



Production and comprehension of pronouns by Greek children with specific language impairment

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This study contributes to the characterization of the deficit in specific language impairment (SLI) by investigating whether deficits in the production and comprehension of pronouns in Greek children with SLI are best accounted for by domain-general or domain-specific models of the language faculty. The Greek pronominal system distinguishes between acoustically salient and non-salient forms, which are both interpreted on semantic/thematic grounds, and non-salient forms (object clitics) interpreted on syntactic grounds either in spec-head agreement or syntactic dependencies incurring feature checking through movement/chain formation. The results revealed a significant effect of the syntactic configuration on the production and comprehension of object clitics. Children with SLI were significantly impaired in the production and comprehension of those clitics that enter into operations necessitated by complex syntactic dependencies involving feature checking through movement/chain formation. Thus, the data support the computational grammatical complexity hypothesis and indicate that the deficits associated with object clitics in Greek-speaking children with SLI result from domain-specific impairment with syntactic dependencies incurring feature checking at the clause level involving movement/chain formation.

Specific language impairment (SLI) is a heterogeneous developmental disorder of language acquisition in the absence of hearing impairment, mental retardation, motor-articulatory impairment, frank neurological impairment, or psycho-emotional disturbance (Leonard, 1998; Stark & Tallal, 1981). Considerable controversy surrounds the nature of linguistic representations in SLI children, the locus of the deficit, as well as the cross-linguistic characteristics of the deficit.

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This study contributes to this debate by investigating the linguistic abilities of Greek children with SLI alongside typically developing children. Specifically, we focus on how Greek-speaking individuals with SLI produce and understand different types of pronouns in sentence contexts. We aim to offer new insight into Greek SLI and to distinguish between competing accounts of SLI; first, to distinguish between domain-general and domain-specific accounts of the deficit, and second, to distinguish between different domain-specific accounts that attribute the deficit to impairments of specific cognitive mechanisms.

SLI across languages

For many English-speaking children with SLI, grammatical morphology represents an area of specific difficulty (Bishop, 1997; Clahsen, 1989, 1991; Norbury, Bishop, & Briscoe, 2001, 2002; Rice & Wexler, 1996). For example, English children with SLI occasionally omit the regular past tense morpheme *-ed* and the inflectional marking *-s* for the third person singular (Leonard, 1998). In an attempt to describe the contribution of morphosyntax to the impairment in SLI, some researchers have suggested that a single grammatical feature, e.g. tense-related grammatical morphology, might serve as a clinical marker of SLI in English (Rice, Wexler, & Hershberger, 1998). However, children acquiring languages other than English, particularly those languages with rich inflectional morphology, are less impaired in the use of grammatical inflections than their counterparts who are acquiring a language with a sparse morphology such as English (Leonard, 1998). Strikingly, Greek and Spanish children with SLI¹ do not have problems with tense marking to the same extent as English children with SLI (Clahsen & Dalalakis, 1999; Restrepo, 1995; Stavrakaki, 1999; Tsimpli, 2001; Varlokosta, 2000b, among others). Based on such evidence, Leonard and colleagues suggest that impaired performance is dependent on the surface properties of each language; hence, the deficit in SLI cannot be adequately described in terms of impaired grammar across languages (Leonard, 1998; Leonard, Bortolini, Caseli, McGregor, & Sabbatini, 1992; Tomblin & Pandich, 1999).

In addition to their morphosyntactic deficit, children with SLI show a pervasive syntactic deficit affecting computationally complex structures, including passives, pronominal reference, and *wh*-questions² (van der Lely, 1998; van der Lely & Battell, 2003; van der Lely & Stollwerck, 1997). Recent cross-linguistic studies confirm the difficulties that children with SLI have with both the comprehension and production of complex syntactic structures (Friedmann & Novogrodsky, 2004, 2007; Jakubowicz, Nash, Rigaut, & Sinka, 1998; Novogrodsky & Friedmann, 2006; Stavrakaki, 2001a, b,

¹ Whilst there are findings that show a delay in the acquisition of past tense (Mastropavlou, 2006; Stamouli, 2000), some of them come from a single case study (Stamouli, 2000), and others show a relatively spared performance on some forms of past tense (Mastropavlou, 2006, p. 81).

² Examples of the SLI responses/preferences for the comprehension of passive sentences and assignment of pronominal reference as well as for the production of *wh*-questions are presented below.

A. Comprehension of short ambiguous passive sentences 'The fish is eaten'

SLI preference for adjectival 'the eaten fish' and not verbal passive interpretation 'the fish is eaten by the man' (van der Lely, 1998, p. 198).

B. Assignment of pronominal reference in sentences like 'Mowgli says Baloo Bear is tickling him'

SLI comprehension: association of 'him' with 'Baloo Bear' (local interpretation of 'him') (van der Lely, 1998, p. 169).

C. Production of *wh*-questions

SLI response: *What did Mrs. Brown broke something? (= What did Mr. Brown break?) (van der Lely, 1998, p. 191).

2002a, b, 2006; Varlokosta, 2002). For example, Greek children with SLI make case errors³ while producing wh-questions in Greek, a language with overt case marking (Stavrakaki, 2002a, 2006) and French children with SLI use the *wh-in situ* strategy, which is available in French,⁴ more often than typically developing children (Prévost, Tuller, Scheidnes, Ferré, & Haiden, 2010).

Models of SLI

Based on empirical data, diverse explanatory theories of SLI have been developed in an attempt to identify locus of the linguistic deficit (Rice, 1994). A background assumption that some of those theories share is that the deficit is domain-general and concerns impaired input processes and processing capacity (Bishop, 1997; Joanisse & Seidenberg, 1998; Leonard, 1998; Tallal *et al.*, 1996) or defective phonological short-term memory (Archibald & Gathercole, 2006; Gathercole & Baddeley, 1990).

In particular, Leonard *et al.*'s (1992) surface hypothesis claims that there is an auditory perceptual impairment in SLI causing problems in the perception of morphemes with 'low perceptual salience'. This primary auditory perceptual impairment in SLI affects linguistic abilities in terms of production and comprehension since it prevents children from perceiving and producing non-salient morphemes.

Alternatively, other scientists working within a domain-specific framework suggest that SLI is caused by impairments that are specific to the grammatical system (Clahsen, 1989, 1991; Gopnik, 1990a, b; Rice & Wexler, 1996; van der Lely, 1998, 2005). However, the locus and breadth of the grammatical deficit is not clear. Some researchers consider that grammatical features intrinsic to lexical items are impaired. Within this framework, Clahsen, Bartke, and Gollner (1997) propose a narrow deficit affecting selectively the number and person features of verb inflection. A further narrow interpretation of the deficit in SLI is made by Wexler, Schutze, and Rice (1998), who postulate that the features of tense and/or agreement are underspecified and that this explains the optionality of tense/agreement morphology in SLI grammar (i.e. the occasional correct use of the verb endings *-ed* and *-s* by children with SLI). According to Wexler (1998, 2002, 2003), this model is derived through a particular developmental constraint, the unique checking constraint (UCC), according to which a grammatical subject can check⁵ the feature of either tense or agreement, but not both. As a result of this constraint, suffixes marking either agreement or tense are omitted. The UCC is

³ Case is a grammatical feature, which denotes the grammatical function of a noun, pronoun, and adjective in a sentence (Blake, 2001). In Greek, case is overtly marked by inflectional morphemes (Holton *et al.*, 1997). Specifically, nominative case denotes the grammatical subject while accusative case denotes the grammatical object. The SLI children incorrectly mark the post-verbal subject in object wh-questions with accusative case instead of nominative. Consider the example below:

SLI response: *pion xtipise ton rinokero?

Who-acc-hit-3s-past-the rhino-acc

Target: Who-acc-hit-3s-past-the-rhino-nom

'Who did the rhino hit?' (the example is taken from Stavrakaki, 2006, p. 390)

⁴ In French different ways of forming wh-questions are available. When the *wh-in situ* strategy is applied, there is no fronting of the *wh*-word, as shown in the example below:

Tu poussees qui? (Literally, You push who) (the example is taken from Prévost *et al.*, 2010, p. 9).

⁵ Checking is a fundamental notion in grammatical theory (Chomsky, 1995). According to this theory, all words have grammatical features that should be checked sometime in the course of derivation. For example, the feature of nominative case of the pronoun 'I' should be checked against the grammatical category of tense (Radford, 1997, p. 497). According to Wexler (1998, 2003), in the adult grammar the subject moves from the specifier position of verb phrase to the specifier position of tense phrase and then to the specifier position of agreement phrase to check and eliminate the non-interpretable feature of both tense and agreement.

considered to be a fundamental explanatory force for a range of phenomena in early child grammar that take place during the optional infinitive stage in which children occasionally produce the correct inflection for tense or agreement. These phenomena include omission (or not) of object clitics across languages. Object clitics are unstressed words which are attached phonologically to a verb (Spencer, 1991; e.g. *Je l'ai vu*: 'I saw him'). In particular, French- and Italian-speaking children omit clitics because clitics should check their features against two functional categories, i.e. object agreement and participle agreement. In contrast, Greek and Spanish children do not omit clitics because clitics check their features against object agreement only, since Greek and Spanish have no participle agreement with the clitic (Tsakali & Wexler, 2003). The predictions of the UCC with respect to clitics concern both SLI and typical grammar, since, according to Rice and Wexler (1996), Wexler (2003), and Wexler *et al.* (1998), SLI grammar is best described in terms of an extended optional infinitive stage, i.e. an extended period of characteristics that appear during the typical development of grammar.

