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Patterns of Change in the Reading Decoding and Comprehension Performance of Adolescents with Specific Language Impairment (SLI)

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Specific Language Impairment (SLI) is associated with reading difficulties. The evidence to support this association, typically, is drawn from studies of elementary school children. Additionally, the extent of the relationship between language and reading skills during adolescence is not yet clear. This study aimed to examine the word reading and comprehension skills of adolescents with a history of SLI at the end of compulsory education in the UK. The study is framed within the Simple View of Reading and the two-dimensional model of reading as proposed by Bishop and Snowling (2004). Fifty-six young people, identified at the age of 8 as having SLI were assessed at 14 and 16 on a range of language and literacy measures. Results indicated that adolescents with a history of SLI were at higher risk of experiencing reading difficulties when compared with their typically developing peers. Single word decoding and receptive vocabulary were significant factors in explaining reading comprehension at the age of 16 for the adolescents with a history of SLI, a pattern that differed from that for their matched peers. Educational and clinical implications for the assessment and intervention of reading skills during secondary education are discussed.

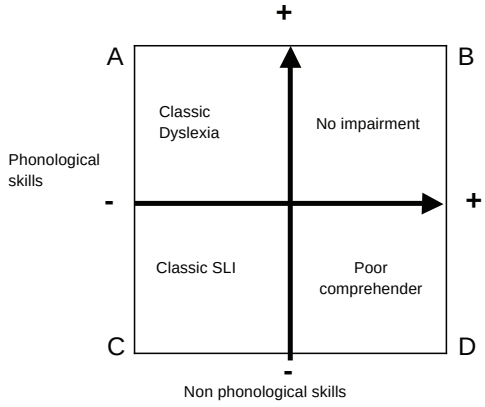
Keywords: Specific Language Impairment, Adolescence, Word Reading, Reading Comprehension, Language Comprehension, Simple View of Reading

The Simple View of Reading proposes that the development of literacy skills is a complex process that depends on two sets of skills: decoding and oral language comprehension (Gough & Tunmer, 1986, Nation & Norbury, 2005). Both skills are equally important for reading for meaning. A child with impaired word reading skills can have difficulties understanding texts, while a child with language comprehension difficulties can experience literacy problems in the presence of adequate word recognition skills. Evidence deriving mainly from studies of typically developing children has shown a close association in the development of skilled decoding and comprehension for children in their early years, but this association tends to decline as children move to high school (Gough, Hoover, Peterson, 1996; Catts, Adlof, Weismer, 2006). As children learn to read, word decoding is predicted by letter knowledge and phoneme sensitivity whereas reading comprehension is

predicted by word recognition, vocabulary and grammar (Muter, Hulme, Snowling, & Stevenson, 2004).

Nonetheless, single word decoding and comprehension can also be dissociated. Children with dyslexia, for example, experience marked difficulties with word decoding but unimpaired comprehension (Snowling, 2000). The difficulties with reading accuracy experienced by these children are attributed to problems with the phonological components of reading (Swann & Goswami, 1997). Another group of children has been identified with impaired reading comprehension skills, but age-appropriate word decoding. The difficulties of these children appear to be based in the non-phonological aspects of reading (Nation, 2005). Based on the Simple View of Reading, Bishop and Snowling (2004) introduced a two-dimensional model to capture these phonological and non phonological aspects of reading and thereby to classify children in relation to reading and language disorders. This model, presented in Figure 1, depicts the two dimensions with decoding skills (phonological skills) ranging from poor to good on the horizontal axis and language comprehension skills (the non-phonological dimension of reading) ranging from poor to good on the vertical axis. Children with dyslexia are usually placed in quadrant A and those children with poor reading comprehension in quadrant D.

