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Psycholinguistic Markers for Specific Language Impairment (SLI)

Gina Conti-Ramsden and Nicola Botting
University of Manchester, U.K.

Brian Faragher
University of Manchester, Institute of Science and Technology, U.K.

In this study 160 children, aged 11 years with a definite history of specific language impairment (SLI), completed four tasks that could be potential positive psycholinguistic markers for this impairment: a third person singular task, a past tense task, a nonword repetition task, and a sentence repetition task. This allowed examination of more than one type of marker simultaneously, facilitating both comparisons between markers and also evaluation of combinations of markers in relation to identifying SLI. The study also provided data regarding the markers in relation to nonverbal IQ, made use of new normative data on all tasks, and examined marker accuracy in relation to current language status. The results show that markers vary in accuracy, with sentence repetition (a previously unused marker) proving to be the most useful. This psycholinguistic marker shows high levels of sensitivity (90%), specificity (85%), and overall accuracy (88%), as well as being able to identify the majority of children whose current language status falls in the normal range despite a history of SLI.

Keywords: Specific language impairment (SLI), psycholinguistic markers, sentence repetition, nonword repetition.

Abbreviations: CELF: Clinical Evaluation of Language Fundamentals-Revised; CNRep: Children's Test of Nonword Repetition; PTT: Past Tense task; RecS: Recalling Sentences; ROC: receiver operating characteristic; SLI: specific language impairment; TPS: Third Person Singular task.

Introduction

There has been much speculation recently regarding the underlying mechanisms of specific language impairment (SLI) and in particular whether "markers" can be identified that differentiate accurately between individuals with and without language disorders. This is at least in part due to the dissatisfaction felt by research and clinical communities at the "exclusionary" way in which SLI is currently diagnosed. It has also perhaps been fuelled by the reports of significant prevalence figures for SLI of around 7% (e.g., Law, Boyle, Harris, Harkness, & Nye, 1998; Tomblin et al., 1997). The role of memory in language performance has been increasingly prominent and the current status of knowledge is neatly summarised in a recent report by Ellis-Weismer, Evans, and Hesketh (1999). The literature at present consists of models postulating both specific verbal memory deficits as well as generalised limitations in processing capacity and the relationship between these and language impairment.

Some of the skills that have recently been examined in children with SLI include performance on phonological short-term memory tasks such as nonword repetition tests (Bishop, North, & Donlan, 1996; Gathercole & Baddeley, 1990: Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998), which are reported to be good indicators of underlying language difficulty even when superficially the impairment appears to have resolved. Interestingly, immediate verbal memory tasks have also been found to be more difficult for children with SLI (Ellis-Weismer et al., 1999). In a different vein, the ability to mark syntactic tense has also been thought as a possible marker. Syntactic tense appears to be a particular hurdle for children with SLI throughout the primary school years (Marchman, Wulfeck, & Ellis-Weismer, 1999; Rice & Wexler, 1996; Rice, Wexler, & Cleave, 1995; Rice, Wexler, & Hershberger, 1998; for an in-depth review see Leonard, 1998).

Markers that appear to reveal underlying impairments when language is adequate in daily use are particularly important when attempting to trace the heritability of language disorders and related clinical outcomes. But there are also direct clinical motivations for identifying markers. They may lead therapists to try alternative approaches and may help to positively identify those most suited to intensive language provision in education. However, most markers, including the nonword repetition marker and immediate memory task, are not unique to specific language impairment and children with more global learning disabilities (e.g., those with Down syndrome) have also been shown to perform more poorly

Requests for reprints to Gina Conti-Ramsden, Human Communication and Deafness, School of Education, University of Manchester, Oxford Road, Manchester M13 9PL, U.K. (E-mail: gina.conti-ramsden@man.ac.uk).

on these tasks (Jarrold, Baddeley, & Hewes, 2000). Interestingly, the first work to examine nonword repetition in children with autism appears to show a moderate deficit in this clinical group also (Kjelgaard & Tager-Flusberg, in press). Thus it may be that such indicators are predictors only of any language impairment and that the specific nature of such impairments needs still to be identified via a process of exclusion—a method with which neither the clinical nor academic professions are entirely satisfied.