A further model that has been initially developed to account for the range of syntactic, morphological, and phonological deficits in a subtype of SLI, grammatical (G) SLI, is termed the computational grammatical complexity (CGC) hypothesis (Marshall & van der Lely, 2007; van der Lely, 2005; van der Lely & Marshall, in press): 'computational' and 'grammatical' because the core computational components of grammar (syntax, morphology, and phonology) are affected, and 'complexity' because the most parsimonious explanation is that the deficit in each component of grammar lies in the formation of complex structural representations. A critical issue in the characterization of the CGC hypothesis is the nature of structural complexity in each component of grammar. For syntax, the representational deficit for dependent relations (RDDR) hypothesis (van der Lely, 1998) postulates that complexity is defined by syntactic structural dependencies involving 'movement', 'an operation by which a word or phrase is moved from one position to another' (Radford, 1997, p. 516). Therefore, syntactic dependencies involving feature checking in spec-head relations, that is, a relation between a head and its specifier (for example, the relation between 'he' and the head of the clause 'has' in the sentence 'he has run'), are predicted to be handled correctly. By contrast, syntactic dependencies involving movement of word or phrases from one position to other and consequently 'chains' associating constituents in different sentential positions with one expression (Radford, 1997, p. 497) are predicted to be impaired. However, the impairment in complex syntactic structures is optionally manifested, which means that children with SLI sometimes show the target linguistic performance but sometimes they do not. We underline that both the RDDR and the CGC hypotheses have been developed in order to account for a small subgroup of children with SLI, specifically, children with G-SLI. However, the predictions of these hypotheses can be successfully extended to the general population with SLI.⁶

The predictions from these accounts for Greek pronouns vary, and are contingent on the psycholinguistic properties of the Greek pronominal system, which we will outline below after discussing previous research into SLI and pronouns.

⁶ There is a significant amount of data in current research showing that difficulties with structural complexity are extended beyond specific subgroups of participants with SLI, in particular, G-SLI (van der Lely, 1998) or syntactic-SLI (Friedmann & Novogrodsky, 2007; see, for example, research findings by Jakubowicz *et al.*, 1998; Prévost *et al.*, 2010; Stavrakaki, 2001a, 2001b, 2006).

Comprehension and production of pronouns in SLI

Pronouns can substitute for nouns or noun phrases (NPs) in a sentence (Radford, 1997, p. 524). For example, in the sentence 'Mary bought flowers for John' all nouns can be substituted by pronouns: 'She bought them for him'. Cross-linguistic investigations of pronouns in SLI provide conflicting findings, suggesting that children with SLI are impaired in comprehending and producing some but not all pronouns. A striking dissociation between lexical-semantic and syntactic knowledge of pronouns was found for English children with SLI (van der Lely & Stollwerck, 1997). Specifically, English children with G-SLI, as well as typically developing children, could use lexical-semantic knowledge of words (such as semantic gender, number, reflexivity marking) but children with G-SLI could not use syntactic structural knowledge to determine appropriate antecedent referents for reflexives and pronouns. For example, they had difficulties with correct reference assignment to 'him' in sentences like 'Is Mowgli tickling him?' in a picture-sentence pair judgment task (van der Lely & Stollwerck, 1997). More specifically, the children were presented with a picture of Mowgli and Baloo Bear in which Mowgli was tickling Baloo Bear and an introductory sentence such as 'This is Mowgli; this is Baloo Bear'. They had to reply 'yes' or 'no' to the test sentence 'Is Mowgli tickling him?'. In addition to the condition in which the test sentences matched the visual stimuli, there was also the 'mismatch condition' in which the test sentences were designed to not match the visual stimuli. Whilst children with SLI had difficulties identifying the correct antecedent for pronouns and reflexives on the basis of structural knowledge, they were significantly facilitated in assigning the correct referent for pronouns and reflexives by exploiting the semantic gender information when the two characters used in the introductory sentence differed in gender (e.g. 'This is Peter Pan; this is Wendy. Is Peter Pan touching her?'; van der Lely & Stollwerck, 1997, p. 259).

Furthermore, Jakubowicz *et al.* (1998) found that French children with SLI produced significantly fewer clitics in object position than clitics in subject position (subject clitics) and reflexive pronouns. Since French children with SLI had variable performance on non-salient pronouns (subject and object clitics and reflexive pronouns), Jakubowicz *et al.* (1998) claimed that their performance was determined by categorical and semantic properties of pronouns. Specifically, they argued that French children with SLI are particularly vulnerable to the syntactic operation of movement of the syntactic unit including the clitic and the verb to finite tense, which results in object clitics being positioned in front of the inflected verb (Jakubowicz *et al.*, 1998). Recent findings from French-English bilingual children with SLI confirm the difficulties that French children have in the domain of object clitics (Paradis, Crago, & Genesee, 2005/2006). The bilingual children with SLI showed severe difficulties with object clitics in French just as the monolingual French SLI children did, and performed better on the production of pronouns in English and articles in French than object clitics in French. Finally, studies on Italian children with SLI reveal that deficits in object clitics constitute a reliable measure for identifying children with SLI (Bortolini *et al.*, 2006; Cipriani, Bottari, & Pfanner, 1998).

Previous research into knowledge of pronouns by Greek children with SLI is inconclusive. On the one hand, Varlokosta (2002), using a truth value judgement task, found deficits in clitics and strong pronouns in some and not all children with SLI. On the other hand, Tsimpli and Stavrakaki (1999) report deficits in object clitics in the spontaneous speech of a preschool child with SLI, but ceiling performance on strong pronouns and genitive possessive clitics. Similarly, Mavratza (2007) showed that

children with SLI had difficulties with object clitics. In addition, Smith, Edwards, Stojanovik, and Varlokosta (2008) tested preschool children with SLI and confirmed their low performance on object clitics, as well as their better performance on genitive clitics. A follow-up study of the preschool child with SLI that participated in Tsimpli and Stavrakaki (1999) a year later revealed significant improvement in her spontaneous speech for object clitics (Stavrakaki & Tsimpli, 1999). Furthermore, school-age children with SLI were able to produce object clitics with highly frequent verbs in their spontaneous speech (Stavrakaki, 2001b).

The specific morphosyntactic properties of object clitics in Greek have been argued to be the cause of the problem in SLI grammar. In particular, based on comprehension data, Varlokosta (2002) suggests that at least a subgroup of SLI children have not completely acquired the co-reference between the clitic/strong pronoun with a discourse antecedent, that is, the principle B in the linguistic literature, according to which pronouns are 'locally free' but may have an antecedent (Chomsky, 1981, 1986; Reinhart, 1999). On the other hand, based on production data, Tsimpli and Mastropavlou (2007) and Tsimpli and Stavrakaki (1999) suggest that object clitics constitute clusters of agreement and case features and, thus, a realization of non-interpretable features of grammar, that is, features without semantic content. According to these researchers, object clitics are selectively impaired due to a deficit affecting all non-interpretable features of grammar. In addition, Smith *et al.* (2008) suggest that whilst interpretability functions as a factor affecting the performance of children with SLI, the deficits in object clitics can be predicted by the RDDR hypothesis proposed by van der Lely (1998).

In sum, SLI performance cross-linguistically is highly dependent on the semantic-syntactic properties of pronouns as well as on the syntactic operations that pronouns undergo. Research findings from a Greek-speaking population with SLI confirm this observation to a certain degree. Remarkably, whilst Greek-speaking individuals with SLI have selective problems with certain types of pronouns, especially with object clitics, typically developing children show evidence for very early acquisition of strong pronouns and clitics (Tsakali & Wexler, 2003; Varlokosta, 2000a, 2002). More specifically, Tsakali and Wexler (2003) found that Greek children aged 2;4–3 performed at ceiling on the elicited production of object clitics.

The present study investigates in a systematic way the production and comprehension of pronouns with different semantic, syntactic, and saliency properties by Greek children with SLI in comparison with typically developing children. Therefore, understanding and explaining SLI performance in Greek requires the identification of the linguistic properties of the Greek pronominal system. We present this in 'The interplay of semantics versus syntax versus +/- saliency in the Greek pronominal system' section.

The interplay of semantics versus syntax versus +/- saliency in the Greek pronominal system

The Greek pronominal system allows the interaction between saliency and semantics, non-saliency, and semantics, as well as non-saliency and syntax. We define saliency in terms of word length and stress: therefore, salient pronouns are those that are disyllabic or monosyllabic stressed items, while non-salient pronouns are those that are monosyllabic, non-stressed items (Leonard, 1998, p. 247). We suggest that saliency interacts with semantics and syntax as follows: there are salient pronouns interpreted in terms of their meaning in the sentence (on semantic/thematic properties), non-salient pronouns interpreted in terms of their meaning in the sentence (on semantic/thematic

properties), and non-salient pronouns interpreted in terms of their syntactic role only (on syntactic properties). Interpretation solely on the basis of syntax implicates that a syntactic relation/process is required in order for the pronoun to be associated with a referent and acquire reference (Cardinaletti & Starke, 1994; Tsimpli, 1999; Tsimpli & Stavrakaki, 1999). On the other hand, the pronouns, which are interpreted solely on semantic/thematic properties, carry an inherent reference on their own, which means that to acquire reference they are not required to be associated with an external referent (Cardinaletti & Starke, 1994; Tsimpli, 1999; Tsimpli & Stavrakaki, 1999). Both non-salient pronouns interpreted on different grounds (semantic/thematic vs. syntactic grounds) contribute to sentence meaning but they do it in a different way. This classification allows us to distinguish five different types of pronouns. Specifically, we distinguish two salient pronouns (strong pronouns, reflexive pronouns) and three non-salient pronouns (genitive clitics, clitics with anaphors, and object clitics). Table 1 provides a summary of each of these pronouns with examples of each in sentences and below we give a fuller description of each pronoun type.

Table 1. Classification of Greek pronouns

	Salient	Semantic	Syntactic
Strong pronouns	+	+	–
I agelada piani aftin			
The-cow-nom-touch-3s- her			
'The cow is touching her '			
Reflexive pronouns	+	+	–
O skilos dihni ton eafto tou			
The-dog-nom-point-3s- the-himself-his			
'The dog is pointing to himself '			
Genitive clitics	–	+	–
O elefantas troi to pagoto tou			
The-elephant-nom-eat-3s-the-ice-cream-acc- his			
The elephant is eating his ice-cream			
Clitics with anaphors	–	–	(Agree)
O eafos tisj tinj tromazi			
The-herself-nom-her-gen- her-clitic -scares			
Herself is scaring her (literal translation)			
'She is scared'			
Object clitics	–	–	(Move/feature checking)
O elefantas ton htipa			
The-elephant-nom- him -hit-3s			
'The elephant is hitting him '			

Salient pronouns (+ salient, + semantic)

Strong pronouns. These pronouns can be used deictically, acquiring denotational meaning within a particular context, or emphatically, for emphatic purposes (Holton, Mackridge, & Philippaki-Warbuton, 1997; Varlokosta, 2000a, 2002). In this respect, they directly express co-reference: they can function as the subject or object of the verb; they can also modify a determiner phrase (DP), which is a phrase consisting of a determiner (e.g. *a*, *the*) and a noun sequence. Therefore, they function as full DPs and not as determiners (Tsimpli & Stavrakaki, 1999).