***Figure 1*. Two-dimensional model of reading adopted by Bishop and Snowling (2004).**



Analyses of the reading profiles of children with SLI offer an opportunity to test and extend the model. Children with SLI experience difficulties with the acquisition and processing of oral language skills, which cannot be explained in terms of other cognitive, perceptual or neurological impairments (Leonard, 1998). Prevalence studies suggest that SLI affects approximately 5-7% of the population at school entry (Tomblin et al., 1997). However, there is heterogeneity in both individuals' profiles of needs and their outcomes over time (Carroll & Dockrell, 2010; Conti-Ramsden, 2008). Problems with language and communication often continue during early (Aram, Ekelman, & Nation,, 1984; Beitchman, Wilson, Brownie, Walters, & Lancee, 1996; Botting, Faragher, Simkin, Knox, & Conti-Ramsden, 2001) and late adolescence

(Conti-Ramsden, 2008; Dockrell, Lindsay, Palikara, & Cullen, 2007; Johnson et al. 1999; Tomblin, 2008). Language difficulties during adolescence include problems with auditory processing (McArthur & Bishop, 2004), the grammatical structure of language (Van der Lely & Ullman, 2001) and verbal working memory (Weismer, Plante, Jones, & Tomblin, 2005).

Reading Skills of Children and Adolescents With SLI

It is now well-documented that children with SLI are vulnerable to difficulties in learning to read accurately and fluently (Bishop & Adams, 1990; Fraser, Goswami, Conti-Ramsden, 2010; Van Weerdenburg, Verhoeven, van Balkom , & Bosman, 2009). Bishop and Adams (1990) investigated the reading skills of children with SLI, initially identified at the age of four, when they were five and eight years old. They found that the children with SLI who had resolved language skills by the age of five seemed to have age-appropriate word reading skills, whereas those with persisting SLI were experiencing marked difficulties with reading decoding. Literacy difficulties with both reading decoding and reading comprehension are evident in children with SLI in elementary school (Botting, Simkin & Conti-Ramsden, 2006; Dockrell & Lindsay, 2004).

There is a general consensus that if language difficulties are not resolved by the age of five, there is heightened risk of reading difficulties in children with SLI (Catts, Fey, Tomblin, & Zhang, 2002; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). The accumulative evidence from relevant studies led some researchers to suggest that SLI and dyslexia were points on the same continuum (Catts, 1991; Kamhi & Catts, 1986; Tallal, Allard, Miller, & Curtiss, 1997). Bishop and Snowling (2004), however, suggested that dyslexia and SLI should be treated as though they are different. Although both developmental disorders appear to have similarities, especially at the behavioural level, children with SLI tend to experience problems both with decoding and reading comprehension (placing them in quadrant C of the model in Figure 1), whereas the reading comprehension skills of children with dyslexia tend to be unimpaired.

Interestingly, recent research has identified a subgroup of children with SLI that had age-appropriate decoding and phonological skills but some comprehension difficulties (Bishop, McDonald, Bird & Hayiou-Thomas, 2009; Catts, Adlof, Hogan, & Weismer, 2005; Kelso, Fletcher & Lee, 2007). Catts et al. (2005) examined the phonological skills of three groups of Grade 2, Grade 4, and Grade 8 children: one group of children with dyslexia, one with SLI and one with SLI and dyslexia. They found that children with SLI performed significantly better than the two other groups on measures of phonology. These findings seem to challenge the assumption that all children with SLI experience severe phonological processing difficulties and provide evidence that some children experience only a mild phonological deficit. However, there is still little information in relation to the different types of reading difficulties experienced by children with SLI over the life span. Additionally, most of the current evidence is drawn from studies on elementary school children (but see Catts et al., 2005), and uncertainties remain about the pattern of difficulties experienced by the children.

There is still a dearth of information available to describe and explain reading skills in SLI during adolescence, but there is an indication that students experi-

ence both reduced levels of decoding and reading comprehension during this developmental period (Johnson et al., 1999; Snowling, Bishop & Stothard, 2000; Young et al., 2002). Snowling et al. (2000) assessed the reading and comprehension skills of 15 year old adolescents with SLI and reported a significant drop in reading accuracy relative to typically developing peers between the ages of 8 and 15, with the exception of those with expressive only language problems who achieved better outcomes.

