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Binding theory and grammatical specific language impairment in children

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Abstract

This study investigates the intrasentential assignment of reference to pronouns (*him*, *her*) and anaphors (*himself, herself*) as characterized by Binding Theory in a subgroup of ''Grammatical specifically language-impaired'' (SLI) children. The study aims to (1) provide further insight into the underlying nature of Grammatical SLI in children and (2) elucidate the relationship between different sources of knowledge, that is, syntactic knowledge versus knowledge of lexical properties and pragmatic inference in the assignment of intrasentential coreference. In two experiments, using a picture–sentence pair judgement task, the children's knowledge of the lexical properties versus syntactic knowledge (Binding Principles A and B) in the assignment of reflexives and pronouns was investigated. The responses of 12 Grammatical SLI children (aged 9:3 to 12:10) and three language ability (LA) control groups of 12 children (aged 5:9 to 9:1) were compared. The results indicated that the SLI children and the LA controls may use a combination of conceptual–lexical and pragmatic knowledge (e.g., semantic gender, reflexive marking of the predicate, and assignment of theta roles) to help assign reference to anaphors and pronouns. The LA controls also showed appropriate use of the syntactic knowledge. In contrast, the SLI children performed at chance when syntactic information was crucially required to rule out inappropriate coreference. The data are consistent with an impairment with the (innate) syntactic knowledge characterized by Binding Theory which underlies reference assignment to anaphors and pronouns. We conclude that the SLI children's syntactic representation is underspecified with respect to coindexation between constituents and the syntactic properties of pronouns. Support is provided for the proposal that Grammatical SLI children have a modular language deficit with syntactic dependent structural relationships between constituents, that is, a Representational Deficit with Dependent Relationships (RDDR). Further consideration of the linguistic characteristics of this deficit is made in relation to the hypothesized syntactic representations of young normally developing children. ©1997 Elsevier Science B.V.

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1. Introduction

Developmental psycholinguistics has recently shown an increasing interest in the investigations of children with a language acquisition deficit, that is, a specific language impairment (SLI), to elucidate the nature of the language capacity in language acquisition and the relationship between language and cognitive processes (e.g., Bishop, 1994; Bishop et al., 1995; Clahsen, 1989; Gopnik and Crago, 1991; Leonard et al., 1992b; Plante, 1994; Plante et al., 1994; Rice, 1994; Rice et al., 1995; van der Lely, 1994, 1996a,c, 1997). These investigations have explored genetic and neurological characteristics as well as linguistic and cognitive abilities. This study extends earlier work investigating the linguistic and cognitive abilities of a subgroup of ''Grammatical SLI'' children (van der Lely, 1993a, 1994, 1996a,b,c, 1997; van der Lely and Howard, 1993; van der Lely and Stollwerck, 1996). The study investigates the intrasentential assignment of reference to pronouns (*him*, *her*) and anaphors (*himself*, *herself*) as characterized by Binding Theory (Chomsky (1986). It aims to (1) provide further insight into the underlying nature of Grammatical SLI in children and (2) elucidate the relationship between different sources of knowledge, that is, syntactic knowledge versus knowledge of lexical properties and pragmatic inference in the assignment of intrasentential coreference. The investigation of children with Grammatical SLI is particularly well suited to provide insight into the relationship between different sources of linguistic knowledge. This is because, first, Grammatical SLI children's non-linguistic cognitive functioning appears to be normal (van der Lely, 1996a,b) and they do not have an impairment in hearing, motor development or emotional behaviour which could account for their language impairment. Secondly, the linguistic deficit in these children may impair particular syntactic abilities needed for normal language acquisition and processing, and therefore, differential functioning of linguistic abilities may occur. Thus, the potential autonomy of syntactic abilities from lexical and/or pragmatic processes may be revealed in a way which is not possible to observe in normally developing children. Thereby such data may contribute to the modularity debate.

1.1. Specifically language-impaired children

SLI children are characterized by severe problems in the development of language comprehension and/or expression. SLI in children is a heterogeneous disorder. However, relatively homogeneous subgroups of SLI children can be identified: for example, semantic–pragmatic SLI children (Adams and Bishop, 1989); Familial SLI (i.e., a family of 30 members of whom half are language impaired) (Hurst et al., 1990; Gopnik, 1990; Gopnik and Crago, 1991); Grammatical SLI (van der Lely, 1993a, 1994, 1996a,c; and van der Lely and Stollwerck, 1996). The investigation of subgroups of SLI children can provide a stronger basis from which to investigate their underlying disorder and draw theoretical inferences (see Aram et al., 1993). Grammatical SLI children are characterized by a persistent specific language impairment with a disproportionate impairment in the grammati-

cal comprehension and expression of language. That is, their grammatical abilities appear to be impaired over and above any general (secondary) language impairment they may have in, for example, lexical development. Concurring *severe* articulatory/phonological deficits, articulatory dyspraxia or phonological disorders of the severity to cause frequent omissions of final consonants or unintelligible speech are not a characteristic of this group of children. We are not claiming that Grammatical SLI children do not have *any* phonological impairment but if it exists it is subtle and, as yet, it has not been investigated in these children.

1.2. Background characteristics of the Grammatical SLI children

A prominent characteristic of Grammatical SLI children is an impairment in inflectional morphology. In their expressive language, investigations revealed a large number (approximately 50%) of omissions of obligatory third person agreement *s* on the verb (e.g., *My Dad make- breakfast*) (Kubli, 1995; van der Lely, 1996a). Errors with both regular (*jump–jumped*) and irregular (*swim–swam*) past tense marking have also been found. Grammatical SLI children may use infinitival or stem verb forms in past tense contexts; e.g., *Yesterday I swim a mile* (van der Lely, 1996a; van der Lely and Ullman, 1996). In addition, they make approximately 10% overgeneralization errors (e.g., *swimmed, falled*) at an age (9:3 to 12:10) when overregularizations would rarely be expected. This pattern of morphological impairment found for Grammatical SLI children concurs with data from previous investigations into the expressive language of younger SLI children (Bishop, 1994; Clahsen, 1989, 1991; Leonard et al., 1992a; Rice and Oetting, 1991; Rice et al., 1995) and adult Familial SLI subjects (Gopnik and Crago, 1991).

However, Grammatical SLI children's problem with inflectional morphology is not merely a production problem. In a grammatical judgement task they judge stem forms (*walk*) and overregularizations of verbs (*falled*) in past tense contexts to be acceptable (van der Lely and Ullman, 1996). Although, in comparison to language-matched control children, the SLI children's proportion of tense-marking errors is more marked with regular verbs, an occurrence of both regular and irregular verb errors indicates that their problem extends to syntactic tense and is not confined to morphology. Furthermore, the similar findings in the production and judgement task illustrates that the underlying deficit causing Grammatical SLI is not to be found in differences between expressive versus receptive language processes.

Grammatical SLI children's problems with syntax have been frequently found when semantic or pragmatic cues are not available to guide them. This has been demonstrated in tasks where they have had to assign thematic roles (*agent, theme*) to NPs (*Subject–NP, Object–NP*) in reversible sentences (e.g., *The boy is hit by the girl*) (Bishop, 1982; Connell, 1986; van der Lely, 1990, 1994, 1996c; van der Lely and Harris, 1990). In contrast to this impaired pattern of morphological and syntactic development, Grammatical SLI children show appropriate linguistic development on measures of pragmatic abilities. For example, pronominal

reference in a narrative is determined in part by the pragmatic–functional role of the referent. Grammatical SLI children showed a similar if not more mature pattern of pronominal use in a narrative than the groups of language-matched control children who participated in this study (van der Lely, 1996a, 1997). (See van der Lely and Stollwerck, 1996, for evidence of familial aggregation of language impairment in this subgroup.)

1.3. The underlying nature of Grammatical SLI

There have been various hypotheses put forward to account for the deficits in subgroups or mixed groups of SLI children. For example, Leonard (1989) and Leonard et al. (1992a) have argued for an auditory perceptual deficit underlying SLI. The missing agreement deficit hypothesis was put forward by Clahsen (1989) to account for the findings from German SLI children and the missing feature deficit hypothesis was put forward to account for Familial SLI (Gopnik and Crago, 1991). Whilst these hypotheses may account for the linguistic impairments found in some populations of SLI children and/or some aspects of the language investigated in the respective studies, the hypotheses cannot account for the range of linguistic impairments found in Grammatical SLI children (see van der Lely, 1996a). In contrast, the expressive and receptive language abilities of Grammatical SLI children can be accounted for in terms of a deficit with structure-dependent relationships, that is, a Representational Deficit for Dependent Relationships (RDDR) (van der Lely, 1994, 1996a,c).

Clahsen (1989), (1991) first identified an underlying impairment with structure-dependent representations in inflectional morphology which he characterized as the missing agreement deficit hypothesis. Subject–verb agreement exemplifies this deficit: the inflectional form of the verb (e.g., *jump*/*jumps*) is dependent on the syntactic relationship between a noun phrase and the verb (i.e., they are in a subject–verb relationship) and the grammatical number and person of the noun. More recently, Rice et al. (1995) have highlighted SLI children's deficit with tense marking in matrix clauses: instead of using a finite verb form (*jumped*), an infinitive (*jump*) may be optionally used. Correct tense marking in sentences requires a syntactic relationship between the verb and Infl (or TNS) (i.e., the functional categories Inflection or Tense – Chomsky, 1986). More complex syntactic relationships between the verb and Comp (the ''Complementizer'' functional category) may be required to integrate tense into the overall syntactic frame (see Enc, 1987). Thus, tense, like agreement, requires structure-dependent syntactic relationships.

A different type of structure-dependent relationship is required for thematic (theta) role assignment. In sentence comprehension, the thematic role of a noun phrase is dependent on a combination of the verb's lexical properties and the noun's syntactic relationship to the verb (i.e., whether it is the Subject NP or Object NP). It is only when syntactic knowledge of the relationship between structures is required for the assignment of thematic roles that SLI children's impaired comprehension is apparent (van der Lely, 1994, 1996c). In other

sentences, such as *The ball is kicked by the boy*, lexical, pragmatic and general world knowledge is sufficient to guide correct assignment of thematic roles, and SLI children do not show a deficit (van der Lely and Dewart, 1986). The syntactic positions *Subject* and *Object* are determined by case marking. Therefore, it may be that inadequate identification of *Subject* and *Object* through case marking lies at the root of SLI children's impairment of theta role assignment.

It is clear that a much more detailed linguistic characterization of the RDDR is required. However, before attempting to specify more precisely the linguistic nature of the impairment it is necessary to substantiate this deficit. In this paper we investigate whether Grammatical SLI children's deficit with structural-dependent relationships extends to other syntactic relationships not previously investigated in this subgroup. The intrasentential assignment of reference to anaphors and pronouns as characterized by Binding Theory (BT) provides an excellent source to further explore structural dependent relationships in Grammatical SLI children.

1.4. Binding Theory

The interpretation of anaphors (e.g., the reflexives himself/herself) and pronouns (e.g., him/her) within the Government and Binding (GB) framework is determined, in part, by knowledge of the syntactic structural properties of the language characterized by BT (Chomsky, 1981, 1986). Specifically, these properties refer to the ''locality'' conditions (Wexler and Manzini, 1987) and c-command relationships in the binding of reflexives and pronouns. The structural–syntactic principles, that is, Principles A and B which determine the antecedent referential possibilities for reflexives and pronouns, are the focus for this study.[1] In addition, an appropriate referent is identified by the syntactic properties of the head and potential antecedent. The potential antecedent must be, for example, an NP in an A-Spec (argument-specifier) relation.

It is claimed within the GB framework that standard BT is part of Universal Grammar (UG) and is ''innate'' (i.e., genetically determined) (Chomsky, 1981; Manzini and Wexler, 1987; Chien and Wexler, 1990; Grimshaw and Rosen, 1990; Grodzinsky and Reinhart, 1993) Thus, in normally developing children, the principles of binding theory are potentially present from birth and only the parameters for the specific language have to be set (Manzini and Wexler, 1987). Although one would not expect to find the absence of ''innate knowledge'' in

[1] For an alternative view of the definition of the Binding conditions, see Reinhart and Reuland (1993). Reinhart and Reuland argue that Principles A and B govern the well-formedness of the interpretation of reflexive predicates. Principle A defines the reflexivity of a syntactic predicate and Principle B defines the reflexivity of a semantic predicate. However, importantly for our purposes, Principle A still depends on specific structural syntactic knowledge for interpretation.

normally developing children, this may not be so in SLI children[2] Binding Principle A is given in (1) below.

(1) Binding Principle A: a reflexive must be bound in its governing category, where ''bound'' means c-commanded by and coindexed with an antecedent. [C-command: in a phrase marker, node A c-commands node B if and only if A and B do not dominate each other, and the first branching node that dominates A also dominates B (Chomsky, 1986)].

According to principle A, a reflexive must be locally bound. Therefore, a reflexive must have an antecedent which is ''local'', that is (roughly speaking), it must be within the same clause as the reflexive and it must c-command the reflexive (Chomsky, 1986).

The relationship between a reflexive and its antecedent is illustrated in (2).

(2) *Captain Hook$_i$ says [Peter Pan$_j$ touched himself$_{*i/j}$]*

According to Principle A, the antecedent for the anaphor *himself* can only be Peter Pan and not Captain Hook. The definition of Principle B is given in (3).