Reflexive pronouns. The Greek reflexive pronoun *o eaftos mou* (the-myself-nom-my-gen; see Table 1) is a NP consisting of the masculine form of the definite article, the declined masculine noun *eaftos* and a possessive clitic (Holton *et al.*, 1997, p. 100).

Non-salient pronouns

All clitics that fall into this category are perceptually non-salient and are only used in close connection with nouns and verbs, forming a phonological word with them (Holton *et al.*, 1997, p. 96). The varying characteristics of these pronouns are as follows.

Genitive/possessive clitics (– salient, + semantic). Possessive clitics occupy the post-nominal position, that is, the position typically occupied by any ordinary genitive DP (Alexiadou & Stavrou, 2000). In the canonical, post-nominal position, the clitic can express any thematic relation with its host noun, i.e. the possessive, the agent, and patient/theme thematic role (that is, ‘the semantic role of the argument in relation to its predicate’ (Radford, 1997, p. 531). In this respect, the clitic is always referential (Tsimpli & Stavrakaki, 1999). In the example in Table 1, the genitive clitic expresses the possession theta role. Since the genitive clitics are related to the host noun in thematic terms, they are referential (Tsimpli & Stavrakaki, 1999). In this respect, genitive clitics correspond to full DPs (Tsimpli & Stavrakaki, 1999). Hence, genitive clitics are interpreted on semantic/thematic properties.

Clitics with anaphors (– salient, + syntactic). In Greek, nominative anaphors are full NPs consisting of the definite article *o* (the), a head *eaftos* and a possessive pronoun *mu/su/tu* (= my/your/his); they appear in subject position with certain predicates, such as, for example, psychological verbs of the *fovizo* (*frighten*) type (Anagnostopoulou, 1999; Anagnostopoulou & Everaert, 1999; Efthimiou, 1988, among others). When this happens, reflexives are accompanied by an object clitic and co-indexed with it (see Table 1). It should be noted that the whole structure is not frequent in Greek.

A significant question is how the syntactic binding of the nominative reflexive and the accusative clitic is achieved. Following recent linguistic assumptions object clitics are taken to be a collection of formal features of the DP on the verb (Alexiadou & Anagnostopoulou, 2000a; Anagnostopoulou, 2003; Tsimpli & Stavrakaki, 1999) and should be associated with a referential expression. If so, the binding takes place through a very local structural configuration between the genitive clitic *tou* (his) of the pronoun *o eaftos tou* (the-himself-nom-his) and the object clitic *ton* (him) that appears under the light *v* node⁷ (Zevgoli, 1999) or under the T(ense) node (Anagnostopoulou, 2003). We follow a particular syntactic analysis according to which the clitic enters into a spec-head agreement relation with the genitive clitic *tou* of the pronoun *o eaftos tou* (Zevgoli, 1999), where the feature checking operation takes place in terms of minimalism (Chomsky, 1995). Hence, through this structural local configuration, i.e. the spec-head agreement relation between *tou* (*o eaftos tou*: the-self-his-gen) and *ton* (object clitic), the binding of the reflexive with the clitic can be done.

⁷ In terms of minimalism (Chomsky, 1995) the light *v* is a phonologically null verb that appears above the lexical verb and has a very strong V(erb) feature (Hornstein, Nunes, & Grohmann, 2005).

Object clitics (– salient, + syntactic). These occupy the preverbal position, except where the verb is of imperative mood or the gerund is used (Holton *et al.*, 1997). Since clitics in Greek co-occur with full DPs in argument position (clitic doubling constructions), a base generation analysis of clitics seems to be quite plausible (Alexiadou & Anagnostopoulou, 2000b). Following this line of reasoning,⁸ it has been suggested that object clitics consist of a collection of formal features, i.e. case and phi-features (person, number, and gender; Tsimpli & Stavrakaki, 1999), or a realization of object agreement (Alexiadou & Anagnostopoulou, 2000a) associated with a DP through chain formation (cf. Anagnostopoulou, 1994). Recently, within the minimalist framework, Anagnostopoulou (2003) suggested that clitics can be naturally treated as formal features of DPs undergoing movement to functional heads (i.e. function words with key role in the phrase; Radford, 1997, p. 510). In such an analysis, doubling clitics⁹ move to their host from argument positions. Thus, the existence of clitic doubling constructions is consistent with a movement approach to cliticization. Therefore, clitics are considered to be formal features of DPs that move due to feature checking considerations and form a complex chain with the full DP in the cases of clitic doubling and clitic left dislocation and ‘empty’ DP¹⁰ in the case of single clitics.

EXPERIMENTS

Two experiments were conducted over a period of 3 months: one testing production experiment and the other testing comprehension. The same children participated in both experiments.

STUDY I (PRODUCTION)

Predictions

The properties of Greek pronouns described in ‘The interplay of semantics versus syntax versus +/– saliency in the Greek pronominal system’ section allow us to make clear predictions with respect to hypotheses of SLI. The surface hypothesis predicts a broad deficit with non-salient pronouns (genitive clitics, clitics with anaphors, and object clitics). In contrast, both the agreement-deficit and the CGC hypothesis predict a narrow deficit: the former predicts deficits with the clitics entering into the local spec-head relation (clitics with anaphors) whereas the latter predicts deficits with clitics entering into complex syntactic dependencies involving movement (object clitics). The UCC hypothesis predicts the same high level of performance in on both clitics that

⁸ But see Philippaki-Warbuton (1977, 1987) and Philippaki-Warbuton and Spyropoulos (1999) for a movement analysis of clitics in Greek; according to this analysis clitics are base-generated within the VP and then move to a higher functional category.

⁹ In some languages clitics are doubled, as they appear together with a NP in object position (clitic doubling). Consider an example of a clitic doubling structure below in (1) and compare it with a clitic left dislocated structure in (2), which is a structure that contains a left-dislocated object and a coindexed clitic.

(1) Ton ida to Gianni
Him-saw-the-John-Acc
(2) To Gianni ton ida
The-John-Acc-him-saw
‘I saw John’

¹⁰ The term ‘empty DP’ – suggested to us by Artemis Alexiadou (personal communication) – indicates no lexical realization of DP within the sentence as is the case with clitic-doubled and clitic-left-dislocated constructions.

check their features through a spec-head agreement relation (clitics with anaphors) and clitics that check their features through movement/chain formation.

Method

Participants

Nine children with SLI, recruited from clinical centres for language disorders in Greece, participated in this study. All those participants showed severe difficulties with the acquisition of morphosyntax. Children's non-verbal IQs were calculated on the basis of the Wechsler Intelligence Scale for Children-III^{GR} (WISC-III^{GR}; Georgas, Paraskevopoulos, Bezevengis, & Giannitsas, 1997) while their lexical and grammatical abilities were calculated on the basis of a non-standardized Greek version of British Picture Vocabulary Scale (BPVS; Dunn, Dunn, Whetton, & Burley, 1997) and a non-standardized Greek version of the word structure subtest (CELF-3; Semel, Wiig, & Secord, 2000), respectively. A summary of subject details can be found in Table 2.

Table 2. Children with SLI and control groups: chronological age (CA), non-verbal IQ, and raw scores from language tests

	CA, mean (SD)	Non-verbal IQ: WISC-III standard score, mean (SD)	Receptive vocabulary: BPVS raw score, mean (SD)	Expressive morphology: CELF word structure subtest raw score, mean (SD)
SLI group	10.6 (2.16)	98.66 (7.96)	69.77 (9.92)	21.3 (4.153)
LA1 controls	4:5 (0.38)		62 (1.73)	19 (1.6)
LA2 controls	5:1 (0.78)			21.44 (3.3)
LA3 controls	6:2 (1.16)		73.83 (11.99)	

There were three language age (LA) control groups in this study, referred to as LA1, LA2, and LA3. LA1 consisted of 17 typically developing children aged 3:11–5:3; this group was included in the study in order for us to get a precise developmental picture of the structures being tested. The LA2 consisted of 18 children aged 4:2–6:2 who were matched with children with SLI on the basis of raw scores on the test of grammar used in this study. Specifically, every child with SLI was matched to two typically developing children on the raw scores from the word structure test. The LA3 controls consisted of 12 children aged 4:7–8:3; this was the vocabulary matched control group; the matching with SLI children was made on the basis of the raw scores on the Greek version of the BPVS.¹¹

No significant difference was found between the SLI children's performance on the word structure test and that of the LA2 controls ($t(25) = -0.76$, $p = .940$) or the SLI children's and LA3 controls' performance on the BPVS test ($t(19) = -0.824$, $p = .420$). A summary of participant details can be found in Table 2.

The profiles of the individual children with SLI are presented in Table 3.

¹¹ The LA2 participants were assessed only for their grammatical abilities while the LA3 participants were assessed only for their vocabulary abilities. In addition, none of the groups of typically developing children were assessed for their non-verbal IQ abilities since they were characterized as children with typical development by their school teachers and parents and attended a school for typically developing population.

Table 3. Children with SLI: CA, non-verbal IQ, and raw scores from language tests

Participant	CA (years/months)	Non-verbal IQ: WISC-III standard score	Receptive vocabulary: BPVS raw score	Expressive morphology: CELF word structure subtest raw score
SLI1	13:5	92	83	20
SLI2	11:10	103	90	27
SLI3	12:3	90	67	24
SLI4	12:9	106	65	24
SLI5	11	97	63	22
SLI6	9:7	89	64	18
SLI7	9:5	94	62	18
SLI8	7:7	110	70	25
SLI9	7:7	107	64	14

Prior to the experimental tasks, we assessed the children's comprehension of the psychological verbs that were to be included in the 'clitics with anaphors' condition. Upon hearing a sentence (e.g. 1), the child had to choose one out of four pictures: (a) the correct response (the camel is happy); (b) a syntactic distractor (the camel makes someone happy); (c) a semantic distractor (the camel is angry); and (d) a second semantic distractor (the camel is hitting herself).

