SLI in Children: Movement, Economy, and Deficits in the Computational–Syntactic System

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The linguistic characteristics of a boy (AZ) with specific language impairment (SLI) are presented. AZ illustrates the linguistic characteristics of Grammatical SLI. Morphosyntactic investigations reveal that all inflectional forms are present but are not used consistently. The impairment extends to syntactically complex utterances involving embedded structures at phrase and clause level and to arguments and wh-movement. There is true optionality in AZ's grammar. I propose that optional movement characterizes Grammatical SLI. Based on the Representation Deficit for Dependent Relationships account, I claim that the underlying deficit causing optional movement is in the syntactic computational system. A deficit in the operation, Move F, was not supported. A deficit with Economy (R. Manzini, personal communication, January 1998) was considered. I argue that Last Resort may be viewed as comprising two principles: Economy 1 ensures that the operation Move F is only permitted if it satisfies an appropriate feature-checking relation; Economy 2 forces movement of unchecked features. Hence, movement is obligatory. The data do not support a deficit with Economy 1. I propose that Economy 2 is missing in SLI grammar and this deficit causes optional movement. I provide an explanation of how the proposed characterization and underlying deficit can account for the range of syntactic findings for children with Grammatical SLI.

1. INTRODUCTION

This article focuses on the linguistic characteristics of children with specific language impairment (SLI) and the linguistic accounts that have been put forward to explain their deficits. Linguistic accounts of SLI have generally been based

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on two assumptions. First, SLI is a deficit in one or more component of core grammar that is independent from general cognitive processes. This first assumption is not addressed in this article (but, see van der Lely (1997a,b)). The second assumption is that, within the grammatical system, SLI is an isolated deficit primarily affecting inflectional morphosyntax. In the past 20 years or more, investigations into SLI in children have largely focused on their inflectional morphological errors (e.g., Leonard, McGregor, and Allen (1992)). Consequently, the hypotheses put forward to characterize or explain SLI have attempted to account for these morphosyntactic errors (e.g., Bishop (1994), Clahsen (1989), Gopnik (1990), Gopnik and Crago (1991), Leonard, Bartolini, Caselli, McGregor, and Sabbadini (1992), Rice, Wexler, and Cleave (1995)). This article addresses this second assumption. A summary is presented of the linguistic characteristics of a boy, known as AZ, who is one of 12 participants from a homogeneous subgroup of children with SLI (van der Lely (1996; 1997b,c), van der Lely and Stollwerck (1996; 1997)). The linguistic characteristics of AZ are typical of the subgroup and are used to illustrate the subgroup’s linguistic characteristics. Recent linguistic proposals about the underlying nature and cause of SLI are explored in the light of these data.1

It is well known that SLI in children is a heterogeneous disorder with variable linguistic characteristics (Aram, Morris, and Hall (1993)). Qualitative differences may exist between young children with SLI and those with a persisting SLI. First, many children who present with SLI at 4 years old are indistinguishable from normally developing children at 7 years old (Bishop and Edmundson (1987)). Rice and Wexler’s (1996b; 1997) follow-up investigation of Tense (Tns) marking of SLI children at 5 and 6 years old illustrates potentially persisting versus resolving SLI. Although none of the children were “normal” with respect to Tns marking, Rice and Wexler’s study revealed that half the group made relatively good progress, whereas the other half of the group showed relatively little progress toward normal performance. Furthermore, qualitative differences are found with investigations of young children with SLI who are not a selected subgroup from the population with SLI and older children with SLI who are selected for a particular persisting grammatical impairment. For example, an investigation of noun compounding by Oetting and Rice (1993) in 5-year-old children with SLI revealed a normal pattern of performance; that is, the children only used singular regular nouns inside compounds (rat-eater). In contrast, van der Lely and Christian’s (1997) study of 10- to 18-year-old participants with SLI revealed a significant use of regular plural nouns inside compounds (rats-eater). It is unlikely that one theory about the underlying nature of SLI will be able to

1Note, performance on any particular aspect of language is only referred to as “impaired” if both the individual data from AZ and the other children in the subgroup have been found to differ significantly from 36 language ability-matched control children. Should any of the children with SLI not conform to the overall pattern of impairment, this is reported in the full versions of the published papers of the relevant studies.
account for all forms of SLI. As a first step toward approaching this problem, this study investigates a subgroup of children with a persisting Grammatical SLI. The generalizability of the findings and conclusions to other children with SLI is an empirical issue. Recently, investigations with other populations of children with SLI have replicated some of the linguistic findings for our Grammatical SLI subgroup (Bishop, Bishop, Bright, James, and van der Lely (1999), O'Hara and Johnston (1997), Precious and Conti-Ramsden (1988)). This suggests that the linguistic characteristics of our subgroup of children with SLI is likely to be more widespread within the population of children with persisting SLI than indicated by a literature that has focused largely on morphosyntactic problems. However, until further evidence is available, caution is expressed in the generalizability of the findings to other groups of children with SLI.

The subgroup of children with SLI central to this study, children with so-called Grammatical SLI (van der Lely and Stollwerck (1997)) are characterized by a persisting language impairment in their comprehension and expression of language. At the beginning of the investigations, which were largely conducted over 2 years, the children were between 9;3 and 12;10 years old. These children with SLI did not have severe articulatory-speech impairments, and their speech was clear for known words. Our investigations of the group have assessed core grammatical abilities in their syntax and inflectional morphology, as well as language abilities outside grammar, such as pragmatic inference, verbal logical reasoning, and nonlinguistic cognitive abilities. These investigations have revealed that their deficit is restricted to core grammatical abilities (Surian, Baron-Cohen, and van der Lely (1996), van der Lely (1996; 1997a,b), van der Lely and Stollwerck (1997)). The pattern of language impairment of first-degree family members of these participants is consistent with an autosomal (non-sex-linked) dominant inheritance underlying their disorder (van der Lely and Stollwerck (1996)).

2. AZ'S GRAMMATICAL ABILITIES

2.1. Background Information

AZ was selected from the group, as his linguistic abilities typify this form of SLI. He was age 10;3 at the beginning of the study. On all nongrammatical language tasks (e.g., a pragmatic inference test) and nonverbal cognitive tasks he scored at or above the range expected for his chronological age (van der Lely (1997a,b)). He has an overall nonverbal IQ of 119 or above (e.g., on the British Ability Performance Scale; Elliott, Murray, and Pearson (1978) (see Table 1)).

AZ was initially diagnosed with SLI by speech and language therapists using standardized language tests. Table 1 summarizes the results of the standardized tests at the beginning of the study. On a picture-selection, sentence-comprehension test (Test of Reception of Grammar; Bishop (1983) (e.g., The boy is pushed by
TABLE 1
Details for AZ (Age 10;3) From the Four Standardized Language Tests and the Nonverbal Performance Test Used for Initial Selection

<table>
<thead>
<tr>
<th></th>
<th>GC–ITPA</th>
<th>TROG</th>
<th>BPVS</th>
<th>NV–BAS</th>
<th>BAS Nonverbal IQ</th>
</tr>
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<tbody>
<tr>
<td>Raw score (z score)</td>
<td>16 (−5.5)</td>
<td>12 (−1.9)</td>
<td>72 (−1.3)</td>
<td>19&lt;sup&gt;a&lt;/sup&gt;</td>
<td>119 (+1.26)</td>
</tr>
<tr>
<td>Equivalent age</td>
<td>5;10</td>
<td>5;9</td>
<td>7;07</td>
<td>&gt; 7:0</td>
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<sup>a</sup>z score not available.

Note. GC–ITPA = Grammatical Closure subtest–Illinois Test of Psycholinguistic Abilities; TROG = Test of Reception of Grammar; BPVS = British Picture Vocabulary Scale; NV–BAS = Naming Vocabulary–British Ability Scales; BAS = British Ability Scales.

the elephant; The pencil is above the spoon)) and a sentence-completion expressive test of general morphology (Grammatical Closure subtest Illinois Test of Psycholinguistic Abilities (ITPA); Kirk, McCarthy, and Kirk (1968) (e.g., There is milk in this glass. It is a glass_____; This man is painting. He is a ____). AZ showed severe impairment, scoring at a level expected for a child of 5;10 (see Table 1 for standard scores). AZ’s comprehension and expression of single-word vocabulary (The British Picture Vocabulary Scale; Dunn, Dunn, Whetton, and Pintilie (1982); The Naming Vocabulary; Elliott et al. (1978)) was slightly less severely impaired; he performed at a level equivalent to older than 7 years. A high-quality digital tape recording of AZ’s speech was analyzed by a phonetician and confirmed that his speech was clear and without articulation errors. A summary of AZ’s grammatical abilities following specific investigations is presented as an illustration of the group findings. Further details of the group findings are available in various papers in the literature (van der Lely (1996; 1997a,b), van der Lely, Rosen, and McClelland (1998), van der Lely and Stollwerck (1996; 1997)), and so full details are not repeated here.