(3) Binding Principle B: a pronoun must be free in its governing category. [Free = not bound].

Within a sentence, such as (4), the pronoun may only refer to a *non-local* antecedent. That is, *him* can only refer to Captain Hook and not to Peter Pan.

(4) *Captain Hook$_i$ says [Peter Pan$_j$ touched him$_{i/*j}$]*

In experimental tasks young children may not perform as if they know the Principles. Their failures have been attributed to performance errors or errors outside the ''syntactic module'' (Chien and Wexler, 1990; Grimshaw and Rosen, 1990; Grodzinsky and Reinhart, 1993; Koster, 1993). In other words, young children are able to derive an appropriate syntactic representation of a sentence involving coindexation of the pronoun or anaphor and its antecedent but the linguistic interpretation of this representation involving pragmatic or general world knowledge is not yet mature and may not rule out incorrect interpretations.

The distinction between competence and performance is particularly important in our investigation of BT as it is the so-called ''knowledge'', or linguistic

[2] There is growing evidence that SLI in children may be caused by a genetic inheritance (e.g., Bishop et al., 1995; Hurst et al., 1990; Tallal et al., 1989; van der Lely and Stollwerck, 1996). Thus, a genetic impairment is consistent with the view that the biological (innate) basis of language may be disrupted. However, we acknowledge that there is controversy surrounding the term ''innate'' and that we are still very far from a precise understanding of the relationship between genes and language and the genetic abnormality underlying SLI in children.

competence, of BT that we wish to investigate in SLI children. Of course, we can only actually observe the performance which reflects the outcome of interpretation, but we tentatively assume that: (a) one cannot have consistent performance across a range of conditions testing syntactic knowledge without competence; and (b) a so-called ''performance deficit'' will affect all conditions to some degree. We shall define below what is involved in determining the reference for pronouns and reflexives in sentences and what we consider would be evidence for a lack of knowledge of BT.

First, a precondition for binding is the acquisition of the lexical knowledge. The child has to distinguish the appropriate syntactic–lexical properties associated with anaphors and pronouns, that is, an anaphor is [+ A − P] and a pronoun is [−A + P]. Without knowledge of the lexical properties the child may, for example, overgeneralize Binding Principle A to pronouns as well as reflexives. Such an error would be a lexical problem, not a violation of the grammatical knowledge underlying Principle B. In addition, as pointed out by Koster (1993), the child must also identify the thematic roles in the test sentence. For sentences with reflexives a self-oriented action with the Agent and Patient assigned to the same person is expressed. In sentences with pronouns an other-oriented action with two different people being assigned the Agent and Patient roles is expressed. In general, experimental evidence has shown that by 4 years of age children do not make ''orientation'' errors (i.e., when a reflexive is interpreted as an other-oriented action and a pronoun as a self-oriented action) when given enough response options (Deutsch et al., 1986; Grodzinsky and Kave, 1994; Jakubowicz, 1989; Koster, 1993).

Secondly, in order to have BT competence the child requires knowledge of the binding relationship of the anaphor or pronoun and the potential antecedent as defined above. Thus, Principle A defines what the referent for an anaphor must be (i.e., it must be a c-commanded locally bound antecedent), while Principle B defines what the referent for a pronoun must *not* be (i.e., it must not be a locally bound antecedent NP, though it may, or may not, be a c-commanded antecedent). Thus, for the sentence shown in (5), acceptance of a sentence–picture pair in which the picture shows Captain Hook touching himself, will be classified as evidence for a lack of the syntactic knowledge of BT. It can be seen from this example that, on the basis of lexical knowledge alone, such a sentence–picture pair would be correct. Following Koster (1993) we shall call this type of error an ''antecedent error''.

(5) * *Captain Hook*$_i$ *says [Peter Pan*$_j$ *is touching himself*$_i$*]*

For sentences with reflexive anaphors, antecedent errors may occur in very young children of 2–3 years old but are rare after this age. Correct performance has been found in experiments which allow for an antecedent error in children of 3 years or more in French and Dutch (Jakubowicz, 1989; Koster, 1993) and in 5-year-olds or older in Hebrew (Grodzinsky and Kave, 1994). However, antece-

dent errors for pronominals have been shown to continue for some years and may be found in children of 6 years (Deutsch et al., 1986; Jakubowicz, 1989).

Recent investigations of BT have considered the source of children's failures with Principle B. One line of suggestions has been that children use a cognitive strategy. For example, Grimshaw and Rosen (1990) suggested that children use a general reflexive strategy to determine reference: that is, children are biased towards self-orientation regardless of the linguistic information, or that children use the lexical cues of *self*, as a marker of a self-oriented action. A discourse strategy of a ''minimal distance principle'' (whereby the anaphoric element will be interpreted as referring to the last mentioned noun) (Deutsch et al. (1986), and a strategy to look for a c-commanding antecedent within the sentence (Koster, 1993), have also been suggested. Further investigations have revealed that by providing an appropriate *sentential antecedent*, rather than one merely in the preceding discourse or contextual environment, these errors are avoided (Jakubowicz, 1989; Koster, 1993). Thus, it appears that some of the children's errors may be ''forced'' errors and reflect the lack of an appropriate syntactically defined antecedent along with the child's desire to give a sentence an interpretation.

A different line of thought has been that young children have a processing deficit. This may cause problems in processing certain types of sentences such as those in which the referent is embedded in a possessive phrase (Grimshaw and Rosen, 1990). Alternatively, Chien and Wexler (1990) and Grodzinsky and Reinhart (1993) propose that the sentence in (5) has two logical (or semantic) interpretations, (6a) and (6b).

(6) *Mary likes her*
  (a) *Mary*$_i$ *likes her*$_i$
  (b) *Mary*$_i$ *likes her*$_j$

In (6b) *Mary* and *her* are *coreferential* but not *coindexed*, and the pronoun is not bound. Therefore, in contrast to (6a) the pronoun is not ruled out by Principle B. For Grodzinsky and Reinhart (1993) it is the processing demands of comparing the two logical possibilities which cause young children to fail. However, Chien and Wexler (1990) propose that failures are due to the absence of a ''Pragmatic Rule'' or ''Principle P'', which regulates the interpretation of indices in (6b) as opposed to syntactic Principle B, which governs the relationship between two coindexed elements. Principle P prohibits the coreference of two non-coindexed elements, except in particular contexts in which the pragmatic constraints on coreference are overridden. Chien and Wexler (1990) point out that when the antecedent is a quantifier, the bound variable reading is required, since the only way an element can be coindexed with a quantifier is to be a variable bound by this quantifier. This is because quantifiers do not have any definite referents with which to be accidentally coindexed. Experimental evidence has shown that performance for pronoun interpretation improves in quantifier NP sentences, thus

supporting Chien and Wexler's claim. Therefore, in this study we include sentences with Quantified NPs.

In conclusion, thorough analysis of errors has shown that children may have difficulties in interpreting pronouns because of a confusion of deictic, discourse and grammatical information in the pronominal test items (Koster, 1993). Importantly for this study, there appears to be a general consensus that failure with Principle B in normal children is not due to a lack of syntactic competence but due to performance errors. With careful selection of materials the source of the errors can be identified (Koster, 1993). Furthermore, the investigations of reflexives, in which performance problems are not apparent, provide a clear test of the grammatical knowledge of BT.

It is against this background, in which the form of the test sentence, the availability of potential antecedent, and the type of errors (antecedent or lexical orientation errors) are considered, that we shall investigate SLI children's knowledge of BT. The experimental test sentences include gender control sentences[3]. In these sentences lexical–semantic knowledge of the male/female differences of pronouns and reflexives is sufficient to accept or reject coreference with an antecedent. The specific questions addressed in this investigation are: (1) Can Grammatical SLI children assign reference to reflexives and pronouns in sentences according to binding Principles A and B? That is: (1a) Do SLI children have the prerequisite lexical properties of reflexives and pronouns? (1b) Do SLI children have the grammatical knowledge underlying the Binding Principles needed for reference assignment of reflexives and pronouns? (2) Can SLI children correctly accept and reject coreference of a reflexive or pronoun with an antecedent when the judgement is not dependent exclusively on syntactic knowledge but may be provided by lexical–semantic cues? (3) Does SLI children's performance differ from: (3a) children matched on aspects of morpho-grammatical abilities, and (3b) children matched on expression and comprehension of single word vocabulary?

We propose that SLI children will be impaired in their ability to identify appropriate antecedents for anaphors and pronouns when knowledge of the syntactic structural principles underlying binding theory is required. Specifically, we propose that SLI children will have problems with identifying the NP which is/is not in the syntactic local domain in relation to the anaphor or pronoun. Therefore, both correct and incorrect antecedents may be syntactically acceptable. We propose that SLI children should not have problems with rejecting in-appropriate antecedent reference on the basis of lexical–semantic properties of reflexives or pronouns. However, if SLI children have a ''general deficit'' (e.g., a processing deficit) in assigning coreference then their performance will be impaired on both the control sentences and the syntactic experimental sentences.

The inclusion of control groups matched on aspects of language abilities when

[3] Throughout this paper the term ''gender'' is used in its semantic, conceptual sense of male/female sex as marked on pronouns and reflexives in English.

investigating SLI children is important as it enables us to rule out a general language delay which could cause an SLI child to fail the task.

2. Method

2.1. Subjects

Four subject groups participated in the experiment: a subgroup of 12 Grammatical SLI children, and three groups of younger children who provided control groups for different aspects of language abilities.

The criteria for selecting the SLI children and the control groups has been previously documented (see van der Lely, 1993b, 1994, 1996a,c; van der Lely and Howard, 1993 for full details). However, because of their importance to the interpretation of the data and to any future comparisons with other subgroups of SLI children, some of the details will be given.

2.2. Grammatical SLI children

A procedure was undertaken to identify a homogeneous subgroup of SLI children from the heterogeneous group of children who are classified as SLI. The SLI children for this study were selected from approximately 60 SLI children attending one of four residential schools specializing in the education of SLI children in England. The SLI children had been diagnosed by speech and language therapists and educational psychologists as having severe and persistent difficulties with language development as measured by standardized tests of language abilities, that is, their scores fell at least -1.5 *SD* below that expected for their chronological age on various language tests.

Their non-verbal cognitive abilities as measured by performance subtests of standardized IQ tests (e.g., British Ability Scale, Elliott et al., 1978) fell within normal limits for their chronological age. The children had a mean IQ of 99.09 (11.46 *SD*) (see Appendix 1 for individual IQ scores). Further general details of the children attending the school may be found in Haynes (1992) and Haynes and Naidoo (1991).

The children were assessed on a battery of tests which tapped a range of comprehension and expressive language abilities. The tests provided standardized measurements of different areas of language abilities in relation to the children's chronological ages which were of use in the initial selection process and for matching purposes. A summary description of the six tests may be found in Table 1. The individual test scores for each subject for the six tests may be found in Appendix A.

A grammatical–morphological/lexical–semantic distinction was broadly made with regard to the tests. The SLI children included in the subgroup generally scored at least -1.5 *SD* on the test of grammatical comprehension. It can be seen from appendix A that the SLI children scored up to -2.5 *SD* on the TROG, and

Table 1
Summary details of the six standardized language tests used for selection purposes

Test	Test description
The British Picture Vocabulary Scale (BPVS)[a]	Comprehension of single words
Test of Reception of Grammar (TROG)	Understanding grammatical structures in sentences
Naming Vocabulary (British Ability Scale)(NV-BAS)[b]	Ability to name pictures
Grammatical Closure, Illinois test of PsycholinguisticAbilities (GC-ITPA)	A test of expressive morphology
The Action Picture Test (APT) and The Bus Story[c]	Expressive samples of speech which provide measures of grammatical structure, sentence length and ''semantic content''

[a]BPVS: Dunn et al. (1982); TROG: Bishop (1983); NV-BAS, Elliott et al. (1978); GC-ITPA, Kirk et al. (1968); APT, Renfrew (1988); The Bus Story (revised), Renfrew (1991).
[b]Many of the subjects scored at ceiling on this test. Therefore, the test merely serves to show a minimum level of ability in naming vocabulary.
[c]The expressive responses from these two tests were audio recorded on a Sony DAT recorder using an Electret condenser microphone (ECM-959) positioned approximately 20 cm to the side of the child's mouth. Detailed transcriptions were made from these recordings. The recordings provided a further means of checking the children's articulatory ability and intelligibility.

up to -5.5 *SD* on the test of expressive morphology. Where *SD* were not available for the tests the equivalent age scores were used as a measure of impairment. The children generally had an equivalent age score of at least 3 years below their chronological age on tasks tapping grammatical ability but many age equivalent scores fell well below this level. For example, one SLI child, MP, who had a chronological age of 12:10, had an equivalent age score on the TROG of 6:0 years. Whatever the individual child's score was on grammatical abilities, generally, he/she had a superior vocabulary–semantic ability. A more detailed description of the linguistic characteristics of the children's expressive morphology and theta role assignment ability can be found in the introduction.

The subgroup of 12 SLI children (10 boys and 2 girls) in this study had a mean chronological age at the time of selection of 11:3 (years:months) (range 9:3–12:10). A summary of the overall subgroups's subject details can be found in Table 2.