- (1) I kamila herete
The camel-nom be-happy-3s
The camel is happy.

As shown in Table 4, all groups showed a very high level of performance on the lexical comprehension of psychological verbs.

Table 4. Comprehension of psychological verbs (maximum: $N = 8$)

	Mean (SD)
SLI group	7.9 (0.33)
LA1 controls	6.9 (0.82)
LA2 controls	7.5 (0.51)
LA3 controls	7.9 (0.3)

Materials and procedure

A training session preceded the main experiment in which the participants were familiarized with the experimental sentences of the task. In particular, they were told that they would participate in a game in which they would see pictures and respond according to the questions they would hear. There was a short pre-experimental familiarization session including five picture-sentence pairs, one for each experimental condition. The main experimental task was an elicited production task. There were five conditions, which reflected the different pronoun types, with eight trial sentences per condition, giving a total of 40 sentences.

Strong pronouns

For the elicitation of strong pronouns, children were presented with two pictures. For example, in one picture a camel was shown kicking a cow while in the other picture a cow was pushing a goat. The experimenter pointed to the incorrect picture, where the cow was pushing the goat, and asked the child a question with particular emphasis highlighted in capitals in the example in (2).

(2) *Probe*: AFTI TIN AGELADA klotsa I kamila?

This the cow-acc kick-3s the camel-nom

Is the camel kicking THIS COW?

Target response:

ohi, AFTIN klotsa i kamila

No, THIS-acc kick-3s the camel-nom

No, the camel is kicking THIS.

The experimental procedure took into account the specific properties of these pronouns in Greek, i.e. deictic and/or emphatic properties. Therefore, to ensure pragmatic appropriateness, the adjectival modifier *afton/afti* (this) was inserted prior to NP and included in the question asked by experimenter. That adjectival modifier is phonologically identical with the strong pronoun. This provided the required semantic contrast with the target strong pronoun.

Reflexive pronouns

To elicit the reflexive pronoun *ton eafto tou* (himself) in object position children were presented with two pictures, for example, a cat was washing a goat; or a cat was washing itself. Then, the experimenter pointed to the first picture and said:

(3) *Probe*

S afti tin ikona i gata pleni tin katsika ke s afti tin ikona i gata ...

In this picture, the cat-nom wash-3s the goat-acc and in this picture the cat-nom ...

In this picture, the cat is washing the goat and in this picture the cat ...

Target response:

I gata pleni ton eafto tis.

The cat-nom wash-3s the herself-acc her

The cat is washing herself.

Genitive clitics

The children were presented with two pictures: for example, in the first picture a rabbit was reading the cat's book and in the second one the rabbit was reading its own book. While the experimenter pointed to the first picture, she said:

(4) *Probe*

Edo o lagos diavazi to vivlio tis gatas eno edo o lagos ...

Here the rabbit-nom read-3s the book-acc the- cat-gen but here the -rabbit-nom

Here the rabbit is reading the cat's book but here the rabbit ...

Target response:

... diavazi to vivlio tou

... read-3s the book-acc his-gen
The rabbit is reading his book.

Clitics with anaphors

The children were presented with one picture; for example, a cat looking at itself in the mirror and being very scared. While the experimenter was pointing to the picture, she said:

(5) Probe

Edo I gata tromakse. Pios tin tromakse?
Here the cat-nom scared-3s. Who-nom her-acc scared-3s
Here the cat was scared. Who scared her?

Target response:

o eafos tis tin tromakse
The herself-nom her-gen her-clt-acc scared-3s
herself_i was scared her_i (literally)
'She scared herself'

Object clitics

Children were presented with pictures depicting a transitive event, e.g. an elephant kicking a dog (cf. Jakubowitz *et al.*, 1998, for a similar experimental method). Here the probe sentence and target response are shown in (6):

(6) Probe

Ti kani o elefantas sto skilo?
What do-3s the elephant-nom to the dog
What is the elephant doing to the dog?

Target response:

(O elefantas)¹² ton klotsa
(The elephant-nom) him-clt-acc kick-3s
The elephant is kicking him.

Results

The correct performance of all groups is presented in Table 5 below:

Table 5 shows that all groups showed high performance in most of the experimental conditions except for the 'clitics with anaphors' and 'object clitic' conditions. In particular, the performance of the younger typically developing children (LA1 and LA2 groups), as well as the performance of the children with SLI, dropped in the condition 'clitics with anaphors'. In addition, whilst the performance of all children with typical development was at ceiling and near ceiling on the production of object clitics, the performance of the children with SLI dropped significantly. Statistical analysis confirmed the above observations.

A 4×5 (group \times sentence type) ANOVA revealed significant effects of group ($F(3, 52) = 6.526$, $p < .05$) and sentence type ($F(4, 208) = 22.862$, $p < .01$); the

¹² Due to the null subject status of the Greek language, the overt subject can be omitted.

Table 5. Production experiment: results for all groups (maximum: $N = 8$)

Perceptual/semantic/ syntactic properties	Pronoun type	SLI group, mean (SD)	LA1 controls, mean (SD)	LA2 controls, mean (SD)	LA3 controls, mean (SD)
+ salient + semantic	Strong pronouns	8 (0.0)	7.82 (0.53)	7.94 (0.23)	7.9 (0.28)
+ salient + semantic	Reflexive pronouns	8 (0.0)	7.4 (0.93)	7.72 (0.57)	7.8 (0.39)
– salient + semantic	Genitive clitics	7.55 (0.72)	7.11 (0.86)	7.38 (0.84)	7.5 (1)
– salient + syntactic (agree)	Clitics with anaphors	5.22 (3.07)	5.12 (2.23)	6.28 (2.13)	7.58 (66)
– salient + syntactic (chain/move)	Object clitics	5.22 (2.38)	7.76 (0.44)	7.78 (0.427)	7.84 (0.38)

interaction between group and sentence type ($F(12, 208) = 5.1$, $p \leq .01$) was also significant. Planned comparisons using the non-parametric Mann-Whitney test indicated that the children with SLI performed significantly below all the control groups on the production of object clitics ($Z = -3.76$, $p < .001$; $Z = -3.75$, $p < .001$; $Z = -3.47$, $p = .001$ for LA1, LA2, and LA3 groups, respectively). In contrast, they showed the same level of performance as the control groups on the production of strong pronouns ($Z = -1.05$, $p = .294$; $Z = -0.71$, $p = .480$; $Z = -0.87$, $p = .386$ for LA1, LA2, and LA3 groups, respectively), and genitive clitics ($Z = -1.34$, $p = .168$; $Z = -0.49$, $p = .618$; $Z = -0.22$, $p = .823$ for LA1, LA2, and LA3 groups, respectively). They also performed at the same level as the LA2 and LA3 controls on the production of reflexive pronouns ($Z = -1.5$, $p = .134$; $Z = -1.257$, $p = .209$ for LA2 and LA3 groups, respectively) but they performed significantly higher than LA1 controls, the youngest group of typically developing children ($Z = -1.97$, $p = .048$). In addition, the children with SLI performed at the same level as the LA1 and LA2 controls on the production of clitics with nominative anaphors ($Z = -0.810$, $p = .418$; $Z = -1.014$, $p = .311$ for LA1 and LA2 groups, respectively), but significantly lower than the oldest group of typically developing children, the LA3 group, on the same structure ($Z = -2.683$, $p = .007$). Notably, the performance of the younger typically developing children on the production of clitics with nominative anaphors was significantly lower than that of the older group of typically developing children¹³ ($Z = 3.894$, $p < .001$). Concerning the rest of the structures, the performance of the younger children was at the same level with that of the LA3 group indicating that Greek children acquire these structures at a very early stage ($Z = -4.442$, $p = .659$; $Z = -1.627$, $p = .104$;

¹³ It should be noted that when the children of this study (all control groups and SLI children) did not produce the target structure (clitics with anaphors), which is of low frequency in Greek, they produced a more frequent structure in most of the cases, in particular a simple transitive structure, e.g.

Child response: *O kathreptis tromakse ti gata*
The-mirror-nom-scared-3s-the cat-acc
The mirror scared the cat
 Target response: *O eafos tis tin tromakse*
The-herself-her-gen-her-acc-scared-3s
Itself scared it (literally)

$Z = -1.242, p = .214$; $Z = -0.335, p = .738$ for object clitics, genitive clitics, reflexive pronouns, and strong pronouns, respectively).

We carried out further individual analysis of the SLI data, and this confirmed the lower performance of the SLI children on object clitics compared to the other experimental structures and indicated considerable variation between children (see Table 6).

Table 6. Production experiment: results for individual children with SLI (maximum: $N = 8$)

Perceptual/semantic/ syntactic properties	Pronoun type	SLI1	SLI2	SLI3	SLI4	SLI5	SLI6	SLI7	SLI8	SLI9
+ salient + semantic	Strong pronouns	8	8	8	8	8	8	8	8	8
+ salient + semantic	Reflexive pronouns	8	8	8	8	8	8	8	8	8
– salient + semantic	Genitive clitics	8	8	7	8	8	7	8	6	8
– salient + syntactic (agree)	Clitics with anaphors	7	8	5	7	7	6	7	0	0
– salient + syntactic (chain/move)	Object clitics	7	8	4	6	4	5	6	0	7

Three SLI children (SLI1, SLI2, SLI9) showed ceiling and almost ceiling performance on the production of object clitics. Two of them were the oldest ones (SLI1, SLI2).

Error analysis

We further examined the error types produced by all groups for the object clitics on which the children with SLI performed significantly lower than the controls (see Table 7). Errors were coded as:

Table 7. Production experiment: error analysis (maximum: $N = 8$)

Error type	SLI group	LA1 controls	LA2 controls	LA3 controls
<i>Object clitics</i>				
A	1.8 (1.8)			
B	0.77 (0.6)	0.24 (0.43)	0.22 (0.4)	0.16 (0.38)
C	0.21 (2.3)			

Note. A, NP; B, omission of clitics; C, reflexive pronoun.