2.2. Inflectional Morphology

Approximately 2 hr of speech, recorded on a Sony digital audiotape, were analyzed from elicitation tasks, narratives, and spontaneous speech. First, AZ displayed the inflectional morphological deficits that are frequently reported (Bishop (1994), Claesens, Bartke, and Goellner (1997), Rice and Wexler (1996a)). For example, he showed that he can use all inflectional forms correctly: plural -s, third-person singular (3Sg) -s, regular past-tense -ed, and the progressive marker -ing. However, like many children with SLI, he did not always use these forms consistently in context where they are required; for example, Two foots; two mens; This is what they ated; The boy climb up . . . and holds onto branches (van der Lely (1997a)). One of the elicitation tasks prompted production of the 3Sg present-tense -s verb form. AZ was asked what his mother, father, or brother/sister usually did every morning or day (e.g., “Every morning, my Mum . . .”). It can be seen from Table 2 that AZ showed a consistent level of 70% to
<table>
<thead>
<tr>
<th>Age</th>
<th>Obl Ctx</th>
<th>No. Correct</th>
<th>%</th>
<th>Obl Ctx</th>
<th>No. Correct</th>
<th>%</th>
<th>Obl Ctx</th>
<th>No. Correct</th>
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<th>Obl Ctx</th>
<th>No. Correct</th>
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<tr>
<td>10;3</td>
<td>10</td>
<td>3</td>
<td>30</td>
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<td>21</td>
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<td>60</td>
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<td>11;3</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td>36</td>
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<td>12;2</td>
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<td>56</td>
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Note. Obl Ctx = total number of obligatory contexts; No. correct = total number correct in obligatory contexts; % = percentage correct.
80% errors on this task at ages 10;3, 11;2, and 12;2. AZ shows some improvement at age 14;5 (36% errors), but this still represents a substantial impairment for his age. His errors consisted of unmarked or nonfinite forms of the verb in the finite context. (See Clahsen et al. (1997) and Goellner (1995) for the group data from this task for our SLI subgroup.)

A past-tense elicitation task (Ullman (1993)) prompted the use of 60 regular and irregular verbs and novel verbs in sentences (e.g., “Every day I look at Susan. Yesterday I . . .”). For the real verbs AZ (age 11;3) only achieved 6.3% correct responses. Of AZ’s errors for the real verbs, 71% were unmarked stem forms. Other errors included occasional semantically associated substitutions (grind-corn, bend-broke), and in two responses AZ used the present-tense form of the verb (thinks, splits). For the novel verbs, AZ produced only one regular affix and two irregular affixes. All his other responses were unmarked stem forms. This task was recently re-administered using half of the stimuli. AZ (age 14;5) produced 56% correct forms for the real verbs (see Table 2). However, a strong frequency effect was evident. He scored seven of eight correct (87.5%) for the high-frequency regular and irregular verbs (100% and 75%, respectively) but only two of eight (25%) correct for the low-frequency regular and irregular verbs (50% and 0%, respectively) (Clare (1997)). Two language-matched control children showed a frequency effect only for the irregular verbs (Clare (1997)). AZ’s errors were all unmarked stem forms. He did not inflect any of eight novel verbs in the test. Thus, AZ continues to show a general deficit with Tns marking. However, analysis of past-tense forms based on a narrative of The Bus Story (Renfrew (1991)) generally revealed fewer errors in this milieu. He only produced between 25% to 32% overall of stem forms in past-tense contexts (Goellner (1995); see Table 2).

A notable characteristic of AZ’s grammar is that he displayed a correct and incorrect use of the same lexical item in a similar syntactic context: for example, My mum goes out; My dad go to work. Furthermore in a grammaticality judgment task, AZ judged sentence with both tensed finite verb forms (Yesterday I looked at Susan) and nonfinite forms (Yesterday I look at Susan) as grammatical. AZ accepted sentences such as Yesterday I walk a mile 90% of the time (van der Lely and Ullman (1996; 1999)). Thus, AZ’s problem with inflectional morphology is not restricted to his expressive language. These data support Rice and colleagues’ findings (Rice and Wexler (1997)).

These data for AZ illustrate the overall findings for the subgroup (see also Clahsen et al. (1997) and van der Lely (1996)) and reveal significant problems with marking third-person present tense and past tense on verbs in finite contexts. AZ’s linguistic characteristics also indicate true optionality in his grammar, rather than a lack of grammatical knowledge specific to lexical items and/or syntactic contexts. Rice et al. (1995) and Rice and Wexler (1996a), in their investigations of younger individuals with SLI, have previously highlighted the optional use of infinitives in matrix sentences.
2.3. Syntactic Abilities

2.3.1. Phrase structure. One of the most notable characteristics of AZ’s grammar, especially in view of his high nonverbal abilities, is the general syntactic simplicity of his utterances. A transcription of a narrative based on the picture book *Frog Where Are You?* can be found in the Appendix. In addition, an analysis of AZ’s syntactic abilities was based on transcriptions recorded at ages 10;3, 12;2, and 14;5 of his spontaneous speech and his narrative of *The Bus Story* (Renfrew (1991)). AZ’s utterances may be characterized by the structure NP + V (Infl) + XP, where phrases mainly contain one or two constituents. Problems with noun phrases (NPs) are illustrated by the few examples of complex NPs, such as the small dog, or embedding an NP or prepositional phrase (PP) within an NP. In the narrative in the Appendix, AZ produced only 3 of 63 determiner, adjective, noun phrases. Evidence for AZ’s problems at the determiner phrase (DP) level are illustrated by his lack of complex DPs such as all of the frogs, a whole family of frogs (examples from the youngest 5-year-old language-matched control group). AZ’s problems with complex DPs are also illustrated by his difficulties with determining the scope of quantifiers (all, every) (van der Lely and Stollwerck (1997)). In a picture-sentence pair judgment task, when presented with the sentence Are all the monkeys tickling Mowgli and a picture of two out of three monkeys tickling Mowgli, AZ accepted the picture as correct on 50% (3 of 6) trials. AZ showed difficulties forming complex PPs involving embedding a PP inside a PP (on the rock behind the tree) and omitted prepositions when they function as infinitival markers and predicates (e.g., The bus decide [to] run away. I’ll go [to] a different place). However, as with many aspects of AZ’s grammar, he showed appropriate uses alongside omissions of a particular linguistic form (cf. My Dad go to work). In addition his utterances do not contain complex verb phrases (VPs), relative clauses or small clauses, tensed subordinate structures, or evidence of temporal embedding (van der Lely (1997a), van der Lely et al. (1998)).

A further investigation, using an elicitation technique, was designed to test whether AZ (age 14;6) could embed structures at an NP and PP level if pragmatically forced in a test situation. This investigation revealed that AZ had increasing difficulties with increasing complexity. He produced sentences such as The large pig is in the yellow room, correctly 75% of the time (3 of 4). For sentences requiring a noun to be modified with two adjectives (The big green bed [is] on a stripy box) he achieved 50% correct responses (2 of 4). AZ was unable (0 of 4) to embed a PP within an NP in a sentence (e.g., The cat with the blue blanket is jumping on the bed) (Clare (1997)). AZ’s correct responses were often only achieved on the second or third attempt, following false starts and errors on previous attempts. In contrast, two children less than half AZ’s age matched on language abilities completed the task with ease and showed almost faultless performance. Interestingly, Bishop (1982) reported that a group
of children with severe receptive-expressive SLI had a significant impairment in comprehending sentences with a similar structure (i.e., sentences with an embedded PP in an NP in subject position).

2.3.2. Predicate-argument structure. AZ’s expressive speech revealed the occasional omission of obligatory subcategorized arguments of verbs and prepositions (The dog was poking [his head] in [to the jar]; . . . and hits [himself/his head] on the ground (see Appendix); I’m just helping my uncle . . . helping [him in] his back garden (AZ age 14;6, spontaneous speech). Comprehension tasks revealed that AZ had problems with assigning θ-roles of verbs to NPs in reversible transitive passive sentences (van der Lely (1996)). This is evident particularly in short passive sentences. In a sentence-picture choice task, for sentences such as The fish is being eaten, he chose the picture depicting an adjectival passive interpretation (The eaten fish) 58% of the time, choosing the correct picture depicting a verbal passive interpretation (The fish is being eaten by the man) only 42% of the time. In addition, AZ, like the other children with Grammatical SLI, showed a strong preference for choosing the picture of an adjectival passive interpretation rather than the verbal passive interpretation for short ambiguous passive sentences (The fish is eaten). This strong preference for an adjectival passive interpretation was not found for the younger normally developing children (van der Lely (1996)). Performance generally on the sentences for AZ and his peer group was significantly worse than that for normally developing language-matched control children (van der Lely (1996; 1997a), van der Lely et al. (1998)). However, it is not the case that AZ could never interpret passive sentences correctly. On a substantial number of occasions (above chance on full passive sentences) he got the interpretation correct (see also Bishop (1997)). In addition, it appears that the syntactic differences between verbal and adjectival passive sentences (see Borer and Wexler (1987) and Grimshaw (1990)) affect AZ and his SLI peers’ performance to a greater extent than children developing normally. This point is taken up later in the general discussion.