Furthermore, a difficulty of immediate memory tasks such as the ones described by Ellis-Weismer et al. (1999) is that nonverbal intelligence appears to be correlated with performance on these tasks for children with SLI. In contrast, Stothard et al. (1998) found that a nonword repetition task did not correlate significantly with a test of nonverbal ability (Raven's matrices). This suggests that nonword repetition tasks may be less loaded towards general nonverbal ability and therefore this type of memory assessment may prove to be a more accurate marker for language impairment.

Even more importantly, to the authors' knowledge no research has examined more than one type of marker in parallel and analysed the relative predictive value of each marker or the combined power of a set of markers. Thus clinicians cannot be sure at present whether assessing two areas of ability is of additional benefit or whether they are using overlapping and thus unnecessary tasks for this process. Combinatory analysis might also enable preliminary examination of the underlying skills that markers tap into, such as different types of memory, knowledge, and processing abilities.

The present study set out to examine whether any of three previously reported clinical assessments could act as psycholinguistic markers for a large cohort of 11-year-old children who were identified as having SLI at 7 years of age. These children's difficulties represent the range of specific language impairment (as reported in Conti-Ramsden & Botting, 1999a,b; Conti-Ramsden, Crutchley, & Botting, 1997). In total 160 children had data confirming their status as SLI at 11 years. Because of the paucity of standardised data for 11-year-old children, the marker tasks were also completed by 100 normally developing age-matched children.

Three potential markers were examined. As discussed above, nonword repetition was assessed. Tense marking ability, as reported by Rice et al. (1995) and by Marchman et al. (1999), has also been identified as a key feature of children with SLI. This was examined using Marchman's elicitation task and a task examining use of third person singular (Simkin & Conti-Ramsden, 2001). Finally, a sentence repetition task, the recalling sentences subtest of the Clinical Evaluation of Language Fundamentals-Revised, CELF-Revised (Semel, Wiig, & Secord, 1994) was used. This task was included based on the work of Tomblin, Freese, and Records (1992) with young adults with a history of SLI. These researchers found that a telephone task involving sentence repetition discriminated well between young adults with a history of SLI and those without a history of SLI. We wanted to extend this work and examine sentence repetitions as a possible psycholinguistic marker for children with SLI.

The analysis attempted to investigate five main issues:

(1) The independent contributions of markers to the identification of SLI (sensitivity, specificity, and overall accuracy).
(2) The effects on identification accuracy of combining markers.
(3) The relative level of identification for each potential marker in relation to *current language status*. In particular examining the fact that children whose difficulties appear to have resolved by 11 years should still be "marked" by these variables.
(4) The relationship between markers in children with a history of SLI and in normally developing children.
(5) The relationship between potential markers and nonverbal intelligence.

Method

Participants

Children with SLI. A group of 242 children were identified, recruited, and assessed at 7 years on a series of language measures. Initial selection at 7 years is described fully in Conti-Ramsden et al. (1997) and consisted of a random 50% sample of all Year 2 children attending mainstream language units. Thus, no specific "SLI" criteria were used at selection, except that those with known current hearing loss or major physical disability were excluded, as were those with definite diagnoses of autism or of moderate learning difficulties.

For the purpose of investigating markers, however, it was felt important to make a post hoc exclusion of data from individuals who appeared to have resolved their language difficulties at recruitment (age 7), since we have no firm data confirming their status as having SLI at earlier stages. In addition, children with global delay at 7 years of age (defined by nonverbal scores more than 2 *SD* below population norm) were excluded. In total, 193/242 children actually showed typical SLI in this way. Of these 160 were seen at 11 years of age (in total 200/242 children participated at this age, thus 40 children for whom 11-year data was available were excluded due to non-SLI characteristics at 7 years). Forty-three children (27%) were girls and 22 children (14%) had exposure to languages other than English at home. The average age of the children was 10; 9 ($SD = 5$ months).

Normally developing children. One hundred normally developing children from three primary schools in rural and urban settings also completed all the marker tasks (Simkin & Conti-Ramsden, 2001). The reasons for this was two-fold. First, the past tense, third person, and nonword repetition tasks had no normative data available for this age group. Second, sensitivity and specificity analysis, as well as between-test correlations, required that all data was available for both groups, hence the children were also tested on the Recalling Sentences subtest of the CELF, although this test has recent available norms for this age group. However, tests of nonverbal cognition and general language ability were not administered to these children.

Of the 100 children, 51 were girls and their mean age was 10; 9 ($SD = 4$ months). Children with a history of special needs education were excluded from this sample.

