Specific language impairment as principle conflict: Evidence from negation

Lee Davies*

University College London, Gower Street,
London WC1E 6BT, UK

Received 24 May 2000; revised version 22 March 2001

Abstract

In this paper I will present the results from an experimental study designed to assess a group of SLI children’s ability to judge the grammaticality of a range of negative constructions. In light of this data, two proposals relating to the underlying nature of SLI will be considered. The two proposals differ with respect to whether they see SLI children’s language as reflecting a broader range of grammatical options (cf. Rice and Wexler, 1996; Van der Lely, 1998) or in fact two separate grammars, each of which specify a different range of grammatical options (cf. Davies, 1998).

I will argue that my data clearly support the latter of these two options, suggesting that for the SLI child the appropriate form is sometimes ungrammatical. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: SLI (Specific Language Impairment); Grammatical deficit; Negation; Optional-ity; Movement; Minimalism

* E-mail: l.davies@schole.freeserve.co.uk

0378-2166/02/$ – see front matter © 2002 Elsevier Science B.V. All rights reserved.
PII: S0024-3841(01)00047-X
1. Introduction

In this paper I will present data on negation collected from a group of specifically language impaired children. The data relate to an experimental study designed to assess the children's abilities on a range of negative constructions. I will argue that the findings have direct implications for the underlying nature of SLI.

Two related observations about the nature of SLI are particularly relevant to this discussion. Firstly, SLI children will optionally omit a range of elements, which are obligatory in normal development (ND). Secondly, however, when the SLI child does produce these optional elements they are used correctly (cf. Menyuk, 1964; Leonard, 1972, among others). Therefore, while production of the form exemplified in (1) is observed, forms such as that in (2) are not.

(1) *John close the front door.
(2) *Mary will closed the front door.

These two observations have led people to conclude that SLI reflects production using a more inclusive grammar which, while constraining the child from over-generating problematic elements, will enable them to be omitted. This is achieved, for example, by proposing deficits which relate to the processes that necessitate the generation of these elements, while leaving the constraints on such generations intact (cf. van der Lely, 1998; Rice and Wexler, 1996). It is this view which I intend to argue against.

I will suggest that, rather than reflecting a single more inclusive grammar, SLI is the result of two different grammars, between which the SLI child optionally alternates.

The paper will take the following form: I shall first attempt to illustrate the general nature of SLI as it has been presented in the literature; then I will discuss proposals which assume a broader (or more inclusive) grammar for SLI more fully, focusing particularly upon their predictions for comprehension. Then experimental data on grammaticality judgements of negative constructions will be presented, followed by a discussion of their implications for SLI. Finally, I will attempt to show how this data might be captured in an explanatory account of the disorder based upon ideas formulated in Davies (1998).

2. The nature of SLI

SLI is a developmental disorder which affects language acquisition in children. It is characterised by severe problems in the development of linguistic comprehension and expression despite the absence of any significant non-linguistic (cognitive,
motor developmental, auditory or environmental) deficit, which could account for such impairment (Menyuk, 1964).

2.1. Clinical definition

SLI's clinical definition is based as much on exclusionary as it is on inclusionary criteria (Leonard, 1998). A child must present with a severe language deficit (e.g. Language test scores of -1.25 deviations or lower (Records and Tomblin, 1994)) while displaying no other non-linguistic disability. The term SLI applies only to individuals who show no deficit in a number of non-linguistic domains (including non-verbal IQ, hearing, physical and social interaction, no recent episodes of otitis media with effusion, no neurological dysfunction, no oral structure abnormalities, and no problems with oral motor function (Leonard, 1998)).

Despite the relatively strict criteria on which SLI is defined, it is still an extremely heterogeneous disorder, with many 'SLI children' failing to fit its modal pattern (Aram et al., 1993). This has led a number of researchers to attempt to identify subgroups of the disorder. One of the earliest attempts in this direction is Aram and Nation, 1975. They identified six distinct patterns in a group of children diagnosed with SLI. The patterns varied in both the linguistic domain of greatest difficulty and in relative difficulties between comprehension and production.

Over the past decade, several relatively homogeneous subgroups of SLI children have been identified, all of whom have differing primary deficits. Most notable are the Semantic-pragmatic SLI (Adams and Bishop, 1989), Familial SLI (Gopnik, 1990; Gopnik and Crago, 1991) and Grammatical SLI (cf. van der Lely and Stollwerck, 1996) groups.

Here I'll focus upon the subgroup of grammatical SLI children and will restrict my discussion of the nature of SLI to this group from now on.

The grammatical SLI subgroup (SLI, henceforth) have unaffected non-grammatical linguistic abilities. For example, on tests of pragmatic inference and the use of pragmatic knowledge, their performance is consistent with that of ND individuals (van der Lely and Stollwerck, 1997). This is despite their displaying severe and persistent impairment with respect to a range of grammatical constructions.

2.2. SLI children's grammatical deficit

SLI children's grammatical deficit is extensive and relates to a number of areas. Since it is relatively well documented, I'll limit my discussion here to a brief summary, beginning with morphology.

Morphology is extensively cited as an area of weakness for SLI children. (cf. Bishop, 1994; Clahsen et al., 1997; among others) A wide range of forms are reported to be problematic. For example, plural -s, third-person singular -s, genitive 's, regular past tense -ed, progressive -ing, auxiliary and copular be and auxiliary do forms are all reported to be optionally omitted by the SLI child (Kessler, 1975; Albertini, 1980; Johnston and Kamhi, 1984; Leonard et al., 1992; Rice et al., 1995; among others). See (3) for examples of each type of omission.
As well as morphology, problems with syntactic structure have also been reported. Bishop (1979) studied a number of different aspects of grammatical comprehension with SLI children. She found that they performed particularly badly on the assessment of reversible passives, such as the dog is being chased by the cat. Van der Lely (1996) suggests that this could be the reflection of problems with the assignment of theta-roles. She also reports data on reversible passives, finding that in a picture selection task, when presented with a sentence such as the fish is being eaten, the children optionally choose the adjectival interpretation (selecting the picture the eaten fish) over the correct verbal interpretation (the picture showing the fish being eaten by X).