The deficit of children with SLI in assigning θ-roles when semantic or pragmatic knowledge cannot guide them has been well documented in the literature over a number of years (Bishop (1982), Precious and Conti-Ramsden (1988), van der Lely (1996), van der Lely and Dewart (1986), van der Lely and Harris (1990)). It should be noted that, in addition to problems assigning θ-roles for early-acquired verbs in passive sentences, children with SLI have a significant deficit assigning θ-roles to arguments of novel verbs based on the syntactic structure of the sentence. This is evident even for simple active transitive sentences (O’Hara and Johnston (1997), van der Lely (1994)). Thus, problems with θ-role assignment do not appear to be restricted to the subgroup investigated by van der Lely and colleagues, nor only to passive sentences. Surprisingly, hypotheses about the underlying nature of SLI have largely not attempted to account for this deficit (e.g., Clahsen (1989), Leonard et al. (1992a), Rice and Wexler (1996a)).
2.3.4. Binding principles. AZ, like the other children in the SLI group, had problems in assigning reference to pronouns and anaphors when knowledge of syntactic constraints, characterized by Binding Principles (Chomsky 1986), are crucially required (van der Lely and Stollwerck 1997). AZ accepted nonlocal antecedents for reflexive anaphors (himself/herself) and local antecedents for pronouns (him/her) (van der Lely 1997a, van der Lely and Stollwerck 1997). For example, when presented with a sentence, such as (1a), AZ accepted a picture showing Mowgli tickling himself on 33% of trials (2 of 6).

(1) a. Mowgli says Baloo Bear is tickling himself.
   b. Mowgli says Baloo Bear is tickling him.

For sentences such as (1b), AZ also accepted a picture showing Baloo Bear tickling himself on 33% (2 of 6) of trials (see van der Lely and Stollwerck 1997 for group data). In contrast, when semantic cues were available, such as semantic gender (him = male), AZ performed faultlessly.

Using the same test materials, Bishop et al. (1999) recently investigated 37 twin pairs selected because one or both twins met criteria for SLI. The twins with SLI were found to be significantly impaired in assigning correct antecedent reference to pronouns and anaphors when syntactic knowledge was required. Thus, these findings replicate those of van der Lely and Stollwerck (1997) and suggest that this syntactic impairment is not an isolated problem in highly selected subgroups of children with SLI.

The findings from investigations into θ-role assignment in semantically reversible sentences and Binding Principles in children with SLI indicate that on a substantial number of occasions they allow options not available in the adult grammar. Therefore, if on occasions their grammar is not constraining their linguistic derivations, then they may be “free” to choose between interpretations. They may accept 100% correct assignment of θ-roles to NPs and reference for pronouns and reflexives (as there are no pragmatic constraints that would rule this out), but they may also choose or accept incorrect assignment of θ-roles to NPs and referents for pronouns and reflexives. This choice may be influenced by semantic or pragmatic factors. For example, the anaphor himself reflexively marks the predicate, whereas him is unmarked for reflexivity (Reinhart and Reuland 1993). The data support this view (van der Lely and Stollwerck 1997). Furthermore, previous investigations of θ-role assignment have shown that children with SLI are significantly influenced by semantic and pragmatic factors, even when these factors conflict with syntactic constraints (Precious and Contri-Ramsden 1988, van der Lely and Dewart 1986).

2.3.5. Wh-movement. One possibility, suggested by the preceding data for AZ and children with Grammatical SLI generally, is that they have problems with syntactic movement (Chomsky 1995). For example, their problems with
Tns marking may be construed as problems with head-to-head (verb (V) to inflection (I)) movement and their impaired assignment of θ-roles to NPs in passive sentences may be indicative of problems with Argument movement. To test this possibility further we investigated wh-movement. An investigation of subject and object wh-questions was carried out using an elicitation “Who done it?” task (Battell (1998)).

There has been much discussion about the syntactic differences between subject and object questions (e.g., Manzini (1992), Rizzi (1990), Stromswold (1995)). Formation of object wh-questions involves A-bar movement of the wh-operator to the specifier (Spec) position of the complementizer phrase (CP), leaving a trace behind, bound by the wh-operator (see (2a)). In addition, there is wh-feature movement involving auxiliary movement of do into the head of CP, that is I to complementizer (C) movement, known as do-support (see (2a)).

(2) a. \[CP\text{What}, [cP\text{did} [IP\text{Mary}[\text{re}][\text{VP[\text{vdrop}\{npt,?\}]]]]]]
   b. \[CP\text{Who}, [cP\text{[VP[saw Mary?]]}]]
   c. \[CP[cP\text{Who}[r[\text{VPsaw Mary?}]]]]

In contrast, for subject questions there is no do-support and, thus, no I to C movement. It is also unclear from the order of the constituents whether wh-operator movement has occurred. The wh-word may move from an original position within the inflectional phrase (IP) to the CP (see (2b)). However, it is also plausible that the wh-word is inserted directly into the Spec of CP, or remains in an original position within the IP as shown in (2c) (Manzini (1992)). Interestingly, despite these syntactic differences between subject and object questions, Stromswold (1995) reported that normally developing children acquire object questions at the same age or earlier than subject questions. However, if AZ and his peers with Grammatical SLI have problems with syntactic movement, we may expect them to have particular difficulties with object questions.

Eighteen subject and 18 object questions using the wh-words who, what, and which, were elicited using probes as illustrated in (3).

(3) Experimenter (The sergeant)
   a. Mrs. Peacock saw someone in the lounge. Ask me who.
   Subject (The Inspector) Target Response:
   b. Who did Mrs. Peacock see (in the lounge)?

AZ (age 15;6) revealed a significant deficit. He produced 14 of 18 (77%) correct subject questions and only 3 of 18 (16%) correct object questions. Three of his responses contained lexical substitutions with a similar meaning (e.g., Who was upset? Target: Who was unhappy?). These utterances were not counted as errors. It is evident that AZ was having significantly more problems with object questions than with subject questions. Further analysis was carried out on the types of
errors made by AZ. For the object questions there are three types of errors that could be indicative of problems with A-bar movement. The first is gap-filling, where the position of the trace is filed by the NP argument as shown in (4a). The second is no movement of the wh-phrase, shown in (4b). The third type of error is turning an object question into a subject question as shown in (4c,d). Thus, this subject for object error shows a misassignment of the Agent θ-role to the named person and avoids the need for movement of the wh-word from its original position.

(4) a. What did Mrs. Brown broke something? (SLI 1, Battell (1998))
   
   b. Which did Mr. Green open the door? (SLI 4, Battell (1998))
   
   c. Who passed Colonel Mustard? (AZ)
   Target: Who did Colonel Mustard pass (in the hall)?
   
   d. Who . . . Where did Mrs. Peacock . . . Who was in the library? (AZ)
   Target: Who did Mrs. Peacock hear (in the library)?

Problems with I to C and V to I movement, indicative of wh-feature movement problems, may show up with three types of errors. These errors are illustrated in (5): (5a) do-support omission; (5b) double Tns marking, where the sentence contains the auxiliary do and the verb is marked for past tense; (5c) tense errors; (i) on the lexical verb in subject questions; (ii) auxiliary substitution be for do or vice versa. The errors in (5c) may be taken as indicative of V to I problems where the verb has not checked Tns or aspect features.

(5) a. Which cat Mrs. White stroke? (AZ)
   
   b. Which door did Rev. Green opened? (AZ)
   
   
   c. ii) Which coat was Prof. Plum weared? (AZ)

For the object questions, AZ’s responses contained five (28%) subject for object errors, indicating problems with A-bar movement. He did not show any gap-filling errors. The results from the group of 12 participants with SLI (age 10;2–18 years) revealed 33% of their responses were indicative of problems with A-bar movement (23% subject for object errors, 10% gap-filling errors; Battell (1998)).

