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Abstract

Background: This investigation reports the results of national educational examinations in secondary schooling for young people who have been participating in the Manchester Language Study.

Aims: The emphasis of the study is on furthering understanding of educational outcomes at the end of compulsory education.

Methods & Procedure: A total of 120 adolescents with a history of specific language impairment (SLI) and 121 adolescents with typical development (TD) who were in their final year of compulsory secondary schooling (mean age – 17;4 years) participated. National educational examination results throughout secondary schooling were collected along with a range of psycholinguistic skills from 11 to 16/17 years.

Outcomes & Results: Forty-four per cent of young people with SLI obtained at least one of the expected qualifications at the end of secondary education, indicating some improvements compared with reports on earlier cohorts. Regressing analyses revealed that literacy and language skills were predictive of educational attainment after controlling for IQ and maternal education. Nearly one-quarter of the sample of adolescents with SLI was not entered for any examinations at the end of compulsory education. A very strong association between earlier patterns of entry for examinations and patterns of examination entry at school leaving age was found.

Conclusions: In addition to performance IQ, concurrent and early literacy and language skills have significant effects on the academic attainments of young people with a history of SLI. The transition from primary to secondary schooling is a crucial time for assessment and evaluation of individual children's needs and levels of support required.

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What this paper adds

It is known that young people with specific language impairment (SLI) can have difficulties with academic achievement in adolescence. The present study found that 44% of young people with SLI obtained at least one of the expected qualifications at the end of secondary education. Although it needs to be noted that twice the proportion of the typically developing (TD) group achieved this level (88%), it is important to remember that earlier studies had found hardly any pupils achieving at this level. Consistent with previous findings, young people with Resolved-SLI achieved levels of attainment similar to TD peers while those with Persisting-SLI performed more poorly. Nevertheless, young people with Persisting-SLI were taking on average one more General Certificate of Secondary Education in 2004/05 than they did in the 1990s.

Introduction

One of the first questions asked by parents and professionals alike is 'how will a child with SLI "turn out"?' In recent years, there has been increased interest in the long-term progress of children with specific language impairment (SLI). Follow-up studies have mainly involved examining the nature of language and literacy difficulties in older children (Bishop and Edmundson 1987, Bishop and Adams 1990, Felsenfeld *et al.* 1992, Beitchman *et al.* 1994, 1996a, b, Stothard *et al.* 1998, Johnson *et al.* 1999, Young *et al.* 2002). It has become clear from these studies that children who have persistent SLI or general delay at around 5 years of age are at high risk for developing literacy difficulties and require support in secondary schooling. These findings suggest that the prospects for how children with SLI will turn out are compromised. Yet, despite the indicators of educational risk for this substantial minority, there is still a dearth of information on the educational experiences and educational outcomes of young people with SLI at the end of compulsory secondary education.

Evidence gathered so far is mixed. Several studies indicate that continuing educational difficulties are common. Rutter and colleagues (Clegg *et al.* 1999, Howlin *et al.* 2000, Mawhood *et al.* 2000) compared a group of 23–24-year-old men with autism with a similar aged group of men with developmental receptive language disorders. The group with SLI had left full-time education at around 16/17 years of age (during the 1980s) with no educational qualifications. Haynes and Naidoo (1991) also carried out their research with pupils who had been in secondary education in the UK during the 1980s. They found that 38% of their sample left compulsory secondary education with no qualifications. The remaining two-thirds were able to obtain qualifications in mainly practical subjects. Only a few children had obtained more academic qualifications and they tended to choose Mathematics and Science subjects. In the USA, Records *et al.* (1992) followed a small group of young adults with a history of SLI who had also left full-time education in the 1980s. They found similarly negative results, with the majority of the young people not progressing to any form of post-secondary education after leaving the American high school system.

Two substantial and more recent studies, however, yield more positive findings. First, Snowling *et al.* (2001) followed 60 young people with a history of speech and language impairment and compared them with typically developing (TD) children at secondary school leaving age (16–17 years old). These adolescents were taking their examinations during the 1990s, around 10 years on from the reports discussed above. Although Snowling *et al.* (2001) do not report the number of pupils who were not entered for any examinations, it is evident from the data presented in their tables that a substantial number in their sample were entered for General Certificate of Secondary Education (GCSE) examinations. These examinations are taken at the end of compulsory education in the UK and are roughly equivalent to a US High School Diploma, French Baccalaureate or Japanese Upper Secondary School Certificate. Those with Persistent-SLI and general delay on average took between two and four GCSE examinations. The performance of the Resolved-SLI group was comparable with that of the comparison group, both taking between eight and nine examinations. These authors also examined potential concurrent predictors of educational attainment. They found IQ to be the strongest predictor of educational achievement. Once IQ was controlled for, literacy skills were a significant predictor, accounting for independent variance in educational achievement, especially amongst the SLI group.

Second, Dockrell *et al.* (2007), in a longitudinal study of students with speech and language difficulties followed from Year 3 to post-16 (with the later stages of data collection taking place in 2004–06) found that a substantial proportion of the young people did participate in national examinations. Performance overall was markedly below national statistics, though a minority of the sample did well (approximately 15% attaining grades A*–C in Mathematics and English). Measures of numeracy, literacy, receptive vocabulary numeracy and the production of written text were significant predictors of GCSE point scores.

The overall indication emerging from previous research is that young people with a history of SLI are at risk of underachievement in key secondary school assessments. However, there are inconsistencies across the findings with some revealing a complete absence of formal qualifications by the end of schooling while others report a level of attainment that is, on average, below age norms for TD children but nevertheless resulting in formal qualifications and, for a minority, reasonably good performance. Studies indicate that outcomes may depend on the severity of the disorder and whether or not it was resolved by entry to primary school. In addition, there appears to be not only a dearth of information with regard to the proportion of young people who are not entered for formal examinations during secondary schooling, but also whether early patterns of non-entry (at 11 years) are related to later patterns of non-entry at school leaving age. This information may be useful in furthering understanding of the inconsistencies of the findings of previous studies.