In addition, van der Lely and Stollwerck (1997) report difficulties in reference assignment to pronouns and anaphors. They found that SLI children accept non-local antecedents for reflexive anaphors and local antecedents for pronouns. This finding has been supported in a recent experiment conducted by Bishop et al. (2000), who also found that a group of 37 twin pairs of SLI children had a significant impairment with respect to the assignment of antecedent reference to these elements.

Finally, severe difficulties are reported with respect to the formation of wh-questions. SLI children are found to have a number of problems in this area of which I will give some of the clearest examples. The first of these is with subject–auxiliary inversion, where the SLI child optionally allows the auxiliary to remain in the declarative position, as in (4a) (Leonard, 1995). Secondly, in wh-questions containing embedded clauses (e.g. what do you think John ate?), SLI children often produce a second wh-word in the embedded clause, as in (4b) (Smith, 1992). Finally, SLI children are observed to insert an extra argument in the gap which is assumed to be the origin of the wh-element in ND production, as in (4c):

(4) a. *What we did do?
   b. *What do you think what John ate?
   c. *What has he got something?

To summarise, SLI children’s (grammatical) deficit comprises a broad range of elements. Although the picture presented is certainly an incomplete one, the deficit in SLI relates to an extensive range of morphological processes, as well as processes of syntactic structure, including thematic role assignment, anaphoric and pronominal reference assignment, and wh-question formation.
2.3. General features of SLI

There are two important aspects of SLI which have not yet been fully discussed. They relate to the two general observations to which I referred in the introduction. Although accounts of SLI are based upon different characterisations, there are two generalisations which hold for almost all of them:

(5) SLI children's production (and comprehension) reflects a true optionality.
(6) Errors are restricted to omissions, commissions are not seen i.e. when an operation is seen it is appropriate.²

If we deal with (5) first, SLI children's production of problematic forms appears to reflect an optionality not found in ND mature production. The deficit described in section 2.2 relates only to the case where these operations are optionally omitted, not to the case where they are invariably absent. This, if true, is significant from a theoretical point of view since it suggests that two forms must be optimal for the child (in the sense of Chomsky, 1995). It is not obviously the case, however, that the production of two forms of a construction reflects optionality. It has been suggested that, although the forms are optionally used, only the case where the form is omitted truly reflects the SLI grammar, while the appearance of the correct form is the product of rote learning or some other compensatory strategy (cf. Gopnik, 1994; Clahsen, 1991). Evidence against this view comes in two forms. The first regards productivity: SLI children overregularise morphological forms, just as ND children do. The fact that forms such as sitted and sheeps are observed suggests that processes inserting the past -ed and plural -s are operative in the child's grammar (cf. Leonard, 1998 for discussion). The second form of evidence relates to the observation in 6 and the example in (2), i.e. the use of a form in inappropriate contexts is not observed, thus suggesting the presence of grammatical constraints.³

The observation in (6) that when a form is produced it is used correctly, is made by a number of people (Menyuk, 1964; Leonard et al., 1992; Rice et al., 1995; among others). The relevant contrast is exemplified in (1) and (2). The implication of this aspect of SLI is that, while the child is unaware of the obligatoriness of these elements, the constraints on when they may be used are still present.

I will now move on to a brief discussion of a number of proposals which attempt to model the SLI child’s grammar, starting with those accounts which propose that the deficit relates to a more inclusive grammar.

² At this point it is important to distinguish the omission of an element from the omission of a process. Although in the simplest cases these two are almost equivalent, here the omission of an element is taken to be the result of the omission of the process move. In the case of wh-movement the process of operator movement my be omitted independently from the omission of any element.
³ The over-regularisation exemplified by sitted and sheeps might seem to contradict this claim. However, here I refer only to the use of these forms in inappropriate contexts.
3. Two approaches

3.1. SLI as production with a broader grammar

Two of the most articulated accounts of SLI are van der Lely’s representational deficit for dependent relations (RDDR, cf. van der Lely, 1998) and Rice and Wexler’s extended optional infinitive (EOI, cf. Rice and Wexler, 1996). Despite differing from each other in fundamental ways, both these accounts have assumed that SLI children have a more inclusive grammar than the ND mature state. In this section I’ll illustrate this point and consider its empirical implications.

Van der Lely’s RDDR assumes that the syntactic operation Move is the locus of SLI children’s difficulty. She suggests that part of the linguistic principle, Last Resort (Chomsky, 1995), which she argues is responsible for making movement obligatory in the ND grammar, is absent in SLI. Further, van der Lely accounts for the observation that inappropriate movement is not observed by suggesting that the principles which constrain movement (also related to Last Resort) are preserved. The result is that what is obligatory movement for the ND becomes a ‘free choice’ for the SLI child. Under this view, therefore, van der Lely assumes a broader grammar for SLI; all aspects of normal production are permitted, while a range of additional options are available to the child. Van der Lely makes this point:

“A failure in the system of movement/feature checking will lead to a broader (less constrained) grammar in children with SLI than in adults. Therefore, derivations that are possible in adult grammar, as well as the ‘base’ derivations prior to movement and feature checking will be possible in the SLI grammar.” (Van der Lely, 1998: 81)

Rice and Wexler’s EOI account (cf. Rice et al., 1995) assumes that SLI is an extended version of a developmental stage observed in ND (the optional infinitive stage (OІ); Wexler, 1994). During this stage, the child may optionally produce the infinitive in contexts where the finite form is obligatorily required. Rice and Wexler argue that, in spite of the inconsistency of (E)OI children’s production, they know the properties of finiteness4 and therefore will not over-generate problematic forms. Although Rice and Wexler consider a number of different accounts of SLI, I’ll concentrate here on the proposal formulated in Wexler (1996). It is proposed that during the (E)OI stage the child will accept too wide a set of antecedents for non-finite tense. Following Enc (1987), Wexler assumes that, in ND mature grammars, non-finite forms are excluded from emerging in the matrix clause because they are dependent on the presence of a higher finite form to fix the reference of their TENSE projections. However, Wexler argues that the (E)OI child treats the non-finite form as if it can be assigned by context (as is the finite form) and, as such, the child has an additional range of options available to him/her.

