	< .001	0.88 [0.87, 0.89]
CCC-S x EAL	< 0.01	0.01	0.13	.723	1.00 [0.98, 1.03]
Male sex	-0.24	0.09	6.85	.009	0.79 [0.66, 0.94]
Age in months	0.04	0.01	10.74	.001	1.04 [1.02, 1.07]
IDACI rank score	< 0.01	< 0.01	76.44	< .001	1.00 [1.00, 1.00]
Constant	-0.27	0.84	0.10	.747	

The next hierarchical logistic regression predicted above target performance in Year 2 assessments. The unadjusted model was significant, $\chi^2(3) = 1{,}064.96$, $p < .001$, and explained between 18% (Cox & Snell R^2) and 26% (Nagelkerke R^2) of the variance. As shown in Table A.6, higher CCC-S scores, reflecting lower English language proficiency in reception year, were associated with significantly lower odds of performing above target in Year 2. EAL status did not significantly predict above target performance. Thus, when CCC-S scores were 0, which reflects high English language proficiency, children with EAL and monolingual peers were equally likely to exceed Year 2 targets. However, there was a significant CCC-S by EAL status interaction; as CCC-S scores increased, reflecting lower English language proficiency in reception year, children with EAL were more likely to perform above target in Year 2 relative to monolingual peers with equivalent CCC-S scores (see Figure A.3). Controlling for demographic variables in the adjusted model did not change these associations (see Table A.6), though prediction was significantly improved, $\chi^2(3) = 194.72$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 1{,}259.68$, $p < .001$, and explained between 21% (Cox & Snell R^2) and 30% (Nagelkerke R^2) of the variance.

Table A.6

Hierarchical Logistic Regression Predicting Above Target Performance in Year 2 Assessments (n = 5307)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	-0.09	0.17	0.30	.584	0.91 [0.65, 1.27]
CCC-S score	-0.17	0.01	578.85	< .001	0.84 [0.83, 0.85]
CCC-S x EAL	0.06	0.01	18.29	< .001	1.07 [1.03, 1.10]
Constant	0.22	0.05	20.71	< .001	
Adjusted model					
EAL	0.04	0.18	0.04	.835	1.04 [0.74, 1.46]
CCC-S score	-0.16	0.01	496.99	< .001	0.85 [0.84, 0.86]
CCC-S x EAL	0.06	0.01	16.90	< .001	1.06 [1.03, 1.10]
Male sex	0.09	0.07	1.56	.211	1.09 [0.95, 1.25]
Age in months	0.08	0.01	60.46	< .001	1.08 [1.06, 1.10]
IDACI rank score	< 0.01	< 0.01	127.94	< .001	1.00 [1.00, 1.00]
Constant	-5.97	0.65	83.33	< .001	

