Comprehension of Reversible Relative Clauses in Specifically Language Impaired and Normally Developing Greek Children

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This paper aims to investigate the syntactic comprehension of reversible relative clauses in a group of eight Greek children with specific language impairment (SLI) and two control groups of normally developing children matched on chronological and language age, respectively. An experiment using an acting out procedure was undertaken. Group analysis revealed that SLI children's performance is qualitatively different than that of both control groups. Interpreting the data, processes involved in syntactic comprehension are taken into consideration. It is claimed that processing demands impede SLI children's performance due to a deficit in their competence grammar. © 2001 Academic Press

Key Words: syntactic comprehension; parsing; reversible relative clauses; SLI children; control groups; performance; competence.

1. INTRODUCTION

To identify the nature of the linguistic deficit in specific language impairment (SLI), the study of expressive as well as receptive language abilities of SLI children is of great importance. However, the bulk of research on SLI is concerned with deficits in expressive language (Clahsen, 1991; Gopnik, 1990; Gopnik & Crago, 1991; Leonard, 1989). The few studies that have been conducted on SLI children's comprehension indicate that SLI children show consistent deficits in interpreting complex sentences such as passives and embedded sentences but also simple active transitive sentences (Bishop, 1982; Precious & Conti-Ramsden, 1988; van der Lely, 1996; van der Lely & Harris, 1990). A high proportion of word order errors in semantically reversible sentences, particularly if noncanonical word order was used, was found to be the hallmark of SLI children's comprehension. On the basis of the findings above, it was claimed that SLI children's performance presents qualitative differences

from that of their chronological age and language age counterparts (van der Lely & Harris, 1990). Consequently, SLI cannot be treated as a simple delay in the language acquisition process as has been suggested by Rice, Wexler, and Cleave (1995).

In this study, comprehension of reversible relative clauses in Greek SLI children and two control groups of normally developing children is investigated. There are two main goals. The first is to identify whether SLI children's comprehension of reversible relative clauses differs from that of their chronological age peers and their language age peers and in what way it differs. The second is to account for the properties of SLI children's comprehension pattern by considering them as indicative of a deficit in their competence grammar, i.e., the implicit syntactic knowledge.

The overall organization of this article is as follows. Section 2 lays out our assumptions about parsing with respect to relative clauses and theta-role assignment. Section 3 sketches the structure of relative clauses in Greek while Section 4 reports on the experiment designed to investigate SLI children's comprehension. In Section 5 the results on group performance are presented and in Section 6 an account of the problematic performance of SLI children is provided.

2. LINGUISTIC AND PROCESSING HYPOTHESES

Complex sentence comprehension places heavy processing demands on the interpretative system that must decode the sentence. Therefore, in the investigation of syntactic comprehension of relative clauses issues related to processing factors should be taken into consideration. Up to now quite different approaches regarding the grammar–parser relationship have been developed (Berwick & Weinberg, 1984; Crocker, 1996; Frazier, 1987; Gorrell, 1995; Marcus, 1980) and thus it is still an open question as to how grammar and the parser interact with each other. The central issue is whether the principles employed to describe the system of knowledge that makes up the language faculty should also provide an adequate description of that system's implementation in language use. Chomsky (1968) points out that the grammar consists of the knowledge a speaker/hearer has of a language, which guides the use of the language, but does not prescribe any one particular parsing algorithm for how that knowledge is put to use. Following this position, it is assumed that the rules incorporated in the grammar are not mirrored exactly in the organization of the parsing and thus parsing can involve processes that are independent of grammar (for a review see Garnham, 1985). Therefore, parsing strategies can be distinct from linguistic knowledge, but nevertheless, sentence processing is guided by the grammar from the outset (Frazier, 1998, p. 133).

As far as the parsing strategies are concerned the following assumptions are being made here. First, it is hypothesized that the parser shows a locality preference (Frazier & Fodor, 1978; Gibson, 1998). Consequently, long distance associations are expected to be more difficult than local ones. Second, it is assumed that when the option of positing a gap or a lexical NP is available, the parser will prefer to posit a gap (Crain, 1999; Crain & Fodor, 1985; Stowe, 1986). It is therefore predicted that if there is an Noun Phrase (NP) instead of a gap, some processing difficulty should arise. The effect of the NP has come to be known as the ''filled-gap'' effect. It is further postulated that the sentence parsing strategies are sensitive to the language-specific properties. Therefore, parsing procedures are expected to be parameterized to the extent that the parser uses the Phonological Form (PF) properties of a particular language (see Frazier & Rayner, 1988; Mazuka & Lust, 1990; Mitchell, 1994; for discussion). The surface properties of typologically different languages in some sense direct the parser as to how to deal with the input; therefore, some input processing