4 Rice and Wexler (1996) point to evidence from French-speaking children in the OІ stage. They note that when marking tense (finiteness) on a verb with a negative particle, the children will correctly position the particle after the verb: Elle ne parle pas, but when producing the infinitive form they will place the particle pre-verbally, the correct position in infinitive constructions like Elle ne peut pas parler.
Both of these accounts propose that SLI reflects a deficit which permits a range of additional constructions to coexist with those permitted in ND mature grammars and, as such, propose a broader, more inclusive grammar for SLI. They share a number of relevant features. First they assume that the SLI child’s grammar permits the full range of options available to ND linguistically mature individuals. Second, they assume a deficit which leads to a less restrictive grammar and, as such, permits a range of additional constructions to co-exist with the original set of constructions. Third, they exclude the possibility of over-production (by commission). At this point I will move on to discuss an alternative to this type of account, the dual grammar proposal.

3.2. Dual grammar proposal

The account I’ll propose as an alternative to the Broader Grammar Proposal (BGP) is based upon the one formulated in Davies (1998). The idea at the core of this proposal was that if a grammar contained two principles which were in conflict, then one of these principles must be rejected while the other stands. In this particular instance, the two principles governed the application of movement operations, one forcing movement and the other prohibiting it. As a result of this conflict it was suggested that movement operations would be subject to optionality.

Before I proceed with a discussion of the precise nature of the PCA, there is a crucial assumption which needs to be made explicit. Although I adopt the Minimalist framework of Chomsky (1995), I reject the strict lexicalist approach which he assumes. I depart from Chomsky in that I assume that, while a lexical item enters the numeration with its full complement of formal features, they need to be checked before they can contribute to the interpretation of an utterance. The reasoning behind this assertion relates to the nature of the deficit which the PCA presupposes. Obviously, if I am to suggest that certain elements are subject to omission because of the absence of a syntactic operation or a particular piece of syntactic structure, then I must also assume that the appearance of that element in normal production is dependent upon that operation or structure.

It is my proposal that the nature of SLI children’s deficit relates to the principle of Procrastinate (Chomsky, 1995). In Chomsky’s (1995) grammar, Procrastinate marks the ‘cost’ distinction between overt (prior to spell-out) and covert (post spell-out) movement. It achieves this by specifying that movement, which is taken to be a costly process, should be delayed as long as is possible without causing the derivation to crash. This has the effect of creating two movement processes, movement before spell-out, which is forced by ‘strong features’, and movement after spell-out, which is forced by ‘strong features’, and movement after spell-out,
which is forced by the requirement of Full Interpretation that all uninterpretable features be checked and deleted before the Logical Form interface. In SLI, however, I suggest that this principle is strengthened so that it carries the instruction that movement should not take place. In a sense, Procrastinate in SLI could be seen as less sophisticated, with a delay function but not the proviso that this be rejected if it cause the derivation to crash. As a result, movement would not be predicted to take place and we would expect to find production affected accordingly. This form of production is observed for SLI children. However, they are also found to produce the alternative ND forms, which would not be predicted.

The explanation for this alternation requires an interaction between the strengthened principle of Procrastinate and the principle of Full Interpretation (FI). FI forces a range of movement processes to take place in order to eliminate all uninterpretable features from a derivation before the syntax–semantics interface. The ‘must move’ role of FI overrides Procrastinate’s ‘delay’ function in the ND mature grammar to ensure convergence. However, in the SLI grammar, FI and Procrastinate conflict, one forcing movement and the other prohibiting it. As such they cannot both be maintained. The SLI child is therefore forced to reject one of the principles in favour of the other. This choice is taken to be completely optional, and is made each time the two principles conflict, the result being two different grammars, both of which select a different optimal derivation. On this basis, the child will optionally choose between the ND derivation and the divergent derivation of an utterance.

A point which should be emphasised is that, while the PCA and the RDDR account share a number of features in common, they are distinct on a number of levels. Some of these distinctions will be made explicit in the next section when we consider the differences in their predictions for grammaticality judgements. However, in addition, there is a most important distinction between the two accounts. The PCA, unlike the RDDR, does not require optional movement, which is prohibited in principle by the Minimalist framework. While movement may appear to apply optionally, this is a side-effect of the child’s alternation between two grammars, one which requires movement and the other which prohibits it. In neither grammar is the movement operation itself optional.

---

6 If we take more recent developments in the minimalist framework into account, then the validity of Procrastinate may be called into question. Chomsky (1998), for example, argues that only a single stage of the movement process need be proposed. Obviously in this case there would be no need for a principle which distinguishes between the stages of movement. However, for our purposes the important issue is whether the principle is valid in the 1995 framework, which I believe it is. At the very least, Procrastinate marks the general tendency to ‘delay’ unnecessary cost in the derivation of a sentence. If movement is not entirely necessary in the overt syntax, with necessity being specified on the basis of feature strength, then it will be delayed until the covert syntax where it becomes necessary by Full Interpretation. If, in the future, the principles which the PCA utilises are no longer available, there would most likely be others through which the core concepts of the account could still be expressed.
4. Predictions

Now I'll proceed to consider the empirical predictions of the two proposals outlined above, beginning with the BGP.