- Full NPs: the production of a full NP instead of the target object clitic.
- Omissions: object clitic omission resulting in an ungrammatical structure.
- Production of reflexive pronoun instead of clitic.

For the children with SLI, the most frequent error for object clitics was the full NP instead of the clitic. Although the use of NPs instead of clitics is not ungrammatical, it is,

nevertheless, pragmatically inappropriate in this context for native Greek speakers. Greek children with SLI, but not typically developing controls, produced NPs in a context where clitics were required presumably due to their difficulties with object clitics.

In addition, the children with SLI also omitted clitics, which is ungrammatical. There was just one instance of a reflexive pronoun (*ton eafto tis: herself* instead of the target clitic (*tin: her*). As far as typically developing children are concerned, the few times they did not produce the target clitic, they omitted it (see Table 7).

Summary

The results of the production experiment indicated that Greek typically developing children acquire a wide range of pronouns at a very early stage. The performance of the SLI group as a whole indicated a selective deficit in the production of object clitics, although this was not of equal severity across the group. The results also indicated a drop in performance on the clitics with anaphors for all groups except for the older group of typically developing children.

STUDY 2 (COMPREHENSION)

Predictions

We claim that the linguistic properties of pronouns constitute the main determinant for the performance of participants with SLI. Thus, we make the same predictions for the production and comprehension of pronouns. Nevertheless, we expect that the specific demands of the comprehension task will impact on the performance of participants with SLI. This task requires certain working memory and metalinguistic abilities: a sentence needs to be stored in working memory and matched to the corresponding picture in the context of distractor pictures. We, therefore, expect that the performance on the comprehension task will be affected by cognitive, metalinguistic demands that rely at least partially on the linguistic abilities we are testing. We, therefore, expect lower performance on the comprehension than the production experiment.

Method

Materials and procedure

A picture-selection task was used whereby children pointed to the picture that depicted the sentence from a set of four pictures. All sentences were semantically reversible. There were eight exemplars of each sentence type for each of the five conditions (see Table 1). The set contained the following pictures: correct response, two syntactic distractors, and one semantic distractor. In all instances, unless specified otherwise, the semantic distractor depicted an alternative event. Examples of how the distractor pictures varied in each condition are detailed below.

- *Strong pronouns.* Here the syntactic distractors depicted (a) the correct action with the thematic roles reversed and (b) the correct action with a reflexive interpretation. There was a semantic distractor depicting a different action.
- *Reflexive pronouns.* For the reflexive pronoun (e.g. the dog is pointing to itself), here the syntactic distractors showed (a) a pronominal interpretation of the reflexive

pronoun (i.e. the dog is pointing to the mouse) and (b) a pronominal interpretation of the reflexive pronoun and reversal of theta roles (i.e. the mouse is pointing to the dog); there was a semantic distractor depicting an alternative action.

- *Genitive clitics*. For the genitive clitics there was one syntactic and two semantic distractors. For the sentence *The cat is painting her nails* the syntactic distractor showed the cat painting the rabbit's nails. The semantic distractors depicted a substituted object NP (or an intransitive verb; the cat is playing a guitar; the cat is drinking orange juice).
- *Clitics with anaphors*. For the target sentence literally translated 'herself (the cat) is scaring her_j', the syntactic distractor depicted a non-reflexive interpretation (the cat is scaring the goat). The first semantic distractor depicted (herself (the cat) makes the goat happy) and a second semantic distractor depicted a different action.
- *Object clitics*. For this structure the first syntactic distractor depicted reversed thematic roles, and the second one depicted a reflexive interpretation. There was a semantic distractor depicting another action.

Results

The four groups' mean correct scores for the test structures are presented in Table 8.

Table 8. Comprehension experiment: results for all groups (maximum: $N = 8$)

Perceptual/semantic/ syntactic properties	Pronoun type	SLI group, mean (SD)	LA1 controls, mean (SD)	LA2 controls, mean (SD)	LA3 controls, mean (SD)
+ salient + semantic	Strong pronouns	7 (1.2)	7.23 (1.48)	7.88 (0.32)	7.9 (0.28)
+ salient + semantic	Reflexive pronouns	8 (0.0)	7.41 (1)	7.833 (0.38)	8 (0.0)
– salient + semantic	Genitive clitics	8 (0.0)	7.4 (0.71)	7.833 (0.38)	8 (0)
– salient + syntactic (agree)	Clitics with anaphors	6.66 (2.5)	6.64 (1.05)	7.27 (0.57)	7.83 (0.38)
– salient + syntactic (chain/move)	Object clitics	4.4 (2)	6 (1.58)	6.95 (1.05)	7.33 (0.88)

All control groups showed ceiling or close to ceiling performance on all test structures. This indicates that by 5 years upwards children understand the different pronoun forms. The SLI children also showed a very high level of performance on all pronoun types except the object clitics. Analysis confirmed this pattern. A 4×5 (group \times sentence type) ANOVA revealed a significant main effect of group ($F(3, 52) = 6.80$, $p = .001$) and sentence type ($F(4, 208) = 33.60$, $p < .001$), and a significant interaction ($F(12, 208) = 4.237$, $p < .001$). Planned comparisons using the non-parametric Mann-Whitney test indicated that the participants with SLI performed significantly lower than all control groups on the comprehension of object clitics (LA1: $Z = 2.066$, $p = .039$; LA2: $Z = 3.303$, $p = .001$; LA3: $Z = -3.465$, $p = .001$). By contrast, the participants with SLI showed the same level of performance with LA1 controls on the comprehension of strong pronouns and clitics with anaphors ($Z = -0.776$, $p = .438$ and $Z = -1.515$, $p = .130$ for strong pronouns and clitics,

respectively). In addition, the participants with SLI performed at the same level as LA2 controls on reflexive pronouns ($Z = -1.275$, $p = .202$), clitics with anaphors ($Z = -0.426$, $p = .670$), and genitive clitics ($Z = -1.275$, $p = .202$). Furthermore, the performance of the participants with SLI and LA3 controls on clitics with anaphors was not significantly different ($Z = -1.522$, $p = .128$), while a comparison of their performance on genitive clitics and reflexive pronouns was not applicable since both the participants with SLI and the LA3 controls performed at ceiling. Notably, there were experimental structures for which children with SLI outperformed control participants. In particular, participants with SLI performed significantly higher than LA1 participants on genitive clitics ($Z = -2.186$, $p = .029$) and reflexive pronouns ($Z = -1.977$, $p = .048$). In contrast, the children with SLI, despite showing a high level of performance on strong pronouns, performed more poorly than LA2 ($Z = -2.55$, $p = .011$) and LA3 controls ($Z = -2.374$, $p = .018$), presumably because the control participants showed almost ceiling performance on these structures. A within-group comparison of participants with SLI between their performance on object clitics and strong pronouns indicated significantly lower performance on object clitics than strong pronouns ($Z = -2.095$, $p = .036$).

Individual participant data confirmed the lower performance of participants with SLI on object clitics than on the other experimental conditions and revealed that only one child (SLI2) deviated from this pattern; she showed almost ceiling performance on the comprehension of object clitics; see Table 9).

Table 9. Comprehension experiment: performance of individual children with SLI (maximum: $N = 8$)

Perceptual/semantic/ syntactic properties	Pronoun type	SLI1	SLI2	SLI3	SLI4	SLI5	SLI6	SLI7	SLI8	SLI9
+ salient + semantic	Strong pronouns	5	8	7	7	8	8	8	7	5
+ salient + semantic	Reflexive pronouns	8	8	8	8	8	8	8	8	8
– salient + semantic	Genitive clitics	8	8	8	8	8	8	8	8	8
– salient + syntactic (agree)	Clitics with anaphors	7	8	8	6	8	7	8	0	8
– salient + syntactic (chain/move)	Object clitics	6	7	1	6	2	4	4	4	6

Thus, most SLI children performed better on clitic production than clitic comprehension, as shown by Figure 1. One contributing potential factor is the increased demands of the comprehension task for processing linguistic input under particular attention and working memory constraints; recall that the children were presented four pictures while they listen to the sentence and they were required to point to the correct one. However, it should be noted that the same number of pictures (with the same syntactic and semantic distractors) was also presented in the strong pronoun condition in which participants with SLI performed significantly better than object clitics (see ‘Study 2’ section). Interestingly, children with SLI showed consistent difficulties with the object clitic condition, as between-group (the group with SLI vs. all

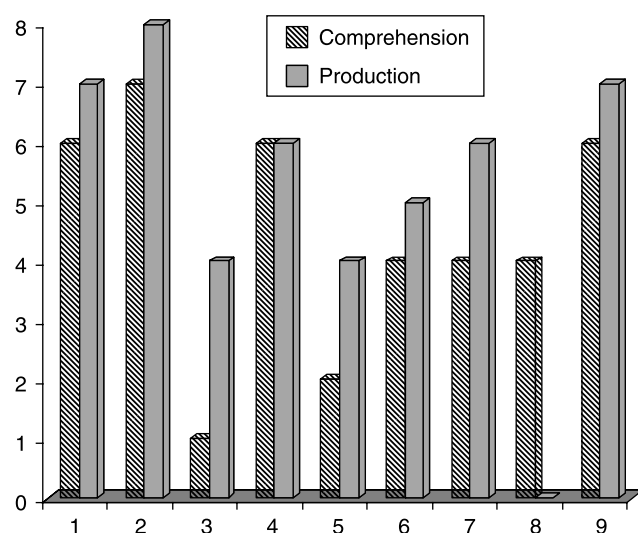


Figure 1. Individual performance on the production and comprehension of object clitics (maximum: $N = 8$).

control groups) and within-group (object clitics vs. strong pronouns) comparisons indicated.

Error analysis

We further examined the error types produced by all groups for the object clitics, given that the children with SLI performed significantly lower than their typically developing controls (see Table 10).