strategies are developed that are dependent on the surface form of the language. With respect to theta-roles, typologically different languages provide surface cues to the parser, which are bound to be language specific. Hence, theta-roles in English are largely indicated through word order but in other languages case or agreement markers are used to convey information about theta-roles. With respect to Greek, I postulate that the parsing mechanism is sensitive to case marking. In Greek, the contrast between the agent and patient theta role is marked by particular morphological suffixes that express nominative and accusative case, respectively. Therefore, default associations between nominative case and the agent theta-role on the one hand and between accusative case and the patient theta-role on the other are made. Such input processing strategies are assumed to underlie native speaker use of language but are not principles of competence grammar and thus not sufficient for theta-role assignment. Experimental evidence in favor of the hypothesis that the surface form of the language provides specific cues to the parser is provided by on line sentence interpretation experiments, which show that Greek speakers rely more on the morphological contrast cue, i.e., marked case, than both animacy contrast and word order cue (Kail & Diakogiorgi, 1994). In English, on the other hand, the word order SVO was found to be a strict and highly valid cue to sentence interpretation (Bates et al., 1984).

On the basis of the above assumptions, it is further suggested that the more the preferences of the parser are violated, the more difficult the processing of the structures will be.

3. ON GREEK RELATIVE CLAUSES

Relatives in Modern Greek (MG) are introduced either with the relative pronoun *o opios, i opia, to opio* (''who'') or with the complementizer *pu* (''that''). In this study only *pu* relatives were tested, since *opios* relatives are not so frequent in MG (Varlokosta, 1998). Consider some properties of MG relevant to relative clauses: (i) although MG is a relatively free word order language, it is noteworthy that in object-gap relatives with an object-head as well as in object-gap relatives with a subject-head the subject of the relative clause obligatorily occupies the postverbal position. (ii) MG allows resumptive strategies and more particularly the presence of a clitic in relative clauses, which is coindexed with the head of the relative. This clitic is clearly resumptive, in the sense that it is marked for the same case as the head of the relative, only when the head of the relative occupies the object position. The clitic strategy is also available when the head of the relative occupies the subject position and the gap is in object position, but the clitic is not marked for the same case as the head of the relative.[1] In this study relatives with subject as well as with object gap were presented. In total seven types of relatives were tested. The first letter in the code identifies the grammatical function of the head while the second letter indicates the grammatical function of the gap within the relative clause. In this study only relatives with clearly resumptive clitics, i.e., marked for the same case with the head of the relative, were tested.

O–O relatives: object head–object gap [**O–O**]
(1) I kopela   sproxni   ton cirio   pu   krata   I nosokoma
The girl-nom   push-3s   the man-acc that hold-3s the nurse-nom
''The girl is pushing the man that the nurse is holding.''

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[1] Consider the following example: I   ciria   pu   ti   fila   o   cirios   ine psili
The woman-nom that her-cl-acc kiss-3s the man-nom be-3s tall-nom
''The woman that the man is kissing is tall''

O–O–cl relatives: Object head–Object gap + clitic in relative clause (morphologi-
cally unmarked[2] case on the arguments) [**O–O–cl**]:
(2)   I   mama   ðiχni   to aγori   pu to sproχni to koritsi
       The mother-nom point-3s the boy-nom/acc that it-clit push-3s the girl-nom/acc
       ''The mother is pointing to the boy that the girl is pushing.''

O–O–cl–case relatives: Object head–Object gap + clitic in relative clause (mor-
phologically marked case on the arguments) [**O–O–cl–case**]:
(3)   To aγori   sikoni   tin kopela   pu ti   ∂iχni   o andras
       The boy-nom carry-3s the young-woman-acc that her-clit-acc point-3s the man-nom
       ''The boy is carrying the young woman that the man is pointing to.''

S–O relatives: Subject head–Object gap [**S–O**]:
(4)   I ciria   pu filai   o cirios   çeretai ti jaja
       The lady-nom that kiss-3s the man-nom greet-3s the grandmother-acc
       ''The lady that the man is kissing is greeting the grandmother.''