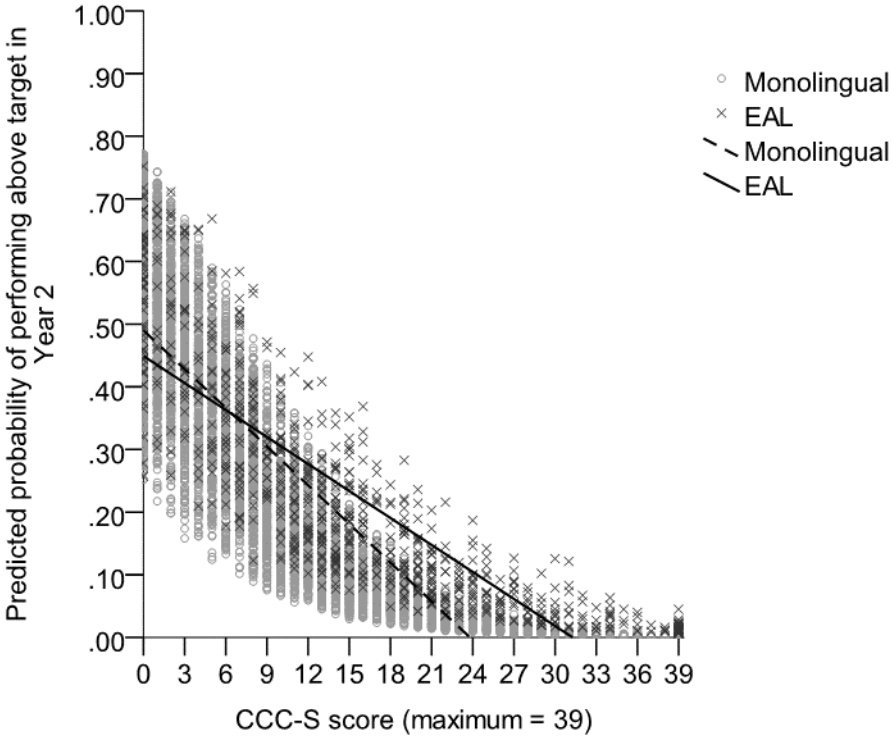

Figure A.3. Predicted probability of performing above target in Year 2 assessments by CCC-S scores for monolingual children and children with EAL, after controlling for demographic variables. Greater CCC-S scores indicate lower English language proficiency.

The final hierarchical logistic regression predicted progression from performing below a good level of development in reception year to performing on target in Year 2. The unadjusted model was significant, $\chi^2(3) = 352.35$, $p < .001$, and explained between 14% (Cox & Snell R^2) and 20% (Nagelkerke R^2) of the variance. As shown in Table A.7, higher CCC-S scores, reflecting lower English language proficiency in reception year, were associated with significantly lower odds of performing on target in Year 2. There was no significant CCC-S by EAL status interaction, however EAL status was associated with significantly higher odds of performing on target in Year 2. This indicates that children with EAL, who were academically underachieving in reception year, were more likely to go on and meet academic targets in Year 2 relative to monolingual peers with comparable language proficiency and academic attainment in reception year. When demographic variables were controlled in the adjusted model, this EAL advantage remained (see Table A.7) and prediction was significantly improved, $\chi^2(3) = 47.25$, $p < .001$. The adjusted model was significant, $\chi^2(6) = 399.60$, $p < .001$, and explained between 16% (Cox & Snell R^2) and 23% (Nagelkerke R^2) of the variance.

Table A.7

Hierarchical Logistic Regression Predicting Progression From Performing Below a Good Level of Development in Reception Year to Performing On Target in Year 2 (n = 2257)

Variable	*b*	*SE*	Wald	*p*	Odds ratio [95% *CI*]
Unadjusted model					
EAL	1.06	0.40	7.14	.008	2.88 [1.33, 6.26]
CCC-S score	-0.10	0.01	234.33	< .001	0.91 [0.90, 0.92]
CCC-S x EAL	-0.01	0.02	0.47	.495	0.99 [0.96, 1.02]
Constant	2.23	0.12	376.23	< .001	
Adjusted model					
EAL	1.19	0.40	8.84	.003	3.29 [1.50, 7.20]
CCC-S score	-0.09	0.01	207.96	< .001	0.91 [0.90, 0.92]
CCC-S x EAL	-0.01	0.02	0.60	.439	0.99 [0.96, 1.02]
Male sex	-0.13	0.10	1.63	.202	0.88 [0.72, 1.07]
Age in months	0.03	0.01	3.31	.069	1.03 [1.00, 1.06]
IDACI rank score	< 0.01	< 0.01	42.87	< .001	1.00 [1.00, 1.00]
Constant	-0.26	0.95	0.07	.788	

Appendix B: Supplementary Analysis for Chapter 5

Table A.8

Concurrent Pearson's Correlations Between Language Composite Z-Scores and Raw Scores on Individual Language Measures in Year 1 (Below the Diagonal) and Year 3 (Above the Diagonal)