In a pair of companion papers, we examine the educational experiences of young people with a history of SLI who have been participating in the Manchester Language Study. In this first paper, we report the results of national educational examinations throughout secondary schooling in an attempt to identify better their educational outcomes at the end of compulsory secondary education. Specifically, we addressed the following questions:

- How do adolescents with SLI and those with TD perform in national examinations as compared with national statistics for all young people in England?
- Are there differences in outcome between adolescents with SLI and those with TD at the end of secondary schooling?
- What factors, i.e. non-verbal IQ, maternal education, literacy and language, are associated with these differences?
- For adolescents with SLI, what are the patterns of educational achievement throughout secondary schooling? To what extent does earlier educational achievement predict educational attainment at the end of secondary education?
- For adolescents with SLI, what are the patterns of entry and non-entry in examinations throughout their secondary schooling? What predicts examination non-entry?

Methods

Participants

Adolescents with specific language impairment (SLI)

The participants in this investigation were originally part of a wider study; the Conti-Ramsden Manchester Language Study (Conti-Ramsden *et al.* 1997, Conti-Ramsden and Botting 1999a, b). An initial cohort of 7 year olds was recruited from 118 language units attached to English mainstream schools. This resulted in an initial study cohort of 242 children. The age range was 7;5 to 8;9 years and consisted of 186 males and 56 females (females forming 23.1% of the cohort). These children were reassessed as part of the original study at 8, 11, 14 and 16 years of age. At age 14 years, funding was only available for a smaller number of participants resulting in the loss of contact with a number of families from the original cohort.

From the original cohort of 242 children described above, 139 (57.4%) agreed to participate in the present stage of the study. Of those who did not take part, contact had been lost with 51 (21.1%) and 52 (21.5%) did not consent to participate. The 139 adolescents who agreed to participate were not found to be different in any early variables of language, behaviour, cognition or socio-economic status (SES) compared with those who did not participate. Adolescents were then selected for participation in the present stage study based on longitudinal data which showed that all met criteria for SLI at least at one assessment time point (7, 8, 11, 14 or 16 years). These criteria included the following:

- Performance IQ (PIQ) of 80 or more and at least one concurrent standardized language test score > 1 standard deviation (SD) below the population mean at one of the longitudinal assessment stages.
- No sensory-neural hearing loss.
- English as a first language.
- No record of a medical condition likely to affect language.

In addition to the criteria for SLI above, participants in this stage of the study were also required to have a complete educational assessment history throughout secondary schooling. In total, there were 120 adolescents with SLI (67.5% male) aged between 16 years 8 months and 18 years 2 months (mean age=17;4).

Typically developing (TD) adolescents

A group of adolescents from a broad background participated in the study. Census data as per the 2001–02 General Household Survey (Office of National Statistics 2002) were consulted in order to target adolescents who would be representative of the range and distribution of households in England in terms of household income and maternal education. They had no history of special educational needs or speech and language therapy provision. In total, there were 121 TD adolescents (61.2% male) aged between 16 years 7 months and 18 years 1 months (mean age=17;4).

Data were collected from the participants' parents in order to ascertain levels of maternal education (minimal to degree level) and household income (less than £5200 to greater than £52 000 per annum). No significant differences were found between TD adolescents and adolescents with SLI in maternal education levels, $\chi^2(2)=2.01$, $p=0.366$, or household income bands, $\chi^2(3)=3.86$, $p=0.277$. Importantly, therefore, the TD adolescents were similar to the adolescents with SLI in terms of socio-economic status indicators. Further, the household income of both groups ranged from the lowest bracket found in the 2001–02 General Household Survey (Office of National Statistics 2002) to the highest bracket and thus were representative of the range of household income distribution found in England as a whole.

Language profiles of the participants

Psycholinguistic data were available at age 14 years for 84/120 (70%) adolescents with SLI. The remainder (36/120, 30%) had identical concurrent psycholinguistic data available at 16 years. For ease, no distinction will be made between these data and they will be referred to as concurrent data. All 121 TD adolescents had concurrent data available from the present stage of the study. The reading measures were available for approximately half the TD adolescents (n=69, 57%). The psycholinguistic profiles of the adolescents are shown in table 1.

Mean psycholinguistic scores for the TD adolescents were within the normal range for age whereas the scores for the adolescents with SLI fell below. As expected, one-way analyses of variance (ANOVAs) revealed that TD adolescents performed significantly better than adolescents with SLI on all assessments, i.e. tests of receptive language, $F(1,235)$=56.691, p<0.001, partial η^2=0.194, expressive language, $F(1,235)$=195.135, p<0.001, partial η^2=0.454, single word reading, $F(1,182)$=32.616, p<0.001, partial η^2=0.152, reading comprehension, $F(1,181)$=59.544, p<0.001, partial η^2=0.248, and non-verbal IQ, $F(1,233)$=47.944, p<0.001, partial η^2=0.171.

Language status of the participants

Adolescents with SLI were classed as currently impaired if, at the time of the study, they met the following criteria: performance IQ (PIQ; Wechsler Intelligence Scale for Children (WISC) — III; Wechsler 1992) of 80 or more and concurrent

Table 1. Psycholinguistic profiles (standard scores) of adolescents with specific language impairment (SLI) and typically developing (TD) adolescents at 16 years

	SLI adolescents (n=120)		TD adolescents (n=121)	
	Mean	SD	Mean	SD
CELF-R Receptive subtest (Word Classes)	84.3	17.2	99.3	13.3
CELF-R Expressive subtest (Recalling Sentences)	74.0	10.6	97.5	14.9
WORD Single Word Reading*	83.8	18.0	98.0	13.0
WORD Reading Comprehension*	75.5	14.7	91.4	11.4
WISC PIQ	83.9	19.6	100.0	15.9

*n=69 for TD adolescents.
CELF-R, Clinical Evaluation of Language Functioning — Revised; PIQ, performance IQ; SD, standard deviation; WISC, Wechsler Intelligence Scale for Children; WORD, Wechsler Objective Reading Dimensions.

expressive or receptive language standard score (Clinical Evaluation of Language Functioning — Revised (CELF-R) Expressive language (Recalling Sentences)/ Receptive language (Word Classes); Semel et al. 1987) less than 85.