For errors indicative of V to I and I to C movement, AZ’s responses contained 50% errors, 44% (8) double Tns marking (see (5b)), 6% (1) do-support omission (see (5a)), and 6% (1) auxiliary substitution error (see (5c,ii)). Overall, the group showed a similar pattern of errors for these object questions. Battell (1998) found that the group of participants with SLI produced 34% of errors indicative of V to I and I to C movement errors. Note that all the children produced both A-bar and Tns errors, although the proportion of their errors showed individual differences.
Although AZ scored six of six correct subject *who* questions, he was unable to produce any correct object questions using *who*. For four of six of AZ’s *who* question responses, he produced a subject question. The remaining attempts consisted of false starts, suggesting an inability to produce *do*-support with *who* object questions as shown in (6):

(6) Who saw Mrs. . . . What did Mrs. Brown saw? (AZ)

In contrast, for the subject questions, AZ incorrectly used *do*-support with two *what* questions (see (7a,b)). Two further subject questions contained incorrect use of the auxiliary-verb marking Tns/aspect (see (7c)). Thus, in total, AZ produced 22% Tns errors for the subject questions (group mean, 23% subject Tns errors; Battell (1998)).

(7) a. What did fell off the table?  
   b. What did glittered in Mrs. Peacock’s hands?  
   c. Which table was fell over?

It is possible that AZ has learned (possibly through explicit teaching) particular *wh*-question patterns for particular *wh*-words. However, he did not appear to have an abstract syntactic representation of *wh*-structures to be able to generalize different structures to all appropriate *wh*-words or to produce correct question forms consistently.

However, among AZ’s frequent errors, he showed that he could produce some *wh*-question forms correctly even for object questions (e.g., *What did Mrs. Peacock like? Which sandwich did she want*?). Thus, AZ’s pattern of *wh*-question formation suggests an optionality of both A-bar and I to C movement.

To summarize, details of AZ’s morphosyntactic abilities have been reported as an illustration of the linguistic abilities of a subgroup of children with SLI. The investigations have revealed:

(i) All inflectional forms are present in his grammar but are not used consistently.
(ii) His grammar shows few examples of syntactic complexity at phrase structure; his utterances are generally simple and he shows difficulties forming embedded structures, such as embedding a PP within an NP or using embedded clauses.
(iii) His grammatical deficit extends to Arguments as revealed by his problems with assigning θ-roles in sentences and pronominal and anaphoric reference.
(iv) AZ has problems forming subject and, particularly, object *wh*-questions. Although the *wh*-word is always in the correct initial position, his question formation provides evidence of problems with *wh*-movement affecting
both \textit{wh}-operator movement (A-bar movement) and \textit{wh}-feature (Tns) movement.

(v) There is true optionality in his grammar as both correct and incorrect forms are used for the same lexical form in similar syntactic contexts across a range of syntactic structures.

It is clear that the extensive investigations of AZ and the other children with persisting Grammatical SLI have revealed that their linguistic deficit extends beyond perceiving and producing inflectional morphological forms with low perceptual salience (Leonard et al. (1992a,b)). Moreover, the findings summarized here need to be accounted for in any theory of the underlying nature of SLI. In light of these findings I now evaluate current linguistic proposals that have been put forward to account for the underlying nature of SLI.

3. \textbf{GENERAL DISCUSSION: THE UNDERLYING NATURE OF SLI}

\subsection*{3.1. The Missing Features Account}

Gopnik and colleagues’ Missing Features Account (Gopnik (1990), Gopnik and Crago (1991)) proposes that syntactic–semantic features such as number, person, and Tns are missing from SLI grammar. Because these features are absent, morphosyntactic rules are also absent (Gopnik (1990), Gopnik and Crago (1991), Ullman and Gopnik (1999)). Therefore, it is proposed that problems with grammatical rule formation in children with SLI will result in regular past-tense forms being associatively stored alongside irregular forms (Ullman and Gopnik (1994)).

If morphosyntactic features are missing in the grammar of participants with SLI it would be predicted that they would not show control of, for example, number, Tns, agreement (Agr), and Case features in their syntax. However, the data show that AZ and his peers with SLI had considerable knowledge of these features. When number, Tns, or Agr marking on the auxiliary verb or main lexical verb is used, it is used correctly. Therefore, we do not find, for example, the use of a plural noun in a singular context, or the use of Agr -s in first-person singular context (see also Bishop (1994)). Thus, the data do not support the missing features account.

The evidence for or against morphological rules per se is less clear-cut. Ullman and Gopnik’s (1994) proposal leads to several predictions. First, if all inflectional forms were stored in the lexicon, we would expect to find memory effects, such as frequency effects, for both regular and irregular past-tense forms in children with SLI. In addition, their ability to generate morphological inflections for novel words should be limited, as should their ability to overgeneralize regular rules to irregular forms (\textit{mices, swimmmed}). Second, if regular and irregular forms were
similarly stored in the lexicon, then grammatical constraints, which affect regularly inflected forms, would not operate.

There are several pieces of evidence that indicate that our participants with SLI are storing regularly inflected words, rather than applying a grammatical rule. First, an investigation into regular and irregular past-tense marking in AZ and his peers with SLI revealed a significant frequency effect for regular past-tense forms that was not found for the younger language-matched control group (van der Lely and Ullman (1996; 1997)). In contrast, both the participants with SLI and the younger normally developing children showed a similar trend for high-frequency irregular past-tense verbs to be produced better than low-frequency irregular past-tense verbs (van der Lely and Ullman (1996; 1997)). The later investigation of AZ’s (age 14;6) ability to produce high- and low-frequency regular and irregular past-tense forms, reported earlier, replicated van der Lely and Ullman’s findings (Clare (1997)). Second, AZ and his peers with SLI generally are not able to inflect novel verbs for past tense. Although AZ understood the elicitation task reported earlier (Clare (1997)) he was unable to produce past-tense forms for novel verbs. However, AZ showed some overgeneralizations (e.g., foots, weared, stoled), suggesting knowledge of morphological rules. One possibility is that these overgeneralized forms result from the use of analogical processes in the associative system. Therefore, we would only expect word stems that are phonologically similar to previously learned forms to be overgeneralized. The past-tense forms AZ overgeneralizes are indeed phonologically similar to other past-tense forms and stem forms (cf. stoled–told, foaled, fold, mould, cold; or weared–shared, paired, chaired, aired). Another possibility is that children with SLI have learned through explicit teaching the plural or past-tense rule. Further investigations of the phonological nature of overgeneralization in children with SLI are required.

Finally, it is of note that analysis of AZ’s narrative of The Bus Story (Renfrew (1991)) showed a greater deficit with regular than irregular past-tense forms at ages 10;3 and 11;2 (40% and 56% regular errors and 22% and 14% irregular errors; Goellner (1995); see Table 2). However, he did not show this difference at age 12;3 (20% regular vs. 35% irregular errors; Goellner (1995)). Furthermore, when verb frequency factors were controlled in the elicitation task (Clare (1997)), regular verbs were not more impaired than irregular verbs, although he continued to show a general deficit with Tns marking.

In summary the evidence from children with Grammatical SLI generally provides some support for problems with morphophonological rules. The relation between productive use of morphological inflections, such as past tense -ed, and the appropriate syntactic knowledge (e.g., Tns marking), which makes the use of inflectional morphology obligatory, is far from clear. One possibility is that the grammatical impairment found in children with SLI independently affects phonology and syntax. Thus, their impairment is most notable in inflectional morphology where the systems interact. However, a single underlying deficit
may be unlikely to unify the impairments we see in using morphological “rules” and the syntactic marking of Tns.

3.2. The Agreement Deficit Account

Based initially on data from German-speaking children with SLI, Clahsen (1989; 1991) proposed that children with SLI have a selective deficit of grammatical agreement. In the German children with SLI he studied, this was manifest in errors of person, number, case, and gender agreement. Clahsen’s original proposal was framed within Generalized Phrase Structure Grammar (Gazdar, Klein, Pul- lum, and Sag (1985)). More recently, Clahsen developed his proposal within the Minimalist framework (Chomsky (1995)). In addition, he supplemented his database by including Goellner’s analysis of third-person Agr -s and past-tense forms (looked, swam) from our data for 9 of our 12 English-speaking children with SLI. Clahsen et al. (1997) claimed that our English-speaking participants with SLI (like the German children with SLI) made significantly more Agr than Tns errors (56% Agr vs. 23% Tns errors). Based on these data and their investigations of German-speaking participants with SLI, Clahsen et al. concluded that children with SLI have problems with Agr features of verbs but that Tns is far less affected. Clahsen et al. went on to claim that the strong categorial features of Comp, Tns, and phi-features of subject DPs are present, whereas noninterpretable Agr features (phi-features) of verbs are absent or underspecified.