Variable	1.	2.	3.	4.	5.	6.	7.
1. Lang. composite	-	.86***	.85***	.73***	.80***	.81***	.84***
2. EOWPVT-4	.84***	-	.76***	.55***	.55***	.69***	.70***
3. ROWPVT-4	.90***	.75***	-	.57***	.68***	.68***	.65***
4. SASIT-E32	.79***	.65***	.68***	-	.71***	.47**	.59***
5. TROG-S	.82***	.55***	.71***	.57***	-	.58***	.55***
6. Narrative recall	.79***	.55***	.63***	.49**	.64***	-	.71***
7. Narrative comp.	.90***	.73***	.77***	.62***	.69***	.69***	-

Note. Lang. composite = language composite *z*-score; EOWPVT-4 = Expressive One-Word Picture Vocabulary Test; ROWPVT-4 = Receptive One-Word Picture Vocabulary Test; SASIT-E32 = School Age Sentence Imitation Task - English 32; TROG-S = Test for Reception of Grammar – Short; Narrative comp. = Narrative comprehension.

*$p < .05$, **$p < .01$, ***$p < .001$

Appendix C: Parent Questionnaire for Chapter 6

Child ID: ____________________ Today's date (DD/MM/YYYY): ____________________

Respondent: ☐ Mother ☐ Father ☐ Other (specify): ____________________

Background information about the child

1.1 Child's country of birth: ____________________

1.2 If country of birth is not UK, then date of arrival in the UK: ____________________

1.3 Child's main language other than English[1]: ____________________

[1]This will be referred to as ***'home language'*** *throughout the questionnaire.*

1.4 Other than this language and English, does your child speak any other languages[2] (please tick one box)?

☐ No ☐ Yes (please specify): ____________________

*[2]This will be referred to as '****other language'*** *throughout the questionnaire.*

1.5 Number of older siblings: ____________________

1.6 Number of younger siblings: ____________________

1.7 Does your child currently receive any extra help at school (please tick one box)?

☐ No ☐ Do not know ☐ Yes (please specify): ____________________

1.8 Does your child have a statement of special education needs (SEN) (please tick one box)?

☐ No ☐ Do not know ☐ Yes (please specify): ____________________

1.9 Does your child have any sensory impairment (please tick all boxes that apply)?

☐ No known sensory impairment

☐ Diagnosed sight loss

☐ Diagnosed hearing loss

☐ Other (please specify): ____________________

1.10 Has your child received any diagnoses from external agencies, e.g. from a Doctor or Psychologist (please tick one box)?

☐ No known diagnoses

☐ Yes (please specify): ____________________

☐ Yes, but unsure of label

Child's early language history

2.1 How old was your child when he/she spoke his/her first word (in any of his/her languages) (please tick one box)?

☐ 1 year or younger

☐ 1 year 1 month - 1 year 6 months

☐ 1 year 7 months - 2 years

☐ Over 2 years

2.2 How old was your child when he/she began to combine two or more words together to make short sentences, e.g. “more milk” (in any of his/her languages) (please tick one box)?

☐ 1 year 6 months or younger

☐ 1 year 7 months - 2 years

☐ 2 years 1 month - 2 years 6 months

☐ 2 years 7 month - 3 years

☐ Over 3 years

2.3 How old was your child when he/she started to receive regular[3] exposure to the languages he/she speaks?

[3]*Regular exposure: the language was used with the child in their home daily* ***OR*** *the child received exposure through nursery/preschool/child-minder/school for at least 3 half day sessions per week.*

	Age (in years and months)
Home language	
English	
Other language	

2.4 Has your child ever spent an extended period[4] of time outside of the UK, where he/she received little or no exposure to English (if no go to question 2.6)?

[4]*Extended period: 3 months or longer*

☐ No ☐ Yes

2.5 What date did your child leave the UK and what date did they return?

Visit	Date left UK	Date returned to UK
1		
2		
3		
4		

2.6 Before your child started reception class in primary/infant school, which people/sources did he/she receive regular exposure to each language from (please tick all boxes that apply)?

	Home language	English	Other language
Mother			
Father			
Siblings			
Grandparents			
Extended family			
Friends			
Babysitter/child-minder			
Nursery/preschool			
Religious activities			
Other (specify)			

2.7 In general, how often was your child exposed to each language when he/she was aged between 0 and 2 years (please tick one box per language)?