Procedure

Following informed written consent from families, children were visited at school and assessed individually in a quiet room or area. Testing on marker tasks was completed as part of a wider battery of language and cognition tests, during a single visit, at the child's own pace, and with normal school breaks. Because of the large number of measures used, the numbers of data points available for each language and cognition assessment vary slightly.

Marker Tasks

Past Tense task (*PTT*; *Marchman et al. 1999*). This is a test designed to assess correct grammatical usage of verbs in past tense form. It consists of 52 line drawings shown to the child one at a time. With each picture, the assessor reads out a sentence related to the picture, which the child must complete. The sentences all follow the format: "This boy is walking. He walks everyday. Yesterday he (walked)." The items are balanced and randomized for frequency of verbs and for regular vs. irregular forms.

Third Person Singular task (*TPS*; *Simkin & Conti-Ramsden, 2001*). This is a test designed to assess correct grammatical usage of verbs in third person singular form. Fifteen colour photo-cards of people at work are shown to the children one at a time. As with the past tense task, a sentence is read by the assessor and must be finished by the child. The sentences all follow the format: "Sailors sail. This man is a sailor, so everyday he (sails)." This is the second test in the battery to assess tense marking.

CELF-R–Recalling Sentences subtest (*RecS*; *Semel, Wiig, & Secord, 1994*). For this task children are given a sentence and asked to repeat it verbatim. Sentences become increasingly longer and more complex. Responses are scored in relation to the number of errors made in each sentence.

Children's Test of Nonword Repetition (*CNRep*; *Gathercole & Baddeley, 1990*). This is a test of verbal / phonological short-term memory consisting of 40 nonwords. In this study, live presentation was used rather than the audiotape version. In this paradigm, the researcher says a nonword (e.g., barrazon) whilst hiding his or her lips behind a screen of paper (to avoid visual strategies being used by the child). The child must repeat the word exactly. The researcher is not permitted to repeat the word.

Tests of Nonverbal Cognition

Children with SLI were also tested using subtests of the *Wechsler Intelligence Scale for Children* (WISC-III, Wechsler, 1992): Block Design and Picture Completion. These are combined to form an estimated Performance or nonverbal IQ. This performance "short form" in particular has been found to correlate well with a full IQ battery and has been used in other studies of cognitive ability and language (e.g. Sparrow & Davies, 2000).

Language Measures for Comparison of Markers across Current Language Ability

A wide range of language tests was also completed by each child with SLI. This battery was not intended to be exhaustive, but to represent important areas of language development, (vocabulary expression, vocabulary comprehension, syntactic comprehension, and word associations/fluency) using standardised assessments. The following four measures were used: *Expressive Vocabulary Test* (EVT; Williams, 1997); *British Picture Vocabulary Scale* (BPVS-II; Dunn, Dunn, Whetton, & Burley, 1998); *Test for Reception of Grammar* (TROG; Bishop, 1982); *CELF—Word Associations* (Semel et al., 1994).

Results

Relationship to Performance IQ

None of the marker tasks correlated highly with Performance IQ in the group of children with SLI (Spearman's rho: CNRep = 0.19; TPS = 0.20; RecS = 0.23; PTT = 0.30), although all relationships were statistically significant because of large numbers of participants. This is important to note since any marker for SLI should not be a proxy for general cognitive level.

Identification of Children with SLI Using Marker Tasks

For each marker, analyses were completed for sensitivity and specificity. This analysis requires that a threshold score be used as a cutoff for predicting group membership. Cutoff points were selected for each test; children scoring at or below the cutoff were defined as "impaired" and children scoring above the cutoff were classified as "nonimpaired". Since all the tasks in the current study are relatively new (at least to the notion of marking clinical groups), three different thresholds were examined for each marker (giving a total of 12 analyses: 4 markers × 3 cutoff values). Threshold values used were determined using normative data gained from the 100 control children. The three cutoff points felt to be of clinical interest were: below the 16th centile (approximately 1 *SD* from the population mean); below the 10th centile (approximately 1.25 *SD* from the population mean) and below the 2.5th centile (approximately 2 *SD* from the mean). Centiles were used in preference to standard deviations following statistical advice, since data was skewed towards ceiling for the normally developing children on all tasks. Figure 1 shows the group distribution on each of the marker measures.