Before further discussion of Clahsen’s hypothesis and how it may be applied to the data for AZ, some caution must be expressed in the interpretation of the data from the English-speaking children with SLI. The Agr analysis was based on data from a structured elicitation task, whereas the past-tense marking was based on analysis of narratives. Thus, the two tasks are not equivalent. Furthermore, it is evident from Table 2 that when the lexical content and syntactic context are controlled in an elicitation task, where the child has to mark past tense on verbs to produce a grammatical sentence, a greater impairment in Tns marking is apparent. The group as a whole produced 80% Tns (nonfinite) errors in past-tense contexts (van der Lely and Ullman (1997)) and AZ (age 14;6) produced 44% errors (Clare (1997)) (see Table 2). Thus, it is not clear whether these data from English-speaking children with SLI can be taken to support Clahsen’s claim that children with SLI generally have a greater deficit with Agr marking than with Tns marking. However, Clahsen et al.’s analysis shows that this group of English-speaking participants with SLI has problems producing third-person -s on verbs.

A further problem with Clahsen et al.’s missing phi-features account was highlighted by Rice and Wexler (1996c). They pointed out that 3Sg -s in English marks Tns as well as Agr. In the auxiliary system (be, do) Agr is marked independently for each person. However Agr marking is still confounded with
Tns marking. Hadley and Rice’s (1996) investigation of 5-year-old children with SLI revealed frequent omissions of BE and DO. In English, it is not possible to distinguish whether the omissions of auxiliaries and 3Sg -s are due to problems with the Agr system, the Tns system, or both. However, when BE and DO forms were used, Agr marking was accurate. These data concur with the findings from our older participants with SLI.2 The only way to achieve forms marked for Agr is via checking (Chomsky (1995)). Thus, the data from this study and previous investigations (Hadley and Rice (1996), Rice et al. (1995)) indicate that the children with SLI in this study have appropriate noninterpretable phi-features of verbs needed for Agr, contrary to Clahsen et al.’s (1997) claim. In addition, the Agr deficit account cannot account for the optionality of third-person Agr -s found in AZ’s grammar or for the grammatical errors that fall outside the scope of the verb Agr system. It is evident from the data presented here that the problems of children with SLI do not only affect noninterpretable phi-features of verbs. Movement checking of features generally appears to be problematic, but the features themselves do not appear to be missing per se.

3.3. The Extended Optional Infinitive Account

This account of the linguistic characteristics of children with SLI is based on Wexler’s (1994) view of the maturation of obligatory Tns marking. Wexler observed that normally developing children produce both nonfinite and finite verb forms in contexts where only finite forms are expected in the adult grammar. This phenomenon has been found in many languages (e.g., French, Hebrew, Dutch, German) and thus is taken to be a universal phenomenon, not specific to a particular language (Wexler (1996)). Rice et al.’s (1995) investigations have revealed a similar pattern of optional infinitives (OI) in children with SLI. These children are at a much older age than the age when this is observed in normally developing children, hence the term Extended Optional Infinitives (EOI). Note that Rice and Wexler (1997) claimed that there is true optionality in the SLI grammar with respect to Tns; that is, finite and nonfinite verb forms are produced and judged acceptable in finite contexts.

The data from AZ and his peer group with SLI are consistent with Rice and Wexler’s (1996a,b) findings. Thus, these data reveal that this EOI phase is still apparent in children with SLI at age 14 and older. Wexler (1996) and Rice and Wexler (1996a,b) stressed that neither young children nor children with SLI at an EOI stage lack grammatical principles (e.g., head movement) or structures. Instead, they propose that Tns features are missing or underspecified, or the representation

2Note that some of our participants use the 3Sg form of BE in third-person plural contexts (e.g., They was . . . ). This is a dialectal variation and is normal for the area where these children live. This pattern is an exception in their Agr system. The children do not produce errors such as I is, He am, We am, He are, and so on. However, they omit auxiliaries on a substantial number of occasions.
(optionally) lacks a Tns projection. Wexler (1996) assumed that the OI child treats nonfinite Tns as if it can be fixed by context. He suggested that the OI child differs in pragmatic rather than structural knowledge from adults (Wexler (1996)). Therefore, OI children accept too wide a set of antecedents for nonfinite Tns. Thus, it is a pragmatic problem in determining what reference is possible. In other words, in the absence of syntactic constraints determining the reference for Tns, young children and children with SLI will determine reference by the context. I first consider the two explanations vis-à-vis missing or underspecified Tns features versus optional Tns projection put forward by Wexler (1996) and Rice and Wexler (1996a,b) to account for the OI found in SLI grammar. I then consider the adequacy of this proposal to account for the data for AZ.

Chomsky (1995) stated that features such as Tns features are either intrinsic to lexical items or added prior to the lexical item entering the numeration. Thus, one interpretation of Rice and Wexler’s (1996a) missing or underspecified features account is that it identifies the underlying deficit causing SLI as a lexical deficit, or at least a presyntactic deficit. It is interesting that although the details differ, there are similarities between Rice and Wexler’s EOI account, Gopnik’s original Missing Feature account (Gopnik (1990), Gopnik and Crago (1991)) and Clahsen et al.’s (1997) Agr account of SLI. They all place the deficit with syntactic features that are intrinsic or added to lexical items rather than a deficit in syntactic operations.

Problems arise with trying to explain AZ’s grammar by means of missing or underspecified features. First, what does it mean if Tns features are absent or underspecified? The absence of Tns features is clearly not specific to particular lexical items as the data from AZ show both correct and incorrect forms for the same lexical item in similar syntactic contexts, and indeed, Rice and Wexler (1996a,b) pointed out such true optionality in SLI grammar. A second problem follows from the logical assumption that if obligatory Tns marking is a maturational feature of Universal Grammar (UG), there must be a learning mechanism that matures or is applied in the lexicon or prior to the numeration. This appears to result in fully specified Tns features—that is, if underspecified Tns features cause optional Tns marking (cf. Clahsen et al. (1997) underspecified phi-features of verbs). However, a theoretical account about such a learning mechanism is not specified.

Alternatively, Wexler (1996) proposed that OI grammar is due to an absence of the Tns projection (cf. Rizzi’s (1994) Truncation Hypothesis) as children think this may be contextually specified. On one hand, this proposal is consistent with AZ’s optional use of Tns marking. However, if Tns marking may be specified contextually, what form of maturation would cause children to realize that tense should be obligatorily specified syntactically? It is not possible to appeal to pragmatic maturation as AZ and the other children with SLI in the group have revealed age-appropriate pragmatic abilities (Surian et al. (1996), van der Lely (1997a,b), van der Lely et al. (1998)).
In conclusion, the data for AZ and his peers with SLI concur with Rice and Wexler's findings of the use of OI in finite contexts. However, the explanation of a pragmatic deficit causing an optional Tns projection does not appear to be supported. Until there is a fuller account of the differences between underspecified versus fully specified features, it is difficult to proceed further with Rice and Wexler's (1996a) missing or underspecified Tns feature explanation. A more serious problem with attempting to apply Rice and Wexler's EOI account to explain AZ's grammar is that it cannot account for many of the deficits previously reported, such as problems with \( \theta \)-role assignment, Binding Principles, and \( \text{wh} \)-operator movement in question formation. AZ and the group of children with SLI that my colleagues and I have been investigating are not atypical of the SLI population with respect to these problems. Similar problems with assigning \( \theta \)-roles and reference to pronouns and anaphors when syntactic knowledge is required have been found by Bishop et al. (1999) in a study of 37 twin pairs with SLI. Thus, these findings and the general lack of syntactic complexity (embedding) need to be accounted for in any explanation of SLI.

3.4. The Representational Deficit for Dependent Relations

The Representational Deficit for Dependent Relations (RDDR) account proposes that the deficit causing SLI is in the computational system; that is, it is in the syntax proper (van der Lely (1994; 1997a), van der Lely and Stollwerck (1997)). Although the detailed characterization of the RDDR is developing, and thus changing, the basic notion that the deficit is in the computational system remains. Van der Lely (1997a) and van der Lely and Stollwerck (1997) proposed that a deficit with linguistic (not general processing) structural complexity characterizes the data for children with SLI, such as AZ. Based on Manzini (1995) and Giannelli and Manzini's (1995) proposal for growth of grammatical complexity, we proposed that children with SLI have a deficit with building nonelementary, complex dependencies. That is, elementary local dependencies (roughly one-step checking and one-step embedding) are possible, but more complex long-distance dependencies are not (van der Lely (1997a), van der Lely and Stollwerck (1997)). Thus, van der Lely and Stollwerck (1997) proposed that children with SLI are similar to young children for whom only elementary dependencies involving binary local relations but not nonelementary dependencies are possible, as put forward by Giannelli and Manzini (1995). Within a Minimalist perspective (Chomsky (1995)), long-distance dependencies necessitate movement, where movement is construed as attraction by a noninterpretable, strong feature.