2.3. Language ability control groups

Three groups of 12 children developing normally provided language ability (LA) control groups. The control groups were younger children covering an age span of 3:4 (years:months). The children were randomly selected from a state school in central London. Four of the six standardized tests were used for matching purposes. Two of the tests assessed aspects of grammatical and

Table 2
Subject details: chronological ages and raw scores from the four standardized tests used for matching purposes

	Subjects				
	SLI children ($N = 12$) Mean (SD)	LA1 controls ($N = 12$) Mean (SD)	LA2 controls ($N = 12$) Mean (SD)	LA3 controls ($N = 12$) Mean (SD)	Summary of analysis between groups
Chronological age[a]	11:2 (1:1)	5:9 (0:4)	6:11 (0:4)	7:11 (0.5)	
Range	9:3–12:10	5:5–6:4	6:5–7:4	7:5–8:9	
TROG	13.08 (1.78)	12.58 (2.35))	16.00 (1.75)	17.33 (1.23)	LA1 = SLI < (LA2 = LA3)
GC-ITPA	20.00 (3.56)	21.25 (3.16)	26.25 (4.08)	28.91 (2.19)	LA1 = SLI < (LA2 = LA3)
BPVS	78.83 (8.93)	56.25 (8.91)	71.67 (9.71)	80.00 (9.62)	LA1 < SLI = (LA2 < LA3)
NV-BAS	17.91 (1.17)	15.67 (1.61)	17.17 (1.27)	17.50 (0.90)	LA1 < SLI = (LA2 = LA3)

[a]Experiments 1 and 2 were carried out approximately 4–5 and 8 months, respectively, after the original selection of the subjects who were all participating in a number of investigations.
TROG = Test of Reception of Grammar. GC-ITPA = Grammatical Closure subtest, Illinois Test of Psycholinguistic Abilities. BPVS = British Picture Vocabulary Scale. NV-BAS = Naming Vocabulary, British Ability Scales.

morphological abilities and two assessed aspects of lexical–semantic development (see Table 2).

Analysis of the raw scores from these tests revealed that the youngest LA1 control group (5:5–6:4 years:months at the time of selection) did not differ from the SLI children on the two tests of morpho-grammatical abilities. It can be seen from Table 2 and Appendices 1 and 2 that both the mean scores and the range of the scores on the two tests of morpho-grammatical ability were well matched. However, the LA1 controls scored significantly lower than the SLI children on the tests of lexical–single word vocabulary development. The LA2 and LA3 control groups performed significantly higher on the test of morpho-grammatical development than the SLI children but their raw scores on the two vocabulary tests did not differ from those of the SLI children. Thus, the SLI children were well matched on the test of single word comprehension to the LA2 and LA3 control groups. However, since the SLI children and LA3 controls were close to or at ceiling on the Naming Vocabulary (BAS) test, caution is expressed as to how well matched these two groups were on this measurement. The Naming Vocabulary test, then, is of most value in showing the discrepancy between the SLI children and the LA1 controls' performance. Table 2 provides a summary of the details for the subject groups and Appendix 2 provides individual test scores for each of the LA control subjects.

EXPERIMENT 1

Experiment 1 was designed to assess whether SLI children had the prerequisite

lexical properties of pronouns and anaphors (i.e., a pronoun expresses an other-oriented action, and an anaphor a self-oriented action) and to provide an initial indication of their knowledge of the binding principles to determine coreference. The study compared the performance of the SLI children with the three groups of younger LA control children. A sentence–picture matching procedure was used, which has frequently been used in previous research.

Experiment 1 was carried out 4–5 months after the original selection of the subjects who were all participating in a number of investigations.

2.4. Design and materials

Subject group (SLI children, LA1, LA2, LA3 controls) constituted the between-subject variable in the experiment.

The task and the test sentences were based on the study carried out by Chien and Wexler (1990), specifically their Experiment 4. The task involved a *yes*/*no* sentence–picture judgement in which the test stimuli either matched or ''mismatched''. For example, the child was presented with a picture of Mowgli and Baloo Bear in which Mowgli was tickling Baloo Bear. An introductory sentence was spoken by the experimenter which was followed by the experimental test sentence (see (7)) to which the children had to reply *yes*/*no* as appropriate.

(7) Introductory sentence: *This is Mowgli; this is Baloo Bear.*
Test sentence: *Is Mowgli tickling himself?*[4]

2.5. Test sentences

Six action verbs (*tickle*, *scratch*, *touch*, *pinch*, *point*, and *wash*) were used to construct the sentences in each condition. For each verb a set of cartoon characters which were both easily identifiable by the children and appropriate for the construction of the test pictures were assigned to each verb (see Appendix 3). The pictures were drawn by a professional graphic artist.[5]

All the introductory and test sentences had the same basic syntactic structure, as illustrated in (7) above.[6] There were four different types of experimental sentences and five types of control sentences. Half of the experimental conditions had a referential, definite NP in subject position, as shown in (7) and half had a quantified NP in subject position (e.g., *Is every Monkey tickling him?*). The object NPs were equally divided as to whether they contained a reflexive (*himself*/*herself*) or a pronoun (*him*/*her*). The sentences were equally balanced for gender. Following Chien and Wexler we shall name the four types of experimental

[4] Following Chien and Wexler (1990) the underlined word was stressed; in this way the reflexive or pronoun was left unstressed.

[5] We are very grateful to Peter Hudspith for his care and attention to detail and our demands when drawing these pictures.

[6] For the verb *point* the preposition *to* was also used in the test sentences.

Table 3
Experiment 1: examples of the test sentences–picture pairs for the four experimental conditions and five control conditions.

Sentence type	Sentence example	Picture description	
		Match	Mismatch
Experimental conditions			
Name–pronoun	Is Mowgli tickling him?	A tickles B (Baloo Bear)	A tickles A
Quantifier–pronoun	Is every monkey tickling him?	Every A tickles B	Every A tickles every A
Name–reflexive	Is Mowgli tickling himself?	A tickles A	A tickles B (Baloo Bear)
Quantifier–reflexive	Is every monkey tickling himself?	Every A tickles every A	Every A tickles B
Control conditions			
Gender–reflexive	Is Mowgli tickling himself?	A tickles A (Mowgli)	A tickles B (Mother Wolf)
Gender–pronoun	Is Mowgli tickling her?	A tickles B (Mother Wolf) A tickles A (Mowgli)	
Quantifier(every)name	Is every monkey tickling Mowgli?	Three A's tickle B	2 of 3 A's tickle B
Quantifier(all)name	Are all the monkeys tickling Mowgli?	Three A's tickle B	2 of 3 A's tickle B
Name–name	Is Baloo Bear tickling Mowgli?	A tickles B	A tickles A

sentence conditions as (1) name–pronoun; (2) quantifier–pronoun; (3) name–reflexive; and (4) quantifier–reflexive (see Table 3).

Five control conditions were designed to assess lexical–semantic knowledge and the assignment of reference which was not dependent on syntactic knowledge. To assess the children's lexical knowledge of quantifiers, two sets of sentences had a quantifier in subject position. The two quantifiers were *every*, which was the quantifier used in the experimental conditions, and *all*, which was not included in the experimental conditions. For these quantifier control sentences, proper names occurred in the object position (i.e., the quantifier(every)name and quantifier(all)name conditions). A further set of control sentences contained names in both subject and object positions (name–name condition). These sentences investigated whether the child could cope with the task demands; that is, if he could identify the characters and correctly accept and reject the sentence–picture pairs.

A further two sets of sentences, which we shall call the ''gender control sentences'', were designed to test whether the children could determine the reference of reflexives and pronouns by matching semantic gender. Syntactic knowledge of Binding Principles A and B may facilitate performance on these sentences but is not essential for correct interpretation. For these sentences the semantic gender of the two characters in the introductory sentences differed, enabling reference to be assigned on the basis of lexical–semantic knowledge (see (8) below).

(8) *This is Peter Pan; this is Wendy.*
Is Peter Pan touching her?

Each sentence was presented twice for each sentence condition. In one sentence presentation, the corresponding picture concurred with the sentence (the match condition), whereas in the other one it did not (the mismatch condition). This made a total of 8 experimental conditions (4 match and 4 mismatch) corresponding to the four sentence types, and 10 control conditions (5 match and 5 mismatch) corresponding to the 5 control sentence types. There were six sentences (one for each verb and corresponding set of characters) for each condition, giving a total of 108 test sentences. Table 3 provides an example of each sentence type and the corresponding description of the pictures for the verb *tickle*. A full list of the verbs with the respective characters used in the experimental and control conditions can be found in Appendix 3.

2.6. Procedure

All the children were tested individually in a quiet room. The child was seated at a small table beside the examiner. The child was told that he would be shown some pictures and asked a question about each picture. It was explained that he had to look at the picture, listen to the question, and then answer *yes* or *no*. Each question was preceded by the introductory sentence which introduced the characters. This made it pragmatically more appropriate for the reflexive or

pronoun to refer to either character. The sentences were presented in two halves with a break of approximately 5 minutes in the middle. Administration of the sentences took a total of 20–25 minutes approximately.

3. Results

The number of correct responses to each condition was calculated. That is, *yes* responses to the match conditions and *no* responses to the mismatch conditions. The mean correct scores for each subject group for the experimental and control conditions are presented in Table 4 Table 5 and Fig. 1 presents the percentage of correct scores for the four subject groups for the experimental conditions.

3.1. Experimental conditions

The match and mismatch conditions were analyzed separately. A 4×4 (Subject group $\times$ Sentence type) ANOVA was carried out to investigate each set of data (match and mismatch).

3.1.1. Match conditions

For the experimental match conditions, ANOVA revealed significant effects of Group ($F(3, 44) = 4.66,\ p = .006$), sentence type ($F(3, 132) = 2.73,\ p = .006$) and

Table 4
Experiment 1: mean scores for the experimental sentence conditions for the SLI children and the three LA control groups

Sentence type	Subjects			
	SLI Mean (*SD*)	LA1 controls Mean (*SD*)	LA2 controls Mean (*SD*)	LA3 controls Mean (*SD*)
Name–pronoun				
Match	5.50 (0.67)	5.92 (0.29)	5.92 (0.29)	5.75 (0.45)
Mismatch	3.83 (1.70)	5.33 (0.99)	4.83 (1.75)	5.33 (0.89)
Quantifier–pronoun				
Match	5.83 (0.39)	6.00 (0.00)	5.92 (0.29)	5.92 (0.29)
Mismatch	5.67 (0.65)	5.50 (1.17)	5.25 (1.48)	5.17 (1.59)
Name–reflexive				
Match	5.50 (0.80)	5.75 (0.62)	5.58 (0.67)	5.92 (0.29)
Mismatch	5.92 (0.29)	5.92 (0.29)	5.92 (0.29)	5.92 (0.29)
Quantifier–reflexive				
Match	4.50 (1.45)	5.33 (1.37)	5.67 (0.49)	6.00 (0.00)
Mismatch	3.25 (1.76)	4.08 (1.83)	4.83 (1.59)	5.33 (0.98)

Note: Maximum score = 6.

Table 5
Experiment 1: mean scores for the control sentence conditions for the SLI children and the three LA control groups

Sentence type	Subjects			
	SLI Mean (*SD*)	LA1 controls Mean (*SD*)	LA2 controls Mean (*SD*)	LA3 controls Mean (*SD*)
Gender–reflexive				
Match	5.92 (0.29)	5.92 (0.29)	6.00 (0.00)	6.00 (0.00)
Mismatch	5.91 (0.39)	5.83 (0.39)	6.00 (0.00)	6.00 (0.00)
Gender–pronoun				
Match	5.92 (0.29)	6.00 (0.00)	5.92 (0.29)	6.00 (0.00)
Mismatch	5.67 (0.65)	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)
Every–name				
Match	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)
Mismatch	5.33 (1.43)	5.92 (0.29)	6.00 (0.00)	5.83 (0.39)
All–name				
Match	6.00 (0.00)	5.92 (0.29)	6.00 (0.00)	5.92 (0.29)
Mismatch	4.50 (1.83)	5.92 (0.29)	5.83 (0.38)	5.83 (0.58)
Name–name				
Match	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)
Mismatch	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)

Note: Maximum score = 6.

a significant interaction ($F(9, 132) = 6.79,\ p < .001$). It can be seen from Table 4 and Fig. 1(a) that for the match conditions the three LA control groups performed at a high level on all four sentence types. That is, the LA control groups correctly accepted a local antecedent for reflexives and a non-local antecedent for pronouns on 93% or more occasions. The SLI children generally performed consistently below both the LA2 and LA3 controls and the youngest LA1 control children (see Fig. 1(a)). Planned comparisons were undertaken to investigate these data further.

The SLI children's performance was compared to the LA1 controls (the grammatical–morphological language-matched controls), and also to the LA2 and LA3 controls (the vocabulary-matched control children)[7]. Finally a comparison of the performance of the LA2 controls and LA3 controls was made. There were no significant differences between the LA2 and LA3 control groups' performance on any of the sentence conditions. However, some significant differences were found for the analyses involving the SLI children and the LA1 controls and the older two control groups.

For the name–reflexive condition no significant differences between the groups

[7] As our interest was in whether the SLI children's performance differed from that which could be expected based on their language abilities, the scores of the LA2 and LA3 controls who were both matched on vocabulary ability but had superior morpho-grammatical ability to the SLI children were analysed together.