4.1. Predictions of the broader grammar proposal

The BGP makes a number of predictions for the nature of SLI children's language. With respect to production, the BGP predicts that SLI children will optionally produce both the grammatical (ND mature) and ungrammatical (omission) forms. This is because, under the BGP, the SLI grammar has two admissible derivations while the ND mature grammar has only one. For comprehension (grammaticality judgement) the prediction of the BGP is that SLI children will judge both the grammatical and ungrammatical (omission) forms as acceptable. This is because the grammar will permit both forms to co-exist, and therefore neither is predicted to be ruled out. Rice et al. (1999) make this point:

"Prediction 1: Children in an OI/EOI grammar will accept finiteness-marked items as grammatical. They will judge 'he is running' and 'he looks big' as grammatical. Prediction 2: Children in the OI/EOI grammar will also accept OI items as grammatical (i.e., 'he running away' and 'he look happy' will be judged as acceptable)." (Rice et al., 1999: 948)

Further, it should be noted that the BGP does not predict the optionality observed in production to be mirrored in SLI children's comprehension. This is because in a more inclusive grammar, which allows more than one optimal derivation to exist, both forms are admissible and are predicted to be accepted by the child.

In summary, the BGP makes the following predictions which concern us here. First, that SLI children will optionally produce both the grammatical and the omission forms, and second, that when judging the grammaticality of these forms, the SLI child will always accept these forms as grammatical.

4.2. Predictions of the PCA

Now let's examine the predictions of the PCA. First, as with the BGP, we would expect the SLI child to optionally produce both the grammatical form and the ungrammatical omission form, reflecting the optional choice between the two grammars which specify these as optimal. In addition, we would not expect the inappropriate overgeneration of these forms since the constraints on movement (Last Resort, the Minimal Link Condition, etc.) are still in place. Third, in contrast to the BGP, we would expect the ungrammatical (omission) forms to be optionally judged as grammatical, since depending upon the outcome of the principle conflict the ungrammatical form may or may not represent the optimal derivation. Fourth, this optionality is also expected in the judgement of the grammatical forms. This is because in the cases where the omission form is optimal, that is, when FI is rejected in favour of Procrastinate, the grammatical form is rejected as non-optimal, since it contains superfluous movement. Thus the PCA differs again in its predictions from the BGP.
since it predicts that the two forms will optionally supplant each other, rather than co-exist.

In the next section I will present data from a study which was designed to test the predictions of the two proposals outlined above. I will argue that the results from this study clearly suggest that SLI reflects the interaction of two separate grammars rather than a single, more inclusive grammar.

5. Experimental design

In this experiment I examine SLI children's grammaticality judgements on a range of negative constructions. My reason for focussing on grammaticality judgements is that, in this domain, the proposals I hope to evaluate make clear and diverging predictions. I have chosen to use negative constructions for a number of reasons. First, negation provides a relatively new domain of investigation for SLI research. Second, because the verb in English remains in situ in most overt contexts, negation provides a valuable diagnostic for the absence of verb movement. It is standardly assumed that the negative head blocks covert raising of the matrix verb (or its formal features) and thus requires an auxiliary form to raise in the overt syntax, as exemplified in the clausal representation, (7):

\[(7) \text{\text{Agrs}} P \text{Bob Agrs} [\text{TP had} t \text{NegP not} \text{Agrro} \text{VP t} \text{VP met Bill}]]\]

In addition, when we consider negative object questions, depending on whether the negative particle is in its contracted or non-contracted form, it will undergo subject auxiliary inversion with the host verb. Consider the contrasts in (8):

(8) a. Who didn't John hit?
    b. Who did John not hit?
    c. *Who did not John hit?

I will examine three main effects in addition to the 'between-subjects' factor of Group.7 The first is Grammaticality. This allows me to compare the children's performance on grammatical and ungrammatical conditions. As discussed, it is a key prediction of the PCA that the SLI child will have comparable difficulty in the judgement of both grammatical and ungrammatical forms. The second main effect is Contraction. The experimental conditions differ on the basis of whether the negative particle is in its contracted or non-contracted form. As discussed, this has implications on the position of the negative particle in some interrogatives while critically not in others. Thirdly, the force of a sentence will provide a main effect. Experimental conditions differ on the basis of whether they have active or interrogative

---

7 Group is a between-subjects factor in that it measures the variation between the tests groups, irrespective of any effects which may be related to the variations between the test items themselves.
force, with interrogative force further subdivided on the basis of whether the condition is a subject or object question. The relevant implication of force relates to the position of the auxiliary verb and interacts with the effect of contraction with respect to the position of the negative particle.

6. Method

6.1. Subjects

Five subject groups participated in the experiment: a group of SLI subjects, three control groups of younger children matched for different language abilities, and a control group matched for chronological age and non-linguistic cognitive abilities.

6.1.1. Specifically language impaired subjects

Ten subjects aged between 12:11 and 19:2 (mean 15:7) participated in the study. All the subjects had been classified as ‘Grammatical SLI’ as detailed in van der Lely (1996) and van der Lely and Stollwerck (1996), using standardised tests and non-standardised procedures designed to assess the group’s grammatical abilities (e.g. tense and agreement marking, thematic role and reference assignment). All ten of the SLI children examined in this experiment have previously participated in studies conducted by van der Lely and her colleagues. For many of the children, these studies have continued over a number of years. As such, their therapeutic history has been well documented.

With respect to the present study, the children have received a certain amount of tuition on question formation and the position of the wh-element, with varying degrees of success. They have also received tuition on the use of auxiliary verbs. However their deficit in this domain has proven remarkably persistent. They have not, however, received specific tuition with respect to the use of the negative particle. The SLI children had a mean non-verbal IQ of 108.3 (15.4 SD), within normal limits, as measured by the Block Design sub-test from the British Ability Scales (BD-BAS) (Elliot et al., 1978). They had a mean equivalent age of 7:4 (1.0 SD) on the Grammatical Closure sub-test from the Illinois Test of Psycholinguistic Abilities (GC-ITPA) (Kirk et al., 1968), which measures expressive morphology. On the Test of Reception Of Grammar (TROG) (Bishop, 1983), measuring understanding of sentences, their mean equivalent age was 7:8 (1.5 SD), and on the British Picture Vocabulary Scale (BPVS) (Dunn et al., 1982), a test of single word comprehension, they performed at a mean equivalent age of 8:4 (2.0SD). These tests were then used to match the SLI subjects with a number of control groups.