The sensitivity and specificity of each test were calculated using the formulae:

Sensitivity: number of impaired children scoring below cutoff point / total number of impaired children (i.e.,

Table 1
Sensitivity, Specificity, and Accuracy of Tasks Using Various Thresholds

	Sensitivity	Specificity	Overall accuracy
TPS			
16th	63% (98/155)	90% (90/100)	74% (188/255)
10th	52% (81/155)	93% (93/100)	68% (174/255)
2.5th	21% (33/155)	100% (100/100)	52% (133/255)
PTT			
16th	74% (114/154)	89% (89/100)	80% (203/254)
10th	71% (109/154)	93% (93/100)	80% (202/254)
2.5th	33% (51/154)	100% (100/100)	59% (151/254)
CNRep			
16th	78% (124/159)	87% (87/100)	82% (211/259)
10th	74% (117/159)	92% (92/100)	81% (209/259)
2.5th	42% (67/159)	98% (98/100)	64% (165/259)
RecS			
16th	90% (144/160)	85% (85/100)	88% (229/260)
10th	86% (137/160)	92% (92/100)	88% (229/260)
2.5th	54% (87/160)	99% (99/100)	72% (186/260)

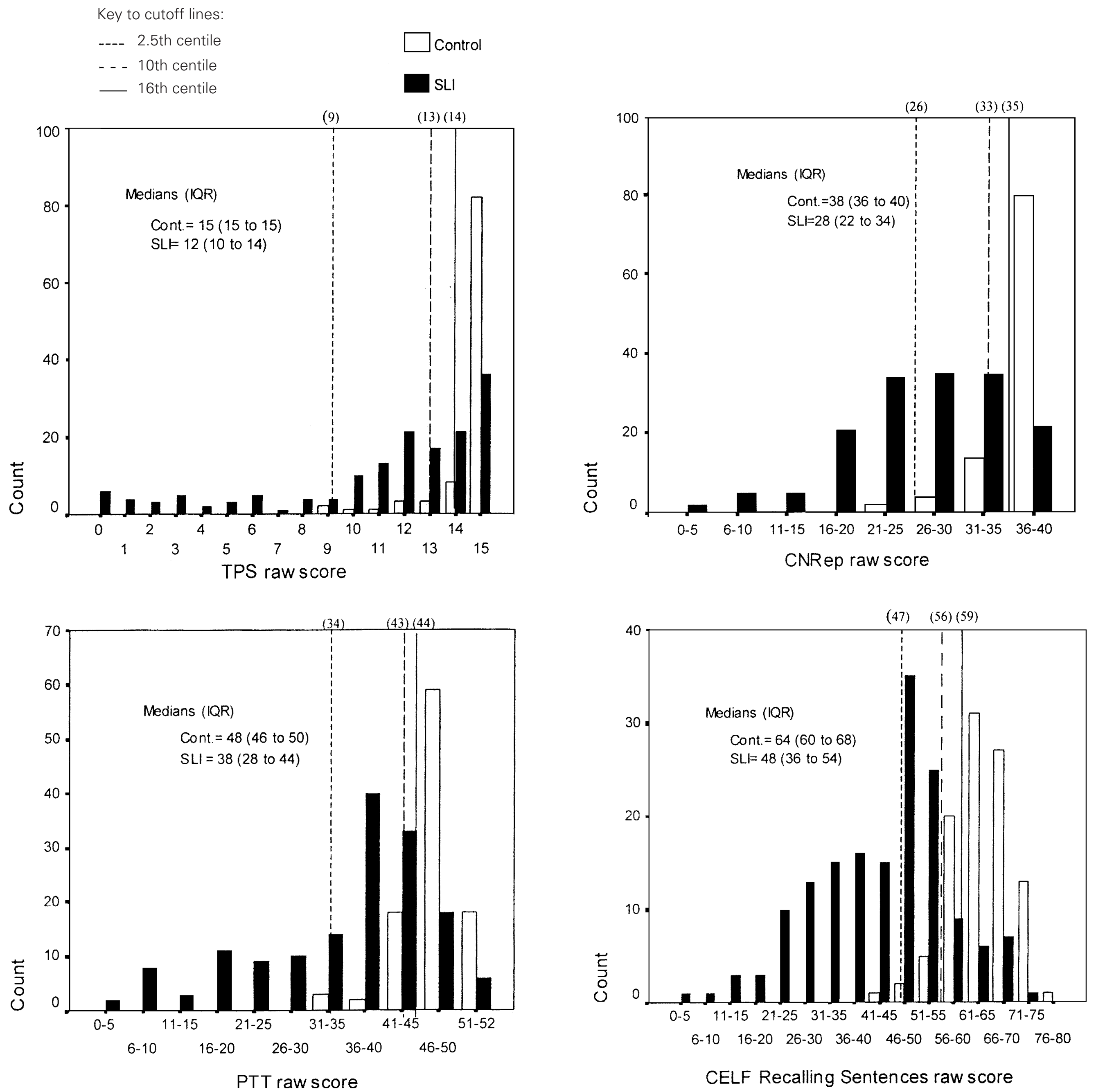

Figure 1. Distributions, medians, and cutoffs for each marker.

probability that an impaired child will be correctly identified by the test = true positive rate).

Specificity: number of nonimpaired children scoring above cutoff point / total number of nonimpaired children (i.e., probability that a nonimpaired child will be correctly identified by the test = true negative rate).

Table 1 shows the sensitivity, specificity, and accuracy values for each analysis. As can be seen, the 16th centile threshold proved to be the most favourable for correct group identification (although little separates the use of 10th and 16th centile cutoffs). Furthermore, the markers differed in their accuracy of predicting children who did and did not have a history of SLI. The least useful task was third person singular, followed by past tense and nonword repetition. Recalling sentences was the most accurate marker of SLI.