After accounting for six cases of missing data, just under half the adolescents with SLI (52/114, 46%) were classified as meeting criteria for SLI at the time of the study (16–17 years old). Of the remainder, 17 (15% of the total) demonstrated concurrent normal non-verbal and resolved language ability and 42 (37% of the total) showed non-verbal and language ability in the impaired range. There were three (3%) adolescents with impaired non-verbal abilities but normal language scores. Therefore, at the time of the study, a total of 94 out of 114 adolescents (83%) had current language difficulties indicated by scores at least 1 SD below the mean on standardized tests of expressive and/or receptive language.

Of the TD adolescents, 86/121 (71%) had normal PIQ and language scores (as defined above). In addition, 25/121 (21%) had normal PIQ but low expressive or receptive language and 6/121 (5%) had normal language but low PIQ. There were 4/121 (3%) with both low PIQ and language. Thus, regardless of PIQ, 92 of 121 (76%) TD adolescents appeared to have normal language functioning.

National Qualifications framework in the UK

In the UK, the National Curriculum specifies which subjects are studied by all children in state schools and also divides them into age groups called Key Stages (KS).

Earlier educational results. KS2 examination results were available for the adolescents with SLI at 11 years of age in three core curriculum subjects: English language, Mathematics and Science. KS2 scores range from 1 (lowest level) to 6 (highest level), with Level 4 being the nationally expected result for children of this age.

KS3 examination results were available for adolescents with SLI at 14 years of age in the same three core curriculum subjects described above. KS3 scores range from 1 to 8, with Level 5 being the nationally expected result for children this age.

Concurrent educational results. KS4 examination results were available for adolescents with SLI and TD adolescents at around 16 years of age. These are usually General Certificates of Secondary Education (GCSE) examinations but also vocational qualifications such as General National Vocational Qualifications (GNVQ). English language, Mathematics and Science are compulsory alongside other optional subjects. GCSE grades are awarded from A* (highest level) to G (lowest level). Part 1 GNVQ Intermediate qualifications are equivalent to two GCSE grades in the range A*–C. Part 1 GNVQ Foundation level qualifications are equivalent to two GCSE grades in the D–G range. Full GNVQ Intermediate and Foundation courses are worth exactly double this. National Qualifications Framework (NQF) Level 2 is the expected level of working and attainment for children of this age and is equivalent to GCSE grades A*–C or GNVQ Intermediate. NQF Level 1 is equivalent to GCSE grades D–G or GNVQ Foundation. The number of Entry Level qualifications was also collected for the adolescents at this stage. Entry Level is the first level of the National Qualifications Framework and applies to those working towards Level 1. Entry Level certificates are designed to be suitable for learners for whom achievement at GCSE is an unrealistic target. KS4 information was available for both the adolescents with SLI and the TD adolescents.

To calculate a score which represented both the quality of KS4 attainment, grades were converted into numeric scores using the point scoring system as follows: GCSE A*=58, A=52, B=46, C=40, D=34, E=28, F=22, G=16, Unclassified or absent=0; GNVQ Full Intermediate (Distinction=220, Merit=184, Pass=160), Full Foundation (Distinction=136, Merit=112, Pass=76), Part One Intermediate (Distinction=110, Merit=92, Pass=80) Part One Foundation (Distinction=68, Merit=56, Pass=38).

Psycholinguistic battery concurrent to KS2 (adolescents with SLI only)

- Expressive Vocabulary Test (EVT; Williams 1997).
- Clinical Evaluation of Language Fundamentals — Revised — word associations subtest (CELF-wa; Semel *et al.* 1987).
- Clinical Evaluation of Language Fundamentals — Revised — recalling sentences subtest (CELF-rs; Semel *et al.* 1987).
- British Picture Vocabulary Scale-II (BPVS; Dunn *et al.* 1998).
- Test for Reception of Grammar (TROG; Bishop 1982)
- WORD single word reading and reading comprehension subtests (WORD; Wechsler 1993).
- Short form of the Wechsler Intelligence Scale for Children (WISC-III, Wechsler 1992).

Psycholinguistic battery concurrent to GCSE/GNVQ (adolescents with SLI and TD adolescents)

- Clinical Evaluation of Language Fundamentals — Revised — recalling sentences subtest (CELF-rs; Semel *et al.* 1987).
- Clinical Evaluation of Language Fundamentals — Revised — word classes subtest (CELF-wc; Semel *et al.* 1987).
- WORD single word reading and reading comprehension subtests (WORD; Wechsler 1993).
- Full form of the Wechsler Intelligence Scale for Children (WISC-III, Wechsler 1992).

Procedure

The TD adolescents and adolescents with SLI were assessed and interviewed either at home or school on the above measures as part of a wider battery. Assessments took place in a quiet room with only the participant and a trained researcher present. Educational results questionnaires for KS2 (SLI only), KS3 (SLI only) and KS4 (SLI and TD) were posted to the schools of the participants at each of the relevant time points with follow-up phone calls where necessary.

Results

Where data were not normally distributed, both parametric and non-parametric tests were carried out. However, the results were identical for both approaches. We report the parametric findings for consistency of presentation throughout the analyses. An alpha (α) level of 0.05 was used for all statistical tests.

Comparing the present samples with national statistics

In order to provide a framework for understanding the performance of the adolescents with SLI and TD adolescents who participated in the study, we examined national statistics for all young people in England in 2004, the year our participants took their examinations. National figures reveal that 53.7% of all pupils in all English schools gained five or more passes at grades A*–C in 2004 (Department for Education and Skills 2005). In the present sample, 67% of the TD adolescents achieved this benchmark. Thus, the TD group performed better than what would be expected of young people nationally. This difference is likely to be due to the fact that the national figures represent all young people in England regardless of whether they had special educational needs, whereas the TD adolescents in the present sample were specifically selected not to have a history of special educational needs. In the case of pupils with Special Educational Needs (SEN), national figures suggest that the proportion of pupils with SEN without a statement achieving five or more passes at grades A*–C was 14.1% in 2004. The comparable figure for pupils with SEN in receipt of a statement was 6.2% (Department for Education and Skills 2005). In the sample of adolescents with SLI, 16% of the pupils gained five or more passes at A*–C, suggesting that our cohort was performing similarly to what would be expected of young people with special needs nationally.