6.1.2. Language ability control groups

Three groups of 12 normally developing children provided language ability (LA) control groups. A range of children were selected from a British state school. Children who fell within the normal range of abilities, as assessed by three standardised language tests, were included in the study. The youngest (LA1) control group (mean
age 6:0, range 5:7–6:5) did not differ from the SLI children on the two tests of morpho-grammatical abilities (GC-ITPA, TROG). However, the LA1 controls scored significantly lower than the SLI children on the test of vocabulary development, BPVS \( t(11.52) = 3.03, p < 0.05 \).

The LA2 control group (mean age 7:0, range 6:6–7:6) did not differ from the SLI children on TROG and the BPVS. However, the LA2 controls scored significantly higher than the SLI children on the test of morphology, GC-ITPA \( t(20) = 3.51, p < 0.005 \).

The older LA3 control group (mean age 8:1, range 7:7–8:6) did not differ from the SLI children on the test of vocabulary development (BPVS). However, the LA3 controls scored significantly higher than the SLI children on the two tests of morpho-grammatical abilities; the GC-ITPA \( t(20) = 4.16, p < 0.0001 \) and the TROG \( t(20) = 3.56, p < 0.005 \). Table 1 provides a summary of the LA control subject details.

### 6.1.3. Chronological age control group

Ten normally developing subjects aged between 13:5 and 19:8 (mean 16:1) made up the chronological age (CA) control group. These subjects were matched to the SLI group for their age and non-verbal IQ (mean 106.7, 6.2 SD), as measured by the Block Design sub-test of the British Ability Scales (BD-BAS) (Elliot et al., 1978). The CA control group were also assessed using a standardised language test (BPVS) in order to compare their normal performance with that of the SLI group. The CA group scored significantly higher than the SLI subjects: BPVS \( t(18) = 7.14, p < 0.0001 \).

Table 1 provides a summary of the subjects' scores from the standardised tests.

### 6.2. Design

The task required the children to judge whether a range of negative constructions were grammatical. The constructions varied in grammaticality, whether the negative element was contracted, and the force of the sentence (declarative or interrogative, with interrogative force further divided into subject and object questions, see Table 2). I compared the effects of these variables in a 2 (Grammaticality: Grammatical, Ungrammatical) \( \times 2 \) (Contraction: Contracted, Non-contracted) \( \times 3 \) (Force: Declarative, Subject Question, Object Question) by 2 (Group: SLI, CA) or 4 (Group: SLI, LA1, LA2, LA3) design. For each type of construction 6 examples were presented, giving a total of 72 (excluding semantic controls) experimental items compared by 2 or 4 groups, examples of which are given in Table 2.

### 6.3. Procedure

The subjects were tested either at home or in a quiet room at school by an experimenter who was familiar to them. Three card models of aliens were introduced as visitors from another planet. The children were told that the aliens wanted to learn...
Table 1
Subject details: Chronological ages and raw scores on the standardised tests

<table>
<thead>
<tr>
<th>Measure</th>
<th>SLI (N=10)</th>
<th>LA1 (N=12)</th>
<th>LA2 (N=12)</th>
<th>LA3 (N=12)</th>
<th>CA (N=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>16:1 (2:3)</td>
<td>6:0 (0:4)</td>
<td>7:0 (0:4)</td>
<td>8:1 (0:4)</td>
<td>16:1 (2:3)</td>
</tr>
<tr>
<td>GC-JTPA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>22.2 (3.49)</td>
<td>22.58 (4.50)</td>
<td>27.0 (2.61)</td>
<td>28.08 (2.84)</td>
<td>n/a</td>
</tr>
<tr>
<td>AE</td>
<td>7.4 (0:10)</td>
<td>7.7 (1:4)</td>
<td>9.0 (1:0)</td>
<td>9.3 (0:11)</td>
<td>n/a</td>
</tr>
<tr>
<td>z-score</td>
<td>n/a</td>
<td>1.58 (1.16)</td>
<td>1.76 (0.56)</td>
<td>0.94 (0.83)</td>
<td>n/a</td>
</tr>
<tr>
<td>TROG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>14.5 (1.75)</td>
<td>14.67 (2.17)</td>
<td>15.83 (1.82)</td>
<td>17.50 (1.98)</td>
<td>n/a</td>
</tr>
<tr>
<td>AE</td>
<td>7.8 (1:7)</td>
<td>7.9 (1:9)</td>
<td>8.10 (1:7)</td>
<td>10.0 (1:6)</td>
<td>n/a</td>
</tr>
<tr>
<td>z-score</td>
<td>-1.65 (0.67)</td>
<td>0.64 (0.92)</td>
<td>0.54 (0.75)</td>
<td>0.98 (1:20)</td>
<td>n/a</td>
</tr>
<tr>
<td>BPVS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>76.9 (14.67)</td>
<td>61.08 (6.08)</td>
<td>76.33 (14.53)</td>
<td>84.67 (13.72)</td>
<td>124.9 (12.12)</td>
</tr>
<tr>
<td>Standard score</td>
<td>71.3 (8.49)</td>
<td>106.42 (6.6)</td>
<td>113.17 (14.24)</td>
<td>111.08 (14.65)</td>
<td>96.5 (2.77)</td>
</tr>
<tr>
<td>AE</td>
<td>8.4 (2.9)</td>
<td>6.7 (0.8)</td>
<td>8.4 (1:9)</td>
<td>9.2 (1:7)</td>
<td>15:6 (2:7)</td>
</tr>
<tr>
<td>z-score</td>
<td>-1.91 (0.57)</td>
<td>0.43 (0.44)</td>
<td>0.88 (0.95)</td>
<td>0.74 (0.98)</td>
<td>-0.23 (0.18)</td>
</tr>
<tr>
<td>BD-BAS (IQ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>108.33 (15.40)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>106.7 (6.2)</td>
</tr>
</tbody>
</table>