More recently, Catts, Bridges, Little and Tomblin (2008) investigated the growth of reading skills between the ages of 6 and 16 years old in 225 children with language impairments and 379 of their typically developing peers. They examined the extent to which their participants showed (1) a *developmental lag* in growth (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996), where they eventually matched their typically developing peers, (2) a *cumulative trajectory* (Leppanen, Niemi, Aunola, & Nurmi, 2004) where gap in widening achievement was evident or (3) a *deficit model* of growth (Francis et al., 1996) where there was lower initial reading achievement but a parallel growth over the school years. For both the *cumulative trajectory* and the *developmental lag*, reading performance would always be impaired, but less so in the latter model. The children and young people with language impairments in the Catts et al. (2008) cohort continued to experience difficulties with both reading decoding and reading comprehension over the course of a ten-year period. However, the growth pattern was similar to that of their typical peers, providing support for the *deficit model* of reading growth. Participants continued to be poor readers during the adolescence years (8^{th}/10^{th} grade). A similar picture was revealed in a recent study examining the developmental trajectories of both reading decoding and reading comprehension between the ages of 7 and 16 in a group of children with a history of SLI (St. Clair, Durkin, Conti-Ramsden & Pickles, 2010). A period of development in reading accuracy skills during childhood was followed by a period of reduction in growth between the ages 14 and 16. This plateau was also evident in the reading comprehension skills in this group of children during adolescence. Reading accuracy at 14 was predicted by phonological memory, whereas reading comprehension was predicted by measures of receptive and expressive language. However, no control group was included to allow comparisons to be made, and no details were provided about the educational support provided to the pupils at this point.

The above studies provide preliminary details about the reading skills of adolescents with a history of SLI, but should be interpreted within a context where methodological consistency remains a challenge for researchers investigating the field. First, the heterogeneous profile of children with SLI is widely acknowledged (Conti-Ramsden, 2008). This has implications for selection of participants and a cautious interpretation of findings. Second, assessment materials within and across studies vary. Additionally, in relation to the studies examining the growth of reading skills, change in the reading assessments used across the different time point limits the interpretation of results. For example, in the study by St Clair et al. (2010), the British Ability Scale word reading test (Elliot, Smith, & McCulloch, 1996) was used at the ages of 7 and 8, while the word reading subtest from the WORD (Wechsler, 1993) was used at ages 11, 14 and 16.

Aims and Predictions

The first aim of the present study was to extend our understanding of the literacy skills of pupils with SLI by profiling their word reading and reading comprehension skills and comparing them with their chronologically matched typically developing peers. Since language skills underpin the development and mastering of reading, we expected the young people with a history of SLI would experience marked difficulties with both word reading and reading comprehension when compared to their age-matched peers.

The second aim of the study was to examine the role of receptive and expressive language and phonological skills and to determine the relative contribution of three factors namely word reading skills, receptive vocabulary and language comprehension in the reading comprehension of adolescents with a history of SLI and their age-matched peers. It was expected that the contribution of these three factors would be different for the students with SLI and their typically developing matched peers.

Finally we aimed to examine the reading profiles of young people with a history of SLI during adolescence and the extent to which their performance on measures of reading accuracy and reading comprehension were consistent with the quadrant model (Bishop & Snowling, 2004). To the authors' knowledge, this is the first study that aimed to explain this in a sample of adolescents with a well-documented history of SLI. It was expected that in line with findings from previous studies, most of the adolescents with SLI would be placed in the quadrant C of the relevant framework, with impaired skills both for word reading and reading comprehension.

Method

SLI Sample

Childhood. The present study was part of a longitudinal study conducted in two English local authorities (LAs) and two regional residential special schools for children with SLI. A group of 69 children with SLI were selected when they were approximately 8 years old. At identification, all children had significant difficulties with language in the presence of average non-verbal ability.

Detailed profiles of language and cognitive skills are presented elsewhere (see Dockrell et al., 2007, for more details). There were 52 boys and 17 girls, a gender disparity typical of children with SLI (Leonard, 1998). All children were on their school's special educational needs register and 54% had a statement of special educational needs under the Education Act 1996. The statement of special educational needs specifies the provision that must by law be made to meet the child's special educational needs. This status is applied to about 3% of school pupils, over half of whom attend mainstream schools. Twenty-one children attended special schools (10 residential, 11 local) and 48 were in mainstream. Children with associated difficulties such as a diagnosis of autism were excluded from the study.