Are there differences in secondary school examination outcomes between adolescents with SLI and TD adolescents?

Table 2 shows the highest level of qualification gained by the school-leavers.
Very few adolescents (2.5% SLI; 0.8% TD) finished their secondary education with no NQF-accredited qualifications at all in an academic subject. However,

Table 2. Highest National Qualifications Framework (NQF) level achieved by adolescents with specific language impairment (SLI) and typically developing (TD) adolescents at the end of compulsory education

	Adolescents with SLI		TD adolescents	
	n	%	n	%
Level 2	53/120	44.2	107/121	88.4
Level 1	38/120	31.7	13/121	10.7
Entry Level	26/120	21.7	0/120	0
None	3/120	2.5	1/120	0.8

chi-square (χ^2) analysis revealed a significant difference in the highest level of qualification achieved between adolescents with SLI and TD adolescents ($\chi^2(3)=57.48$, $p<0.001$). The highest level of vocational subject qualifications on leaving secondary school was also examined. Few adolescents in either group had studied vocational subjects (12.4% SLI; 1.7% TD) and none had done so to the exclusion of academic subjects.

Table 3 presents educational data on number of examinations and grades achieved.

Adolescents with SLI were entered for significantly fewer KS4 examinations than their TD peers, $F(1,239)=92.65$, $p<0.001$, partial $\eta^2=0.279$. Twenty-nine adolescents with SLI (24%) were not entered for any KS4 examinations compared with only one TD adolescent (1%). Further, the numbers achieving high grades (A*–C) differed between groups, with TD adolescents outperforming their counterparts with SLI, $F(1,239)=126.68$, $p<0.001$, partial $\eta^2=0.346$.

In order to make more direct comparisons with the findings of Snowling et al. (2001), who had examined the outcomes of children with distinct developmental trajectories with respect to language, the SLI sample was divided into two groups:

Table 3. Number of qualifications and grades achieved by adolescents with specific language impairment (SLI) and typically developing (TD) adolescents at the end of secondary education

	Adolescents with SLI, n=120	TD adolescents, n=121
Number GCSE/GNVQs entered		
Mean (SD)	5.7 (4.0)	9.7 (2.0)
Range	0–12	0–14
Grades A–C achieved*		
Mean (SD)	1.7 (2.7)	6.5 (3.8)
Range	0–10	0–14
Grades D–G achieved		
Mean (SD)	3.9 (3.3)	3.0 (2.8)
Range	0–11	0–11
Unclassified		
Mean (SD)	0.2 (0.6)	0.2 (0.7)
Range	0–4	0–4

GCSE, General Certificate of Secondary Education; GNVQ, General National Vocational Qualification.

- Group 1, the Persisting-SLI group, included those meeting criteria for SLI currently and those who had met criteria for SLI at some point but now presented with low IQ and language difficulties (n=94). Snowling et al. found little difference between these two profiles of impairment; thus, we have pulled them together here under the heading of Persisting-SLI.
- Group 2, the Resolved-SLI group, included young people with current normal non-verbal and language abilities (n=17).

Information on KS4 achievement for these two groups is presented in table 4.

Young people with Resolved-SLI sat significantly more examinations and obtained significantly higher grades than those with Persisting-SLI. Interestingly, we did not find any significant differences in number of examinations taken nor on grades achieved between the Resolved-SLI group and their TD peers.

Performance on specific core GCSE subjects was examined for all participants (English language, Mathematics and Science). The results are presented in table 5.

The proportion of adolescents gaining grades A*–C was consistently higher in the TD group for English language (67% versus 14%), Mathematics (61% versus 16%) and Science (69% versus 21%). Large proportions of the adolescents with SLI were not entered at Level 1 or 2 for each of these core academic subject examinations.

After omitting those who had not been entered for Level 1 or 2 KS4 examinations (SLI=29; TD=1), the mean GCSE/GNVQ point score for adolescents with SLI was 238.1 (SD=124.2, range 16–538) compared with 390.5 (SD=130.0, range 54–676) for TD adolescents. This difference was significant, $F(1,209)=73.89$, $p<0.001$, partial $\eta^2=0.26$.

Point scores for the Persisting-SLI and Resolved-SLI groups were also examined. The mean score for the Persisting-SLI group was 208.3 (SD=102.4, range 16–442) compared with 387.6 (SD=100.9, range 214–538) for the Resolved-SLI group, a significant difference, $F(1,83)=40.0$, $p<0.001$, partial $\eta^2=0.33$.

Table 4. Number of qualifications and grades achieved by Persisting-specific language impairment (SLI) and Resolved-SLI groups at the end of secondary education

	Persisting-SLI, $n=94$	Resolved-SLI, $n=17$
Number GCSE/GNVQs entered		
Mean (SD)	5.3 (4.0)	9.1 (2.7)*
Range	0–12	0–12
Grades A–C achieved*		
Mean (SD)	1.1 (2.0)	5.4 (3.7)*
Range	0–10	0–10
Grades D–G achieved		
Mean (SD)	4.1 (3.3)	3.8 (3.2)
Range	0–11	0–8
Unclassified		
Mean (SD)	0.2 (0.6)	0
Range	0–4	–

*Significant difference ($p<0.01$).
GCSE, General Certificate of Secondary Education; GNVQ, General National Vocational Qualification.

Table 5. Specific core GCSE results for adolescents with specific language impairment (SLI) and typically developing (TD) adolescents

	Adolescents with SLI		TD adolescents	
	N	%	N	%
English language				
Grades A*–C	16/118	13.6	83/121	68.6
Grades D–G	58/118	49.2	36/121	29.8
Unclassified	1/118	0.8	0/121	0
Not entered for exam	43/118	36.4	2/121	1.7
Mathematics				
Grades A*–C	19/117	16.2	74/121	61.2
Grades D–G	62/117	53.0	43/121	35.5
Unclassified	3/117	2.6	3/121	2.5
Not entered for exam	33/117	28.2	1/121	0.8
Science†				
Grades A*–C	25/119	21.0	84/121	69.4
Grades D–G	58/119	48.7	33/121	27.3
Unclassified	1/119	0.8	2/121	1.7
Not entered for exam	36/119	30.3	2/121	1.7
Not entered for any core examination	30/117	25.6	1/121	0.8

†Where there was more than one grade for Science, i.e. when pupils were entered for double science or there were separate entries for physics, chemistry and biology, a single score was calculated by taking the average.