Indeed, one interpretation of the data summarized earlier for AZ is that he had problems with the movement operation in the grammar: deficits in head-to-head movement are illustrated by problems with \textit{do}-support and Tns (V to I and I to C movement). Problems with A-movement are illustrated by AZ’s impairment with passive sentences and Binding Principles. In addition, \( \text{wh} \)-operator and feature movement involving I to C movement and A-bar movement are prob-
lematic, as illustrated by errors in these two areas. If the deficit lies in the movement operation itself, this suggests that the missing component in the grammar of children with SLI is in the rule system (i.e., the operation Move). However, as van der Lely and Stollwerck (1997) pointed out, and it is evident from the preceding data, there are problems with this proposal if it is an account of the underlying deficit causing SLI. First, the grammar of children with SLI is more complex than the most basic binary relations proposed by Giannelli and Manzini (1995) to account for young children’s grammar. Therefore, movement operations must be available to them. If this is so (and nothing else is impaired), why does it not function as normal? This leads to the second problem pointed out by van der Lely and Stollwerck (1997): How can this proposal account for the optionality in their grammar? Do children with SLI sometimes have movement and sometimes not? Therefore, I claim that a descriptive characterization of the observable grammar of children with SLI is consistent with optional movement. Furthermore, if movement is optional, then the rule system for movement is available in SLI grammar. Therefore, the underlying deficit is not in the operation Move itself.

An alternative possibility suggested by R. Manzini (personal communication) is that there is a defect with the Economy principles (Chomsky 1995)) and that this could cause optional movement in the grammar. R. Manzini (personal communication, January 1998) suggests that Last Resort is missing as well as other least effort principles and, therefore, the derivation admits multiple choices at each step. I now consider the possibility of Economy being the locus of deficit causing SLI in children.

Two of the basic properties of the operation Move that make up Economy are (i) the Minimal Link Condition (MLC), and (ii) Last Resort. The MLC is an economy constraint that selects the movement operation that creates the shortest link. Movement of A takes place provided there is no B that is closer to the target K and that could satisfy the checking relation with K as well as A could (Chomsky 1995)). Formally Chomsky (1995) defined Last Resort as “Move F raises F (a feature) to target K only if F enters into a checking relation with a sublabel of K.” Last Resort itself may be thought of as comprising two principles (R. Manzini, personal communication, January 1998). The first, which I refer to as Economy 1, ensures that the operation Move is permitted only if it satisfies a feature-checking relation. In other words, Move F only occurs if there are features to be checked. The second principle of Last Resort, Economy 2, forces movement (and thus, checking), either covert or overt, if the target has not had its features checked. Thus, this Economy 2 principle of Last Resort ensures that movement operations are obligatory. Finally, it should be noted that covert movement of features is favored over overt movement involving pied piping, as the former is more economical. This third principle, referred to as Procrastinate by Chomsky (1995), is largely irrelevant here, so it is not considered further.

I consider first the possibility of a failure with the MLC. The finding that children with SLI accept nonlocal antecedents for reflexives could be taken as
support for such a failure. However, a general failure with the MLC would open up the possibility of nonlocal antecedents crossing local ones in the derivation, resulting in inappropriate movement of features and/or lexical items, as shown in the super-raising violation in (8). Evidence for violations of MLC, illustrated in (8), and errors involving incorrect movement of lexical items producing word order errors are not attested (see also Clahsen (1991)).

(8) John seems that it is likely to win.

The second possibility within Economy is that there are problems with Last Resort; that is, there is a deficit with either Economy 1 or Economy 2 as previously defined. Economy 1 cannot be missing, as the data provide plenty of examples of correct feature checking (e.g., Agr and Tns marking is correct at least 20% to 30% of the time in AZ’s spontaneous speech). Furthermore, evidence of inappropriate feature checking (see (9)) is not found.

(9) I likes John.

In contrast, I claim that Economy 2, the Must Move principle, which forces Move F, is missing from AZ’s grammar and other similarly impaired children with SLI. Without Economy 2, movement is a free choice. Note that this restricts the derivation to one of two possibilities: Either the target correctly attracts the feature of the nearest lexical item to satisfy feature checking, or simply there is no movement of features and consequently no checking of the target’s features. Thus, this results in movement generally being optional. Note that feature checking may occur in the absence of movement through Merge. In contrast, movement only occurs with feature checking as stated in Economy 1.

I now consider in more detail whether the proposed deficit provides a parsimonious explanation and what modification or further specification of the Minimalist program is required to account for the data from AZ and his peers with SLI. Specifically, can optional movement caused by missing Economy 2 account for AZ’s problems with Agr, Tns, ০-role assignment, and question formation, as well as his problems with syntactic embedding and complexity and the general optionality in his grammar? Can this proposed failure of Economy 2, resulting in optional movement, account for the apparent paradox in SLI grammar? Although AZ had problems or an impairment with Tns, Agr, wh-question formation, and so on, none of these syntactic operations are missing per se, but they are not realized consistently.3

3An anonymous reviewer pointed out that if participants with SLI have optional movement then well-formed SLI grammar should represent a superset of well-formed nonimpaired grammar. This is exactly what we find in the data. AZ and his peers with SLI produced sentences with structures such as What Mrs. White dropped?, What did Mrs. White dropped?, and What did Mrs. White drop?
First, I am taking Chomsky’s (1995) view that if a lexical item enters the numeration then it already has its appropriate features either intrinsically or attached to it as it is selected from the lexicon. Second, if features of the target are not checked then they are not interpreted at the interface. In this respect I depart from Chomsky’s grammar where lack of checking means that the derivation crashes by Full Interpretation at the interface. Third, as the system of movement—feature checking basically constrains the possible derivations, then its failure will lead to a broader (less constrained) grammar in children with SLI than in adults. Therefore, derivations that are possible in adult grammar, as well the “base” derivations prior to movement and feature checking, will be possible in SLI grammar. This does not preclude semantic, pragmatic, or general cognitive constraints playing a later role at or after the interface level, but these are not considered here (see van der Lely and Dewart (1986) and van der Lely and Stollwerck (1997) for evidence of this).

As already discussed, the data for AZ and his peers with SLI for Tns and Agr support Rice et al.’s (1995) finding of true optionality, whereby either the correct tensed form or the default infinitival form is possible in SLI grammar as illustrated in (10a,b).

(10) a. My Mum goes out.
    b. My Dad go to work.

(AZ, 11;2)

However, although the data presented here concur with Rice et al. (1995), my explanation for this linguistic behavior differs. I claim that optional movement due to missing Economy 2 as previously outlined may adequately account for these data. To obtain Tns marking, there is head-to-head, V to I movement: either overt movement of V to I, if I is not filled with an auxiliary, or covert F movement and checking. This leaves the verb in a checking relation with the DP in the Spec of I, where phi-features of goes and My Mum can be checked (see (10a)). Thus, correct Tns and Agr marking will surface. In contrast, (10b) may be accounted for by an absence of V to I movement, and thus, Tns and Agr phi-features of My Dad and go are not checked and the default is realized at the interface. Agr errors, such as I goes, do not occur and instead only the default unmarked forms occur. We may take this to mean that unchecked features are compatible only with nonrealization or default realization at the interface. It is interesting that Rice and Wexler’s (1996a) analysis of be/do reveals 45% correct forms for be and 46% correct forms for do. They reported that errors are omissions. Thus, this chance level of correct forms and omissions is what would be expected in a grammar if movement and feature checking was a free choice. Thus, the absence of Economy 2 Principle of Last Resort causing optional movement may provide a parsimonious account for these data for Agr and Tns marking.
I now turn to accounting for the problems of AZ and his peers with SLI with assigning \( \theta \)-roles to argument positions. First, the (arguably) syntactic differences between adjectival and verbal passive sentences should be noted. Borer and Wexler (1987) and Grimshaw (1990), among others, claimed that affixation for adjectival passives occurs in the lexicon; there is a categorial change (V to A), and elimination of the external \( \theta \)-role in the lexicon. Thus, the adjectival passive is syntactically simpler, having only one \( \theta \)-role to be assigned. In contrast, affixation for verbal passives occurs in the syntax (Borer and Wexler (1987)). Following Baker, Johnson, and Roberts (1989), I assume that both the external and internal \( \theta \)-roles of transitive verbs need to be assigned in passive sentences. Second I assume Manzini and Roussou’s (1997) proposal for A-movement and control. I briefly summarize Manzini and Roussou’s model, which departs from the standard transformation theory of A-movement. Manzini and Roussou argued that DPs are merged in the position where they surface and thematic properties are conveyed to the checking domain of the DPs themselves by Move F(eatures). Following Tenny (1994) and Borer (1994), Manzini and Roussou took the position that thematic properties correspond to the nesting of arguments within the aspectual structure of the lexical predicate. Thus, assignment of \( \theta \)-roles may be construed as the pairing of DPs with aspectual features determined by the verb. Manzini and Roussou (1997) assumed the properties of the Event Measure (EM) (Theme) is represented on the lower V on the VP shell, and the properties of the Originator of the event (OR) (Agent) is represented as the content of the upper V of the VP shell. The \( V_{EM} \) can bear accusative case features (Arad (1996)). Thus, the \( V_{EM} \), associated with a strong D-feature, can be checked by merger of a DP. This DP is therefore interpreted as the thematic object. Raising of the lexical V within the VP shell produces the correct word order (Manzini and Roussou (1997)). Assignment of the OR feature is achieved via movement of V to I where OR is in the checking configuration with the DP that has merged in Spec I.