Adolescence. At age of 14 years (mean age 13;11, range 13;4-14;10), there were 68 students in the SLI group. Thirty-nine were attending mainstream secondary school with a further 8 attending designated special units within a mainstream setting. Furthermore, there were 11 SLI students in specialist language schools and 10 in secondary special schools for students with moderate learning difficulties.

The mean Z score for the sample's nonverbal intelligence measure at 14 was -.81 (SD = .96) indicating that, as a group, the sample were performing within the normal range. Nonetheless, the young people continued to experience substantially delayed development as measured on a number of language assessments. To examine patterns between non-verbal performance and measures of language and literacy, a series of repeated measures (ANOVAs) was computed. Language measures were all statistically significantly lower than a measure of nonverbal ability (British Ability Scales II (BAS II) matrices (Elliot, Smith & 1996): namely, British Picture Vocabulary Scale II (BPVS) (Dunn, Dunn, Whetton, &Burley, 1997) $F(1,56) = 9.032$, $p = .004$, $\eta p^2 = .14$; CELF ^{UK} (Peers, Lloyd, & Foster, 1999) listening to paragraphs $F(1, 56) = 5.90$, $p = .018$, $\eta p^2 = .10$; and formulated sentences $F(1,56) = 174.48$, $p < .0005$, $\eta p^2 = .76$.

At age 16 years (mean age 15;8 range 15;2-16;5), the last year of compulsory education in the UK, data were collected from 56 participants of the initial SLI sample. The young people at this age were attending a wide range of educational provision. These young people continued to have substantial difficulties as evidenced by their results on measures of language, literacy and numeracy at this age (Year 11) (Dockrell et al., 2007). In all cases except the Test of Reception Grammar (TROG: Bishop, 2003), the mean Z scores of the sample were more than one standard deviation (*SD*) below the mean: BPVS mean $Z = -1.28$ $(SD = 1.11)$; CELF listening to paragraphs mean $Z = -1.16$ $(SD = 0.66)$.

The chronological age matched comparison group. A comparison group of typically developing peers matched at chronological age (CA match $N = 42$) were initially identified at the age of 10 and followed up at the age of 16 (see Dockrell & Lindsay, 2007). These young people were attending the same mainstream classes as the adolescents with SLI when identified and were in the average range for reading, maths and science. The chronological aged matched control group had no history of speech and language difficulties or any other special educational needs.

Measures

Standardised Assessments of Reading

The British Ability Scales II (BAS, Elliot et al., 1996) Word Reading Scale (administered at ages 14 and age 16) assesses recognition and oral reading of single words. The principal aim is to test single word decoding ability using a sample ranging from common words found in children's books to less common words: reliability Cronbach α .93; validity with WORD reading scale .71.

The Test of Word Reading Efficiency (TOWRE) (Torgesen, Wagner, & Rashotte, C.A, 1999) (age 16) contains two timed subtests that provide a total score: the Sight Word Efficiency (SWE) subtest, which assesses the number of real printed words that can be accurately identified within 45 seconds, and the Phonetic Decoding Efficiency (PDE) subtest which measures the number of pronounceable printed non-words that can be accurately decoded within 45 seconds: reliability Cronbach α .93; validity .84.

Wechsler Objective Reading Dimensions: Reading comprehension subscale (WORD; Wechsler, 1993) (ages 14 and 16). This scale assesses children's reading comprehension skills. The child is asked to read silently a series of passages and then is

asked a question related to the text of passage; reliability Cronbach α .93; validity with WORD reading scale .71.

Other Standardised Assessments

Language assessments previously identified as clinical markers of SLI were included in the assessment battery (Conti-Ramsden, Botting, & Faragher, 2001).

Vocabulary

British Picture Vocabulary Scale II (BPVS) (Dunn et al., 1997) assesses vocabulary knowledge. The children are shown four line drawings and asked to choose the one that best illustrates a word spoken by the assessor: reliability Cronbach α .89.