What factors are associated with educational attainment at the end of secondary education?

The correlations between GCSE/GNVQ point score, maternal education level and concurrent PIQ, language and reading scores are presented in table 6.

Significant correlations were observed between educational achievement and both psycholinguistic ability and maternal education level. However, for the TD adolescents, lower associations were observed between educational achievement and language ability, with expressive language showing a non-significant correlation.

In order to examine first the contribution of non-verbal IQ and maternal education level, two separate hierarchical regressions were conducted using the GCSE/GNVQ point score as the outcome variable (and thus excluding those adolescents who did not attempt any GCSE/GNVQ examinations). The first block in each regression consisted of concurrent non-verbal IQ and maternal education level respectively. The regression model for non-verbal IQ was significant, $F(1,205)=116.75$, $p<0.001$, with non-verbal IQ accounting for 36% of the variance in GCSE outcome. The regression model for maternal education level was also significant, $F(1,200)=16.83$, $p<0.001$, with maternal education level accounting for 7% of the variance in GCSE/GNVQ outcome.

Further hierarchical regressions examined the contribution of language and literacy measures to GCSE/GNVQ outcome over and above the contribution made by non-verbal IQ and maternal education levels. The first block comprised these two variables. The second block added concurrent measures of expressive language, receptive language, single word reading and reading comprehension. The regression

Table 6. Correlations between General Certificate of Secondary Education (GCSE)/General National Vocational Qualification (GNVQ) point score and concurrent performance IQ (PIQ), language and literacy scores for adolescents with specific language impairment (SLI) and typically developing (TD) adolescents

	GCSE/GNVQ point score (excluding those not entered for any KS4 examinations)
CELF receptive subtest	0.581**
	0.614**
	0.383**
CELF expressive subtest	0.506**
	0.538**
	0.155
WORD single word reading	0.653**
	0.641**
	0.541**
WORD reading comp	0.707**
	0.730**
	0.525**
WISC PIQ	0.602**
	0.540**
	0.514**
Maternal education level	0.279**
	0.262*
	0.281**

*$p<0.05$; **$p<0.01$.
The top value in each cell denotes the whole sample (SLI and TD); the middle value denotes SLI only and the bottom denotes TD only.
CELF-R, Clinical Evaluation of Language Functioning — Revised; PIQ, performance IQ; SD, standard deviation; WISC, Wechsler Intelligence Scale for Children; WORD, Wechsler Objective Reading Dimensions.

model was significant at step two, $F(6,138)=38.75$, $p<0.001$. Table 7 shows the results of this analysis for predicting GCSE/GNVQ outcome.

At step two, after accounting for non-verbal IQ and maternal education level, single word reading ($p=0.003$), reading comprehension ($p<0.001$) and expressive language ($p=0.041$) contributed significantly to GCSE/GNVQ attainment in terms of overall point score. After considering the effects of non-verbal IQ and maternal education level (34%), language and literacy measures were found to account for an additional 27% of variance. Overall, the model explained 61% of the variance in GCSE/GNVQ outcome.

When this regression was repeated to examine the unique contribution of language by adding the literacy measures to step 1, the model was found to be significant at step two, $F(6,144)=38.75$, $p<0.001$. Expressive language was a significant predictor ($p=0.041$) of GCSE outcome over and above non-verbal IQ, literacy and maternal education level, accounting for an additional 2% of unique variance.

The factors associated with GCSE/GNVQ outcome were then examined separately for each group (SLI and TD). Hierarchical regression was conducted with GCSE/GNVQ point score as the outcome variable. The first block for each regression consisted of concurrent non-verbal IQ and maternal education level. The second block added concurrent expressive and receptive language, single word reading and reading comprehension.

Table 7. Hierarchical regression analysis predicting GCSE point scores in adolescents

Variable	B	$SE\ B$	β
Step 1			
WISC PIQ	4.10	0.53	0.53**
Maternal education level	21.52	6.57	0.22*
Step 2			
CELF expressive subtest	1.15	0.55	0.14*
CELF receptive subtest	0.71	0.64	0.09
WORD single word reading	2.07	0.69	0.23*
WORD reading comprehension	3.29	0.82	0.32**

*$p<0.05$; **$p<0.01$.

Adjusted $R^2=0.365$ for Step 1 ($p<0.001$); $\Delta R^2=0.262$ for Step 2 ($p<0.001$).

CELF-R, Clinical Evaluation of Language Functioning — Revised; PIQ, performance IQ; WISC, Wechsler Intelligence Scale for Children, WORD, Wechsler Objective Reading Dimensions.

For both groups the final regression model was significant, (SLI $F(6,77)=20.38$, $p<0.001$; TD $F(6,54)=6.51$, $p<0.001$). For the adolescents with SLI, the independent variables associated with GCSE/GNVQ outcome were non-verbal IQ ($p<0.001$) and maternal education level ($p=0.020$) at step 1 and basic reading ($p=0.011$) and reading comprehension ($p<0.001$) at step 2. Overall, the model accounted for 63% of the variance in GCSE/GNVQ outcome among adolescents with SLI. For the TD adolescents, non-verbal IQ ($p=0.001$) and maternal education level ($p=0.004$) were significantly associated with outcome at step 1, with single word reading borderline associated ($p=0.127$) with outcome at step 2. This model accounted for 36% of variance in GCSE/GNVQ outcome.

When examining outcome in specific subjects, it was found that level of attainment in English language, Mathematics and Science GCSE was associated with literacy (both single word reading and reading comprehension) and non-verbal abilities for both the adolescents with SLI and TD adolescents. There was no contribution of expressive or receptive language measures. These models accounted for around 50% of the variance in quality of GCSE outcome in each subject.

Adolescents with SLI: patterns of earlier educational achievement and their role in educational attainment at the end of secondary education

Table 8 presents earlier KS2 and KS3 examination results for the adolescents with SLI.