For passive sentences, following Baker et al. (1989), Manzini and Roussou (1997) proposed that the aspectual features (OR, EM) associated with the arguments of the verb both move from V to I. The OR feature (normally assigned to the external argument of active sentences) is assigned to the passive morphology, leaving the EM feature to be attracted and checked by the DP in Spec I.

Thus, I propose that within this framework, the deficit of children with SLI with \( \theta \)-role assignment may be encompassed by the proposed deficit with Economy 2 causing optional movement–feature checking. Children with SLI are not reported to make errors with simple intransitive utterances such as *Mary laughs* or with sentences with early acquired verbs in transitive active structures (van der Lely (1996)). In prototypical active sentences, such as *The car hits the lorry*, post-Logical Form (LF), cognitive strategies and pragmatic knowledge may be adequate to assign any unchecked thematic-aspectual feature of the verb. Interestingly, when assigning prototypical thematic-aspectual feature to novel verbs, even in simple active transitive sentences, children with SLI have been found to
be significantly impaired in comparison to language-matched control children (van der Lely (1994)). It could be predicted that children with SLI would show a greater impairment in argument assignment when post-LF cognitive strategies and pragmatic knowledge are less likely to be effective in inferring any unchecked θ-aspectual features to the verb’s arguments. The data appear to support this prediction. A greater number of errors occur for novel than real verbs (van der Lely (1990; 1994)), for nonprototypical and noncanonical assignment than prototypical and canonical assignment of θ-roles, for passive sentences than active sentences, and for sentences with more versus fewer θ-aspectual features. Thus, more errors are found for dative than transitive sentences and verbal passives than adjectival passive sentences (van der Lely (1994; 1996), van der Lely and Harris (1990)). Finally, it should be noted that the performance of children with SLI in many investigations of predicate–argument structure reveals inconsistent assignment of θ-aspectual features. Typically, they perform above chance level (Bishop (1997)). Thus, their performance does not indicate “no knowledge” of θ-aspectual feature assignment (see Bishop (1997) for a review). This observation is consistent with optional movement–checking of θ-aspectual features, which I proposed earlier. Furthermore, this pattern of performance is consistent with the performance of SLI children in other aspects of language, such as Tns marking.

I now consider AZ’s problems with anaphoric and pronominal Binding in sentences such as (1) earlier, repeated as (11). Within the Minimalist framework, anaphoric binding is taken to reduce to the Attract/Move operation and therefore to its locality properties, notable the MLC (Manzini and Roussou (1997)).

(11) Mowgli says Baloo Bear is tickling himself.

Reinhart and Reuland (1993) proposed that the properties of lexical anaphors are derived via movement, in that self moves to the closest predicate marking it as reflexive. Following Manzini and Roussou (1997), (11) would have an abstract structure of the form Baloo Bear is self-tickling him, where the reflexively marked predicate forces coreference between Baloo Bear and him. In the absence of a reflexively marked predicate, disjoint reference is assigned to Baloo Bear and him. Thus, for correct interpretation of sentences such as (11) movement of self to the predicate is required. Optional movement due to failure of the Economy 2 principle of Last Resort may affect this movement-checking operation.

The data for AZ and his peers with SLI indicate that the presence of self alone may act as a reflexive marker of the predicate as shown by the children’s rejection of pictures that do not depict a reflexive action for sentences such as (11). However, without movement-feature checking of self, coreference between Baloo Bear and him is not forced. Thus, as predicted, the children accept a nonlocal coreferent for the anaphor. If movement is optional in the child with SLI, the acquisition of the properties of anaphors and pronouns may be problematic. In the absence of obligatory movement–checking, the child observes anaphoric him as coreferential with a local antecedent. Therefore logically, pronominal him may
also be coreferential with a local antecedent. Thus, the distinction between the properties of anaphoric and pronominal him are likely to be impaired. Therefore, our children's chance level of performance in the absence of semantic or pragmatic cues, accepting the wrong antecedent for the anaphors and pronouns, is expected if movement and checking occurred optionally and the children were free to choose which of two antecedents was the correct one.

AZ's performance on wh-questions raises a number of interesting issues. First, his better performance on subject than object questions may be explained by the wh-word in subject questions being base generated in subject position and, thus, no movement being required. However, his severe deficit with object questions is an illustration, par excellence, of his problems with movement. The fact that on three occasions he produced correct object questions suggests that the required movement operation and feature checking is not impossible for him, although it is certainly problematic.  

As discussed earlier, wh-questions illustrate two types of movement operations, specifically operator movement (A-bar movement) and wh-feature movement (I to C movement). The data provide support for the view that both movement operations are problematic in SLI grammar. (See also Eyer and Leonard (1995) and Hamman, Penner, and Lindner (this issue) for other evidence of wh-movement problems in children with SLI.) It is noteworthy that on no occasion was the wh-word produced in the argument (trace) position, and it was not omitted by AZ and his peers with SLI. Thus, it appears that, even for some object question, children with SLI may merge the wh-word as an interrogative marker in the Spec of CP. It is likely that the test procedure facilitated the children starting their utterances with the wh-word. In addition, the intensive therapy the children had explicitly taught them to start questions with a wh-word. However, the 10% of the overall group's responses that contain gap-filling errors supports the view of a lack of phrasal, A-bar movement and checking on a substantial number of

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4 An anonymous reviewer suggested that the data from wh-questions and passive sentences indicate that movement is unavailable to participants with SLI and that the degree of structural complexity or embedding may account for the data. This line of reasoning would imply that separate impairments underlie the deficits in morphology and production of complex or embedded structures in participants with SLI. It should be noted that performance on comprehension and judgment tasks by participants with SLI is typically above a chance level, and in expressive tasks on target structures (e.g., subject–verb Agr, passive sentences) they typically obtain between 20% and 70% correct utterances. Thus, I maintain the position that movement is not missing in SLI grammar. However, I recognize that there are some problems with the account of optional movement. For example, problems with embedding could result from other deficits, such as a general processing deficit. The RDDR account presented earlier provides a linguistic basis for complexity. Moreover, this hypothesis predicts that an impairment with morphology necessarily will incur an impairment with embedding. Therefore, the most parsimonious hypothesis is one that can account for both impairments by the same underlying deficit. Thus, I pursue the line of investigation into the RDDR–optional movement deficit hypothesis on the basis that it provides a more restrictive theory and set of predictions. Therefore, we should see two separate disorders: one involving impaired morphology and embedding (as seen in individuals with grammatical SLI) and one with normal morphology but impaired embedding. This research focuses on explaining the first of these deficits.
occasions. The large number of subject question for object question errors made by AZ, as argued earlier, is also indicative of the wh-word being merged directly in the position in which it surfaces, avoiding movement. It is interesting to compare the performance of our older participants with SLI with the performance of younger participants with SLI who frequently (approximately 50% of the time) omit the wh interrogative marker (Hamann et al. (this issue)). This supports the suggestion that the older children’s correct positioning of the wh-word reflects the effect of therapy, which leads to the wh-word being inserted directly as an interrogative marker. It is also possible that the double Tns errors are indicative of do being base generated in C, rather than involving I to C movement (cf. Hollebrandse and Roeper (1996)). Thus, this would leave I to attract V where its Tns features would be checked. AZ’s use of incorrect irregular past-tense forms (e.g., weared, stoleed) indicates that it is unlikely that he was merely repeating a section of the probe sentence that contained the past-tense form of the verb. It is interesting that on purely semantic criteria, lexical selection of a past-tense form of a verb is appropriate in questions about past events. In contrast, on syntactic criteria, the nonfinite form should be selected from the lexicon in object question formation as the Tns feature has already been marked on the auxiliary. In addition, the do-support omissions and the incorrect form of the auxiliary or lexical verb are indicative of an absence of I to C movement and/or checking of aspectual features (see (5c.ii)).