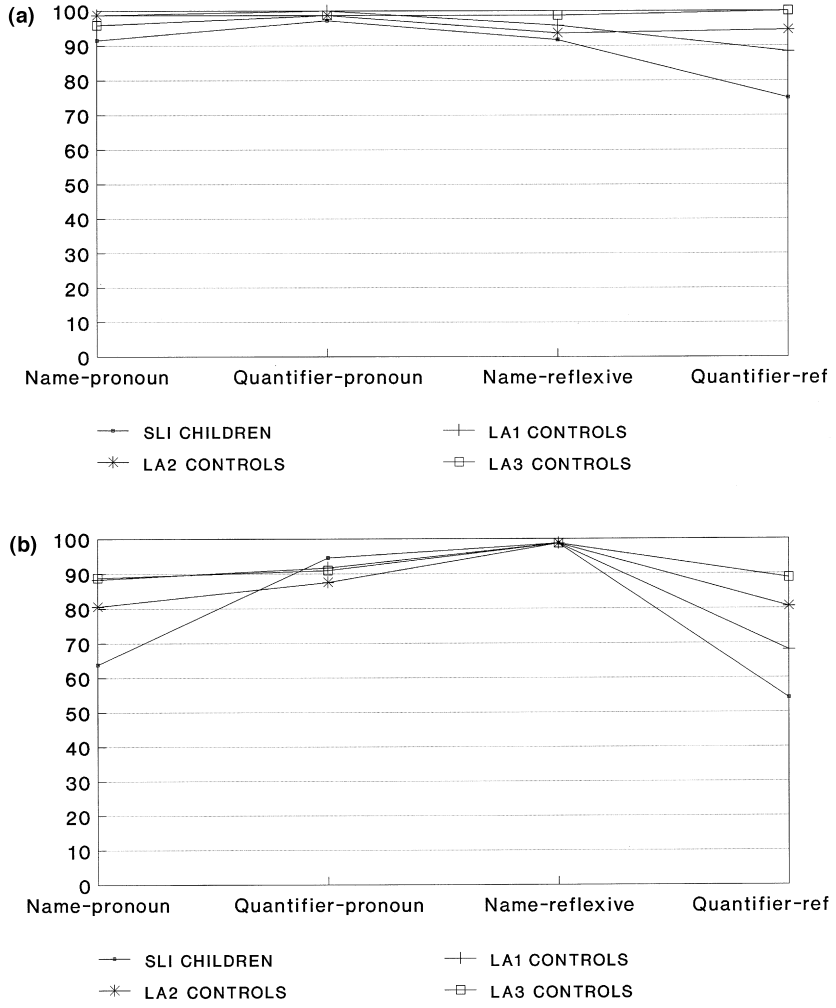


Fig. 1. Experiment 1. Mean percentage correct for the SLI children and LA control groups on the match (a) and mismatch (b) experimental sentence conditions.

were revealed. However, on the name–pronoun condition the SLI children were found to perform significantly worse than the LA1 controls ($F(1, 44) = 3.311$, $p = .029$) and the LA2 and LA3 controls ($F(1, 44) = 5.427$, $p = .003$). Thus, the SLI children accepted significantly fewer non-local referents for the pronouns than even the youngest children of 5:9–6:8 years. However, as can be seen from Fig. 1(a), the SLI children's performance on the match condition was high, with 91.6% of their answers being correct *yes* responses. Moreover, this level of performance was identical to their correct responses to the name–reflexive condition.

A different pattern of results emerged from the quantified NPs conditions. For

the quantifier–pronoun condition no differences were found between the SLI children and any of the control groups. The SLI children and the three control groups performed near ceiling, with all groups scoring 97% or more correct. However, for the quantifier–reflexive condition the SLI children's performance was marginally significantly worse than the LA1 controls, ($F(1, 44) = 3.96$, $p = .053$ and significantly worse than the LA2 and LA3 controls ($F(1, 44) = 13.51$, $p < .0001$).

Thus, it appears that the quantifier NP sentences, involving a bound variable, improved the SLI children's performance for pronouns but made their performance *worse* for the reflexive sentences. The SLI children correctly accepted the local antecedent for reflexives only 75% of the time. It can be seen from Fig. 1(a) that, although not as marked, correct responses for the youngest LA1 controls also decreased on the quantifier–reflexive match condition in comparison to the name–reflexive condition (88% vs. 95% correct, respectively).

3.1.2. Mismatch conditions

For the mismatch conditions correct responses for all subject groups was generally lower than for the match conditions (see Table 4 and Fig. 1(b)). This finding concurs with previous research showing that children are worse at rejecting violations of binding principles than accepting correct picture–sentence pairs (Chien and Wexler, 1990; Grimshaw and Rosen, 1990). A 4×4 ANOVA did not reveal significant main effect of Group, but a significant effect of Sentence type ($F(3, 132) = 17.37$, $p < .0001$) and a significant Group $\times$ Sentence type interaction was found ($F(9, 132) = 3.06$, $p = .002$).

Planned comparisons revealed a similar pattern of responses in the mismatch conditions as in the match conditions. No significant difference between the groups were found for the name–reflexive and quantifier–pronoun conditions. However, on the name–pronoun condition the SLI children performed below all the control groups. The difference between the SLI children and LA1 controls was approaching significance ($F(3, 42) = 2.556$, $p = .068$) and for the SLI children and LA2 and LA3 controls the difference was clearly significant ($F(3, 42) = 4.694$, $p = .006$).

For the quantifier–reflexive condition, (e.g., *Is every Monkey tickling himself*, in which the picture showed the Monkeys tickling Mowgli) a worse level of performance was particularly evident for the SLI children and LA1 controls (see Fig. 1(b), and Table 4). In other words, the children accepted the sentence–picture mismatch. The SLI children's performance was significantly worse than the LA2 and LA3 controls' ($F(1, 44) = 10.80$ $p = .002$). The lack of a significant difference between the SLI children and LA1 controls may be accounted for by the worse performance of the LA1 controls. One-sample *t*-tests revealed that the SLI children's performance did not differ significantly from chance on the quantifier–reflexive mismatch condition ($t(11) = 1.701$, $p > .05$, two tailed) or the name–pronoun mismatch condition ($t(11) = 0.491$, $p > .25$, two tailed). In contrast, the LA1 controls and the two older control groups performed significantly above

chance on all sentence conditions ($t(11) > 2.04$, $p < .05$ for all analyses). A comparison between the quantifier reflexive condition and the name–reflexive condition revealed a systematically worse performance for all subject groups when the antecedent was a quantifier; correct responses for the SLI children dropped from 98.6% to 54.2% correct, and for the LA1 control from 98.6% to 68% correct. This is a surprising result as quantified nouns should increase a bound variable reading and, therefore, facilitate performance.

3.2. Control conditions

All the subject groups performed at ceiling on the name–name match and mismatch conditions. Performance on the gender–reflexive and gender–pronoun control sentences also revealed over 94.5% correct performance for the SLI children and LA control groups for both the match and mismatch conditions (see Table 5). The SLI children and LA control groups correctly accepted the local antecedent and rejected the non-local antecedent for reflexives and, conversely, correctly accepted non-local antecedents, and rejected local antecedents for pronouns. These results indicate that the SLI children are able to use the additional semantic cues of gender (i.e., more accurately, male/female sex) to infer the correct antecedent and, importantly, rule out an incorrect antecedent in a sentence.

The results of the mismatch quantifier control conditions revealed that the SLI children do not have full understanding of quantifiers. For the every–name and all–name conditions the SLI children produced 88.8% and 75% correct responses respectively. In contrast, the LA controls' performance indicated, generally, a good understanding of the quantifiers. For the quantifier *all* significantly worse performance was revealed for the SLI children in comparison to the LA1 controls ($F(1, 44) = 12.25$, $p = .001$) and the LA2 and LA3 controls ($F(1, 44) = 14.47$, $p < .0001$). For the quantifier *every* a significant difference was only evident between the SLI children and LA2 and LA3 controls ($F(1, 44) = 4.74$, $p = .035$). If we consider the mismatch pictures for the quantifier control sentences the reasons for the SLI children's errors may be revealed (see Table 3). For the sentence *Are all the Monkeys tickling Mowgli?*, the picture showed two out of three Monkeys tickling Mowgli. The SLI children accepted these pictures as being correct 25% of the time. Thus, it appears that on these occasions the SLI children process the meaning of the quantifier as a non-specific plural marker, indicating more than one. It was noted that one SLI child commented during testing that two of the Monkeys were tickling Mowgli, so yes, the sentence was correct. A trend consistent with this interpretation is also evident for *some* of the SLI children for the quantifier ''every''. However, the errors for the Every–name condition can be largely accounted for by one SLI child who made 5/6 errors on the Every–name mismatch condition. Three SLI children made one error, but 8 of the SLI children did not make any errors on these quantifier sentences. Further investigation of SLI children's understanding of quantifier NPs is warranted.

4. Discussion

We shall first summarize the results from the normally developing, LA control children before discussing the findings for the SLI children in relation to these data.

For the five control conditions, the judgements by all three LA control groups were close to ceiling. Their percentage correct was above 97% for both the match and mismatch conditions. These findings closely replicate and support those of Chien and Wexler (1990) on which this study was based. The results indicate that normally developing children of over 5:9 years know the concepts of quantified NPs, such as *every* and *all*, and can also use semantic–gender cues to help facilitate assigning reference to reflexives and pronouns.

The results from the experimental name–reflexive and name–pronoun conditions indicate that the LA controls also have knowledge of the lexical properties underlying Binding Principles A and B: the LA control groups judged correctly over 95% of the sentences for the match conditions and between 80% and 88% of the sentences for the mismatch conditions. The findings concur with the many previous investigations of binding theory which indicate that children from the age of around 6:0 years know that a reflexive expresses a self-oriented action and must be coreferential with a local c-commanding antecedent (e.g., Chien and Wexler, 1990; Lust, 1986, 1987; McDaniel et al., 1990; Grimshaw and Rosen, 1990; Deutsch et al., 1986). For the name–pronoun judgements the LA controls' good performance (accepting non-local antecedents and rejecting local antecedents) also concurs with the previous investigations cited above. For example, Chien and Wexler's 6- to 7-year-olds, who were closest in age to the LA1 controls, rejected a local antecedent for pronouns 76.7% of the time.

The quantifier–pronoun and quantifier–reflexive conditions were included in this study to investigate the children's ability to accept or reject coreference with a bound variable, thought to preclude alternative non-bound interpretations. It was perhaps not surprising, since the LA controls performed almost perfectly on the name–pronoun condition, that they also performed well on the quantifier–pronoun condition. However, before we can conclude that a quantifier–noun antecedent improves the bound variable reading with pronouns the LA controls' performance on the quantifier–reflexive condition needs to be considered.

The LA control groups had a high percentage of correct responses ($>88\%$ correct) on the quantifier–reflexive match condition. However, a marked decrease in correct responses on the quantifier–reflexive mismatch condition was found for the LA1 controls and, to a lesser extent, for the LA2 and LA3 controls. Careful observation of previous research findings reveals that this is a consistent pattern in the data. In Chien and Wexler's (Chien and Wexler, 1990) study for all the children (aged from <4:0 to 7:0 years) a similar trend was evident. For example, in Chien and Wexler's Experiment 4, the 4- to 5-year-olds' scores decreased for the quantifier–reflexive in comparison to the name–reflexive sentence types by 16% and 27% for the match and mismatch conditions respectively. The implications of this finding will be taken up again later in the discussion.

We conclude that the performance shown by the LA control groups indicates that they have the prerequisite lexical knowledge of anaphors and pronouns; that is, a reflexive is [+ A − P] and expresses a self-oriented action; a pronoun is [−A + P] and expresses an other-oriented action. Therefore, on this basis we may also expect the SLI children to have lexical knowledge of anaphors and pronouns.

The SLI children had a qualitatively different pattern of performance across the sentence types than the LA control groups, as shown by the significant Group × Sentence type interactions. On the quantifier–pronoun and name–reflexive conditions the SLI children performed as well as (if not slightly better than) the LA control groups and no significant differences were found between the groups. This is an important finding as it indicates that any difference in the SLI children's performance cannot be attributed to a general procedural or processing problem in accepting correct and rejecting inappropriate antecedents, or to assigning disjoint reference. However, the SLI children generally performed significantly below even the youngest matched LA1 control children on the name–pronoun and quantifier–reflexive conditions. For the two mismatch conditions the SLI children's performance was not significantly different from chance.

We shall now consider what we can conclude from the pattern of performance produced across the sentence conditions by the SLI children; that is, does their performance indicate that they do or do not have knowledge of the lexical properties of pronouns and anaphors, and/or knowledge of Binding Principles A and B?