Please think about the total language exposure that your child received during this time and consider roughly how much of that time they were exposed to each language. Response examples for a child exposed to two languages:

- 'Half of the time' and 'half of the time' - if both languages were used a roughly equal amount of time
- 'Always' and 'Never' - if one language was always used and the other was never used.
- 'Usually' and 'Sometimes' - if one language was usually used and the other language was used sometimes.

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

2.8 In general, how often was your child exposed to each language when he/she was aged between 2 years and the age he/she started reception class in primary/infant school (please tick one box per language)?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

Current language environment at home

3.1 How often does the child's mother/guardian use each language when speaking to the child (please tick one box per language)?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.2 How often does the child's father/guardian use each language when speaking to the child?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.3 How often does the child's older siblings use each language when speaking to the child (if applicable)?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.4 How often does the child's younger siblings use each language when speaking to the child (if applicable)?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.5 How often does the child's grandparents/extended family on the child's mother's side of the family use each language when speaking to the child?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.6 How often does the child's grandparents/extended family on the child's father's side of the family use each language when speaking to the child?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.7 How often does the child's friends, who he/she regularly plays with <u>outside of school time,</u> use each language when speaking to the child?

	(0) Never	(1) Sometimes	(2) Half of the time	(3) Usually	(4) Always
Home language					
English					
Other language					

3.8 How often does your child do the following activities <u>outside of school time</u> in each language (please tick one box per activity; please turn page over)?

Language	Activities	Frequency				
		(0) Never/ almost never	(1) 1-2 days a month	(2) 1-2 days a week	(3) 3-5 days a week	(4) Daily/ almost daily
Home language	Reading alone or with assistance					
	Listen to others reading					
	Writing					
	Use a computer/tablet					
	Watches television/films/videos					
	Listens to music/songs/radio					
	Religious activities					

Language	Activities	Frequency				
		(0) Never/ almost never	(1) 1-2 days a month	(2) 1-2 days a week	(3) 3-5 days a week	(4) Daily/ almost daily
English	Reading alone or with assistance					
	Listen to others reading					
	Writing					
	Use a computer/tablet					
	Watches television/films/videos					
	Listens to music/songs/radio					
	Religious activities					
Other language	Reading alone or with assistance					
	Listen to others reading					
	Writing					
	Use a computer/tablet					
	Watches television/films/videos					
	Listens to music/songs/radio					
	Religious activities					

Child's current language proficiency

4.1 How well does your child speak each language (please tick one box per language)?

	Home language	English	Other language
(0) Little to no proficiency - can only say a few words or nothing at all			
(1) Limited proficiency - can only say a few sentences/phrases			
(2) Moderate proficiency - can express himself/herself with short, simple sentences			
(3) Good proficiency - can express himself/herself well in most situations given age. He/she can carry on a conversation.			
(4) Full proficiency - can express himself/herself with full fluency for their age. Very comfortable having a conversation.			

4.2 How well does your child understand what others say to him/her in each language (please tick one box per language)?

	Home language	English	Other language
(0) Little to no proficiency - understand only a few words or nothing at all			
(1) Limited proficiency - understand a few sentences/phrases			
(2) Moderate proficiency - understand the general idea of what is said			
(3) Good proficiency - understand most of what is said			
(4) Full proficiency - understand everything or almost everything			

4.3 How well does your child read in each language (please tick one box per language)? For this question, please imagine that your child was asked to read a passage of text from a story book targeted at their age group and consider how much of the text he/she would be able to understand.

	Home language	English	Other language
(0) Little to no proficiency - understand only a few words or nothing at all			
(1) Limited proficiency - understand the meaning of a few sentences			
(2) Moderate proficiency - understand the general idea of what is written			
(3) Good proficiency - understand most of what is written			
(4) Full proficiency - understand everything or almost everything			

4.4 Please indicate how frequently your child displays the following communicative errors or communicative strengths when speaking in their home language (and any other language they speak, except English). Please answer all of the questions as best as you can (please write the appropriate number in the box to the right of each statement)[5].