Grammar

Test of Reception of Grammar (TROG) (Bishop, 1983). This is a multiple-choice test designed to assess understanding of grammatical constructions. Children are shown four pictures and the assessor reads a sentence. The child is required to select a picture that matches the sentence: reliability Cronbach α .88; validity with the Clinical Evaluation of Language Fundamentals: Revised UK Edition (CELF-R ^{UK}; Peers, Lloyd, & Foster, 1999) .53.

Receptive Language

Clinical Evaluation of Language Fundamentals ^{UK} (CELF) (Peers et al., 1999) included formulated sentences and listening to paragraphs. Formulated sentences requires a child to produce a sentence in response to an orally presented single word or two-word combination: reliability .82; validity with CELF other expressive subscales .43 - .49. Listening to paragraphs requires the child to attend to a short paragraph and answer specific questions related to the content: reliability Cronbach α .74; validity with other receptive scales .30 - .43.

Non Verbal Ability

British Ability Scales II (BAS II) matrices subtest (Elliot, et al, 1996). Children are presented with a set of patterns where one pattern is incomplete. There is a choice of six responses and children are required to point to the missing piece: reliability Cronbach α .85; validity with the WISC-III performance scale .47.

Procedure

The young people were assessed individually by a qualified school psychologist, who had previously worked with each young person in this cohort on at least two other occasions, in a quiet room in college or school, or by a home visit. Confidentiality was assured and the young people were informed that they could terminate the session if they wished, but none chose to do so. All standardised tests were administered using the standard procedures in the manuals.

Results

To normalise performance on the test, each standard score, centile or T score was transformed to a Z score to provide a standard, common metric for analysis.

The results are presented in three sections. Section 1 describes the adolescents' performance on the single word decoding and comprehension measures and the change of the reading profiles between the ages of 14 and 16. Section 2 presents the relationships between language skills, word reading and reading comprehension. Additionally, this section considers the relative contribution of single word decoding and measures of language to the reading comprehension skills of adolescents with SLI and the CA matched group, respectively. Section 3 examines how the reading profiles of the adolescents with SLI at the age of 16 can be conceptualised within the two-dimensional model of reading and language difficulties as proposed by Bishop and Snowling (2004).

Adolescents' Performance on Single Word Decoding and Comprehension Assessments.

Table 1 summarises performance on reading measures at ages 14 and 16 along with *t*- values for comparisons. At age 14, performance on BAS single word reading was statistically significant lower for students with SLI than their typically developing peers (t (1,96) = -8.89, p = .001, d = -2.09). A similar picture of statistically significant lower scores for the SLI group was evident at this time point for their reading comprehension scores on the WORD reading comprehension test (t (1, 96) = -9.16, p < .0005, d = -1.9).

At age 16, the pattern of results was similar to performance at 14 for all three measures of reading: BAS single word reading (t (1, 96) = -8.04 p < .0001, d = -1.7) WORD reading comprehension (t (1, 93) = -8.79, p< .0005, d = -1.83) TOWRE. (t (1, 96) = -6.22 p< .0005, d = -1.27).

A repeated measures ANOVA including both cohorts indicated that there was no significant difference in reading decoding skills over time (F (1, 94) =.114, *ns*) and no interaction with group (F(1, 94) = 3.66, *ns*). In contrast there was a significant improvement in reading comprehension scores over time (M at 14 = -1.4, M at 16 = -1.1; F (1, 94) = 15.024, p <.0005, partial eta squared .14*)* but no interaction with group (F (1, 96) = .147, *ns*).

To summarise, adolescents with a history of SLI experienced marked difficulties on both single word decoding and reading comprehension at both 14 and 16 years compared with their age-matched peers. Over time improvements in reading comprehension but not decoding were evident for both groups. There were no statistically significant differences in the patterns of change over time.