The effects of using different diagnostic cutoff points for each test were then evaluated using ROC (receiver operating characteristic) curve analyses (G. Dunn, 2000). Sensitivity and specificity were estimated for a series of cutoff points across the full range of possible test values, and a graph of sensitivity (the true positive rate) plotted against [1 − specificity] (the false positive rate). The ROC curve was examined to identify the "best" cutoff point for the test (i.e., the test score giving the highest sensitivity with an acceptably high specificity level).

In this context, the area under a ROC curve is the probability that a randomly selected nonimpaired child will record a higher test score than a randomly selected impaired child.

Clearly, the higher this area is, the more accurate the test will be. Thus, the areas under the curves were compared across the tests to identify which was likely to be most effective at correctly identifying impaired and non impaired children. Table 2 shows the areas under the curves for the four markers used in this study. Again, recalling sentences was the most predictive of the marker tasks used. A sample ROC curve is shown in Fig. 2.

Table 2
Areas under ROC Curves for Marker Tests

Test	Area under ROC curve
Recalling Sentences	.9227
Nonword Repetition	.8990
Past Tense	.8731
Third Person Singular	.8224

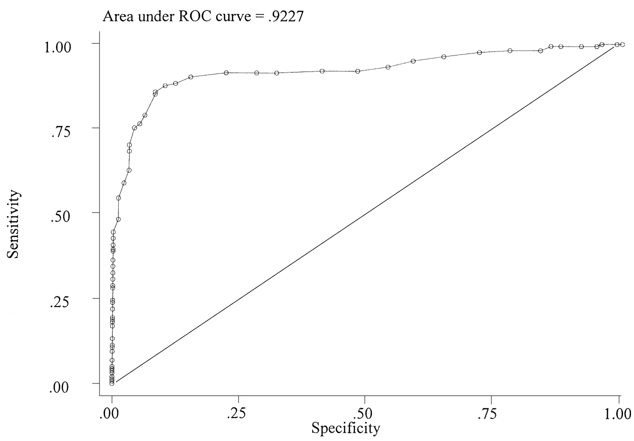

Figure 2. Sample ROC curve: Recalling Sentence marker.