There was some consistency in achievement across secondary schooling in young people with SLI but this related to relatively small proportions of children. The majority of young people exhibited patterns of gain and/or decline in attainment throughout secondary schooling. To explore early factors associated with later outcome in adolescents with SLI, a series of hierarchical regressions was again conducted using specific GCSE/GNVQ point score as the outcome variable (and thus excluding those adolescents with did not attempt the examination). This was carried out for the three specific core subjects.

Attainment in GCSE English language in adolescents with SLI was predicted by expressive language ($p=0.016$), non-verbal abilities ($p<0.001$) and also

Table 8. Numbers of children (and percentages in parentheses) with specific language impairment (SLI) scoring at or above and below the expected level in KS2 and KS3 examinations

	English language	Mathematics	Science
Greater than or equal to Level 4 KS2	20/120 (16.7)	29/119 (24.4)	43/119 (36.1)
Less than Level 4 KS2	41/120 (34.2)	40/119 (33.6)	44/119 (37.0)
Non-attender	1/120 (0.8)	2/119 (1.7)	2/119 (1.7)
Not entered for the examination	46/120 (38.3)	35/119 (29.4)	24/119 (20.2)
Home educated	1/120 (0.8)	1/119 (1.7)	1/119 (0.8)
No level awarded	11/120 (9.2)	12/119 (10.1)	5/119 (4.2)
Greater than or equal to Level 5 KS3	24/117 (20.5)	35/118 (29.7)	30/115 (26.1)
Less than Level 5 KS3	47/117 (40.2)	62/118 (52.5)	64/115 (55.7)
Non-attender	0/117 0	0/118 0	4/115 (3.5)
Not entered for the examination	39/117 (33.3)	14/118 (11.9)	13/115 (11.3)
Home educated	0/117 0	0/118 0	0/115 0
No level awarded	7/117 (6.0)	7/118 (5.9)	4/115 (3.5)

age-appropriate functioning in KS2 English, i.e. achieving Level 4 or above (borderline significance, $p=0.082$) at 11 years. This model accounted for 43% of the variance in GCSE English language outcome. For GCSE Mathematics outcome, only non-verbal abilities ($p=0.001$) and age-appropriate functioning in KS2 Mathematics ($p=0.003$) at 11 years were predictive. This model accounted for 49% of the variance in GCSE Mathematics outcome. In contrast, for GCSE Science outcome, the model including early predictors at 11 years was not significant.

Overall outcome was examined in terms of GCSE/GNVQ point score and both psychometric scores at 11 years and KS2 results were entered as a single block. Although 52% of variance was accounted for and the model was significant ($p<0.001$), there were no unique predictors. The model was repeated using backwards entry and it was found that non-verbal abilities ($p=0.048$), reading comprehension ($p=0.007$), KS2 Mathematics score ($p=0.003$) and borderline expressive language ($p=0.086$) were the variables most associated with outcome. Thus, GCSE/GNVQ attainment at 16/17 years of age was predicted by earlier measures at 11 years of age which included non-verbal skills, language, literacy and examination performance.

National examinations: patterns of entry and non-entry across secondary education in young people with SLI

Nearly one-quarter of adolescents with SLI were not entered for any Level 1 or Level 2 GCSE/GNVQ examination at the end of compulsory secondary schooling. Table 9 presents the psychometric profiles of the adolescents who were and were not entered for examinations.

One-way ANOVAs revealed that the adolescents with SLI who were not entered for KS4 examinations performed significantly worse than those who were entered on tests of concurrent receptive language, $F(1,114)=7.19$, $p=0.008$, partial $\eta^2=0.059$, expressive language, $F(1,114)=7.37$, $p=0.008$, partial $\eta^2=0.061$, single word reading, $F(1,113)=13.88$, $p<0.001$, partial $\eta^2=0.109$, reading comprehension,

Table 9. Psycholinguistic profiles (standard scores) for adolescents with specific language impairment (SLI) entered or not entered for Level 1 or Level 2 KS4 examinations

	Adolescents with SLI who were entered for KS4 examinations		Adolescents with SLI who were not entered for KS4 examinations	
	Mean	SD	Mean	SD
Age 16 years	*n*=86		*n*=28	
CELF-R Receptive subtest	86.5	17.1	77.9	16.4
CELF-R Expressive subtest	75.6	10.8	69.7	9.1
WORD Single Word Reading	87.2	15.8	73.2	21.6
WORD Reading Comprehension	79.3	13.2	63.3	12.9
WISC PIQ	87.0	19.1	75.2	18.5
Age 11 years	*n*=88		*n*=29	
TROG	91.3	14.7	76.4	14.2
CELF-R Recalling Sentences	76.3	12.8	70.1	9.6
CELF-R Word Associations	94.3	16.5	79.8	15.0
BPVS	87.3	12.3	78.9	13.9
EVT	76.2	14.1	60.9	14.7
WORD Single Word Reading	83.6	13.6	72.7	15.0
WORD Reading Comprehension	79.7	12.1	64.1	13.8
WISC PIQ	90.1	23.2	73.8	21.3

Changes in *n* across time due to missing data.
BPVS, British Picture Vocabulary Scale; CELF-R, Clinical Evaluation of Language Functioning — Revised; EVT, Expressive Vocabulary Test; PIQ, performance IQ; TROG, Test for Reception of Grammar; WISC, Wechsler Intelligence Scale for Children; WORD, Wechsler Objective Reading Dimensions.

$F(1,112)=31.99$, $p<0.001$, partial $\eta^2=0.222$, and non-verbal IQ, $F(1,112)=8.80$, $p=0.004$, partial $\eta^2=0.073$.

There were also differences between these groups on 11-year psychometric assessments. Adolescents with SLI who were not entered at KS4 performed significantly worse than those who were entered on tests at age 11 years on each measure: TROG, $F(1,118)=23.87$, $p<0.001$, partial $\eta^2=0.168$, CELF recalling sentences, $F(1,118)=6.44$, $p<0.05$, partial $\eta^2=0.052$, CELF word associations, $F(1,118)=18.98$, $p<0.001$, partial $\eta^2=0.139$, EVT, $F(1,118)=26.69$, $p<0.001$, partial $\eta^2=0.184$, BPVS, $F(1,118)=9.95$, $p=0.002$, partial $\eta^2=0.078$, single word reading, $F(1,117)=14.08$, $p<0.001$, partial $\eta^2=0.107$, reading comprehension, $F(1,116)=34.38$, $p<0.001$, partial $\eta^2=0.229$, and non-verbal IQ, $F(1,117)=11.88$, $p=0.001$, partial $\eta^2=0.092$.