Relationship Between Reading and Language Measures for SLI and CA Matched Adolescents

In order to assess the relationship of reading comprehension and single word decoding with oral language for the SLI and the CA matched group, intercorrelations between measures of reading and oral language were examined separately for each group. Table 2 shows intercorrelations for the SLI and the CA matched samples at age 16. There were statistically significant correlations between the three tests of reading for the SLI group. Additionally, there were significant correlations between reading measures and oral language measures, except for single word decod-

ing (BAS) with language comprehension (CELF: listening to paragraphs). Overall, Table 2 shows strong positive correlations between measures of reading and oral language, except for single word decoding (BAS) with language comprehension (CELF) in the SLI group. Intercorrelations between reading and language measures for the CA matched group were then examined. The table shows that the pattern of relationships was different for the CA matched group. This was examined by further analyses in order to identify the different contribution of the various components to reading comprehension.

Table 1. ***Mean Performance of Groups on Standard Assessments of Reading at Ages 14 and 16 (Z Scores)***

	SLI		TC matched			
	M	SD	M	SD	T	D
Age 14						
BAS word reading	-2.01	1.14	-.11	.94	-8.89***	-2.09
WORD comprehension	-1.93	.81	-.58	.59	-9.16***	-1.9
Age 16						
BAS word reading	-1.82	.98	-.33	.75	-8.04***	-1.7
TOWRE total	-1.81	.99	-.56	.97	-6.22***	-1.27
WORD comprehension	-1.60	.71	-.36	.64	-8.79 ***	-1.83

Table 2. ***Correlations Between Reading and Language for Adolescents With a History of SLI and the Chronological Age Matched Students at age 16***

	1.	2.	3.	4.	5.
SLI					
1. BAS reading					
2. TOWRE	0.54**				
3. WORD comprehension	0.54**	0.61**			
4. BPVS	0.51**	0.48**	0.56**		
5. TROG	0.33*	0.26*	0.30*	0.43**	
6. CELF-Listening to paragraphs	.22	.29*	.27*	0.46**	.11
CA matched					
1. BAS reading					
2. TOWRE	0.38*				
3. WORD comprehension	0.33*	0.24			
4. BPVS	0.22	-0.01	0.21		
5. TROG	0.39*	0.29	0.43**	0.28	
6. CELF-Listening to paragraphs	0.32*	0.13	.21	0.41**	.22

*p < .05, **p <.01

To investigate further the contribution of word reading, receptive vocabulary, grammatical comprehension, and language understanding to reading comprehension in adolescents with SLI and CA matched peers, separate hierarchical regression analyses were conducted with the WORD reading comprehension as the outcome variable. Inspection of the diagnostic tests and residuals for each regression model suggested that the necessary assumptions were met (Field, 2009).

The results of these analyses for the SLI sample are summarised in Table 3. Single word decoding (BAS) was entered as a first step and explained a significant 29% of the variance in reading comprehension (WORD) (F (1, 56) = 23.28 $p <$ .001, $R_{adj}^2 = 29$). At step 2, receptive vocabulary (BPVS), grammatical comprehension (TROG) and language comprehension (CELF) were entered in the model. After controlling for single word decoding (BAS word reading), receptive vocabulary (BPVS) was found to increase the variance explained to 38% (F (1, 56) = 17.41 p = .005, $R_{adj}^2 =$ .38). Grammar comprehension (TROG) and language comprehension (CELF: listening to paragraphs) were not significant predictors in the current model.

Table 3. ***Hierarchical regressions with the SLI sample predicting reading comprehension (WORD reading comprehension)***

Model	Step	Variable added	adjR²	P	Final b
1	1	BAS Word reading	.29	<.001	.54
	2	BPVS vocabulary	.38	<.001	.36
2	2	TROG	.29	.73	.39
3	2	CELF-listening to paragraphs	.30	.36	.12

Note: p values refer to the significant level for the variance explained by the variable as it entered into the model. Final (standardized) β values correspond to the variable in the complete model with all variables included.

The analysis was repeated for the CA matched group (Table 4). Single word decoding (BAS) was entered as a first step and explained a significant 11% of the variance in reading comprehension (WORD) (F (1, 56) = 4.38 p = .043, $R_{adj}^2 =$ .11). At step 2, receptive vocabulary (BPVS), grammatical comprehension (TROG) and language comprehension (CELF) were entered in the model. After controlling for word reading, the only predictor that was found to be a significant contributor to the model was grammatical comprehension explaining 22% of the variance in reading comprehension (F(2,36) = 4.92 p = .01, $R_{adj}^2 =$ .22). These results are considered in more detail in the discussion section.