0 = less than once a week, 1 = once a week, 2 = once or twice a day, 3 = several times a day

[5]If the child speaks their 'home language' or 'other language' with 'little or no proficiency' then DO NOT complete this question for that language.

Item	Home language	Other language
Forgets words s/he knows in that language, e.g. instead of "rhinoceros" may say, 'that animal with a horn.'		
Uses pronouns (e.g. "he" or "it") without making it clear what s/he is talking about. E.g. when talking about a film may say 'he was really great' without explaining who 'he' is *(vague language)*.		
Misses the point of jokes and puns (though may be amused by nonverbal humour).		
Uses incorrect language structure to talk about past events (e.g. what s/he did at school).		
Takes in just one or two words of a sentence, so misinterprets what has been said. E.g. if someone says 'I want to go skating next week', s/he may think they have been or want to go now.		
Gets the sequence of events muddled up when trying to tell a story or describe an event. E.g. if talking about a film may describe the end before the beginning.		
Uses appropriate language to talk about future events (e.g. plans for tomorrow or plans for going on holiday).		
You can have an enjoyable, interesting conversation with him/her.		
Can produce long and complicated sentences such as: "When we went to the park I had a go on the swings"; "I saw a girl holding a spotty umbrella."		
Uses words that refer to whole classes of objects, rather than a specific item; e.g. refers to chairs, tables and drawers as "furniture" or apples, bananas and pears as "fruit."		

Speaks clearly, producing all speech sounds in a word accurately.		
Explains a past event clearly (e.g. what s/he did at school or what happened at a party).		
When answering a question, provides just the right amount of information, without being overly precise or too vague.		

Family information

5.1 Mother's country of birth: ____________________

5.2 If mother's country of birth is not UK, then date of arrival in the UK: ____________________

5.3 Father's country of birth: ____________________

5.4 If father's country of birth is not UK, then date of arrival in the UK: ____________________

5.5 What age was each parent when they completed full time education (please tick one box per parent)?

	Mother	Father
16 or less		
17-18		
19-20		
21+		

5.6 What is each parent's highest completed level of education (please tick one box per parent)?

	Mother	Father
Primary		
Secondary		
University - degree		
University - higher degree		

5.7 How well does each parent speak each language?

	Mother			Father		
	Home language	English	Other language	Home language	English	Other language
(0) Little to no proficiency - can only say a few words or nothing at all						
(1) Limited proficiency - can only say a few phases or sentences						
(2) Moderate proficiency - can express yourself with short, simple sentences						
(3) Good proficiency - can express yourself well in most situations. You can carry on a conversation						
(4) Full proficiency - can express yourself with full fluency. Very comfortable having a conversation						

5.8 How well does each parent understand what others say to him/her in each language?

	Mother			Father		
	Home language	English	Other language	Home language	English	Other language
(0) Little to no proficiency - understand only a few words or nothing at all						
(1) Limited proficiency - understand a few sentences/ phrases						
(2) Moderate proficiency - understand the general idea of what is said						
(3) Good proficiency - understand most of what is said						
(4) Full proficiency - understand everything or almost everything						

5.9 How well does each parent read in each language? Please imagine you are reading a passage of text from a book targeted at an adult audience and consider how much of the text you would be able to understand.

	Mother			Father		
	Home language	English	Other language	Home language	English	Other language
(0) Little to no proficiency - understand only a few words or nothing at all						
(1) Limited proficiency - understand the meaning of a few sentences						
(2) Moderate proficiency - understand the general idea of what is written						
(3) Good proficiency - understand most of what is written						
(4) Full proficiency - understand everything or almost everything						

5.10 Is there a history of any of the following in the child's family (please tick one box per row)?

	No	Siblings	Mother	Father	Other (specify)
Speech and/or language difficulties					
Reading difficulties/dyslexia					

5.11 Do you have anything else to add? ____

Thank you for your time!