Table 10. Comprehension experiment: error analysis (maximum: $N = 8$)

Error type	SLI group	LA1 controls	LA2 controls	LA3 controls
<i>Object clitics</i>				
A	1.7 (1.2)	0.71 (0.68)	0.39 (0.61)	0.25 (0.45)
B	1.1 (0.92)	0.70 (0.98)	0.33 (0.68)	0.08 (0.28)
C	0.78 (0.7)	0.59 (0.71)	0.33 (0.48)	0.34 (0.49)

Note. A, reversal of theta roles; B, reflexive interpretation; C, semantic error.

Statistical analysis, using the non-parametric Mann-Whitney test, indicated that the children with SLI produced significantly more theta role errors than LA1 ($Z = -2.401$, $p = .016$), LA2 ($Z = -2.469$, $p = .014$), and LA3 controls ($Z = -3.205$, $p = .001$). Similarly, they produced significantly more reflexive errors than the LA2 and LA3 controls ($Z = -2.934$, $p = .036$ and $Z = -3.179$, $p = .001$, respectively), but not than LA1 controls ($Z = -1.271$, $p = .20$). Furthermore, the participants with SLI produced the same level of semantic errors as the LA1 ($Z = -0.771$, $p = .441$), LA2 ($Z = -1.768$, $p = .077$), and LA3 groups did ($Z = -1.61$, $p = .107$).

Summary

The comprehension experiment indicated that the performance of children with SLI and the control participants did not differ on reflexive pronouns, genitive clitics, clitics with anaphors, and strong pronouns. Despite the high level of performance of individuals with SLI on strong pronouns, significantly lower performance was shown than two control groups (LA2 and LA3 controls) on the comprehension of strong pronouns. This result can presumably be accounted for by the almost ceiling level of performance of those control groups. Notably, the participants with SLI did not differ from the LA2 and LA3 controls on the production of strong pronouns. Therefore, the performance of the participants with SLI seems to be task dependent. The additional demands on the comprehension task, such as holding a sentence in memory prior to selecting the correct picture, would be impaired by poor or defective syntactic representation of the sentence. Strikingly, participants with SLI showed a significantly lower performance than all control groups on object clitics. The error analysis indicated that participants with SLI produced more grammatical errors (theta role errors and reflexive errors) than most of the controls.

Discussion

We shall first summarize the results from typically developing control children before discussing findings for the children with SLI. All control groups, even the youngest controls, generally showed a high level of performance on all test structures. The drop of the LA1 controls' performance on the clitic with anaphor condition can be accounted for by the low frequency of the target structure rather than to a general lack of grammatical knowledge of (object) clitics.¹⁴ The comprehension experiment supported previous findings indicating that typically developing children have already acquired all forms of pronouns and established complex dependencies in their grammar. The findings from this study support previous research showing that typically developing children have acquired strong pronouns and clitics at an early age (Tsakali & Wexler, 2003; Varlokosta, 2000a, 2002).

In contrast, the SLI group showed a high level of performance on most but not all pronoun types. The findings revealed that the participants with SLI were significantly impaired in producing and comprehending object clitics when compared with all control groups. The poor performance of the participants with SLI on object clitics can be contrasted with their high level of performance on strong pronouns. Specifically, the participants with SLI showed comparable performance with the control groups on the production of strong pronouns while they performed at the same level with the younger controls on the comprehension task. Although the comprehension task had similar cognitive metalinguistic demands for both the object clitic and strong pronoun conditions, yet participants with SLI performed significantly better on strong pronouns. One possible explanation for the high level of production performance on strong pronouns by children with SLI could be that it was included in experimenter's question and thereby was primed. However, we think this unlikely for the following reasons. First, there is much evidence that Greek children with SLI show ceiling performance on the production of strong pronouns in spontaneous speech (Stavrakaki & Tsimpli, 1999)

¹⁴ In both conditions (i) clitics with anaphors and (ii) object clitics in transitive structures the clitic occupy the object position.

possibly due to the deictic or emphatic function of this pronoun (Holton *et al.*, 1997; Varlokosta, 2000a, 2002); interestingly, even very young children with SLI produce strong pronouns with deictic use in spontaneous speech (Varlokosta, 2000b). Second, research findings indicate that Greek children with SLI do not correctly repeat morphemes that are problematic in their spontaneous speech (see Tsimpli & Stavrakaki, 1999, for examples). Third, the individuals with SLI participating in the current study showed high (although not ceiling) performance on the comprehension of strong pronouns. Therefore, we consider that the SLI children's good performance on strong pronouns correctly reflects their grammatical knowledge.

The SLI group's good performance compared to the control groups on clitics with anaphors compared to their impaired performance on object clitics enables us to identify more precisely the locus of the deficit in SLI. Both clitics with anaphors and object clitics share properties of non-saliency, and no distinguishing semantic information for interpretation, and therefore require syntactic information for interpretation. However, whereas clitics with anaphors are interpreted through a syntactic relation requiring feature checking within spec-head agreement, object clitics are interpreted through syntactic dependencies at the clause level and require feature checking, movement or chain formation. That the performance of the SLI group was significantly worse than that of the control groups on object clitics only, and not on other types of pronouns, supports the claims of the CGC hypothesis that there is a deficit in syntactic dependencies involving movement/chain formation.

The impairment in syntactic dependencies involving movement in SLI grammar is also supported by their theta role reversal errors for object clitics. Such errors could result from SLI children being unable to identify the referent of the clitic pronoun using syntactic cues. The finding that children with SLI make significantly more theta role errors than L2 and L3 controls, indicates that they have persistent deficits in the acquisition of syntactic ability to identify the clitic's referent. Their syntactic deficit provides a parsimonious explanation for their 'reflexive' interpretation of object clitics. Here, it would appear that children with SLI opted for a 'locality strategy' and associated the object clitic pronoun with its nearest local antecedent.

Individual analysis revealed that a few children with SLI showed a different pattern of performance. Whereas most of the children with SLI did better on production than comprehension of clitics and no child with SLI showed ceiling performance on the production and comprehension of pronouns, three children with SLI showed a high performance on object clitics, with one of them showing ceiling performance on the production task. There are (at least) two possible explanations for this heterogeneous pattern within the SLI population. The first is that within our group there are different forms of SLI (see, for example, Bishop, Adams, & Norbury, 2006). A second explanation is that some children with SLI are able to acquire to a certain degree even complex syntactic dependencies at some point of their linguistic development; recall that the child with SLI who performed at ceiling on the production of object clitics was among the oldest children of the group. However, it is not clear from these data whether these children are using the same cognitive mechanisms as typically developing (TD) children use when they acquire such abilities at a much younger age. Brain-imaging data (Fonteneau & van der Lely, 2008) and on-line studies (Marinis & van der Lely, 2007) indicate that semantic systems may at least partially compensate for defective or missing syntactic operations. We leave this possibility open, but together these data may explain for the apparent 'optionality' seen in the surface behavior. Regardless of the precise cause of such variation in performance, the optional and inconsistent performance of

individuals with SLI strongly contrasts with very early acquisition of object clitics in typically developing children reported by a number of studies (Tsakali & Wexler, 2003; Varlokosta, 2000a, 2002) and confirmed by the data of this study.

In addition, the overall pattern of performance that SLI children show cannot be accounted for by a simple dichotomy between saliency versus non-saliency, nor between semantics versus syntax. First, when semantic cues are available, the factor $+/-$ saliency does not determine performance, as shown by all children's high level of performance on salient strong pronouns and reflexive as well as non-salient genitive clitics. Second, when neither semantic cues nor saliency properties are available (clitics with anaphors and object clitics), the performance of participants with SLI is only significantly impaired on object clitics. Thus, it appears that the nature of the syntactic knowledge required, rather than a simple dichotomy between syntax versus semantics, characterizes Greek SLI grammar. We suggest that a more parsimonious explanation of SLI performance is one that takes into account the specific semantic and syntactic properties of the clitics with anaphors and the object clitics. Both types of clitics share the following properties: (i) clitics consist of collection of features, i.e. case, number, and gender (ii) checking operations take place between the clitics and the DPs. For clitics with anaphors checking occurs through local spec-head agreement relation, and for object clitics it is through syntactic dependencies at the clause level involving movement or chain formation (cf. van der Lely, Jones, & Marshall, 2010). Therefore, possible deficits in grammatical features or in checking operations *per se* cannot adequately explain the performance of children with SLI in this study. Alternatively, clitics with anaphors and object clitics differ in their checking operations: whereas the former checking takes place within the spec-head agreement, the latter necessitates checking through syntactic dependencies at the clause level are involved and require movement/chain formation. Therefore, a deficit in syntactic dependencies at the clause level and the operations underlying this (e.g. movement/chain formation) provides a parsimonious explanation of our findings.

The findings of this study have straightforward implications for current theories on SLI. Accounts that postulate a deficit in perceiving non-salient forms, e.g. the surface hypothesis (Leonard, 1998), cannot explain our data, as saliency does not discriminate SLI performance (cf. Paradis *et al.*, 2005/2006). Therefore, an interpretation within the accounts postulating a deficit in grammar seems to be more promising. This interpretation addresses two issues: the first one concerns the specificity of the deficit in grammar. We claim that the grammatical deficits revealed by these experiments do not affect all aspects of grammar. First, the deficit does not appear to be related to the grammatical nature of the object clitics. Otherwise, the participants with SLI would have problems with clitics with anaphors, but they did not. Therefore, as clitics consist of grammatical features such as case, number, and gender then accounts postulating deficits in grammatical features cannot explain the findings (e.g. Gopnik, 1990b; Tsimpili & Stavrakaki, 1999, among others). Second, core grammatical operations such as feature checking are not missing from SLI grammar, as shown by the fact that they showed the same level of performance as that of typically developing controls on clitics with anaphors. Consequently, the spec-head agreement relation is well established in SLI grammar. This contrasts with the predictions of the agreement deficit account (Clahsen, 1991; Clahsen *et al.*, 1997). Finally, the SLI performance cannot be explained in terms of the UCC (Wexler, 1998). Within this framework, SLI performance is predicted to be the same on both clitics that check their features through a spec-head agreement relation (clitics with

anaphors) and clitics that check their features through movement/chain formation. However, clitics with anaphors were unimpaired.