Table 4. ***Hierarchical Regressions With the CA Matched Sample Predicting Reading Comprehension (WORD Reading Comprehension)***

Model	Step	Variable added	adjR^2	P	Final b
1	1	BAS Word reading	.11	< .05	.33
	2	BPVS vocabulary	.13	.09	.14
2	2	TROG	.22	< .05	.39
3	2	CELF-listening to paragraphs	.12	.12	.24

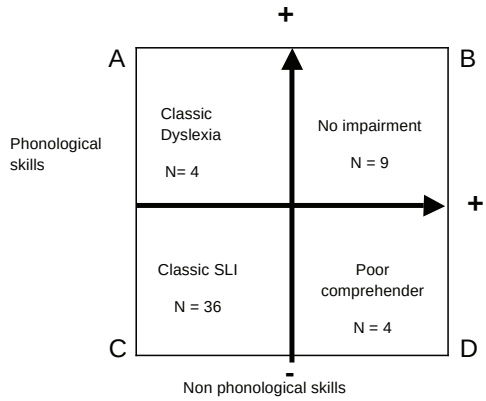
Note: p values refer to the significant level for the variance explained by the variable as it entered into the model. Final (standardized) β values correspond to the variable in the complete model with all variables included.

Categorisation of the Reading Profiles of Adolescents With a History of SLI According to the Two-Dimensional Reading Model (Bishop & Snowling, 2004)

The last set of analyses examined the reading profiles of adolescents with a history of SLI within the quadrant model proposed by Bishop and Snowling (2004). Young people were categorised, according to the 16-year-old test results, as dyslexic, if they had a word decoding (TOWRE) standard score of less 85, and a WORD reading comprehension standard score of more than 85 (quadrant A). The young people that scored more than 85 for both word decoding (TOWRE) and WORD reading comprehension were classified as typically developing. Those with a standard score below 85 for both word decoding (TOWRE) and reading comprehension (WORD) were categorised as classic SLI. Finally, the young people with a word decoding (TOWRE) score of more than 85 but a reading comprehension (WORD) score of less than 85 were coded as poor comprehenders.

Nine participants obtained scores of more than 85 for both word decoding (TOWRE) and comprehension (WORD) (quadrant B), indicating typical development. Four participants obtained a standard score of less than 85 in word decoding (TOWRE) but had age-appropriate reading comprehension skills, placing them in quadrant A of the model, typically described as the quadrant for dyslexia. Thirty-six participants (68%), the majority of the young people, scored below 85 for both word decoding (TOWRE) and comprehension (WORD) and were placed in quadrant C of the model (classic SLI). Finally, four young people obtained a standard score of more than 85 for word decoding (TOWRE), but less than 85 for reading comprehension (WORD) placing them in quadrant D, that is, poor comprehenders.

***Figure 2*. Categorization of young people with SLI reading profiles at the age of 16 following two-dimensional model of reading (Bishop & Snowling, 2004).**



Discussion

This study examined the reading skills of young people with a history of SLI and of their typically developing peers during adolescence and the relative contribution of word decoding and language skills to reading comprehension at this age, within the framework of the Simple View of Reading.

In line with other studies (Catts et al., 2008; Kelso et al., 2007; St. Clair et al., 2010), it was found that adolescents with a history of SLI continued to experience marked difficulties with both word decoding and reading comprehension at the ages of 14 and 16 years, when compared with chronological age-matched peers. Despite these depressed scores, both groups followed similar developmental trajectories between the ages of 14 and 16 demonstrating relative improvements in reading comprehension but not single word decoding. Nonetheless the levels of reading ability in the participants with a history of SLI will severely compromise students' ability to access the curriculum.