The academic history of these 29 adolescents who showed lack of age-appropriate academic qualifications at the end of compulsory schooling was also examined. For English language (disregarding one child who had been home educated), it was found that the majority of this group (21/28, 75%) had also not been entered previously at both KS2 and KS3. For Mathematics, this proportion was much smaller: 10/28 (36%) had not been entered at both stages. The same was true of Science results. This can be contrasted with the academic history of those adolescents who had at least one full GCSE/GNVQ entry at KS4. Of these, only 7/88 (8%) had not been entered previously at KS2 and KS3 for English. For Mathematics, the figure was 3/89 (3%) and for Science the figure was 3/86 (4%). Thus, there appears to be a relatively stable pattern of examination entry/non-entry for children with SLI throughout secondary education.

The adolescents with SLI were grouped depending on whether they had or had not been entered for GCSE English language (75 entered, 43 not entered), GCSE Mathematics (84 entered, 33 not entered) and GCSE Science (83 entered, 36 not entered) at the end of secondary education. Separate logistic regression procedures were employed to determine the link between possible predictive factors in terms of language, non-verbal IQ and literacy profiles at 11 years and also entry/non-entry at KS2 in each of the relevant subjects. A forward stepwise procedure was used with significance levels for entry set at $p=0.05$. Outcome was coded as 0 (good outcome, entered at GCSE level) and 1 (poor outcome, not entered at GCSE level). Logistic regression coefficients were used to estimate the odds ratios (OR; set at ten standard scores) for each of the independent variables in the model. Odds ratios are a measure of effect size and are used to assess the risk of a particular outcome (in this case the entry/non-entry on a particular subject) if a certain factor or set of factors (in this case the predictive variables) are present.

Predictive variables in each regression consisted of non-verbal IQ, receptive language, expressive language, receptive syntax, expressive vocabulary, receptive vocabulary, single word reading, reading comprehension at age 11 years and also whether child had been entered for the subject at KS2.

For prediction of GCSE English language entry/non-entry, it was found that expressive vocabulary (OR=0.63), reading comprehension (OR=0.55) and entry/non-entry for KS2 English language (OR=3.05) were all significantly related to outcome. For prediction of GCSE Mathematics entry/non-entry, expressive vocabulary (OR=0.54) and entry for KS2 Mathematics (OR=4.52) were significantly related to outcome. For prediction of GCSE Science entry/non-entry, reading comprehension (OR=0.39), expressive language (OR=0.46) and entry for KS2 Science (OR=10.38) were significantly related to outcome.

These results suggest that for core GCSE examinations, entry/non-entry at this level is strongly predicted by earlier entry/non-entry for KS2 examinations in English, Mathematics and Science at 11 years. Being excluded at the end of primary schooling for national examinations increases the chance of being excluded at GCSE by approximately three times for English, 4.5 times for Mathematics and ten times for Science.

Discussion

This paper illustrates the heterogeneity of educational outcomes associated with specific language impairment (SLI). A wide range of outcomes was found amongst the sample of young people at the end of compulsory schooling in the UK. Some pupils achieved good outcomes, equivalent to those of comparison TD peers, while others experienced poor outcomes with no qualifications obtained, and many others were intermediate. These data, from one of the largest samples studied in this context, help to clarify the mixture of findings in previous literature and provide a detailed picture of how contemporary adolescents with SLI are faring.

The sample had the opportunity to be entered for GCSE examinations or their equivalent in 2004 and 2005. This is some 20 years on from the studies based on adolescents followed in the 1980s (Haynes and Naidoo 1991, Clegg *et al.* 1999, Mawhood *et al.* 2000), which had indicated very poor educational prognoses for people with histories of language disorders. It is approximately 10 years on from the large-scale study of Snowling *et al.* (2001), which found that substantial proportions of young people with SLI were being entered for GCSE examinations, albeit with below-average outcomes if the language difficulties had not been resolved. The present study was broadly contemporaneous with that of Dockrell *et al.* (2007), which reports that many pupils with speech and language difficulties were attaining GCSEs at 16 years of age, though the qualifications were typically achieved at Level 1 (grades D–G). Of particular interest is that although we observed the same diversity of attainment as exemplified across previous studies, the findings, like those of Dockrell *et al.*, suggest an improvement in academic achievement in young people with SLI. The majority of adolescents with a history of SLI are obtaining some national qualifications at the end of compulsory secondary education.

It was found that 44% of young people with SLI obtained at least one of the expected NQF Level 2 qualifications at school leaving age. Although it needs to be noted that twice the TD group achieved this level (88%), it must not be forgotten that hardly any pupils with SLI in the study by Haynes and Naidoo (1991) did so. Recall that achievement at Level 2 is equivalent to GCSE grades A*–C or GNVQ Intermediate. This achievement in national qualifications by young people with SLI is a positive indicator.

Snowling et al. (2001) provide information on levels of attainment across subgroups, but do not report the proportion of young people who did or did not gain any national examination qualifications, which makes comparisons with their investigation difficult. With this in mind, we carried out a set of analyses that permitted direct contrasts with their study. The present results were very similar to theirs. Like them, it was found that the Resolved-SLI group was performing very much like TD comparison peers. On average, these young people were taking nine GCSEs (or equivalent), with five of those GCSEs at grades A*–C and just about four at grades D–G. In contrast, and much like Snowling et al. (2001) (but also see below), those with Persisting-SLI (with or without global delay) were taking on average five GCSEs (or equivalent); with one of those GCSEs at grades A*–C and four at grades D–G. Significant differences were found between the Persisting-SLI group and the Resolved-SLI group in both the number of GCSEs taken and the number of GCSEs with grades A*–C. One difference worth noting is that on average those with Persisting-SLI were taking one more GCSE in the 2000s than their counterparts were in the 1990s (an average of five in the present study with an average of four in the study by Snowling et al. 2001). One possibility that needs to be considered is that the percentage of children achieving particular results may have altered over time. Thus, the observed increase of one more GCSE may represent changes in the examination system rather than improvements. However, national statistics for 1999, the year the Snowling et al. (2001) study cohort took their examinations, suggest that this is an unlikely explanation as the proportion of pupils achieving at the benchmark level in 1999 was very similar to the proportion in 2004 (47.8% versus 53.7%, respectively).