These data indicate that SLI deficits are highly restricted to feature checking in particular syntactic dependencies that incur movement or chain formation. The pattern of performance is consistent with the predictions of the CGC hypothesis (van der Lely, 2005) where performance is characterized by an inconsistent (rather than missing) establishment of syntactic dependencies involving movement. Here, this manifests as a deficit in establishing syntactic dependencies between object clitics and their referents. According to Anagnostopoulou (2003), clitics are formal features of DPs that undergo movement from theta-positions to a functional head, and therefore necessitate complex dependencies in order to be interpreted. It, therefore, seems that children with SLI are occasionally unable to carry out particular syntactic operations consistently, in particular movement triggered by feature checking considerations or to consistently establish chains in their grammar.

The second issue concerns the extent to which these particular grammatical operations, i.e. movement or chain formation, are affected. On the one hand, we point out that significant individual variation was attested. However, none of the SLI children showed ceiling performance on both tasks (production and comprehension of clitics). In addition, the participants with SLI performed better on the production than on the comprehension task. This pattern we propose is related to the comprehension task demands, which specifically affected performance on the object clitic condition. In this respect, the comprehension task (but not the production task) requires greater meta-linguistic abilities that may rely on the very syntactic representations that are impaired. We suggest, therefore, that the better performance of some of the children with SLI on the production than the comprehension task can be accounted for in terms of the specific meta-linguistic requirements of the comprehension task: although children with SLI produced clitics, they were less effective than typically developing children in coping with the metalinguistic and cognitive demands of the comprehension task; they, thus, showed a significant drop in comprehending sentences with object clitics compared to all groups of control participants.

Based on this evidence we make a twofold claim. On the one hand, participants with SLI are only occasionally (un)able to carry out particular syntactic operations, which means that they do not show constant linguistic behavior. On the other hand, grammatical knowledge and/or representation of this structure is not completely missing from the grammar of children with SLI. Such a claim implicates that a performance deficit is more plausible in individuals with SLI than a severe representational deficit (cf. Stavrakaki, 2006).

The findings of this study fit well with recent reported difficulties in SLI with establishing the relation between a moved element and the base generation position (Friedmann & Novogrodsky, 2004, 2007; Novogrodsky & Friedmann, 2006) and performing (case) checking operations in complex syntactic structures (wh-questions; Stavrakaki, 2006). A crucial question for SLI theory is to what extent children with SLI show problems with complex structures that necessitate movement and/or checking operations and whether they show the ability to overcome these problems over time. Such compensation or variable performance is consistent with the use of alternative, and non-optimal, brain mechanisms being recruited for syntactic operations in the face of impaired mechanism. The use of such alternative mechanisms was discovered using imaging (specifically, event related potential) techniques when children with G-SLI processed syntactic dependencies in questions (Fonteneau & van der Lely, 2008).

The data from this study suggest Greek children's processing of object clitics warrants further investigation using imaging techniques. Cross-linguistic research has so far revealed that impaired syntactic operations in syntactic dependencies at the clause level constitute a robust marker for SLI. It is a real challenge for future SLI research to investigate and describe in detail the psychological reality of those complex linguistic operations that can distinguish SLI and typically developing grammar.

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References

- Alexiadou, A., & Anagnostopoulou, E. (2000a). Clitic doubling and (non-) configurationality. *Proceedings of the North East Linguistic Society*, 30, 17–28. MA: GLSA.
- Alexiadou, A., & Anagnostopoulou, E. (2000b). Greek syntax: A principles and parameters perspective. *Journal of Greek Linguistics*, 1, 169–222.
- Alexiadou, A., & Stavrou, M. (2000). Adjective-clitic combinations in the Greek DP. In B. Gerlach & J. Grijzenhout (Eds.), *Clitics in phonology, morphology and syntax* (pp. 63–84). Amsterdam: John Benjamins.
- Anagnostopoulou, E. (1994). *Clitic dependencies in Modern Greek*. PhD dissertation, University of Salzburg, Salzburg, Austria.
- Anagnostopoulou, E. (1999). On experiencers. In A. Alexiadou, G. Horrocs, & M. Stavrou (Eds.), *Studies in Greek syntax* (pp. 69–93). Dordrecht: Kluwer Academic Publishers.
- Anagnostopoulou, E. (2003). *On double object alternations and clitics*. Berlin/New York: Mouton de Gruyter.
- Anagnostopoulou, E., & Everaert, M. (1999). Towards a more complete typology of anaphoric expressions. *Linguistic Inquiry*, 30, 97–119.
- Archibald, L., & Gathercole, S. (2006). Short-term memory and working memory in specific language impairment. *International Journal of Language and Communication Disorders*, 41, 675–695.
- Bishop, D. V. M. (1997). *Uncommon understanding: Comprehension in specific language impairment*. Hove: Psychology Press.
- Bishop, D. V. M., Adams, C. V., & Norbury, C. F. (2006). Distinct genetic influences on grammar and phonological short-term memory deficits: Evidence from 6-year-old twins. *Genes, Brain, and Behavior*, 5, 158–169.
- Blake, B. J. (2001). *Case*. Cambridge: Cambridge University Press.
- Bortolini, U., Arfe, B., Caselli, C., Degasperi, L., Deevy, P., & Leonard, L. (2006). Clinical markers for specific language impairment in Italian: The contribution of clitics and non-word repetition. *International Journal of Language and Communication Disorders*, 41, 695–712.

- Cardinaletti, A., & Starke, M. (1994). The typology of structural deficiency. On the three grammatical classes. *Working Papers in Linguistics* 4(2). Centro Linguistico Interfacolta, Universita degli studi di Venezia.
- Chomsky, N. (1981). *Lectures on government and binding*. Dordrecht: Foris.
- Chomsky, N. (1986). *Knowledge of language: Its nature, origin, and use*. New York: Praeger.
- Chomsky, N. (1995). *The minimalist program*. Cambridge, MA: MIT Press.
- Cipriani, P., Bottari, C., & Pfanner, L. (1998). A longitudinal perspective on the study of specific language impairment: The long-term follow-up of an Italian child. *International Journal of Language and Communication Disorders*, 33, 245–280.
- Clahsen, H. (1989). The grammatical characterization of developmental dysphasia. *Linguistics*, 27, 897–920.
- Clahsen, H. (1991). *Child language and developmental dysphasia: Linguistic studies in the acquisition of German*. Amsterdam: John Benjamins.
- Clahsen, H., Bartke, S., & Gollner, S. (1997). Formal features in impaired grammars: A comparison of English and German SLI children. *Journal of Neurolinguistics*, 10, 151–172.
- Clahsen, H., & Dalalakis, J. (1999). Tense and agreement in Greek SLI: A case study. *Essex Research Reports in Linguistics*, 24, 1–25.
- Dunn, L. M., Dunn, L. M., Whetton, C., & Burley, J. (1997). *British Picture Vocabulary Scale* (2nd ed.). Windsor: NFER-Nelson.
- Efthimiou, E. (1988). The reflexive NP (article-self-enclitic) in Modern Greek. *Studies in Greek Linguistics*, 8, 277–292.
- Fonteneau, E., & van der Lely, H. (2008). Electrical brain responses in language-impaired children reveal grammar-specific deficits. *PLoS One*, 3(3), e1832.
- Friedmann, N., & Novogrodsky, R. (2004). The acquisition of relative clause comprehension in Hebrew: A study of SLI and normal development. *Journal of Child Language*, 31, 661–681.
- Friedmann, N., & Novogrodsky, R. (2007). Is the movement deficit in syntactic SLI related to traces or to thematic role transfer? *Brain and Language*, 101, 50–63.
- Gathercole, S., & Baddeley, A. (1990). Phonological memory deficits in language disordered children: Is there a causal connection? *Journal of Memory and Language*, 29, 336–360.
- Georgas, D., Paraskevopoulos, I., Bezevengis, I., & Giannitsas, N. (1997). *Guidelines for the Greek WISC III*. Athens: Ellinika Grammata.
- Gopnik, M. (1990a). Feature-blind grammar and developmental dysphasia. *Nature*, 344, 115.
- Gopnik, M. (1990b). Feature blindness: A case study. *Language Acquisition*, 1, 139–164.
- Holton, D., Mackridge, P., & Philippaki-warbuton, I. (1997). *Greek: A comprehensive grammar of the Modern Greek language*. London: Routledge.
- Hornstein, N., Nunes, J., & Grohmann, K. (2005). *Understanding minimalism*. Cambridge: Cambridge University Press.
- Jakubowicz, C., Nash, L., Rigaut, C., & Sinka, I. (1998). Determiners and clitic pronouns in French speaking children with SLI. *Language Acquisition*, 7, 113–160.
- Joanisse, M., & Seidenberg, M. (1998). Specific language impairment: A deficit in grammar or processing? *Trends in Cognitive Sciences*, 2, 240–247.
- Leonard, L. (1998). *Children with specific language impairment*. Cambridge, MA: The MIT Press.
- Leonard, L., Bortolini, U., Caseli, U., McGregor, K., & Sabbatini, L. (1992). Morphological deficits in children with specific language impairment: The status of features in the underlying grammar. *Language Acquisition*, 2, 151–179.
- Marinis, T., & van der Lely, H. K. J. (2007). On-line processing of wh-questions in children with G-SLI and typically developing children. *International Journal of Language and Communication Disorders*, 42(5), 557–582.
- Marshall, C. R., & van der Lely, H. K. J. (2007). The impact of phonological complexity on past tense inflection in children with grammatical-SLI. *Advances in Speech-Language Pathology*, 9, 191–203.