The match and mismatch pictures for the name–reflexive conditions show a self-oriented and other-oriented action respectively (see Table 3). Therefore, we may conclude that the SLI children's good performance on both these conditions indicates that they too have the lexical–conceptual knowledge that the reflexive expresses a self-oriented action. With only this knowledge of the lexical properties of the reflexive, but not necessarily the knowledge of Principle A, the SLI children would be able to achieve a correct response. However, the SLI children, like their younger language peers, surprisingly, showed a marked decrease in correct responses for the match and mismatch quantifier–reflexive conditions (see Fig. 1(a),(b)). The complexity of constructing the distributed reading associated with the quantifier-bound variable, as suggested by Grimshaw and Rosen (1990), may account for the pattern of responses in the quantifier conditions. Grimshaw and Rosen hypothesized that children fail to construct the bound reading for quantifier NP sentences on a percentage of trials (e.g., 20%). Thus, overall, quantified NPs will increase correct performance for pronouns which involves rejecting a bound antecedent. Alternatively, for reflexives, if the bound variable interpretation is not constructed, performance will decrease, as reflexives require accepting a bound antecedent. The pattern of performance found for the SLI children and the normally developing children is consistent with Grimshaw and Rosen's predictions. The interpretation is supported by the quantifier control conditions which indicates that SLI children may have some general difficulties in interpreting the bound variable reading for quantifiers. The data for the quantifier control sentences

indicate that the SLI children may interpret the quantifier as a non-specific plural marker involving all the named characters. Hence, they may reject coreference between a quantified noun (represented, for example, by three monkeys) and the pronoun or the anaphors on the basis of a mismatch between the number features of the reflexive and the depicted antecedents. Further investigations are required with the plural pronoun and reflexive, which it is predicted would improve the SLI children's performance.

On the name–pronoun condition the SLI children's chance level of performance when rejecting a local antecedent (see Table 4) appears similar to that usually found for children of less than 4 or 5 years of age (Chien and Wexler, 1990; Crain and McKee, 1985; Solan, 1983). The chance level of performance, rather than a significantly below chance performance, is easily explained if several factors in relation to the lexical properties of the NPs and the overall sentence interpretation are considered: specifically knowledge of semantic gender, reflexive marking of the predicate, and the assignment of the agent theta role to the subject NP. If the SLI child was only relying on these factors and not on syntactic knowledge of Principle B, it can be seen that there would be a conflict as to whether to accept or reject the sentence–picture pair. Therefore, one may expect performance to be at chance, as indeed was found.

We shall now turn to the quantifier–pronoun condition to see if these data are compatible with our interpretation: that is, the SLI children are basing their assignment of reference to pronouns largely on lexical knowledge and are not constrained by Binding Principles. The SLI children's good performance on the quantifier–pronoun condition, that is, when the antecedent is a bound variable, concurs with the many previous findings for young children (Avrutin and Wexler, 1993; Chien and Wexler, 1990; Grodzinsky and Reinhart, 1993). Based on the two pronoun conditions alone we could conclude that the SLI children lack either pragmatic rules (Chien and Wexler, 1990) or the processing capacity to compute the appropriate reference (Grodzinsky and Reinhart, 1993) as pragmatic rules or processing capacity are relevant for ruling out coreference in the noun–pronoun condition. Superficially, the data indicate that when the only logical interpretation available is one in which the antecedent and pronoun are coindexed (as in the quantifier–pronoun condition) Principle B correctly rules it out. However, the SLI and LA control children's poor performance on the quantifier–reflexive condition is in direct conflict with this interpretation. Instead, our data support Koster's (Koster, 1993) claim that children resist binding a quantifier antecedent with a pronoun or anaphor. Further investigations may reveal whether SLI children's problems with quantifiers are independent of their problems with pronominal and reflexive reference. The findings from this study pose a problem for the ''Pragmatic rule'' deficit, or a general processing capacity explanation for failures with BT. Taken together, the different pattern of performance for pronouns and reflexives when the antecedent is a name or quantified NP cannot be explained by either a Pragmatic rule deficit (Chien and Wexler, 1990) or a general Processing deficit (Grodzinsky and Reinhart, 1993). Do the children sometimes have the

pragmatic rule or processing capacity but not at other times? If so, why? And why are no pragmatic impairments found in Grammatical SLI children? (van der Lely, 1996b, 1997; Surian et al., 1996).

EXPERIMENT 2

Experiment 2 was largely a replication of Experiment 1 in that the same testing procedure was used (a sentence–picture judgement task) and all the experimental conditions tested in Experiment 1 were tested in Experiment 2 (i.e., name–pronoun/reflexive and quantifier–pronoun/reflexive conditions). However, Experiment 2 differed in that a subordinate sentence was used (e.g., *Mowgli says Baloo Bear is tickling him/himself*). The use of a subordinate sentence provides two potential c-commanding antecedents and enables us to assess more directly the SLI children's syntactic knowledge of a ''local domain''. In addition, it eliminates potential forced errors due to the unavailability of an appropriate sentence-internal antecedent.

Two further mismatch conditions for the reflexives were included in Experiment 2. It can be recalled that previous investigations have found that reflexives are correctly understood by 3–4 years of age and, therefore, may provide the clearest experimental test of the grammatical knowledge of BT. The additional reflexive mismatch conditions (the name–reflexive syntax and the quantifier–reflexive syntax) provided a test of SLI children's ability to rule out violations of Principle A when knowledge of the lexical properties of the reflexive is insufficient for interpretation of coreference. That is, we provided the opportunity for the children to make an ''antecedent'' error. An example of one sentence used to test Principle A and the three pictures paired with the presentation of the sentence is given in (8) below.

(8) Test sentence: *Mowgli$_A$ says Baloo Bear$_B$ is tickling himself*

Pictures:
- (a) name–reflexive match: B tickles B
- (b) name–reflexive orientation mismatch: B tickles A
- (c) name–reflexive antecedent mismatch: A tickles A

It can be seen that, unlike (8a) and (8b), (8c) requires syntactic knowledge of Principle A and cannot be accepted or rejected on the basis of knowledge of the lexical properties of ''self'' or ''himself'' alone as a marker of a self-oriented action. The two gender control conditions (gender–reflexive and gender–pronoun) were also included to ensure that, with the more complex subordinate sentences, the children could still use lexical semantic cues accurately to facilitate correct assignment of coreference.

5. Method

5.1. Subjects

The same four subject groups (SLI children, LA1, LA2, LA3 controls) who participated in Experiment 1 participated in Experiment 2.

5.2. Design and materials

The same test sentences relating to the experimental conditions used in Experiment 1 were modified to construct the subordinate sentences for Experiment 2. The verb *say* was used in the main clause. The character who in Experiment 1 was only mentioned in the introductory sentence but not in the test sentence was added to the subject position of the main clause. A further two sets of sentences were added for the experimental mismatch conditions which related to the name–reflexive syntax and quantifier–reflexive syntax mismatch conditions. For these sentences, the name or quantifier NP used in the original sentence became the subject of the main clause and the additional (previously unmentioned) character was placed in the subject position of the subordinate clause (e.g., *Every Monkey says Mowgli is tickling himself*).

There were 6 sentences for each of the 14 conditions, giving a total of 84 test sentences. A sample list of the experimental sentence conditions with the corresponding match, mismatch and syntactic mismatch pictures can be found in Table 6. The same pictures used in Experiment 1 were used in Experiment 2. The sentences were assembled in a random order and a new test booklet and testing form was prepared.

5.3. Procedure

The procedure was identical to that carried out for Experiment 1. The verb in the embedded sentence was stressed to ensure that the children based their judgements on this embedded sentence and not the first sentence (in which case the children would judge whether the character in the picture was *saying* something or not). Two practice sentences were administered to ensure that the children were correctly judging the embedded sentence.[8] Administration of the test sentences took approximately 15–20 minutes and included a break of a few minutes half way through. Experiment 2 was carried out 3–4 months after Experiment 1.

[8] We did not find on any occasion that the children's responses to the practice items indicated that they were judging the first sentence. If this had been so, we would have expected that they would have wrongly accepted the mismatch practice item. In this picture both characters had their mouths open and so could have been saying something.

Table 6
Experiment 2: examples of the test sentences–picture pairs for the experimental conditions

Sentence type	Sentence example	Picture description	
		Match	Mismatch
Experimental conditions			
Name–pronoun	Baloo Bear says Mowgli is tickling him	A tickles B (Baloo Bear)	A tickles A (Mowgli)
Quantifier–pronoun	Mowgli says every monkey is tickling him	Every C (monkey) tickles A	Every C tickles every C
Name–reflexive	Baloo Bear says Mowgli is tickling himself	A tickles A	A tickles C (Baloo Bear)
Quantifier–reflexive	Mowgli says every monkey is tickling himself	Every C tickles every C	Every C tickles A
Name–refl syntax	Mowgli says Baloo Bearis tickling himself	–	A tickles A (Mowgli)
Quant–refl syntax	Every monkey says Mowgli is tickling himself	–	Every C tickles every C

6. Results and discussion

The number of correct responses for the match and mismatch conditions for the four subject groups was calculated. The mean scores for each subject group for the 10 experimental and 4 control conditions can be found in Table 7 Table 8 respectively.

The match and mismatch experimental conditions were analysed separately in a 4×4 (match) and 4×6 (mismatch) (Group $\times$ Sentence type) ANOVA (see Fig. 2(a),(b)). As in the previous experiment the SLI children's performance was worse than the three LA control groups on some but not all of the sentence conditions. The results of the analyses supported and extended the results of Experiment 1.

6.1.1. Match conditions

A significant main effect of sentence type was found ($F(3, 132)$ 8.20, $p <$ .0001) but the main effect of Group did not reach the significance level. However, the Group $\times$ Sentence type interaction was significant ($F(9, 132) = 2.35$, $p =$ .017).

Planned comparisons revealed that the interaction could be attributed to a

Table 7
Experiment 2: mean scores for the experimental sentence conditions for the SLI children and the three Language ability control groups

Sentence type	Subjects			
	SLI Mean (*SD*)	LA1 controls Mean (*SD*)	LA2 controls Mean (*SD*)	LA3 controls Mean (*SD*)
Name–pronoun				
Match	5.67 (0.65)	5.83 (0.39)	5.92 (0.29)	5.92 (0.29)
Mismatch	3.83 (1.89)	5.58 (0.67)	5.50 (0.79)	5.75 (0.62)
Quantifier–pronoun				
Match	5.83 (0.39)	6.00 (0.00)	6.00 (0.00)	6.00 (0.00)
Mismatch	5.33 (1.07)	5.83 (0.39)	5.75 (0.62)	5.67 (0.65)
Name–reflexive				
Match	5.75 (0.45)	5.75 (0.62)	5.50 (0.67)	5.83 (0.39)
Mismatch	4.83 (1.27)	5.75 (0.52)	5.58 (0.84)	6.00 (0.00)
Quantifier–reflexive				
Match	5.00 (0.85)	5.00 (1.47)	5.67 (0.89)	6.00 (0.00)
Mismatch	2.75 (1.96)	4.33 (1.56)	4.58 (1.88)	5.59 (0.91)
Name–reflexive syntax				
Mismatch	3.00 (1.86)	4.67 (1.37)	5.17 (1.12)	5.75 (0.45)
Quantifier–reflexive syntax				
Mismatch	3.75 (1.86)	4.92 (1.08)	5.42 (0.90)	5.08 (0.90)

Note: Maximum score = 6.

Table 8
Experiment 2: Mean scores for the control sentence conditions for the SLI children and the three LA control groups

Sentence type	Subjects			
	SLI Mean (*SD*)	LA1 controls Mean (*SD*)	LA2 controls Mean (*SD*)	LA3 controls Mean (*SD*)
Gender–reflexive				
Match	5.75 (0.45)	6.00 (0.00)	6.00 (0.00)	5.92 (0.29)
Mismatch	5.08 (1.31)	6.00 (0.00)	5.75 (0.62)	6.00 (0.00)
Gender–pronoun				
Match	5.75 (0.45)	6.00 (0.00)	6.00 (0.00)	5.92 (0.29)
Mismatch	5.00 (1.12)	6.00 (0.00)	5.67 (0.65)	6.00 (0.00)

Note: Maximum score = 6.

significantly worse performance on the quantifier–pronoun sentences by the SLI children as compared to the youngest LA1 controls ($F(1, 44) = 4.40$, $p < .042$), and the older LA2 and LA3 control groups ($F(1, 44) = 5.87$ $p = .020$). The SLI children also made significantly fewer correct responses than the LA2 and LA3 controls on the quantifier–reflexive condition (($F(1, 44) = 6.01$, $p = .018$). Although the SLI children's performance was significantly lower than the LA controls for these analyses, they scored very highly on the quantifier–pronoun condition (97% correct), and the quantifier–reflexive condition (83% correct) (see Table 7 and Fig. 2(a)). Therefore, caution is expressed in attributing too much weight to these results. There were no significant differences between the groups for the name–reflexive or name–pronoun conditions. Thus, the findings indicate a weakness for the SLI children in interpreting the quantifier NP as a bound variable.

6.1.2. Mismatch conditions

Analysis of the mismatch conditions revealed significant main effects for Group ($F(3, 44) = 13.16$, $p < .0001$), Sentence type ($F(5, 220) = 13.08$, $p < .0001$), and a significant interaction ($F(15, 220) = 2.14$, $p = .004$).

Planned comparisons revealed, generally, significantly fewer correct responses by the SLI children than both the LA1 controls (analysis A) and the older vocabulary-matched LA2 and LA3 controls (analysis B) (see Table 7 and Fig. 2(b)). (For the name–reflexive $F_A(1, 44) = 8.93$, $p < .005$; $F_B(1, 44) = 13.02$, $p < .001$; name–pronoun $F_A(1, 44) = 14.48$, $p < .0001$; $F_B(1, 44) = 20.24$, $p < .001$; quantifier–reflexive $F_A(1, 44) = 5.66$, $p < .022$; $F_B(1, 44) = 15.82$, $p < .0001$[9]). However, on the quantifier–pronoun condition the SLI children performed relatively well (88.8% correct) and no significant differences were found between the groups. Further analyses of the sentence conditions (see Table 7) showed that, as in Experiment 1, the SLI children's performance did not differ significantly from chance for the name–pronoun mismatch condition ($t(11) = 1.52$,

[9] The syntactic–mismatch conditions, which formed part of this analysis, are reported below for purposes of clarity.