What factors influence educational attainment at the end of secondary education? A series of regression analyses expanded the findings of Snowling et al. (2001) and suggested that concurrent non-verbal IQ and literacy skills were predictors of educational attainment. These authors did not examine the potential role of language skills (in addition to non-verbal IQ and literacy skills) or maternal education in predicting attainment for school leavers. The present findings suggest that both these factors were associated with academic achievement. Furthermore, language skills indeed play a role and accounted for independent variance in educational achievement, in particular for adolescents with SLI. Nonetheless, examination of the size of the coefficients obtained and further analyses of the GCSE core subjects confirms that literacy is a stronger predictor of educational attainment than oral language skills. The results suggest a hierarchy of within-the-individual, concurrent contributions to educational attainment: non-verbal IQ being the strongest predictor, followed by literacy skills, which in turn is followed by language skills. Having said this, it needs to be noted that a simple interpretation of this hierarchy may not be warranted. It could well be the case that oral language difficulties may have had (and we would argue they are likely to have had) a prior impact on literacy skills. Thus what is observed in the results of the regression analyses, at least partly, may reflect the developmental influence of language on literacy skills.

We were also able to add a longitudinal dimension to our understanding of educational achievement for school leavers with a history of SLI. It was found that, for young people with SLI, performance at 11 years in the core subjects of English language and Mathematics were predictive of performance in these core subjects at GCSE level. Interestingly, non-verbal IQ as measured at 11 years continued to play a strong predictive role longitudinally in both English language and Mathematics performance at GCSE level. Language was also a predictor, but only for English language examination outcome. As expected, the longitudinal picture for overall attainment was complex and reflects a breadth of variables that are likely to affect educational performance across time, such as non-verbal skills, literacy, language and earlier examination performance.

The present paper also reports for the first time the pattern of educational achievement throughout secondary schooling, from KS2 (11 years of age, just before entry to secondary schooling in the UK) onwards. In general, the results suggest that a number of young people with SLI exhibited changes in performance across secondary schooling, with patterns of gain and/or decline evident. Across time, there was also some consistency in achievement, mainly for a small proportion of adolescents with SLI. These children fell into one of three patterns: those who consistently performed as expected for their age in the core subjects, those who consistently performed below what was expected for their age in the core subjects, and those who were not entered for any examinations throughout their secondary schooling.

We were interested in examining patterns of entry and non-entry for examinations, particularly in light of the findings that nearly one-quarter of the sample (24%) of adolescents with SLI were not entered for any Level 1 or Level 2 GCSE/GNVQ examinations at the end of compulsory education. The findings show a very strong association between earlier patterns of entry to examinations and patterns of entry at school leaving age. Specifically, earlier patterns of entry examination for KS2 at 11 years in the core subjects of English, Mathematics and Science were the strongest predictors of later entry for these examinations at 16/17 years at GCSE. The odds ratios revealed increased chances of non-entry for English language (three times), Mathematics (4.5 times) and Science (ten times). Early literacy and language skills also played a predictive role, but these were not as strongly associated as early non-entry. Examination of the psycholinguistic profiles of those not entered for GCSE examination revealed poorer performance on all the variables measured by this study at both the early stage (11 years) and the GCSE stage (16/17 years). It seems that students are entered for GCSE examinations by their schools if they have a chance to succeed in gaining that qualification. Teachers' perceptions of young people's abilities are an important factor in whether young people are entered or not entered for formal examinations. This interpretation is corroborated by our finding that the vast majority of those who were entered did obtain a pass grade for GCSE. However, in terms of education and service provision, it is important that we ensure that the flexibility already present in the system for options at 14 years of age, e.g. NVQ is available for all children, but particularly children with language difficulties as a substantial proportion currently only work at Entry Level. In addition, future research could address in more detail the messages that are conveyed in the classroom with regard to ability and examination entry and the appropriateness of the curriculum, educational placements and support for those children who are unlikely to participate in the formal assessment of educational achievement in secondary schooling. The companion paper by Durkin et al. (2007) investigates in more detail the educational experiences of this group of adolescents.

The present study has expanded previous research and revealed that, in addition to non-verbal IQ, early and concurrent literacy and language skills have a significant effect on the educational attainments of young people with a history of SLI at the end of compulsory education. Furthermore, subject specific attainment at 11 years for English language and Mathematics also play a significant role in later attainment at GCSE level in these two core subjects. Taken together, the findings of this investigation suggest that KS2, when children are 11 years of age and on the verge of moving to secondary education, is a crucial time for assessment and evaluation of individual children's needs and levels of support they require. This stage usually coincides with the transition from primary to secondary education, thus there is an increased need to monitor carefully the transitions of young people with language difficulties. Performance at this stage in their education is related to performance after a further 5 years of schooling, when they are 16/17 years of age and school leavers.

In summary, the answer to the question 'how will this child with SLI turn out?' need not invariably be negative. Certainly, young people with SLI attain on average less successful outcomes from secondary education. However, the findings add to the accumulating body of evidence that the range of possible outcomes is broad. The evidence here supports the suggestions of Snowling *et al.* (2001) that early resolution of SLI is a positive indicator, and that such children do not differ significantly from TD peers in terms of their secondary examination results. Children with persistent SLI are at greater risk, but even so, their outcomes are influenced by both individual differences in ability and social context. Those among this group who are identified by the school system as not expected to perform well at an early Key Stage have a greater likelihood of not being entered for examinations in subsequent stages. This suggests a need for future research into possible interactions among ability levels, labelling processes, and teacher expectations, as well as raising pedagogical and policy questions about the nature of specialist support provision needed for young people with SLI in secondary schools (Conti-Ramsden and Botting 2000).

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