- Mastropavlou, M. (2006). *The role of phonological salience and feature interpretability in the grammar of typically developing and language impaired children*. PhD dissertation, Aristotle University of Thessaloniki, Thessaloniki, Greece.
- Mavratza, S. (2007). *Specific language impairment in Greek: A study of agreement, tense and the determiner system*. PhD thesis, University of Essex, Colchester, UK.
- Norbury, C. F., Bishop, D., & Briscoe, J. (2001). Production of English finite verb morphology: A comparison of SLI and mild-moderate hearing impairment. *Journal of Speech, Language, and Hearing Research*, 44, 165–178.
- Norbury, C. F., Bishop, D., & Briscoe, J. (2002). Does impaired grammatical comprehension provide evidence for an innate grammar module? *Applied Psycholinguistics*, 23, 247–268.
- Novogrodsky, R., & Friedmann, N. (2006). The production of relative clauses in syntactic SLI: A window to the nature of impairment. *Advances in Speech-Language Pathology*, 8, 364–375.
- Paradis, J., Crago, M., & Genesee, F. (2005/2006). Domain-specific versus domain-general theories of the deficit in SLI: Object pronoun acquisition by French-English bilingual children. *Language Acquisition*, 13, 33–62.
- Philippaki-Warbuton, I. (1977). Modern Greek clitic pronouns and the 'surface syntax constraints' hypothesis. *Journal of Linguistics*, 13, 259–281.
- Philippaki-Warbuton, I. (1987). The theory of empty categories and the pro-drop parameter in Modern Greek. *Journal of Linguistics*, 23, 289–318.
- Philippaki-Warbuton, I., & Spyropoulos, V. (1999). On the boundaries of inflection and syntax: Greek pronominal clitics and particles. In G. Booij & J. van Marle (Eds.), *The yearbook of morphology* (pp. 45–72). Dordrecht: Kluwer Academic Publishers.
- Prévost, P., Tuller, L., Scheidnes, M., Ferré, S., & Haiden, M. (2010). Computational complexity effects in the acquisition of wh-questions in child L2 French. *Proceedings of Romance Turn*, 3. Advance online publication.
- Radford, A. (1997). *Syntactic theory and the structure of English. A minimalist approach*. Cambridge: Cambridge University Press.
- Reinhart, T. (1999). Binding theory. In R. A. Wilson & F. C. Keil (Eds.), *The MIT encyclopedia of the cognitive sciences* (pp. 86–88). Cambridge, MA: MIT Press.
- Restrepo, M. A. (1995). *Identifiers of Spanish-speaking children with language impairment who are learning English as a second language*. PhD thesis, University of Arizona, Tucson, AZ, USA.
- Rice, M. L. (1994). Grammatical categories of children with specific language disorders. In R. Watkins & M. Rice (Eds.), *Language impairments in children* (pp. 69–89). Baltimore, MD: Paul Brookes Publishing.
- Rice, M. L., & Wexler, K. (1996). A phenotype for specific language impairment: Extended optional infinitives. In M. L. Rice (Ed.), *Toward a genetics of language* (pp. 215–237). Mahwah, NJ: Erlbaum.
- Rice, M. L., Wexler, K., & Hershberger, S. (1998). Tense over time: The longitudinal course of tense acquisition in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, 41, 1412–1431.
- Semel, E., Wiig, E. H., & Secord, W. (2000). *Clinical evaluation of language fundamentals (CELF-3 UK)* (3rd ed.). San Antonio, TX: The Psychological Corporation.
- Smith, N., Edwards, S., Stojanovik, V., & Varlokosta, S. (2008). Object clitic pronouns, definite articles and genitive possessive clitics in Greek preschool children with Specific Language Impairment: Implications for domain general and domain specific accounts of SLI. In H. Chan, E. Kapaia, & H. Jacob (Eds.), *A Supplement to the Proceedings of the 32nd Boston University Conference on Language Development*. Boston: Cascadia Press. Retrieved from <http://www.bu.edu/linguistics/APPLIED/BUCLD/proc.html>.
- Spencer, A. (1991). *Morphological theory. An introduction to word structure in generative grammar*. Oxford: Blackwell.
- Stamouli, S. (2000). The grammatical categories of Tense, Aspect and S-V Agreement: A comparative study of a single case of a Greek SLI child and typically developing Greek children.

- Proceedings of the 8th conference of the Panhellenic Association of Speech and Language Therapists* (pp. 221–238). Athens: Ellinika Grammata.
- Stark, R., & Tallal, P. (1981). Selection of children with specific language deficits. *Journal of Speech and Hearing Disorders*, 46, 114–122.
- Stavrakaki, S. (1999). The case of a Greek SLI child: Evaluation of person and number agreement, case assignment to overt subject pronouns and tense marking. In A. Kakouriotis & V. Bolla-Mavrides (Eds.), *Working papers in theoretical and applied linguistics* (Vol. 6, pp. 165–187). Thessaloniki, Greece: Ziti.
- Stavrakaki, S. (2001a). Comprehension of reversible relative clauses in specifically language impaired and normally developing Greek children. *Brain and Language*, 77, 419–431.
- Stavrakaki, S. (2001b). *SLI in Greek: Aspects of syntactic production and comprehension*. PhD thesis, Aristotle University of Thessaloniki, Thessaloniki, Greece.
- Stavrakaki, S. (2002a). A-bar movement constructions in Greek children with SLI: Evidence for deficits in the syntactic component of language. In E. Fava (Ed.), *Clinical linguistics: Theory and applications in speech pathology and therapy* (pp. 131–154). Amsterdam/Philadelphia, PA: John Benjamins, Current Issues in Linguistic Theory.
- Stavrakaki, S. (2002b). Sentence comprehension in Greek SLI children. In N. Hewlett, L. Kelly, & F. Windsor (Eds.), *Investigations in clinical linguistics and phonetics* (pp. 57–92). Mahwah, NJ: Erlbaum.
- Stavrakaki, S. (2006). Developmental perspectives on specific language impairment: Evidence for the production of wh-questions by Greek SLI children over time. *Advances in Speech-Language Pathology*, 8, 384–396.
- Stavrakaki, S., & Tsimpli, I. M. (1999). The appearance of functional categories in the language of a Greek SLI child: A comparative study of two stages in her linguistic development. *Studies in Greek Linguistics*, 19, 475–489.
- Tallal, P., Miller, S., Bedi, G., Wang, X., Nagarajan, S., Schreiner, C., ... Merzenich, M. (1996). Language comprehension in language-learning impaired children improved with acoustically modified speech. *Science*, 271, 81–84.
- Tomblin, J. B., & Pandich, J. (1999). What can we learn from children with exceptional language development? Lessons from children with specific language impairment. *Trends in Cognitive Science*, 3, 283–285.
- Tsakali, V., & Wexler, K. (2003). Clitics in early Modern Greek. In J. van Kampen & S. Baauw (Eds.), *Proceedings of GALA 2003* (Vol. 2, pp. 493–504). Utrecht, The Netherlands: LOT.
- Tsimpli, I. M. (1999). Determiners and clitics in Greek. In A. Kakouriotis & V. Bolla-Mavrides (Eds.), *Working papers in theoretical and applied linguistics* (Vol. 6, pp. 189–208).
- Tsimpli, I. M. (2001). Interpretability and language development: A study of verbal and nominal features in normally developing and SLI Greek children. *Brain and Language*, 77, 432–452.
- Tsimpli, I. M., & Mastropavlou, M. (2007). Feature interpretability in L2 and SLI: Greek clitics and determiners. In J. Liceras, H. Zobl, & H. Goodluck (Eds.), *The role of formal features in second language acquisition* (pp. 143–183). London: Routledge.
- Tsimpli, I. M., & Stavrakaki, S. (1999). The effects of a morphosyntactic deficit in the determiner system: The case of a Greek SLI child. *Lingua*, 108, 31–86.
- van der Lely, H. K. J. (1998). SLI in children: Movement, economy and deficits in the computational-syntactic system. *Language Acquisition*, 7, 161–192.
- van der Lely, H. K. J. (2005). Domain-specific cognitive systems: Insight from grammatical specific language impairment. *Trends in Cognitive Sciences*, 9, 53–59.
- van der Lely, H. K. J., & Battell, J. (2003). Wh-movement in children with grammatical SLI: A test of the RDDR hypothesis. *Language*, 79(1), 153–181.
- van der Lely, H. K. J., Jones, M., & Marshall, C. R. (2010). *Who did Buzz see someone? Grammaticality judgments of wh-questions in typically developing children and children with grammatical-SLI. *Lingua*. Advance online publication.
- van der Lely, H. K. J., & Marshall, C. R. (in press). Grammatical-specific language impairment: A window onto domain specificity. In J. Guendouzi, F. Loncke, & M. Williams (Eds.), *Handbook*

- of psycholinguistics & cognitive processing perspectives in communication disorders*. LEA Taylor & Francis.
- van der Lely, H. K. J., & Stollwerck, L. (1997). Binding theory and grammatical specific language impairment in children. *Cognition*, 62, 245–290.
- Varlokosta, S. (2000a). *Lack of clitic-pronoun distinction in the acquisition of principle B in child Greek*. Proceedings of the 24th Boston University Conference on Language Development (pp. 738–748). Somerville, MA: Cascadia Press.
- Varlokosta, S. (2000b). *Observations on the first stage of linguistic development of a Greek child with specific language impairment*. Proceedings of the 8th Symposium of the Panhellenic Association of Speech and Language Therapists (pp. 159–164). Athens: Ellinika Grammata.
- Varlokosta, S. (2002). (A)symmetries in the acquisition of principle B in typically developing and specifically language impaired children. In I. Lasser (Ed.), *The process of language acquisition* (pp. 81–98). Berlin: Peter Lang Verlag Publishing.
- Wexler, K. (1998). Very early parameter setting and the unique checking constraint: A new explanation of the optional infinitive stage. *Lingua*, 106, 23–79.
- Wexler, K. (2002). The theory of clitics, a parameter of object agreement, and the extension of the unique checking constraint to massive cross-linguistic differences in object clitic omission: Evidence from normal development and SLI. XXVII incontro di Grammatica Generativa, Lecce, Italy.
- Wexler, K. (2003). Lennenberg's dream: Learning, normal language development and specific language impairment. In Y. Levy & J. Schaeffer (Eds.), *Language competence across populations: Towards a definition of specific language impairment* (pp. 12–61). Mahwah, NJ: Erlbaum.
- Wexler, K., Schutze, C. T., & Rice, M. (1998). Subject case in children with SLI and unaffected controls: Evidence for the Agr/Tns omission model. *Language Acquisition*, 7, 317–344.
- Zevgoli, S. (1999). *The MG reflexive o eaftos mou*. Proceedings of the 12th International Symposium of Theoretical and Applied Linguistics (pp. 197–211). Thessaloniki: AUTH.

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