Regression analyses revealed that different competencies predicted reading comprehension in adolescents with SLI compared to their aged-matched peers. In the SLI group, word decoding was the most significant predictor of reading comprehension, but the amount of variance explained was significantly increased by including receptive vocabulary in the model. Thus as predicted from the Simple View of Reading, both word decoding and receptive vocabulary were significant predictors of reading comprehension at the age of 16 (Hoover & Gough, 1990). However, of particular interest were that the patterns of predictors between the SLI and the age-matched group were different. For both groups single word decoding was significant and the most important predictor of reading comprehension. For the typically developing students, the observed variance explained was small (10%). Grammatical understanding was also found to be a significant underlying skill for reading comprehension for this group. In contrast to the SLI group receptive vocabulary did not contribute to the explanatory model once decoding had been taken into account.

There are a number of possible explanations of this result. As in other studies on this population, vocabulary may serve as a proxy for depth of semantic knowledge (Dockrell & Connelly, 2009) for the students with a history of language impairments. For typically developing students, the subtleties of their text comprehension abilities may be evident through tasks that tap grammatical understanding as reflected in their performance on the TROG. It is also possible that their focus on text elements differs, and students with a history of SLI are more dependent on word level information, as shown by the fact that vocabulary predicts comprehension whereas typically developing students use syntactic information, as shown by the fact that our grammar measure is significant in the model for this group. Thus the combination of limitations in text decoding and either depth of semantic representations or focusing on single words reduce the performance in reading comprehension of students with a history of SLI.

This study provides further evidence in relation to the heterogeneity observed in SLI by categorising the reading profiles of adolescents with a history of SLI according to the two-dimensional model of reading and language difficulties (Bishop & Snowling, 2004). As expected, the majority of the young people during adolescence had impaired skills in both the domains of word decoding and reading comprehension. However, interestingly when the cutoff point of a standard score of 85 was used, almost one fifth of the participants were found to have developed reading and comprehension skills in the average range by the last year of compulsory education. Further investigation is needed in order to examine whether the participants that had this level of reading skills have resolved their language difficulties by adolescence or whether—despite their continued difficulties—they have managed to develop strategies to compensate for limitations in decoding and text comprehension. Four participants of this study at the age of 16 met the criteria for developmental dyslexia and another four were categorised as poor comprehenders. These findings are in line with those reported by Catts et al. (2006) in relation to the identification of similarities with developmental dyslexia in the reading skills of children with language impairments and by Nation, Clarke, Marshall, & Durand (2004) about poor comprehenders and language difficulties. Importantly this variability in performance suggests that no single model of reading development accounts for the reading comprehension and word decoding trajectories of students with a history of SLI.

Limitations and Suggestions for Further Studies

The present study was restricted to considering students' single word decoding. At this level of reading proficiency, success and errors in a passage reading test would enhance understanding of the barriers to successful reading. Moreover the WORD relies on information retrieval and does not demand inferences (Cutting & Scarborough, 2006; Keenan, & Betjemann, 2006; Keenan, Betjemann, & Olson, 2008). A more comprehensive assessment battery is required to evaluate the impact of early language difficulties on literacy problems.

Educational and Clinical Implications

The current study has two major implications for educational and clinical practice. Approaches such as The Simple View of Reading and the two-dimensional

model of reading and language difficulties provide valuable frameworks for the assessment and effective planning of support for this group of children. By highlighting the importance of phonological skills for reading decoding and language skills for reading comprehension, there are clear implications about the need to assess both single word decoding and reading comprehension and other underlying skills including language and phonology.

Second, the results support other studies in identifying the importance of the development and implementation of interventions, closely associated with the target skill and the developmental stage of the child (Gillon, 2000; 2004). Young children who have SLI in the first grades of primary school and who are just learning to read will benefit from different interventions when compared to older young people attending high schools. As children go through schooling, they need to start moving from "learning to read" to "learning to learn." This may be a particularly challenging task for adolescents with a history of SLI as the demands of the curriculum increase. Indeed, recent evidence has highlighted the risk of adolescents with SLI developing negative images of themselves as learners. (Dockrell et al., 2007; Lindsay, Dockrell, & Palikara, 2010; Palikara, Lindsay, & Dockrell 2009). Intervention programmes targeting the implicit teaching of higher level linguistic and meta-linguistic skills—e.g., inferencing—are needed in order to effectively support these young people in the later stages of secondary education.

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