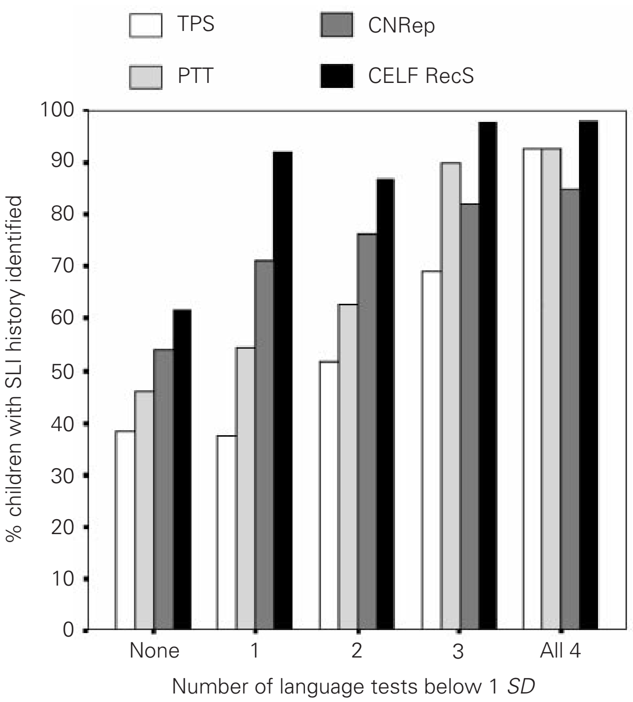

Figure 3. Identification of children with a history of SLI by current language status.

Markers in Relation to Current Language Status

Using the four independent tests of language, current language ability was determined for each child with a history of SLI. This was done by coding each child for how many tests fell below the 16th centile for age (using published test norms). In total the distribution was as follows: 17 (11 %) had no tests below; 25 (16 %) had one test below; 39 (24 %) had two tests; a further 39 (24 %) had three tests; and 40 (25 %) had all four tests below this threshold. Figure 3 shows the accuracy of each marker in relation to different levels of current linguistic ability. It illustrates that whereas all markers are excellent identifiers of those with concurrently severe language impairment, only nonword repetition and recalling sentences are able to identify those with mild or resolved difficulties at a 50 % level of accuracy or greater. This is important since a true marker of SLI (especially when considering genetic/family history studies) should identify all individuals with a history of language impairments.

Table 3
Relationship between Marker Variables for Children with SLI (Normally Developing Children in Parentheses)

	PTT	TPS	CNRep
RecS	.62* (.62)*	.57* (.06)	.55* (.34)*
PTT		.60* (.21)	.39* (.39)*
TPS			.37* (.13)

*$p < .01$.

Relationship between Markers

Correlations between marker tasks were moderate but not as high as anticipated. Table 3 shows the Spearman's rho values for the children with SLI (and normally developing children in parentheses). The results suggest that although all markers are related to some degree, they do not measure entirely overlapping skills. Recalling sentences is the only task to have consistently high correlations with all other tests.

Results for the normally developing group showed weaker correlations in general except for past tense and recalling sentences, which were equal with Spearman's rho = 0.62. Low correlations with all tests and the third person singular task for the normally developing group are probably due to ceiling effects on this assessment.

Combinations of Markers

Clinically, it may be useful to use two assessments in combination to positively determine specific language impairment. Thus we also examined the sensitivity and specificity of pairs of marker tasks. Since the 16th centile cutoff had proved most useful in previous analyses, this threshold was used for all combinations. Two types of combinations were investigated—whether the child scored low on *either* task; and whether the child scored low on *both* tasks. The results are shown in Table 4 and indicate first that the first type of combination (i.e., low on *either* task) is more useful than the other type, since a requirement that both tests are low causes sensitivity levels to drop to unacceptable levels. Second, it shows that improved sensitivity, specificity, and overall accuracy can be gained by combining test results in this way, with low scores on nonword repetition *or* recalling sentences showing the most impressive values. However, it should be noted that the overall accuracy of using both these tests only increases by 1 % over the individual value found for the sentence repetition task alone.

Table 4
Sensitivity, Specificity, and Accuracy of Combined Tasks

	Sensitivity	Specificity	Overall accuracy
Either-test combinations			
TPS *or* PTT	82% (123/151)	82% (82/100)	82% (205/251)
TPS *or* CNRep	86% (133/154)	81% (81/100)	84% (214/254)
TPS *or* RecS	93% (144/155)	78% (78/100)	87% (222/255)
PTT *or* CNRep	92% (140/153)	80% (80/100)	87% (220/253)
PTT *or* RecS	93% (143/154)	78% (78/100)	87% (221/259)
CNRep *or* RecS	96% (152/159)	78% (78/100)	89% (230/259)
Both-test combinations			
TPS *and* PTT	54% (82/151)	97% (97/100)	71% (179/251)
TPS *and* CNRep	55% (85/154)	96% (96/100)	71% (181/254)
TPS *and* RecS	60% (93/155)	97% (97/100)	75% (190/255)
PTT *and* CNRep	61% (93/153)	96% (96/100)	75% (189/253)
PTT *and* RecS	71% (110/154)	96% (96/100)	81% (206/254)
CNRep *and* RecS	73% (116/159)	94% (94/100)	81% (210/259)

Discussion

The present study aimed to explicitly compare and contrast candidate psycholinguistic markers for specific language impairment (SLI). In particular, four marker tasks were examined covering three possible behavioural markers for SLI: sentence repetition, nonword repetition, and linguistic tense marking. The study focused on data from 160 children who were approximately 11 years of age with a documented history of SLI at age 7 years.