Table 2
Test stimuli

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Grammaticality</th>
<th>Contraction</th>
<th>Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeff didn’t burst the balloon</td>
<td>Grammatical</td>
<td>Contracted</td>
<td>Declarative</td>
</tr>
<tr>
<td>Jeff don’t burst the balloon</td>
<td>Ungrammatical</td>
<td>Contracted</td>
<td>Declarative</td>
</tr>
<tr>
<td>Jeff did not burst the balloon.</td>
<td>Grammatical</td>
<td>Non-contracted</td>
<td>Declarative</td>
</tr>
<tr>
<td>Jeff not burst the balloon.</td>
<td>Ungrammatical</td>
<td>Non-contracted</td>
<td>Declarative</td>
</tr>
<tr>
<td>What didn’t burst the balloon?</td>
<td>Grammatical</td>
<td>Contracted</td>
<td>Sub question</td>
</tr>
<tr>
<td>What don’t burst the balloon?</td>
<td>Ungrammatical</td>
<td>Contracted</td>
<td>Sub question</td>
</tr>
<tr>
<td>What did not burst the balloon?</td>
<td>Grammatical</td>
<td>Non-contracted</td>
<td>Sub question</td>
</tr>
<tr>
<td>What didn’t Jeff burst?</td>
<td>Grammatical</td>
<td>Contracted</td>
<td>Ob question</td>
</tr>
<tr>
<td>What did Jeff didn’t burst?</td>
<td>Ungrammatical</td>
<td>Contracted</td>
<td>Ob question</td>
</tr>
<tr>
<td>What did Jeff not burst?</td>
<td>Grammatical</td>
<td>Non-contracted</td>
<td>Ob question</td>
</tr>
<tr>
<td>What did not Jeff burst?</td>
<td>Ungrammatical</td>
<td>Non-contracted</td>
<td>Ob question</td>
</tr>
<tr>
<td>The chair didn’t shut the balloon</td>
<td>Semantic control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
how to talk to earthlings and needed their help. They were instructed to listen carefully as the aliens tried to talk, and after each attempt to make a judgement as to whether the sentence was correct. If they thought the sentence was produced correctly the child was asked to give the alien a star, if not, a spider. At the end the child would count the stars to see which alien had won.

The examiner pretended to speak for the aliens, limiting prosodic cues by maintaining a neutral stress. The 72 experimental items were supplemented by a further 6 ‘semantic control’ items, grammatically correct items that were semantically odd (see Table 2), and were preceded by 4 practice items, to which corrections were given as necessary. The instructions used at the beginning of each session are given in (9).

(9) These are three aliens from another planet. They all want to learn how to talk to earthlings and want you to help them. They will take it in turns to say something. I want you to listen carefully and decide if they say it correctly. If you think it sounds right, then you give the alien a star. If you think it sounds wrong, then you give the alien a spider. The alien who has the most stars at the end will be the winner! First we are going to have a practice, and I will help you.

A test-scoring booklet was used for each child with the basic presentation format for each item in a set random order.

7. Results

The overall mean correct responses across the groups was 82.0% (3.49 SD, range 60.83–97.22%). The percentages of correct responses for each group across each sub-condition are given in Table 3.

I will deal with the comparison between the SLI group and the CA controls separately and then move on to compare the SLI group with the LA controls.

7.1. SLI/CA analysis

The group performances were investigated using a 2 (Group: SLI, CA) × 2 (Grammaticality: Grammatical, Ungrammatical) × 2 (Contraction: Contracted, Non-contracted) × 3 (Force: Declarative, Subject Question, Object Question) ANOVA by subject. A significant main effect of group was found, $F(1,18) = 110.01, p < 0.0001$. This reflected the fact that the CA controls had significantly more correct responses than the SLI subjects. A significant main effect of Force was also found $F(2,36) = 9.58, p < 0.0001$, which reflected significantly more correct responses to declarative sentences than to object questions. There was no significant main effect of either Grammaticality or Contraction (Grammaticality: $F(1,18) = 0.89, p = 0.359$; Contraction: $F(1,18) = 1.38, p = 0.256$). The Group × Force interaction was significant $F(2,36) = 8.72, p < 0.01$, indicating that Force was differentially affecting the SLI subjects and CA controls’ performance. Further analysis revealed that the SLI sub-
Table 3
Mean percentage correct and mean raw scores for the SLI and control groups