S–S relatives: Subject head–Subject gap [**S–S**]:
(5)   I ciria   pu filai   ton cirio sproχni   tin kopela
       The lady-nom that   kiss-3s the man-acc push-3s   the girl-acc
       ''The lady that is kissing the man is pushing the girl.''

O–S relatives: Object head–Subject gap [**O–S**]:
(6)   I   ciria   klotsai tin kopela pu pçani   ton andra
       The woman-nom kick-3s the girl-acc that hold-3s the man-acc
       ''The woman is kicking the girl that is holding the man.''

To assess whether there is a word order effect in SLI children's performance,
we changed the subject position in O–O relatives from postverbal to preverbal. The
preverbal subject position is more easily acceptable when another constituent, for
instance a PP, follows the verb. Four tokens of this sentence type were tested:

O–O–preverb.subj relatives: Object head–object gap–preverbal subject in the rela-
tive clause [**O–O–preverb.subj**]:
(7)   To koritsi   sproχni ton andra pu I nosokoma   krata   apo to çeri
       The girl-nom push-3s the man-acc that the nurse-nom hold-3s by the hand-acc
       ''The girl is pushing the man that the nurse is holding by hand.''

O–O–cl and O–O–cl–case relatives differ minimally in that in the former case on
the NP arguments is unmarked, whereas in the latter it is marked. Furthermore, the
presence/absence of a clitic differentiates O–O–cl–case relatives from O–O rela-
tives, respectively, while the subject position is the minimal difference between
O–O relatives and O–O–preverb.subj relatives.

4. METHODOLOGY

4.1. Subjects

Three groups of subjects participated in the experiment. The first group consisted
of 8 SLI children, selected according to a set of criteria proposed by Stark and Tallal

[2] In Greek there is no overt morphological contrast between the nominative and accusative case for
the neuter gender.

TABLE 1
Subject Details: Chronological Ages (all groups) and Raw Scores
from the Verbal IQ Test (SLI Children and LM Controls)

Subject group	Chronological age (CA)			Raw scores		
	Range	Mean	SD	Range	Mean	SD
SLI group N = 8	5.4–9.4	7.38	1.567	60–92	79	12.0475
AM controls N = 8	5.1–9.3	7.37	1.399			
LM controls N = 16	3.4–5.2	4.1	.5825	63–93	78	7.9956

(1981). Each child in the SLI group was individually matched with two control children on the basis of individual raw scores from the Verbal IQ Test for Greek children (Stavrakaki & Tsimpli, 1999). Therefore, the Language-Matched (LM) control group consisted of 16 normally developing children, who were selected on the basis of raw scores in the Verbal IQ Test. Analysis revealed no significant difference in raw scores between SLI children and LM controls [$t(22) = .229, p = .821$]. Notice that the use of the Language Test was preferred over the Mean Length of Utterance (MLU) measure for the following reasons. First, no work on mean length of utterance (MLU) calculation has been conducted for Greek and thus no such measure exists. Second, it is dubious whether the MLU calculation could give us an accurate picture of the grammatical development of Greek children. This is mainly due to the fusion morphology of Greek: Greek verbs are inflected for person, number, tense, aspect, voice, and—to some extent—mood (Holton et al., 1997). Verbal affixes are never omitted and thus counting the number of morphemes does not constitute an accurate measure for grammatical development. Finally, the particular test that was used provides measurements of different areas of language abilities. Expressive language abilities, i.e., naming pictured object/actions and producing morphological forms and syntactic structures, receptive language abilities, i.e., comprehension of metalinguistic concepts and syntactic structures, as well as imitation of grammatical structures are tested. Although SLI children are found to perform poorly on language tests,[3] as pointed out by an anonymous reviewer, their performance nevertheless constitutes an objective measure of their linguistic development.

Each SLI child was also matched with one normally developing child on the basis of chronological age (±3 months). Thus, the Age-Matched (AM) control group consisted of eight children. A summary of the three groups' details can be found in Table 1.

4.2. Design and Materials

There were four tokens of each sentence type, giving a total of 28 sentences. All of them were semantically reversible sentences.

4.3. Procedure

An acting out task was employed. There were two toys compatible with the head of the restrictive relative. In this setting the restrictive function of the relative, i.e.,

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[3] For the lower performance of SLI children on elicited tests than in spontaneous speech data, see Clahsen et al. (1992) and Stavrakaki (1999).