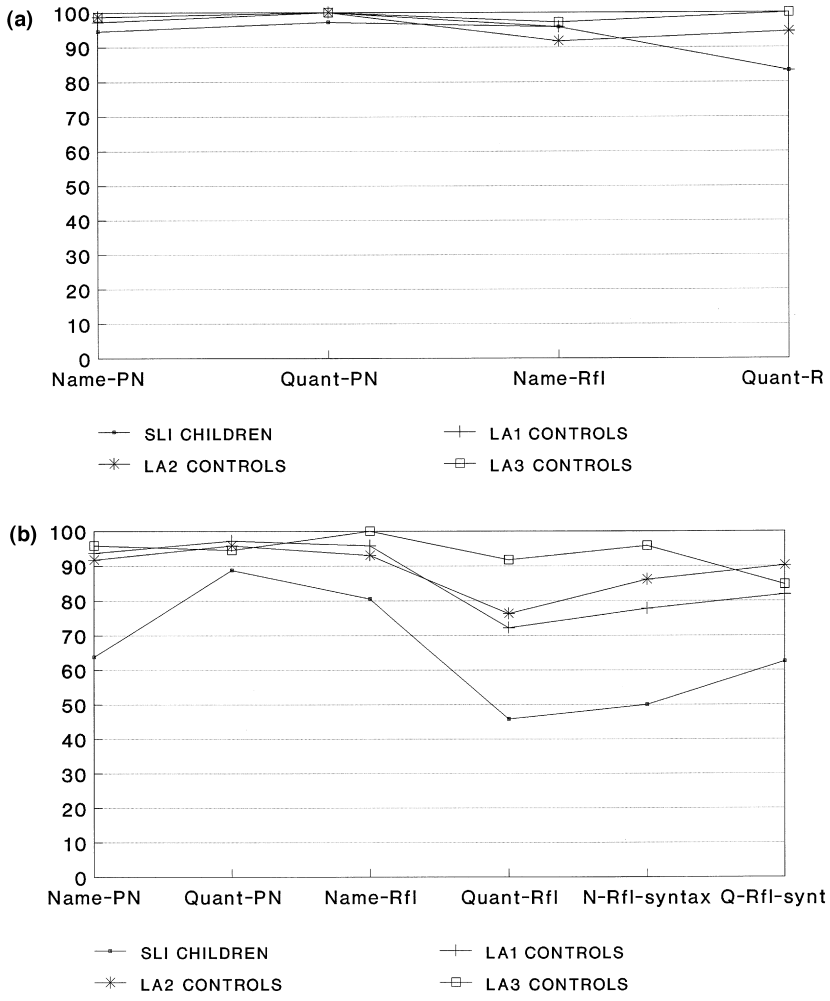


Fig. 2. Experiment 2. Mean percentage correct for the SLI children and LA control groups on the match (a) and mismatch (b) experimental sentence conditions.

$p > .05$), or the quantifier–reflexive mismatch condition ($t[11] = 0.44$, $p > .05$), but they performed significantly above chance on the name–reflexive and quantifier–pronoun mismatch conditions. Thus, the results for the SLI children in Experiment 2, in which a subordinate sentence was used, replicate the results of Experiment 1 in which only one c-commanding antecedent was available in the test sentence.

Observation of Fig. 2(b) indicates that differences between the sentences with the name versus quantified NPs is again causing opposite effects for the interpretation of pronouns and reflexives. The SLI children's performance on the quantifier–pronoun mismatch condition was significantly better than their per-

formance on the name–pronoun mismatch condition ($t(11) = -2.83$, $p = .016$), whereas their performance on the quantifier–reflexive condition was significantly worse than their performance on the name–reflexive condition for both the match condition ($t(11) = 300$, $p = .012$), and the mismatch condition ($t(11) = 3.23$, $p = .008$). The LA controls' responses also showed a trend for worse performance on the quantifier–reflexive condition than the name–reflexive mismatch condition. The difference between these conditions was significant for the LA1 controls ($t(11) = 3.56$, $p = .004$). The quantifier NP did not significantly improve the LA controls' performance for the pronoun conditions. This may be attributed to the very high level of performance for the match and mismatch conditions achieved by all of the control groups on sentences testing Principle B.

6.1.3. Syntactic mismatch conditions

The most important analyses in Experiment 2 were on the data from the two sets of sentences testing Principle A in which knowledge of the lexical properties of reflexives was insufficient to achieve a correct interpretation. First, the SLI children performed significantly below the LA control groups on the name–reflexive-syntax ($F_A(1, 44) = 9.83$, $p < .003$; $F_B(1, 44) = 28.52$, $p < .0001$) and the quantifier–reflexive-syntax conditions ($F_A(1, 44) = 5.21$, $p < .027$; $F_B(1, 44) = 11.48$, $p < .001$) (see Table 7 and Fig. 2(b)). In addition, on these sentence conditions the SLI children performed at chance ($t(11) = 0.00$, $p > .4$, name–reflexive syntax; and $t(11) = 1.394$ $p > .05$, quantifier–reflexive syntax). This is clearly an important finding as it indicates that this group of Grammatical SLI children do not reliably rule out coreference based on the syntactic knowledge characterized by BT. Because of the significance of this finding and the known potential heterogeneity of groups of SLI children, an individual subject analysis was carried out on the name–reflexive syntax conditions. We were concerned with whether all or only some of the SLI children showed an inability to reliably use the syntactic knowledge of Principle A.

Weighting a criterion against accepting our hypothesis, we set a liberal criterion of 4 or more out of 6 correct responses as showing knowledge of Principle A ($p = .344$, cumulative Binomial probability).[10] Ten of the 12 SLI children failed to meet this criterion, making between 2–6 errors. The two SLI children (JS, RJ) who reached the criterion did not make any errors. In contrast to the rest of the group, these two SLI children appear to be able to rule out coreference based on the syntactic knowledge underlying Principle A.

Finally, comparisons between the name–reflexive and name–reflexive syntax condition (see Table 7) revealed that the SLI children and LA1 controls' scores were significantly worse when the lexical property of a ''reflexive action'' was insufficient to guide their judgements of coreference ($t(11) = 3.34$, $p = .007$, SLI children; $t(11) = 2.49$, $p = .030$, LA1 controls). There were no significant differences for the older two control groups on these comparisons, although a similar

[10] A child would have had to score 6 out of 6 correct to have a probability of achieving a performance above chance ($p = .0156$, cumulative Binomial).

trend for the children to perform worse on the name–reflexive syntax condition was evident (see Fig. 2(b)). These data indicate that normally developing children do make some antecedent errors for reflexives (i.e., violations of Principle A) when the lexical properties of the antecedent match those of the reflexive. In total, for the three LA control groups, 7 children made up to 2 antecedent errors on the name–reflexive syntax condition. Thus, the results support Koster's (Koster, 1993) findings and the view that the lexical properties of the anaphor may be used to facilitate judgements of coreference. However, although the LA control children generally showed a trend to perform worse on the reflexive-syntax conditions their performance, unlike the SLI children, was still significantly above chance ($t(11) > 2.97$, $p < .05$ for all analyses).

6.2. Control conditions

The control sentence conditions were analysed in a 4×4 ANOVA. This analysis revealed a significant effect of Group ($F(3, 44) = 5.45$, $p = .003$), which reflected fewer correct responses by the SLI children. However, a ceiling effect was evident for the LA control groups (see Table 8). The SLI children achieved 95% correct for the two match conditions and, importantly, scored more than 83% correct on the Gender–reflexive and Gender–pronoun mismatch conditions. Thus, it appears that the SLI children can ''check'' and compare lexical–semantic feature of the gender (sex) of two constituents in a subordinate sentence to facilitate correct acceptance or rejection of coreference for reflexives and pronouns.

GENERAL DISCUSSION

This study has investigated the ability of Grammatical SLI children and younger LA control children to assign reference to pronouns and anaphors based on their syntactic knowledge as characterized by BT. The findings of Experiments 1 and 2 concurred. We will argue that the pattern of responses from these experiments indicates that both the SLI children and the LA controls are sensitive to semantic–conceptual lexical knowledge associated with reflexives and pronouns. The children use this information to help make judgements about the reference of anaphors and pronouns. We claim that for normally developing children, when the lexical properties are consistent with the syntactic representations (e.g., both sources of knowledge rule out coreference) correct performance is facilitated. However, in the absence of the additional lexical support to determine coreference, normally developing children, generally, are still able to determine coreference appropriately based on their syntactic knowledge. This was clearly not the case for the SLI children who performed at chance when syntactic information was required to rule out inappropriate coreference. We consider below possible explanations for these findings. We will argue that a range of factors, including knowledge of lexical properties and theta role assignment, as well as syntactic knowledge of Binding Principles need to be considered when accounting for the children's judgements of coreference in the sentences. We will conclude that

Grammatical SLI children, generally, have sufficient knowledge of the semantic/conceptual lexical properties of pronouns and reflexives and theta role assignment to judge the sentence–picture pairs but that they do not have the syntactic knowledge characterized by BT; that is, their syntactic representation appears to be ''underspecified'' with respect to coindexation between constituents. We will then discuss possible options for the linguistic nature of this underspecified syntactic representation which can account for the findings from this study and previous linguistic investigations of Grammatical SLI children

7. Conceptual and semantic lexical properties

The findings from Experiments 1 and 2 indicate that the children have knowledge of semantic/conceptual lexical properties of the pronominals *him*/*her* and the reflexives *himself*/*herself*, which facilitate correct identification of a referent. The results indicate that the more semantic/conceptual features an antecedent and pronoun or anaphor share, which also clearly differentiate the antecedent as *the* referent from other possible referents, the more likely the child is to respond correctly. In this study the properties of semantic gender, number, and reflexive marking (or non-reflexive marking) of the predicate as appropriate for reflexives or pronouns were found to facilitate the children's correct judgements. The results of Experiment 2 further indicate that the SLI children interpret a quantified noun as a non-specific plural, possibly akin to *all*. The conflicting nature of these conceptual–semantic properties in some of the mismatch conditions leads to a chance level of performance, rather than 100% incorrect performance which could be expected if the child did not have knowledge of Binding Principles.

The data, across all the sentence conditions, indicate that the SLI children, generally, assign the agent theta role appropriately to the NP preceding the verb. It is possible that the SLI children's problems with assigning thematic roles could have exacerbated their problems with judgements of coreference and may have contributed to their worse performance in Experiment 2 with the subordinate sentences. However, it is with sentence structures other than those used in this experiment, such as passive sentences, which cause particular problems for the SLI children in terms of thematic role assignment. Generally, transitive active sentences, which were used in this experiment, are interpreted correctly with respect to thematic role assignment. This group of SLI children achieved a score of 93% correct responses for active sentences in a 4 picture–sentence choice task which was designed to assess their assignment of thematic roles (van der Lely, 1996c). The contribution of theta role assignment to the SLI children's judgements will be further discussed in the next section.

8. Syntactic knowledge

The normally developing children, generally, correctly rejected coreference between a reflexive and a non-local antecedent, even if this antecedent was

carrying out a reflexive action. The performance of even the youngest LA controls was significantly above chance. The findings indicate that the LA control children can base their judgements on the syntactic representation of the sentence and their underlying syntactic knowledge of coreference. These results concur with the findings of Grodzinsky and Kave (1994) who observed that children as young as 3:0 years perform above chance and by 5:0 years children do not make any ''antecedent errors'' with reflexive sentences. In contrast, 10 of the 12 SLI children performed at chance on the name–reflexive syntax condition. These data provide the strongest evidence to indicate that the SLI children are not able to use the syntactic knowledge characterized by BT to contribute to judgements of the assignment of reference to reflexives.

A comparison of Fig. 1(b) and 2(b) or Tables 4 and 7 shows a trend for each of the LA control groups to perform better on the name–pronoun condition in Experiment 2 than in Experiment 1. This may be attributed to the availability of an appropriate non-local antecedent in the subordinate sentences. Thus, a syntactically defined antecedent facilitates normally developing children's rejection of an incorrect coreference. These data support the findings of Jakubowicz (1989) and Koster (1993) who concluded that by providing an appropriate sentential antecedent, rather than one merely in the preceding discourse or contextual environment, ''forced errors'' for pronouns are avoided. In view of this finding it is particularly interesting that the SLI children do not seem to be influenced by this additional syntactic information. Tables 4 and 7 show that the SLI children's performance in Experiments 1 and 2 for the name–pronoun mismatch condition is identical.

We claim that the SLI children's performance is easily accounted for when the appropriate use of the lexical properties of reflexives and pronouns but the lack of syntactic knowledge of BT are taken into consideration in their judgements. We will work through just one example in detail to illustrate this point; that is, the name–reflexive syntax mismatch condition. One of the sentence–picture pairs for this condition was the sentence *Mowgli says Baloo Bear is tickling himself*, accompanied by the picture showing Mowgli tickling himself and Baloo Bear standing nearby. Thus, the depicted referent for *himself* correctly shows a singular male referent carrying out a reflexive action. On this basis alone we could have expected the SLI children to have incorrectly accepted all the pictures if syntactic knowledge of BT was absent. However, their 50% chance level of performance indicates that there was some conflict in their decision. This may be accounted for by their awareness of the incorrect depiction of the agent theta role.