<table>
<thead>
<tr>
<th>Condition</th>
<th>SLI (N=10)</th>
<th>LA1 (N=12)</th>
<th>LA2 (N=12)</th>
<th>LA3 (N=12)</th>
<th>CA (N=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean percentage correct for the SLI and control groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total % correct</td>
<td>60.8</td>
<td>82.4</td>
<td>84.6</td>
<td>85.0</td>
<td>97.2</td>
</tr>
<tr>
<td>Grammatical % correct</td>
<td>66.1</td>
<td>84.3</td>
<td>79.5</td>
<td>82.2</td>
<td>97.2</td>
</tr>
<tr>
<td>Ungrammatical % correct</td>
<td>55.6</td>
<td>80.6</td>
<td>89.6</td>
<td>87.7</td>
<td>97.2</td>
</tr>
<tr>
<td><strong>Mean raw scores for the SLI and control groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total correct n=72 (SD)</td>
<td>43.8 (7.4)</td>
<td>59.3 (6.9)</td>
<td>60.9 (3.1)</td>
<td>61.2 (2.0)</td>
<td>70.0 (1.4)</td>
</tr>
<tr>
<td>Grammatical correct n=36</td>
<td>23.8 (6.3)</td>
<td>30.3 (4.0)</td>
<td>28.6 (2.5)</td>
<td>29.6 (1.4)</td>
<td>35.0 (1.0)</td>
</tr>
<tr>
<td>Declarative n=12</td>
<td>10.6 (0.9)</td>
<td>11.5 (0.8)</td>
<td>8.9 (1.2)</td>
<td>9.2 (1.2)</td>
<td>11.7 (0.6)</td>
</tr>
<tr>
<td>Sub question n=12</td>
<td>6.3 (3.3)</td>
<td>9.5 (1.3)</td>
<td>9.5 (1.6)</td>
<td>10.0 (0.7)</td>
<td>11.7 (0.6)</td>
</tr>
<tr>
<td>Ob question n=12</td>
<td>6.9 (3.0)</td>
<td>9.3 (2.7)</td>
<td>10.2 (1.3)</td>
<td>10.4 (0.8)</td>
<td>11.6 (0.8)</td>
</tr>
<tr>
<td>Non-contracted n=18</td>
<td>11.1 (3.1)</td>
<td>14.5 (2.7)</td>
<td>14.2 (1.7)</td>
<td>14.4 (0.8)</td>
<td>17.6 (0.5)</td>
</tr>
<tr>
<td>Contracted n=18</td>
<td>12.7 (3.5)</td>
<td>15.8 (2.0)</td>
<td>14.5 (1.3)</td>
<td>15.2 (1.0)</td>
<td>17.4 (0.7)</td>
</tr>
<tr>
<td>Ungrammatical correct n=36</td>
<td>20.0 (7.7)</td>
<td>29.0 (5.8)</td>
<td>32.3 (1.7)</td>
<td>31.6 (1.3)</td>
<td>35.0 (1.0)</td>
</tr>
<tr>
<td>Declarative n=12</td>
<td>6.1 (3.0)</td>
<td>8.7 (2.9)</td>
<td>10.5 (0.7)</td>
<td>10.5 (0.6)</td>
<td>11.8 (0.4)</td>
</tr>
<tr>
<td>Sub question n=12</td>
<td>8.3 (2.8)</td>
<td>10.9 (1.1)</td>
<td>10.6 (0.9)</td>
<td>9.8 (1.0)</td>
<td>11.4 (0.7)</td>
</tr>
<tr>
<td>Ob question n=12</td>
<td>5.6 (3.9)</td>
<td>9.4 (2.3)</td>
<td>11.2 (1.0)</td>
<td>11.3 (0.7)</td>
<td>11.8 (0.4)</td>
</tr>
<tr>
<td>Non-contracted n=18</td>
<td>10.1 (4.8)</td>
<td>13.0 (4.0)</td>
<td>16.6 (0.6)</td>
<td>15.6 (0.8)</td>
<td>17.5 (0.7)</td>
</tr>
<tr>
<td>Contracted n=18</td>
<td>9.9 (3.3)</td>
<td>16.0 (2.4)</td>
<td>15.6 (1.6)</td>
<td>16.0 (0.7)</td>
<td>17.5 (0.7)</td>
</tr>
</tbody>
</table>

Subjects performed significantly better on judging both declarative sentences and subject questions than they did on object questions (declarative vs. object: t(9) = 4.26, p < 0.01; subject vs. object: t(9) = 2.51, p < 0.05), while CA controls showed no effect of Force. Similar differentiation was found with regards to the interaction of Group × Grammaticality × Force F(2,36) = 6.27, p < 0.001, and Group × Contraction × Force F(2,36) = 4.94, p < 0.05, where these were found to be significant factors in the performance of the SLI group, but not the CA group.

The interaction of Grammaticality and Force was found to be significant F(2,36) = 4.90, p < 0.05. Further investigation revealed that this was a reflection of an overall significantly better performance on grammatical declarative sentences in comparison to grammatical subject questions t(19) = 2.76, p < 0.05, grammatical object questions t(19) = 2.79, p < 0.05, and the ungrammatical declaratives t(19) = 2.85, p < 0.05. The interaction of Contraction and Force was also significant F(2,36) = 4.76, p < 0.05. This reflected a significantly better performance overall on non-contracted declaratives than on either non-contracted subject questions t(19) = 3.58, p < 0.01, or non-contracted object questions t(19) = 3.07, p < 0.01, as well as a significantly better performance on the contracted declaratives than on contracted object questions t(19) = 2.33, p < 0.05 and on contracted subject questions than on non-contracted subject questions t(19) = 2.45, p < 0.05.

Finally, the interaction of Group and Grammaticality was not significant F(1,18) = 0.890, p = 0.359.
7.2. SLI/LA analysis

These were investigated using a 4 (Group: SLI, LA1, LA2, LA3) × 2 (Grammaticality: Grammatical, Ungrammatical) × 2 (Contraction: Contracted, Non-contracted) × 3 (Force: Declarative, Subject Question, Object Question) ANOVA by subject. Significant main effects for Group, Contraction and Force were found (Group, $F(3,41) = 31.25, p < 0.0001$; Contraction, $F(1,41) = 36, p < 0.0001$; Force $F(2,82) = 20.68, p < 0.0001$), but the main effect for grammaticality was not significant $F(1,41) = 0.01, p = 0.936$.

To further investigate the main effect of Group, a planned comparison was carried out. The analysis revealed that the SLI children gave significantly fewer correct judgements than the LA control groups ($F(1,41) = 39.29, p < 0.0001$, SLI vs. LA1; $F(1,41) = 67.89, p < 0.0001$, SLI vs. LA2; $F(1,41) = 75.50, p < 0.0001$, SLI vs. LA3).\(^8\) The main effects of Contraction and Force were found to reflect a higher number of correct responses for contracted vs. non-contracted verbs and subject vs. object questions respectively.

The Group × Force interaction was found to be significant $F(6,82) = 3.67, p < 0.005$. Further analysis revealed that SLI subjects gave significantly fewer correct judgements for all Force types (declarative, Subject Questions, Object Questions) than the LA control groups (declarative sentences: $F(1,41) = 42.43, p < 0.0001$; subject questions: $F(1,41) = 62.01, p < 0.0001$; object questions: $F(1,41) = 73.74, p < 0.0001$). Additionally, it was found that the SLI group produced significantly more correct responses for the declarative sentences than for object questions ($t(9) = 5.43, p < 0.0001$), and both the SLI and LA1 groups produced significantly more correct judgements for the subject questions than for the object questions ($t(9) = 2.51, p < 0.05$, SLI; $t(11) = 2.50, p < 0.05$, LA1). Finally, it was found that while the SLI subjects produced significantly more correct responses for the declarative sentences than for subject questions ($t(9) = 2.56, p < 0.05$), the LA1 and LA2 groups showed the opposite, a significantly better performance on subject questions than on declarative sentences ($t(11) = 4.63, p < 0.005$, LA1; $t(10) = 4.10, p < 0.005$, LA2). The LA3 group showed no effect of Force.