TABLE 2
Correct Performance on Comprehension of Relative Clauses

Sentence type	SLI group	LM controls	AM controls
O–O	18/32 (56.25%)	47/64 (73.43%)	31/32 (96.87%)
O–O–cl	10/32 (31.25%)	36/64 (56.25%)	28/32 (84.37%)
O–O–cl–case	12/32 (37.5%)	51/64 (79.68%)	30/32 (93.75%)
S–O	7/32 (21.87%)	23/64 (35.93%)	22/32 (68.75%)
S–S	13/32 (40.6%)	47/64 (73.43%)	30/32 (93.75%)
O–S	16/32 (50%)	37/64 (57.81%)	28/32 (87.5%)
O–O–preverb.subj	13/32 (40.62%)	46/64 (71.87%)	31/32 (96.87%)
Totals	89/224 (39.73%)	287/448 (64.06%)	200/224 (89.28%)

the function of restricting the reference of the head noun by selecting a subset of the set that it denotes, was met. If the child was presented with one toy for the head of the relative, the semantic presupposition of the restrictive relative clause would not be satisfied in the experimental context (Hamburger & Crain, 1982; Crain & Thornton, 1998). Violation of the above semantic presupposition might contribute to the low performance of children on certain types of relative clauses[4] in previous studies conducted by Tavacolian (1981), as argued by Hamburger and Crain (1982).

5. RESULTS

5.1. Analysis of Group Data

The total correct scores for all groups are presented in Table 2.

A 3×7 (Group $\times$ Sentence type)-way ANOVA was conducted to investigate the data. The main effects of subject group and sentence type were both significant [$F(2, 205) = 99.609$, $p < .001$ and $F(6, 205) = 10.67$, $p < .001$, respectively], whereas the interaction Subject group $\times$ Sentence type was not significant [$F(12, 205) = 1.37$, $p = .180$]. Posthoc analysis (LSD technique) confirmed that the scores of SLI children were significantly lower than those of LM controls ($p < .001$) and the scores of LM controls were significantly lower than those of AM controls ($p < .001$). In order to clarify the way the SLI children and LM controls were performing across the test sentences independent-samples t tests were carried out. SLI children and LM controls performed similarly on O–O and O–S relatives [$t(22) = -1.506$, $p = .146$ and $t(22) = -.704$, $p = .489$, respectively]. A significant difference was found between the two groups in the following types of relatives: O–O–cl [$t(22) = -2.432$, $p = .032$], O–O–cl–case [$t(11.12) = -7.879$, $p = .000$], S–O [$t(21.52) = -2.8$, $p = .011$], S–S [$t(22) = -3.694$, $p = .001$], and O–O–preverbs.subj [$t(22) = -3.22$, $p = .004$]. Consider now some striking differences between SLI children's performance and that of LM controls. A paired t test analysis showed that SLI children performed similarly on O–O–cl and O–O–cl–case [$t(7) = -.552$, $p = .598$]

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[4] This was the O–S structure for which very low correct scores were obtained in comprehension tasks using an acting-out procedure (Tavakolian, 1981). Based on these results, as well as on the main error type, which was the interpretation of the subject of the first clause as the subject of the relative clause, Tavakolian argued for the use of nonadult rules in relative clause formation. However, as was shown by Hamburger and Crain (1982), this was mainly due to the design of the study and particularly to the fact that there was one animal of each type in the group of toys used in the comprehension. As there was no presupposition for the existence of a set from which a subset was to be chosen, children interpreted sentences such as *The cow pushed the dog that kissed the rabbit* as *The cow pushed the dog and kissed the rabbit*; in the latter there is no implication that there is more than one animal of any type.

TABLE 3

Reversal of Theta-Roles in Relative Clauses: The Proportion of Reversal of Theta-Roles out of the Total Number of Errors by Group, the Number of Children Produced This Error Type, and the Number of Sentence Types with This Error