Marker Tasks, IQ, and Clinical Levels of Impairment

A useful starting point is the possible relationship of the candidate psycholinguistic markers for SLI with Performance IQ. Bishop et al. (1996) have argued that a useful criterion for a marker is that it should be largely independent of IQ as one is interested in identifying the language deficit in children and not their general learning ability. Interestingly, we found that none of the marker tasks correlated highly with Performance IQ. As mentioned previously, all correlations were statistically significant given the large number of participants in our study. But an examination of the values of the correlations suggests a different interpretation. For example, Bishop et al. (1996) found a nonsignificant correlation of .16 between Raven's Matrices and the CNRep, a very similar figure to our findings of .19 correlation between Performance IQ on the WISC-III and the CNRep. The highest value we obtained was a correlation of .30 for the PTT. Again, we would argue this is not a substantial correlation and previous work by Rice and colleagues (Rice et al., 1998) is in line with our findings. Hence, none of the marker tasks showed a clear advantage in terms of independence from Performance IQ.

A second important starting point is the issue of clinical levels for the identification of SLI. In the present study, we examined three possible clinical cutoff points for SLI. This was done because the determination of SLI, i.e. the discrepancy between language achievement and chronological age expectations, has usually been arbitrarily set (Tomblin, Records, & Zhang, 1996). Thus, Bloom and Lahey (1978) suggest a cutoff point of 2 *SD*s below the mean, a cutoff equivalent to below the 2.5th centile. On the other hand, a number of researchers (Fey, 1986; Lee, 1974; Paul, 1995; Rizzo & Stephens, 1981) have suggested the 10th centile (approximately −1.25 *SD*) as a desirable cutoff point. Furthermore, a centile score below the 16th centile, which is approximately equivalent to 1 *SD* below the mean, has also been suggested as a clinical cutoff point for SLI (Aram, Morris, & Hall, 1992; Records & Tomblin, 1994; Wiig, Secord, & Semel, 1992). In the present study, it was found that the 16th centile cutoff (−1 *SD*) proved to be the most useful cutoff point for correct SLI/non-SLI identification. This was in line with the work of Records and Tomblin (1994) who found that −1 *SD* represented the point where the majority of clinicians make the decision that a child has SLI. Hence, −1 *SD* has been found to be a clinical "gold standard" and the data from this study corroborates these findings.

Short-term Memory, SLI, and Repetition Tasks

Of particular interest are the results of the present study suggesting that both tasks involving short-term memory, i.e., sentence repetition and nonword repetition, are the best candidate psycholinguistic markers for SLI.

First, the present study replicates the findings by Gathercole and Baddeley (1990) and Bishop et al. (1996) of a significant deficit in nonword repetition in children with SLI. In addition, our results further corroborate those findings of Bishop et al. in suggesting that the deficits in nonword repetition are identifiable even in children with a documented history of SLI but whose more overt language difficulties have resolved at the time of the assessment. These consistent findings point to the primacy of the deficits in children with SLI.

It is important, however, to ask the question: What, exactly, are these repetition tasks measuring? As far as the nonword repetition task is concerned, Gathercole and Baddeley (1990) regard this task as a measure of phonological short-term memory with deficits associated with limitations in the capacity of a phonological store and/or atypical rapid decay of items in memory. These authors have argued persuasively that output explanations, e.g. articulatory complexity, are not likely explanations for the disorder based on direct comparisons of children with SLI and nonaffected control children. Another possibility that needs to be considered is possible deficits in speech input, i.e. in the perceptual classification of incoming speech. It may be argued, for example, that deficits in nonword repetition may reflect delayed phonemic awareness. However, Kamhi and Catts (1986) did not find a significant relationship between nonword repetition and phonological awareness measures. Hence, it is unlikely that either output or input explanations play a significant role in nonword repetition deficits in children with SLI.