The interaction between Grammaticality and Force was significant $F(2,82) = 26.34, p < 0.0001$. It was found that significantly more correct responses were given for grammatical declarative sentences than for both grammatical subject questions ($t(11) = 5.08, p < 0.0001$) and grammatical object questions ($t(11) = 2.93, p < 0.05$). Significantly more correct responses were also given for ungrammatical subject questions than for grammatical subject questions ($t(11) = 3.23, p < 0.01$).

The interaction between Contraction and Force was significant $F(2,82) = 8.82, p < 0.0001$. It was found that more correct responses were given for both contracted and non-contracted declarative sentences, than for contracted and non-contracted subject questions (contracted declarative vs. contracted subject: $t(11) = 4.10, p < 0.0001$).

\(^8\) The analysis also revealed that the LA1 group produced significantly fewer correct answers than either the LA2 or LA3 groups $F(1,41) = 7.51, p < 0.01$
In addition, significantly more contracted subject and object questions were correctly produced than non-contracted subject and object questions (contracted vs. non-contracted subject: $t(11) = 5.74, p < 0.0001$; contracted vs. non-contracted object: $t(11) = 3.08, p < 0.05$).

Finally, the interaction between Group and Grammaticality was not found to be significant $F(3,41) = 1.65, p = 0.192$.

### 7.3. Summary and interpretation of findings

Both the SLI/CA and the SLI/LA analyses showed a significant effect of group. The SLI subjects performed significantly worse overall than their CA and LA controls.

Force was found to have a significant effect in both analyses as well as the Force $\times$ Group interaction. Further investigation revealed that Force was a significant factor in the performance of the SLI group and the two youngest control groups, LA1 and LA2, but not in the performance of the two older groups, LA3 and CA. The main effect of Contraction was found to be significant in the SLI/LA analysis, but not in the SLI/CA analysis. Finally, the main effect of Grammaticality was not found to be significant in either analysis, and nor was the interaction of Grammaticality with Group.

The findings from this experiment appear to reflect the fact that SLI children have a general difficulty with the judgement of ungrammaticality in constructions where movement has failed to take place. In addition, the finding that Grammaticality was not a significant factor in their performance suggests that the children also had difficulty deciding whether the sentences which represented the appropriate movement applications were grammatical. In the next section I will consider the implications of these results for the BGP and the PCA.

### 8. Discussion

An examination of the group means (Table 3) appears to support the BGP’s prediction that SLI children will accept a wider range of constructions as grammatical. The overall mean for the CA group (97.2%) is close to ceiling, while the SLI group are performing just over 60% (60.8%). This would be a direct prediction of the BGP, given that it would lead us to expect correct judgements from the SLI child only on the grammatical sentences (accounting for 50%). The finding that the main effect of group was a significant factor across both the SLI/CA and SLI/LA analyses is therefore also consistent with a BGP, since it is predicted that the SLI subjects will incorrectly judge the ungrammatical sentences as grammatical while the controls will not. 

The findings of significant main effects of Force and Contraction are not relevant to the predictions of the BG account but rather to the specifics of individual accounts, which I won’t discuss here.
However, the finding that there was no significant effect of Grammaticality across either of the analyses would not be predicted by the BGP. Moreover, the finding that the Group × Grammaticality interaction is not significant directly contradicts the BGP's predictions. Under the BGP we would certainly expect Group × Grammaticality to be a significant interaction, since it would predict that the grammaticality of a sentence would directly affect the SLI group's performance. The explanation for these findings can be found through further examination of the group means (Table 3). While the findings for the overall means support the predictions of a BGP, their breakdown does not. There are two findings which conflict with the BGP's predictions. Firstly, with respect to SLI children's acceptance of the ungrammatical forms, the prediction that they will always judge these to be grammatical is not upheld. While an optionality in the acceptance of the ungrammatical forms is observed, this is far from 100%. Rather, the SLI children's acceptance of these forms seems to mirror the optionality of their production. It is possible that the less than 100% acceptance of these forms could be due to the SLI children's use of non-linguistic compensatory strategies. This would mean that, while the SLI grammar accepts these forms, an alternative strategy intervenes and gives the correct judgement. Given the unaffected status of SLI children's non-linguistic abilities this is a possibility, but it would not explain why the child only optionally applies these strategies.

A second finding with respect to the grammatical forms is also clearly in conflict with the BGP's predictions. The group means seem to show that the optionality found in the judgement of ungrammatical forms is mirrored in the judgement of grammatical ones. SLI children are found to reject grammatical forms at a rate of (33.9%), which does not differ significantly from their rejection of the ungrammatical form. It is a prediction of the BGP that the SLI child's ability to correctly judge the grammatical form should not be affected. Given the proposal of a more inclusive grammar it would be expected that a wider range of forms would co-exist as grammatical constructions for the SLI child. However, the finding that these forms are only optionally accepted implies that the grammatical form is optionally ungrammatical for the SLI child.

These two findings cannot be captured by the BGP, since their implication is that the forms do not consistently co-exist. However they are consistent with, and indeed requirements, of the PCA.

The findings appear to show that, for the SLI child, one form is optionally supplanting the other as optimal, and that the child has two separate grammars between which he/she alternates, one specifying the grammatical form as optimal, and another specifying the ungrammatical form as optimal.

9. Conclusion

In this paper I have discussed the nature of the Broader Grammar proposal which attempts to explain SLI children's linguistic abilities as reflecting a more inclusive grammar. I have presented data, which I argue suggests that this view is untenable, and have suggested an alternative account which depends upon a conflict between
the principles of Procrastinate and Full interpretation. This allows me to predict the optional production observed in SLI, as well as explain the finding that the optionality of SLI production is mirrored in their judgement of both the grammatical and the ungrammatical forms.

References