	SLI children	LM controls	AM controls
Proportion	65/135 (48.15%)	27/161 (16.77%)	10/24 (41.66%)
No. of children	8/8 (100%)	15/16 (93.75%)	5/8 (62.65%)
No. of sent.types	7/7 (100%)	6/7 (85.7%)	5/7 (71.42%)

regardless of whether case is marked or not, whereas marked case has a significant facilitating effect on the performance of LM controls (compare their performance on O–O–cl and O–O–cl–case relatives: $[t(15) = -3.758, p = .002]$). On the other hand, the absence of the clitic significantly affects SLI children's performance, since they exhibit significantly different performance on O–O–cl–case relatives than O–O ones $[t(7) = -2.393, p = .048]$. By contrast LM controls show similar level of performance on O–O–cl–case and O–O relatives $[t(15) = 1, p = .333]$ regardless of the absence/presence of the clitic. Notice that the change of word order in O–O relatives had no significant effect on the performance of SLI children since they perform similarly on O–O and O–O–preverb.subj, as comparisons between their performance on these relatives showed $[t(7) = 1.667, p = .140]$; the LM controls exhibited a similar pattern of performance, too, on O–O and O–O–preverb.subj relatives $[t(15) = 1, p = .333]$. With respect to AM controls, notice that they show an overall high level of performance, but it is noteworthy that their performance drops in S–O relatives. The performance of AM controls resembles that of LM ones in that the clitic has no effect [compare their performance on O–O and O–O–cl–case relatives: $t(7) = -1, p = .351$] but, unlike LM controls, case marking has no impact on their performance, as shown by their similar level of performance on O–O–cl and O–O–cl–case relatives $[t(7) = -1.528, p = .170]$. This is due to their generally high performance.

Furthermore, error analysis[5] revealed another asymmetry between the performance of SLI children and LM controls. The former reverse theta-roles in relative clauses significantly more often than LM controls $[t(22) = 12.74, p = .000]$, whereas the errors of the latter appear to be distributed across all error types. Notice that significance was also found between SLI children and AM controls $[t(14) = 9.63, p = .000]$ with respect to reversal of theta-roles in relative clauses but not between LM and AM controls $[t(22) = .731, p = .472]$. The proportion of reversal of theta-roles out of the total number of errors by group, the number of children that produced this error type, as well as the number of sentence types where this error was attested are presented in Table 3.

6. DISCUSSION

The results clearly demonstrate some asymmetries in the performance of the three groups. Consider first the different performance of each group across the test sentences. As the results indicated, the attested dissociation is mainly related to the following factors: (i) presence/absence of a clitic in O–O–cl–case and O–O relatives, respectively, (ii) presence/absence of case marking in O–O–cl–case and O–O–cl relatives, respectively. In sum, the presence of the clitic reduces only SLI children's

[5] Detailed error analysis is not provided here. Notice that nine error types were attested to in total in our data from SLI children and LM controls.

performance, whereas case marking increases only that of LM controls significantly. As has already been mentioned, neither a clitic effect nor a case marking effect was found for AM controls. The absence of overt morphological case marking in relative clauses does not prevent them from reaching a high level of performance. Thus, their performance is not dependent on the overt morphological case marking on the arguments of the relative clause. In this respect, they have fully mastered the syntactic representation of the relative clause. By contrast, the overt morphological case marking is exploited by LM controls, who undergo the normal process of language acquisition, but not by SLI children. On the other hand, the presence of the clitic has no significant effect on LM controls' performance but significantly decreases the performance of SLI children. Notice that, despite the matching on language age, children with SLI demonstrate a pattern of performance not equivalent to that of normally developing children with immature language (LM controls). SLI children's performance seems to be the mirror image of that of LM controls with respect to overt morphological case marking and clitic presence: there is an effect of clitic presence but not of case marking. It therefore appears that SLI children's performance is not only lower but also presents qualitatively different properties than that of control groups. On the other hand, LM controls' performance is similar but not identical to that of AM controls, since AM controls exhibit an overall higher level of performance. Therefore, it becomes evident that SLI children's deficit cannot be interpreted in terms of a general delay in language development (Rice et al. 1995); otherwise, similar properties between the performance of SLI children and LM controls should be exhibited.

Between-group comparisons indicate that SLI children's performance is significantly different from that of LM controls on certain structures. It is argued that the attested asymmetries are due to a drop of SLI children's performance while processing demanding structures. Recall that demanding structures have been defined as those violating the parser's preferences (see section 2). On the other hand, in most cases processing demands do not impede the performance of LM controls. The grammatical and processing properties of the test sentences, as well as the group for which each of them is difficult are presented in Table 4.