It is interesting that for the normally developing children, particularly at younger ages, the lexical properties of pronouns and reflexives, theta role assignment and the syntactic knowledge of Binding Principles appear to make independent contributions to the ill-formedness of the sentence–picture pairs. Thus, it is not merely syntactic principles which are affecting the children's judgements, as suggested by Reinhart and Reuland (1993), but also lexical properties. In view of the paradigm used in these experiments, that is, an ''off-line'' task which requires some degree of conscious reflection and decision making, it is not surprising that all the children were influenced by the conceptual–semantic lexical properties. However, whilst the non-syntactic factors appear to

influence to some extent the LA control children's judgements (particularly the younger children) the syntactic factors are clearly playing a major role in their decisions, given that the LA controls perform consistently above chance level. This is clearly not the case for the Grammatical SLI children. All the evidence outlined above strongly indicates that the SLI children have a good knowledge of lexical–conceptual information but not the necessary syntactic information provided by the syntactic representation to rule out inappropriate coreference.

Based on the findings from this study it would be predicted that Grammatical SLI children should also be impaired in other tasks which require knowledge of BT, such as Principle C, which is concerned with the properties of referential expressions. Further investigations are required to test this prediction.

9. Cognitive processing

Can a deficit in cognitive processing account for the pattern of performance found for the SLI children? First, it should be noted that considerably younger children performed consistently above chance on all conditions. Based on non-linguistic performance tasks (e.g., Block design, British Ability Scale), these younger children were functioning at a much lower level than the SLI children. Therefore, the findings from this study do not support a general processing explanation for the data. However, it is possible that if we had tested even younger children their pattern of performance would have been similar to the SLI children's. Thus, performance factors, which have been argued to account for young children's failures with Binding Principles, could also account for the SLI children's failures. Chien and Wexler's (Chien and Wexler, 1990) study, Experiment 4, on which Experiment 1 was based, allows us to investigate this possibility. Chien and Wexler's 4- to 5-year-old group, like our SLI subjects, performed at chance on the name–pronoun mismatch condition. In addition, both groups (Chien and Wexler's 4- to 5-year-olds and our SLI children) (see Table 4 and Fig. 1) show a similar drop of around 17% (to approximately 75% correct) on the quantifier–reflexive *match* condition in comparison to the name–reflexive match condition (92% correct). In contrast, the quantified antecedent improved both groups' performance for the quantifier–pronoun condition. The percentage increase in correct responses for the groups was similar for the match condition. However, on the mismatch quantifier–pronoun condition the SLI children performed at ceiling (94.5% correct) whereas the 4- to 5-year-olds still performed at chance (60% correct),[11] albeit their performance showed improvement. Furthermore, the 4- to 5-year-olds showed a *general* impairment with *all* of the mismatch conditions, including the control conditions. For example, on the name–name mismatch condition (where no knowledge of pronouns or reflexives is required) Chien and Wexler's 4- to 5-year-olds scored only 83% correct, whereas our SLI children

[11] We estimated that 60% correct responses was at chance based on our data. Chien and Wexler do not provide the standard deviations for the scores which would enable us to carry out a one-sample *t*-test, which is needed to test this.

scored 100% correct. The pattern of performance shown by the 4- to 5-year-olds could be expected if the SLI children were having general performance difficulties with the task. However, it appears that the SLI children's pattern of performance is not similar to very young children's performance who also appear to violate Binding Principles.

In conclusion, whilst the evidence from the comprehension of pronouns and reflexives in young normally developing children indicate that their failures to obey Binding Principles are due to performance factors we see no convincing evidence to indicate that this is so for the Grammatical SLI children. Instead, the data for the Grammatical SLI children indicate that they lack the (innate) syntactic knowledge of Binding Principles.

10. The underlying nature of Grammatical SLI[12]

We shall now consider whether an underspecification of the syntactic representation can account for the SLI children's failure with Binding Principles and what the nature of this ''underspecification'' may be. We will also consider other pertinent syntactic characteristics of Grammatical SLI which the theory must account for. These include the omission of tense marking and agreement marking, and incorrect assignment of theta roles, particularly in full passive sentences. Based on the findings from this study, we can add to the list of linguistic characteristics incorrect assignment of coreference for anaphors and pronouns and problems with deriving a bound variable interpretation for quantified nouns. It is of note that many of these phenomena are also found in young, normally developing children, usually of less than 3 years of age. We shall consider whether some of the recent explanations for these phenomena in language acquisition can shed light on the underlying linguistic nature of SLI children's ''underspecified'' syntactic representation.

Recently, a number of researchers have postulated that the young child has a syntactic representation that is ''underspecified'' (non-adult-like) and that they will construct phrase structure trees in a gradual fashion when justified by positive evidence (Clahsen et al., 1993; de Villiers and Roeper, 1995; Radford, 1990; Rizzi, 1994; Tsimpli, 1992). They argue that structural simplifications can account for features of child language such as optional use of infinitives, omission of case and agreement marking, and omission of functional categories. These researchers' hypotheses vary as to the form of the structural simplification: for example, the absence of all functional categories (Radford, 1990; Tsimpli, 1992); the absence of some functional category, such as CP (Complementizer Phrase) (Clahsen et al., 1993, 1994); or the child may ''choose'' a more economical under-representation, such as choosing an NP rather than a DP (Determiner Phrase) (de Villiers and Roeper, 1995). Another feature of young children's language, highlighted by Wexler (1994), is the use of infinitives in matrix clauses. Rizzi (1994) provides an

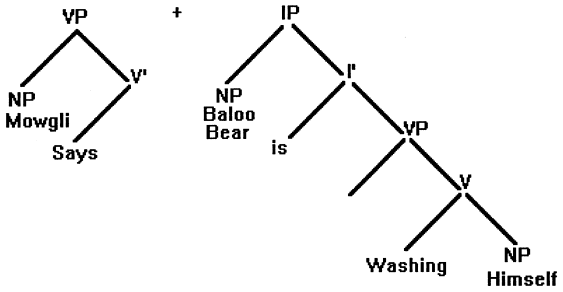
[12] We are particularly grateful to Rita Manzini for discussions and her comments on this section. However, any remaining problems are our responsibility.

alternative account to the absence of functional categories for children's infinitival errors. He has hypothesized that whilst the child's syntactic representations have all functional categories available, root infinitives may occur due to the structure being ''truncated''. Rizzi hypothesizes that this is due to the child selecting the wrong ''axiom'' for the point of departure to generate the structure; for example, instead of CP the child may choose VP.

A different approach to structural simplification is taken by Giannelli and Manzini (1995) (based on Manzini, 1995), who hypothesize that grammar growth is essentially growth in complexity. Giannelli and Manzini (1995) propose that the first stage of language acquisition is restricted to ''local relations'' (Chomsky, 1993). Thus, binary relations are allowed (e.g., head–complement; specifier–head; head–head) but more complex relations are banned. Giannelli and Manzini hypothesize that the initial stage is restricted essentially to two member elementary dependencies. In later stages of acquisition, longer, more complex dependencies are formed by ''composing'' elementary ones. Empirical evidence from child language data such as the presence of elementary dependencies, for example, [Asp, V] or [D, N], but the absence of non-elementary dependencies, for example, [T, Asp, V] or [D, Agr, N], is given in support of their hypothesis (Giannelli and Manzini, 1995).

So, is a variation of these simplified P-S trees a realistic option to explain the syntactic impairments in Grammatical SLI children? We will take the premise that SLI children generate ''less complex'' P-S trees and see how far it can account for the data. One possibility is that SLI children may generate a more simplified tree whenever such a structure is ''sufficient'' (but not adult like) to account for all the constituents in an utterance. In particular, the SLI child could generate two adjacent, coordinated trees for the subordinate utterance in Experiment 2, as shown in (8).[13]

(8)



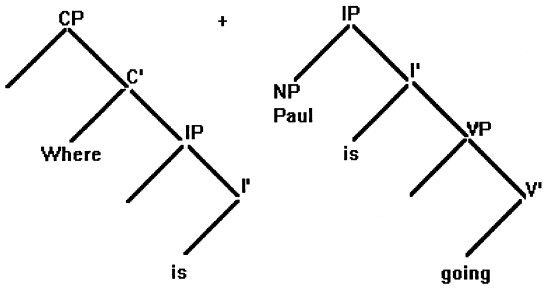
It is notable that SLI children produce very few subordinate clauses in their spontaneous speech, which would be predicted by this proposal (see Appendix 1). The quantifier may also be simplified as a specifier in the NP rather than in DP (see de Villiers and Roeper, 1995). Analysis of the quantifier as a specifier in the NP by the SLI could account for why they did not produce a distributed bound variable reading for the sentences with quantified nouns.

[13] We are using the '' + '' sign to represent coordination because at this point in time we do not want to commit ourselves to any particular syntactic theory with respect to coordination. For recent discussion see Kayne (1994).

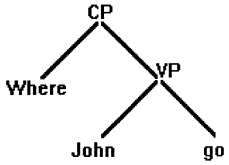
This proposal does not claim that any functional category is missing *per se*. In fact, given the data it would be hard to make such a claim as SLI children show that they can produce most if not all morphological and syntactic forms, such as tense marking. They just appear to have a grammar which also allows alternative representations in which, for example, tense marking is not obligatory. Therefore, our proposal is not consistent with acquisition theories which propose the absence of all functional categories (Radford, 1990) or a particular functional category (Clahsen et al., 1993; de Villiers and Roeper, 1995; Wexler, 1994). Based on the proposal that SLI children build less complex, conjoined P-S trees, it would be predicted that for all syntactic functions, such as movement, agreement, and case assignment, involving relationships within a local domain, the simpler the P-S tree that could be incurred, the greater the possibility that any constituent within that tree would be realized correctly. Thus, local syntactic relations, involving simpler structures, would be more likely to be correct than complex structures. Therefore, it could be predicted, for example, that syntactic functions, such as case assignment, agreement, and theta role assignment, would be more likely to be realized correctly with intransitive verbs (which require the simplest of structures) than transitive verbs, which in turn may contain less errors than the more complex structures required for dative verbs. The evidence from theta role assignment would appear tentatively to support the predictions (van der Lely and Harris, 1990; van der Lely, 1994).

As mentioned above, we do not claim that the SLI children will not show any evidence of movement, for example in the formation of questions. However, the question is, what is the form of the syntactic representation underlying the utterance? Based on our proposal, one possibility is that the question and moved auxiliary form an adjunct, which is conjoined to the rest of the P-S, such as in (9a) below. It would be predicted that errors such as ‘‘Where is// Paul is going’’ could occur. Another possibility, which is more consistent with Giannelli and Manzini’s (Giannelli and Manzini, 1995) hypothesis, is that the child merely builds a less complex structure, such as (9b) below.

(9a)



(9b)



Interestingly, utterances from one SLI subject in this study (OC) show the pattern predicted if only local relations are generated: he consistently correctly marks subject verb agreement on the verb if it follows an overtly expressed subject, but not on any subsequent verbs such as ones in conjoined utterances: e.g., *Mum makes the bed and go to work*.

The linguistic characterization of the RDDR (the Representational Deficit for Dependent Relationships) we have proposed to account for the data from Grammatical SLI, in essence, is consistent with Giannelli and Manzini's (Giannelli and Manzini, 1995) ''Growth of grammatical complexity'' hypothesis for the initial stage of language acquisition: that is, what is at issue is the complexity of syntactic dependent relationships between constituents. However, the data from Grammatical SLI subjects would suggest that their grammar is more advanced, or complex, than the most basic binary local relations proposed by Giannelli and Manzini to characterize the initial stage of acquisition. In addition, a problem arises as to how their hypothesis can account for the apparent ''optionality'' in SLI children's grammar: for example, sentences with either the presence or absence of tense marking are produced and judged as grammatical by Grammatical SLI children. One possible explanation is that the optionality is present in the input. On the basis of input evidence alone a child could conclude that matrix infinitivals are possible in adult language (e.g., *Oh, to live in Guadaloupe!*) and in questions, sequences such as *John go* occur (e.g., *Where did John go?*). Thus, in the absence of building complex dependencies between constituents, the contexts in which infinitivals occur would not be restricted.

There is growing evidence to support the claim that SLI children have more difficulties with increasing complexity of syntactic structures: they make a greater number of theta role assignment errors with dative than transitive verbs (van der Lely and Harris, 1990; van der Lely, 1994); they rarely produce phrases with two specifiers, for example, two adjectives or an adjective and a determiner (Cromer, 1981; Clahsen, 1991; Deutsch, 1995); and the Grammatical SLI children in this study rarely used subordinate clauses. On a standardized narrative test their use of 0, or only 1, or 2 subordinate clauses could be expected for a child of less than 4:0 years (see Appendix 1).

In relation to Binding domains, with representations of only local syntactic relations, the opposition of notions such as ''local domain'' versus ''non-local domain'' which is paramount for Binding Principles does not have relevance. However, we claim that SLI children may and do develop semantic–conceptual and pragmatic relationships between constituents in their representations. It is this difference between the SLI children's ability to determine appropriate semantic and pragmatic relationships between constituents but not syntactic relationships between constituents which makes the data from these children so exciting. The discussion above is necessarily tentative but appears to provide a plausible description of the underspecification of Grammatical SLI children's syntactic representations. It is difficult to see what linguistic evidence from the input the SLI child is lacking. He shows at some level that he has all the necessary prerequisites to hear and produce appropriate morphological forms, at least on some occasions.