As far as the sentence repetition task is concerned, our data shows an interesting and significant correlation between the nonword repetition task and the sentence repetition task (recalling sentences). This replicates the findings of Kamhi and Catts (1986) and Bishop et al. (1996). The sentence repetition task is thought to place few demands on phonological analysis and, once again, input and output explanations do not appear to play a key role on this task (much like the nonword repetition task). Thus, we are again forced to consider limitation in capacity in short-term memory and/or atypical rapid decay of items in memory as plausible explanations. Although our data cannot provide a firm answer to the question of the underlying deficits tapped by the sentence repetition task, it supports the notion that impairments in sentence repetition and nonword repetition involve some common mechanisms. We argue that these common mechanisms are likely to involve limitations in short-term memory.

It is also important to discuss the possible overall advantage of sentence repetition over nonword repetition in terms of sensitivity, specificity, and overall accuracy as a psycholinguistic marker for the identification of SLI. It is also worth noting that the sentence repetition task is easier to score "on-line" than the CNRep and so has practical advantages. As discussed previously, it is clear that both tasks involve short-term memory. We would like to argue that the CNRep has a greater involvement of phonological short-term memory (Bishop et al., 1996; Gathercole, 1995; Gathercole & Baddeley, 1990). We would also like to argue that the sentence repetition task has not only short-term memory involvement but also some involvement of prior language knowledge, which may be conceived as residing in long-term memory (Gathercole & Baddeley, 1993). In a sense, nonword repetition tasks may be considered to tap single-word processing skills whereas sentence repetition tasks tap something of the language knowledge base of the child. This is supported by our findings of a significant correlation between the sentence repetition task (RecS) and the linguistic tense tasks (PTT and TPS). Interestingly, the CNRep did not appear to be so highly correlated with the aforementioned linguistic tasks (see Table 2), pointing once again to the different nature of processing it assesses.

It needs to be made clear, nonetheless, that the present study examined potential psycholinguistic markers in a sample of 11-year-old children with a documented history of SLI. It is possible that at this developmental stage, sentence repetition tasks have an overall advantage over nonword repetition tasks in terms of marking SLI. But whether this advantage of sentence repetition over nonword repetition is evident in younger children meeting criteria for SLI remains unanswered and open to further investigation. It is possible that different short-term memory tasks with different biases (one biased more towards phonological short-term memory with the other more biased towards the linguistic knowledge base in long-term memory) may mark language impairments more accurately at different developmental stages across the lifespan.

In addition, we found that the linguistic, more purely knowledge-based tasks involving linguistic tense marking also showed potential for being psycholinguistic markers for SLI. In particular, the past tense task appeared to have reasonable sensitivity, specificity, and accuracy very much in line with previous work by Rice and colleagues (Rice & Wexler, 1996; Rice et al., 1995). Having said this, it was evident that the linguistic tense markers were much better at identifying those children who currently had severe language impairments and were much less successful in identifying those children with a documented history of SLI but who appeared to be resolved at age 11 years. In contrast, the repetition tasks (both sentence repetition and nonword repetition) were able to identify those with mild and resolved difficulties. Gershon and Goldin (1986) point out that genetic markers not only need to be associated with the condition of interest, in this case SLI, but also should be state independent. In other words, the marker should be present when the condition itself is no longer manifest. In this sense, linguistic tense does not appear to fully meet the criteria for a marker for SLI.

In conclusion, the data from the present study suggest that deficits in repetition tasks, i.e., sentence repetition in particular and nonword repetition, are promising psycholinguistic markers for the SLI phenotype. Nonetheless, a final word of caution is necessary. Although the aforementioned tasks are good discriminators between SLI and control groups, it is still unclear what the impact of a repetition deficit is. In terms of nonword repetition, it is known that children with severe reading difficulties are also impaired (Kamhi & Catts, 1986). The fact that nonword repetition deficits appear to be a characteristic of literacy difficulties as well as SLI may point to a common limitation of phonological short-term memory in these children (Snowling, Bishop, & Stothard, 2000). On the other hand, work with children with more global learning disabilities (e.g., Down syndrome; Jarrold et al., 2000) suggests that difficulties with nonword repetition may be more related to any language impairment and that the specific nature of SLI still remains to be understood fully. In the case of sentence repetition (recalling sentences) there is a dearth of research with children having other developmental disorders associated with language impairments. There is no doubt that given the proposed involvement of both processing skills and the knowledge base in sentence repetition tasks that this should be a fruitful area for future research in understanding the specific or otherwise nature of SLI.

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