Consider first the test sentences, in which no significance between LM controls and SLI children was found. These are O–O and O–S relatives. Both of them seem to be compatible with the preferences of the parser as they were sketched in section 2. First, no long-distance associations are required between the gap and the head of the relative. Second, no ''filled gap'' effect is evoked, and third, the required association between theta-roles and case is established; i.e., nominative case is associated with the agent theta-role and accusative with the patient role. However, notice that LM controls exhibit lower performance on one of the two nondemanding structures in terms of processing, i.e., the O–S relatives. In Stavrakaki (2001) it is argued that this may be due to the possibility of experimental biases entering the data. More specifically, the use of the ''bird-in-the-hand'' strategy (Legum, 1975) was broadly attested to in some children: they incorrectly hang on to the toy used as the actor of the main clause when they act out the relative clause. As a result, the sentence ''The woman is kicking the girl that is holding the man'' is interpreted as ''The woman is kicking the girl and holding the man.'' When we changed the number of the verb in the relative clause, as it is shown in example (8), so that such a strategy could not be applied, as the subject NP in the main clause does not agree with the verb of the relative clause in number, the performance of LM controls was better.[6] Again, no significant difference with the performance of SLI children was found.

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[6] The correct percentage was 72%.

TABLE 4
The Grammatical and Processing Properties of the Test Sentences and
the Subject Group for Which Each Sentence Type Is Difficult

Sentence type	Grammatical properties	Processing properties	Group
O–O relatives	Postverbal subject Marked case	Compatible with the parser's preferences	None
O–O–cl	Postverbal subject Unmarked case Resumptive clitic	Filled gap effect	SLI children
O–O–cl–case	Postverbal subject Marked case Resumptive clitic	Filled gap effect	SLI children
S–O	Postverbal subject Marked case	Long-distance association between the verb of the main clause and the subject NP; nominative case is associated with the patient theta-role	All
S–S	Marked case	Long-distance association between the verb of the main clause and the subject NP	SLI children
O–S	Marked case	Compatible with the parser's preferences	None
O–O–preverb.subj	Marked case Preverbal subject	Filled gap effect	SLI children

(8) I ciria   klotsai tis kopeles   pu pçanun ton andra
The woman-nom kick-3s the girls-acc-pl that hold-3p the man-acc.
''The woman is kicking the girls that hold the man.''

Turn now to the cases where SLI children's performance drops significantly. Consider first the O–O–preverb.subj relatives, which are slightly different from O–O relatives with respect to the subject position in the relative clause. Following our assumptions in Section 2, it could be suggested that the drop in performance might be due to a filled gap effect. For the same reason, O–O–cl and O–O–cl–case relatives are also difficult to parse. Notice that an object clitic follows the relative complementizer *pu* in these relatives. Although clitics are not full NPs, in the sense that they acquire the ability to refer by virtue of their ability to point to an antecedent in the discourse (Cardinalleti & Starke, 1994), their presence after the relative complementizer has the same effect as the presence of a NP in the same position.[7] In this respect a filled gap effect is considered to be responsible for the reduced performance of SLI children. Turning now to S–S relatives, it is suggested that SLI children exhibit significantly different performance due to the fact that the parser does not favor long-distance associations that occur in center-embedded relatives between the verb of the main clause and the subject NP. The above processing limitations do not hold for LM controls.

Let us now discuss the low performance of the three groups on S–O relatives. It is noteworthy that all of them exhibit the lowest performance on this type of relatives. This finding is consistent with a number of findings from English, indicating a higher complexity of this type of relatives than of subject-extracted relatives (Caplan & Hildebrandt, 1988; Carpenter, Miyake, & Just, 1994; Crain, 1999). As far as the

[7] This is a tentative conclusion. Notice that in coordinated structures with clitics, SLI children perform significantly lower than their LM counterparts (Stavrakaki, 2001), whereas the two groups exhibit the same level of performance when there is an NP instead of a clitic.

Greek data are concerned, based on the processing mechanism that was sketched in section 2, it is suggested that the performance of the groups drops under the simultaneous influence of the following factors. First, the sequence of two NPs in nominative case, i.e., the head of the relative and the postverbal subject NP of the relative clause (see example 4), imposes processing difficulties on the parser, since the default association of nominative case with agent theta-role is made. By using the parsing principle of locality, whereby local associations between the empty category and the head of the relative are favored, the first NP (the head of the relative) incorrectly qualifies as the subject of the relative clause. Notice that the head of the relative is morphologically marked for nominative case and functions as agent in the main clause but is also coindexed with the empty category bearing the patient theta-role in the relative clause. Therefore, an NP marked for nominative case is associated with a patient theta-role, which is a violation of the parser's preferences. Second, the locality parsing principle is violated, as is the case in center-embedded relatives. Notice that even in this structure where a general drop in performance occurs, SLI children perform significantly lower than LM controls.