In addition, it is difficult to ascertain the effects of an apparently normally developing non-linguistic cognitive system and years of language remediation in facilitating (at least the appearance of) the use of more complex syntactic structures. Whilst the Grammatical SLI children's grammars may have advanced beyond the most basic binary local relationships characterizing the initial stage of language acquisition (Giannelli and Manzini, 1995), their ability to build complex syntactic dependencies is far from adult like. Further investigations are required to explore whether the Grammatical SLI children's apparent advances in syntactic complexity can be accounted for by language learning strategies outside the language module and, or whether individual stages and individual differences of complex dependencies in syntax exist in these children. However, whatever the answers are to these questions, at this point we can conclude that evidence from the input, and good non-linguistic cognitive abilities appear to be insufficient to allow the SLI child to build adult-like syntactic representations. Thus, this evidence provides a strong argument for an innate syntactic module, which is impaired in SLI children.

11. Conclusion

This study has shown that Grammatical SLI children, like younger normally developing children, use conceptual–semantic knowledge of lexical words (such as semantic gender, number, reflexivity marking) and theta role assignment to help judge whether an antecedent is an appropriate referent for reflexives and pronouns. However, the SLI children, in contrast to the LA control children, are unable to rule out inappropriate coreference between an antecedent and a reflexive when knowledge of syntactic constraints are required. The findings from this study provide further support that Grammatical SLI children have a representational deficit for dependent syntactic relationships (RDDR). We have argued that the findings for the Grammatical SLI children from this study cannot plausibly be explained by any performance or general processing capacity impairment. The range of data for Grammatical SLI children is not consistent with language acquisition theories which propose an absence of all functional categories (Radford, 1990; Tsimpli, 1992) or a particular functional category (Clahsen et al., 1993; de Villiers and Roeper, 1995; Wexler, 1994). However, we claim that a deficit with building non-elementary complex syntactic dependencies between constituents as characterized by Giannelli and Manzini (1995) provides the most parsimonious linguistic characterization of the RDDR proposal and a useful starting point for further linguistic investigation. Our explanation suggests that the maturation of innate syntactic abilities, which enables the normal child to generate adult-like complex dependencies, is dysfunctional in Grammatical SLI children. The findings are consistent with the theory that the principles governing Binding and coreference are innate and that Grammatical SLI children lack this knowledge. The data provide additional evidence for an innate syntactic module in which SLI children are impaired. Further linguistic specification of Grammatical SLI may

provide valuable insight into the biological underpinnings of language acquisition and modular language abilities.

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Appendix 1

Raw scores, z-scores or standard scores and equivalent age score for the matching and selection language tests for individual SLI children

Subjects	Chronological	Language tests							
	age	BPVS		TROG		NV-BAS		GC-ITPA	
		Raw score (z-score)	Equivalent age	Raw score (z-score)	Equivalent age	Raw score (SS)	Equivalent age	Raw score (z-score)	Equivalent age
JW	9:3	60 (−1.7)	6:5	10 (−2.2)	5:3	17 *	7:9	17 (−3.7)	6:0
WL	9:5	72 (−0.9)	7:9	12 (−1.7)	5:9	17 *	7:9	18 (−3.8)	6:3
JS	9:10	89 (0.0)	9:9	13 (−1.5)	6:0	19 *	>7:11	17 (−4.6)	6:0
AZ	10:3	72 (−1.3)	7:9	12 (−1.9)	5:9	19 *	>7:11	16 (−5.5)	5:10
RJ	10:11	76 (−1.4)	8:2	16 (−0.8)[14]	9:0	19 *	>7:11	16 *	5:10
AZ	11:0	72 (−1.7)	7:9	12 (−2.1)	5:9	18 *	>7:11	24 *	7:11

[14] On the basis of the scores for RJ and AW, they would not have been included in the group. However, previous scores on this test for both children showed a greater deficit in relation to their BPVS scores. It appeared that the TROG score obtained above represented a sudden improvement on this test. This may have resulted from the remedial help they were receiving at this time which was directed at improving the performance on particular structures which were assessed in this test.

CT	11:11	86 (−1.1)	9:0	13 (−2.2)	6:0	18 *	>7:11	21 *	7:0
SB	12:0	90 (−0.7)	9:5	15 (−1.6)	8:0	17 *	7:9	24 *	7:11
AT	12:1	80 (−1.6)	9:0	13 (−2.2)	6:0	16 *	6:3	17 *	6:0
BS	12:2	78 (−1.8)	8:5	12 (−2.5)	5:9	20 *	>7:11	22 *	7:3
AW	12:2	84 (−1.5)	9:3	16 (−1.2)[15]	9:0	17 *	>7:11	22 *	7:3
MP	12:10	87 (−1.4)	7:9	13 (−2.2)	6:0	18 *	>7:11	26 *	8:6

Note: BPVS = British Picture Vocabulary Score. TROG = Test of Reception of Grammar. NV-BAS = Naming Vocabulary, British Ability Scales. GC-ITPA = Grammatical Closure subtest from Illinois Test of Psycholinguistic Abilities.

SS = Standard score. *SS or *z*-score not available.

	Chronological age	Language tests					Non-language
		Bus Story			Action Picture Test		BAS:IQ.
		Info. (age)	Sent. Length (age)	Sub-Clause (age)	Info (age)	Grammar (age)	Visual Performance Score
JW	9:03	28(6:1)	14(8:2)	2(4:8)	34(6:9)	23(5:3)	105
WL	9:05	23(5:1)	10(6:4)	1(4:2)	26.5(4:2)	20(4:3)	115
JS	9:10	29(6:4)	11(6:10)	1(4:2)	33.5(6:6)	26(6:3)	90
AZ	10:03	42(5:3)	13(7:10)	2(4:8)	28(4:8)	20(4:3)	119
RJ	10:10	27(5:10)	8(4:7)	1(4:2)	34.5(7:0)	22(5:0)	110
AZ	11:00	22(4:11)	11(6:10)	1(4:2)	34.5(7:0)	25(6:0)	105
CT	11:11	33(7:4)	12(7:4)	2(4:8)	38(8:5)	24(5:9)	86
SB	12:00	20(4:7)	12(7:4)	3(5:10)	35.5(7:6)	23(5:3)	92
AT	12:01	29(6:4)	11(6:10)	1(4:2)	34.5(7:0)	26(6:3)	90
BS	12:02	30(6:7)	11(6:10)	2(4:8)	35(7:3)	26(6:3)	99
AW	12:02	25(5:5)	9(5:7)	2(4:8)	35(7:3)	25(6:0)	92
MP	12:10	32(7:1)	9(5:7)	1(4:2)	35(7:3)	28(6:9)	86

Note: Action Picture Test/Bus Story: Info = information score; sub-clause = number of subordinate

[15] See footnote 14.

clauses; (age) = Equivalent age score. BAS = British Ability Scales.

Appendix 2

Raw scores, z-scores or standard scores and equivalent age score for the language tests used for matching purposes for the individual LA control children

Subjects	Chronological	Language tests							
LA1-3[a]	age	BPVS		TROG		NV-BAS		GC-ITPA	
controls		Mean (z-score)	Equivalent age	Mean (z-score)	Equivalent age	Mean (z-score)	Equivalent age	Mean (z-score)	Equivalent age
1	5:5	41 (−0.7)	5:11	9 (−0.7)	5:0	14 (−0.5)	4:3	15 (0.3)	5:8
2	5:5	67 (1.2)	7:2	12 (0.0)	5:9	15 (0.0)	5:3	19 (1.5)	6:5
3	5:5	52 (−0.1)	5:7	12 (0.0)	5:9	17 (1.0)	7:9	22 (2.3)	7:3
4	5:6	53 (0.1)	5:9	14 (0.7)	7:0	15 (−0.4)	5:3	19 (1.5)	6:5
5	5:8	55 (0.1)	5:11	10 (−0.6)	5:3	16 (0.2)	6:5	20 (1.2)	6:8
6	5:8	50 (−0.2)	5:5	11 (−0.3)	5:6	15 (−0.4)	5:3	21 (1.3)	7:0
7	5:9	46 (−0.5)	5:0	10 (−0.6)	5:3	16 (0.2)	6:5	19 (1.0)	6:5
8	5:11	61 (0.5)	6:7	15 (1.1)	8:0	18 (1.7)	> 7:11	26 (2.8)	8:6
9	6:0	52 (−0.2)	5:7	12 (−0.6)	5:9	16 (0.1)	6:5	25 (2.2)	8:2
10	6:3	62 (0.4)	6:8	15 (0.3)	8:0	17 (0.8)	7:9	25 (2.2)	8:2
11	6:3	67 (0.8)	7:2	16 (0.6)	9:0	17 (0.8)	7:9	23 (1.5)	7:7
12	6:4	69 (0.9)	7:5	15 (0.3)	8:0	16 (0.1)	6:5	21 (0.7)	7:0
13	6:5	62 (0.3)	6:8	15 (0.3)	8:0	16 (0.1)	6:5	26 (2.0)	8:6
14	6:6	73 (1.1)	7:10	16 (0.6)	9:0	19 (> 1.9)	> 7:11	30 (3.0)	10:4
15	6:7	78 (1.5)	8:5	19 (2.6)	> 11.0	18 (1.2)	> 7:11	30 (3.0)	10:4
16	6:8	54 (−0.5)	5:10	16 (0.6)	9:0	17 (0.5)	7:9	22 (0.7)	7:3
17	6:9	58 (−0.3)	6:3	13 (−0.3)	6:0	17 (0.5)	7:9	19 (0.0)	6:5
18	6:9	67 (0.4)	7:2	16 (0.6)	9:0	16 (−0.2)	> 7:11	21 (0.3)	7:0
19	6:10	75 (1.0)	8:1	16 (0.6)	9:0	18 (1.2)	> 7:11	30 (2.7)	10:4
20	7:2	76 (0.6)	8:2	19 (2.2)	> 11.0	19 (> 1.6)	> 7:11	31 (2.5)	> 10:4
21	7:3	83 (1.1)	9:0	15 (−0.1)	8:0	16 (−0.4)	6:5	24 (0.8)	7:11
22	7:3	76 (0.6)	8:2	17 (0.7)	10:0	17 (0.2)	7:9	29 (2.0)	9:8
23	7:3	86 (1.3)	9:5	16 (0.3)	9:0	18 (0.9)	> 7:11	28 (1.8)	9:2
24	7:4	72 (0.3)	7:9	14 (−0.4)	7:0	15 (−0.9)	5:3	25 (0.7)	8:2
25	7:5	74 (0.1)	8:0	18 (1.3)	8:0	16 (−0.6)	6:5	26 (0.7)	8:6
26	7:8	75 (0.2)	8:1	19 (2.2)	> 11:0	17 (0.0)	7:9	29 (1.3)	9:8
27	7:8	81 (0.6)	8:9	18 (1.3)	11:0	18 (0.7)	> 7:11	32 (2.2)	> 10:4
28	7:9	78 (0.4)	8:5	16 (0.3)	9:0	17 (0.0)	7:9	30 (1.7)	10:4
29	7:9	70 (−0.1)	7:7	16 (0.3)	9:0	17 (0.0)	7:9	28 (1.2)	9:2
30	7:9	71 (−0.2)	7:8	18 (1.3)	11:0	18 (0.7)	> 7:11	31 (1.8)	> 10:4

31	7:9	92 (1.3)	10:1	19 (2.2)	> 11:0	19 (1.4)	> 7:11	32 (2.2)	> 10:4
32	7:11	77 (0.2)	8:4	16 (−0.3)	9:0	18 *	> 7:11	30 (1.3)	10:4
33	7:11	99 (1.7)	11:0	16 (−0.3)	9:0	18 *	> 7:11	28 (0.8)	9:2
34	8:2	87 (0.6)	9:6	18 (0.7)	11:0	16 *	6:5	28 (0.5)	9:2
35	8:7	88 (0.5)	7:7	18 (0.7)	11:0	18 *	> 7:11	28 (0.3)	9:2
36	8:9	68 (−1.0)	7:4	16 (−0.3)	9:0	18 *	> 7:11	25 (−0.3)	8:2

[a] Subject numbers 1–12 = LA1 controls; 13–24 = LA2 controls; 25–36 = LA3 controls.

Note: BPVS = British Picture Vocabulary Score. TROG = Test of Reception of Grammar. NV-BAS = Naming Vocabulary, British Ability Scales. GC-ITPA = Grammatical Closure subtest from Illinois Test of Psycholinguistic Abilities.SS = Standard Score.

*z-score not available.

Appendix 3

Verbs and characters used to construct the experimental and control conditions in Experiments 1 and 2

Verbs	Characters
Tickling	Mowgli, Baloo Bear, The Monkeys, Mother Wolf
Washing	Minnie Mouse, Daisy Duck, The Ducks, Donald Duck
Touching	Captain Hook, Peter Pan, The Boys, Wendy
Pinching	Minnie the Minx, Grannie, The Dancers, Grandpa
Scratching	Winnie the Pooh, Christopher Robin, The Rabbits, Kanga
Pointing	Wicked Witch, Fairy Godmother, The Fairies, Mr Magician

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