The double Tns marking errors, like many of the other wh-errors found for participants with SLI are evident in young normally developing children’s language (e.g., Hollebrandse and Roeper (1996), Stromswold (1995)).

Finally, I consider whether optional movement can account for AZ’s problems with embedding a PP inside an NP, shown in (12).

(12) The cat with the blanket is sleeping on the bed.

Following Manzini and Roussou’s (1997) theory of A-movement and control, I propose that predicates such as prepositions have a PP shell. The internal and external arguments associated with the preposition (Higginbotham (1985)) may be construed as aspectual features. I call them Asp 1 (external argument) and Asp 2 (internal argument). Considering (12), I propose that the preposition with is merged in the lower P head position. Asp 1 is formally represented on the upper P of the PP shell as shown in (13).

(13) \[P_{Asp1}[\text{blanket with}_{Asp2}]\]

The strong case feature forces the presence of a DP (the blanket) in the Spec of the lower PP, where it can get its case features checked. Asp 2 is assigned to the internal argument DP, because its head D attracts (or “saturates”) Asp and thematic roles (Higginbotham (1985)). Raising lexical P within the PP shell yields
the correct word order. The problem now arises with assigning Asp 1 of the prepositional predicate to a DP generated in the Spec of IP, where presumably it also receives thematic-aspectual features from the main predicate. However, according to Manzini and Roussou's (1997) theory of control, a DP may receive one aspect from the main predicate and one from the secondary predicate. Thus, by the same token, in (12), the aspectual features of the embedded preposition may function in the same way as any other secondary predicate. Therefore, the subject DP may check Asp 1 from the prepositional secondary predicate. Thus, I propose that embedded phrases such as (12) also require movement and feature checking. This enables more than one 0-aspectual feature to be assigned to a DP, and facilitates syntactic complexity.5

In sum, I have argued that a broad range of syntactic impairments found in AZ's grammar can be accounted for by optional movement–feature checking. I have claimed that optional movement is best viewed as a descriptive characterization of SLI. Based on the RDDR account, I have claimed that the underlying deficit causing optional movement is in the computational system. Specifically, I have argued that Economy 2 principle of Last Resort, the Must Move principle, is missing from their grammar and that this provides a parsimonious explanation for the data from AZ and his peers with SLI.

4. CONCLUSION

In this article I have argued that the linguistic description of SLI is best characterized by optional syntactic movement that is construed as feature movement (Chomsky (1995)). Previous accounts of SLI have argued that children with SLI have an underlying feature deficit, affecting all morphosyntactic features (Gopnik (1990), Missing Features Account), affecting noninterpretable phi-features of verbs (Clahsen et al. (1997), Agr deficit account), or affecting Tns features or the Tns projection (Rice and Wexler (1996a,b) EOI account). I have argued that missing or underspecified feature deficits must be located in the lexicon or prior to the syntactic numeration. I have claimed that these accounts cannot explain the range of deficits that we find for AZ and his peers with SLI. In contrast to these accounts, I have proposed that the underlying deficit causing SLI lies in

5A reviewer questioned why we do not see sentences with "unmoved" embedded constituents. This is an interesting point. It may be explained by the following: A failure in movement could be seen at two interfaces—that is, at LF or Phonetic Form (PF). Moreover there is an asymmetry between what is interpreted at LF or PF. Inflectional morphology is not interpretable at either PF or LF unless it has been checked. In contrast, thematic roles are interpretable at LF even if not checked. If thematic-aspectual features are not checked at PF then this may result in omission of an argument (a PP or an NP within a PP or VP). In other words, within the theory I am proposing, if ASP moves to DP then it is interpreted at PF; if ASP does not move to DP then it is not interpreted at PF and therefore is omitted.
the syntactic computational system (van der Lely (1994; 1997), van der Lely and Stollwerck (1997), the RDDR account). The RDDR account has been developed to accommodate the findings summarized in this article for AZ and his peers with SLI. Within the Minimalist framework the two possibilities that could account for optional movement were explored. First, a deficit in the rule operation, Move F was ruled out as AZ and the other children with SLI on occasions show appropriate movement-feature checking. (However, cf. Gopnik’s (1990) Morphological Rule deficit account, which may account for morphological impairments found in participants with SLI.) Second, a deficit with Economy suggested by R. Manzini (personal communication, January 1998) was considered. A deficit with one or both of the two main properties of the operation Move F was explored (i.e., a deficit with the MLC and/or Last Resort). The data did not generally support a deficit with the MLC. It was proposed that Last Resort may be split into two principles: Economy 1 ensures that only features that require checking enter into an appropriate checking relation. The Economy 1 principle does not appear to be impaired in children with SLI. The second principle is Economy 2, the Must Move principle of Last Resort that forces any unchecked feature to move and be checked. Thus, movement is not an option, it is obligatory. I claim that children with SLI lack the Economy 2 principle. It should be clearly noted that I am not claiming that syntactic movement is missing or is impaired per se.

Optional movement, which characterizes SLI grammar, results from the underlying deficit with the Economy 2 principle. Based on Manzini and Roussou’s (1997) theory of A-movement and control, I have presented an account of how optional movement–feature checking can account for the broad range of syntactic impairments illustrated by AZ’s grammar. That is, it can account for problems with Tns marking, assignment of θ-aspectual features, and anaphoric and pronominal reference, wh-movement, as well as problems with embedding structures.

Although this article has highlighted the breadth of the syntactic deficit in children with SLI, I have argued that the deficit is confined to affecting features that fall under the operation Move F. Furthermore, I have claimed that the underlying nature of SLI may be accounted for by a discrete deficit in Economy, specifically Economy 2 principle of Last Resort, which is located in the syntactic computational system. This account represents a development of the RDDR (van der Lely and Stollwerck (1997)).

The data presented here show many similarities between the grammars of children with SLI and children 4 years old or younger (cf. Borger and Wexler (1987), Chien and Wexler (1990), Crain (1991), Hollebrandse and Roeper (1996), Wexler (1996)). Thus, it is tempting to speculate that the deficit proposed in this article with the Economy 2 principle of Last Resort may also account for at least some of the immaturities in the grammar of young children. However, although there are similarities in some areas of syntax in children with SLI and young children, differences also exist, such as in pragmatic inference and world knowledge (van der Lely (1997c), van der Lely et al. (1998), van der Lely and Stollwerck
The possibility that similar errors in syntax could exist for different underlying reasons must also be considered.

Finally, in this article I have attempted to account for all the main areas of syntactic deficits found in children with Grammatical SLI, illustrated by AZ’s grammar. The proposed deficit in the computational syntactic system may provide a new avenue of research that aims to go toward a theory of the underlying nature of SLI in children and to provide insights into the innate basis of UG.

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APPENDIX

Transcription of AZ’s narrative of the picture book

Frog Where Are You?

AZ: Age 11;2
[The boy had a frog . . . and put it in the jar . . . but not a lid over it.]
[The dog was poking in] [... where was it?]
[And the boy was happy.]
[The mother came up (inaudible) “Your bedtime now.” “Your bedtime!”].
[But he was in mibble night] [... and the frog climb out] [... and the next morning the boy was ... sad] [... because the frog was gone.]
[The boy was looking in it everywhere ... looking inside the boots] [... and the dog ... has lost the ___ he got his head the jug ___ he got a jar ___ jug ___ I mean a glass on his head.]
[And the boy was shouting: “Frog, frog!”].
[[And then the dog ... slipped from the edge ... and hit on the ground ... outside] [... and the glass opened] [... and ... and the boy was very mad.]
The boy still called “Frog, frog!”] [... and then he was shouting down a hole] [... and the boy was looking at these ... bees] [going to a honey ... cone.]
[And he got hurt by the little ___ er mole.]
[And the dog still was walking about with this bee ... thing (++) and the dog has broke the cone] [... and the boy was loo___ was on the tree and looking through a hole] [and a owl poke up ... “Woo!”] [... and again the bees was after the dog] [... and the boy has run away ... bit deep in the forest] [... and the owl was gone.]
[But the boy climb up the rock ... and holds onto branches] [... but it wasn’t branches] [... it was a moose.
A moose was running to the edge and stops.]
[And the boy was falling down including the dog.
Down and down ... and splash!]
[Oh they got wet.]
[And the boy heared what the ribit sound and the boy said “Sh” to the dog]
[... and they poke over the log and they saw a male frog and a ... his fre___frog.]
[And the little frog came] [... well ... the boy took one frog] [... and that’s what happened.]