To summarize the discussion so far, SLI children demonstrate a pattern of performance that is not equivalent to that of their LM counterparts. SLI children's performance decreases under the effect of processing load, whereas the processing demands of the test sentences do not seem to have an effect on LM controls' performance in most of the cases, as is indicated in Table 2, except for S–O relatives. It seems, therefore, that the parser's preferences do not impede LM controls' performance as much as that of SLI children. This is probably due to the fact that normally developing children have knowledge of the linguistic principles and tend to follow them in most cases (Crain & Thornton, 1998). On the other hand, SLI children's performance seems to be completely dependent on parser's preferences in the sense that they reach the same level of performance with their language age counterparts only on structures without processing demands. If processing demands exert little influence on normally developing children's performance due to the fact that their competence grammar preempts processing factors in most cases (Crain & Thornton, 1998), it could be suggested that in the case of SLI children's performance, processing demands play such an important role because they cannot be overridden by the use of their competence grammar. Thus, SLI children, unlike normally developing children, do not use linguistic knowledge.

At this point the third asymmetry concerning the predominance of reversal of theta-roles in relative clauses in SLI data will be discussed. Recall that around half of the errors attested in SLI data belong to this category. By contrast, only 16.77% of the total number of errors constitute a reversal of theta-roles in LM controls' data. This finding highlights the difficulty that SLI children experience in theta-role assignment in relative clauses compared with the LM group. Few errors were produced by AM controls; thus a comparison is made between SLI children and LM controls. Notice also that this error was consistently made by all SLI children of this study across all test sentences, as is shown in Table 3. Based on the overall proportion of this error type in SLI data compared to that in LM controls' data and its distribution across the testing sentences and SLI children, it could be suggested that this error is indicative of ''a changing grammatical system'' (McKee, McDaniel, & Snedeker, 1998, p. 589). Hence, not only a different developmental language process seems to be followed by both groups but also the predominance of this error type is taken to indicate different underlying grammars between the groups.

To interpret the SLI children's tendency to produce this kind of error, consider first the possibility that there is a deficit in theta-role assignment, which is treated as a property of the position of merger and its very local configuration (Chomsky,

1995, p. 313). However, if this were the case, SLI children would exhibit the same level of performance across a range of structures, i.e., simple actives, coordinated and subordinated structures (Stavrakaki, 2001). However, even in the test sentences of this study, their performance varies, and thus, it can be argued that theta-assignment is relatively spared. An alternative hypothesis is that the predominance of this kind of error is related to the fact that coindexation between the head of the relative and the empty category, i.e., a variable bound by a null operator (Tsimpli, 1999a), has not been established. Following minimalist assumptions, I assume that empty categories have the full set of features required for interpretation of the argument. If theta-role assignment is spared and consequently the interpretation of the argument at LF, then it is hypothesized that the source of the problems may be located in the use of formal features, i.e., case and phi-features (Tsimpli, 1999b). On the basis of the finding that SLI children reverse theta-roles at a significantly different level than LM controls, it is suggested that they cannot exploit syntactic cues, such as formal features, unlike their LM counterparts. Recall that SLI children cannot exploit case marking in O–O–cl–case relatives. A question that arises if we follow the suggested line of reasoning is the following. If the locus of the deficit were in the noninterpretable features of the grammar, then more serious problems than the attested ones would be found in SLI data, as case would not be visible in SLI children's grammar. At this point the distinction between morpho-phonology and syntax is of great importance. Greek SLI children are exposed to the PF of a language with rich morphology; hence their parser is expected to make associations between morphological case and theta-roles (see section 2). Thus, they can learn to a certain degree the whole NP paradigm and the relevant thematic associations. However, when the referential index of the empty category is acquired via A'-binding by an operator predicationally related with an NP in an A-position, morpho-phonological cues are not available and thus problems in comprehension are expected.

All in all, in this paper it has been argued that SLI children's comprehension of reversible relative clauses is a qualitatively different process than that of their LM and AM counterparts. This claim was based on (i) the different performance of groups across the test sentences, (ii) the SLI children's drop of performance on processing-wise demanding structures, and (iii) the predominance of a particular type of error in SLI data. Furthermore, SLI children's deficit in comprehension was attempted to be attributed to competence rather than to performance factors, giving support to syntactic accounts rather than to processing ones.

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