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Editorial

Specific Language Impairment (SLI) across languages: Properties and possible loci

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This special issue is dedicated to the memory of Celia Jakubowicz.

ABSTRACT

This Special Issue, dedicated to Celia Jakubowicz, brings together work on impaired language acquisition with a focus on Specific Language Impairment (SLI). The languages under investigation include Mainstream American English, African American English, Brazilian Portuguese, French, German, Greek, and Hebrew. The majority of studies are devoted to the area of wh-questions, while some studies explore other syntactic domains, including clitics and complementizers. All contributions address the question of how the specific difficulties observed in children and adolescents with SLI can be accounted for in a generative linguistic framework, and propose various accounts and suggestions as to the nature and locus of SLI. New evidence for the properties, types, and possible loci of SLI is presented, demonstrating the intimate relationships that exist between linguistic theory and psycholinguistic research on SLI.

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Intimate relationships exist between the research of Specific Language Impairment (SLI) and the precise generalizations suggested by linguistic theory for various aspects of the language capacity, aspects that may differ or may be shared across languages. Let us briefly consider three of these relationships.

Consider first the role of theoretical linguistics for research on SLI. Imagine a child with SLI who understands a sentence like *The girl kissed the grandma* but not a question like *Which grandma did the girl kiss*. If we want to explain this difference, we need to turn to the cognitive theory that studies the structure of such sentences: linguistics, or more precisely syntactic theory. Syntactic theory would explain the difference in terms of the syntactic properties of the two sentences, and the types of syntactic movement they involve. Without such a theoretical basis, neither this difference nor the puzzle of why children who find wh-questions difficult also fail on the comprehension of relative clauses (such as *This is the grandma that the girl kissed*) can be accounted for. Within linguistic theory, wh-questions involve wh-movement, whereas simple sentences do not. This explains the dissociation between the comprehension of the simple sentence and the wh-question. Moreover, wh-questions and relative clauses are both derived by the same type of syntactic movement, wh-movement. This accounts for the association between impaired comprehension of wh-questions and relative clauses. In short, the dissociation and association observed above follow from a deficit this child with SLI has in the comprehension of sentences involving wh-movement. This insight has substantial consequences for the study of SLI in general. Ascribing the deficit in comprehension of certain types of wh-questions to a more general deficit related to wh-movement would motivate researchers of SLI to explore additional structures involving the same properties. Consequently, such collaboration between theoretical linguistics and psycholinguistic research of SLI is able to generate precise predictions with respect to the performance of individual children with SLI. For example, a clinician working with a child with SLI who discovers that the child has difficulty understanding object wh-questions will be able to infer that relative clauses are likely to be impaired as well. Moreover, the clinician will be able to use this knowledge to guide further steps in diagnosis and to apply an informed treatment that will target the impaired syntactic construct, wh-movement.

Secondly, data from (a)typical language acquisition pose challenges for linguistic theory and can help in deciding between competing linguistic accounts. Imagine a child with SLI who has difficulty understanding exhaustive wh-questions like *Who is sitting on a chair* and *Who is sitting where*. The child fails to answer exhaustively, and in both cases never produces plural answers. For example, when looking at a picture with four people sitting on four chairs she

answers the question *Who is sitting on a chair* by naming a single individual, but never two or three, which would be plural answers. Likewise, when looking at a picture with four people sitting on different pieces of furniture and being asked *Who is sitting where*, the child with SLI never answers with a list of just two or three pairs of people and furniture they sit on, but for example with one person-furniture pair. These response patterns would favor a theoretical account of exhaustive wh-questions that places these two types in a unified framework. Such a framework could address the absence of plural responses more comprehensively than an account in which the two structures are analyzed as being unrelated or an account that would license plural responses. What is more, findings from acquisition actually open up new strands of research questions. For example, the fact that plural responses to paired wh-questions are virtually unattested in both typical and SLI acquisition raises new theoretical questions concerning the semantics of paired wh-questions. Similar contributions from SLI to linguistic theory can be seen in the syntactic domain. Consider the linguistic debate with respect to whether in a given language a sentence with a resumptive pronoun (like the pronoun 'her' in *This is the grandma that the girl kisses her*) involves wh-movement. If it is found that children with a deficit in wh-movement comprehend sentences with a resumptive pronoun significantly better than sentences with wh-movement, these data from SLI would inform the linguistic debate. They can suggest that resumptive pronouns in this language do not involve wh-movement.

Finally, cross-linguistic evidence from atypical acquisition of vulnerable language domains may shed light on the universal properties of the language faculty, on language-specific influences, and on principles not specific to the faculty of language in the narrow sense. For example, wh-questions have been found to be difficult for children with SLI in several typologically different languages. This would make wh-movement a possibly universal property of the language faculty and, more importantly, would predict difficulties with wh-movement to be indicative of impaired acquisition, even in languages in which SLI has not been studied. Similarly, cross-linguistic data on atypical acquisition may contribute to the debate on the modularity of the language system. For example, studies that find children with SLI to have difficulty with phonological and lexical tasks, but to show normal performance in tasks related to wh-movement, can provide evidence for the presence of distinct modules, which may be selectively impaired.

This Special Issue brings together work on impaired child language acquisition from a wide range of languages, including Mainstream American English (MAE), African American English (AAE), Brazilian Portuguese, French, German, Greek, and Hebrew. It is mainly based on papers drawn from the 9th EUCLDIS Conference on *Specific Language Impairment: Uniformity and Diversity Across and Within Languages*, that Celia Jakubowicz organized in Royaumont, France, in May 2005 in collaboration with Catherine Rigaut and Marie Thèrese Le Normand. The conference included three main sessions: (i) Criteria for SLI; (ii) (Psycho)linguistic markers of SLI: wh-questions across languages and language modalities, and (iii) About the nature of the deficit: the locus of SLI. The success of the conference was supported by the unique atmosphere of Royaumont Abbey, which was the setting of the debate on language and learning between Chomsky and Piaget in 1975. It was Celia Jakubowicz' heartfelt wish that this Special Issue appear despite her illness, and she asked Naama Friedmann to step in as a co-editor.

The focus of the first six papers in the special issue is on the acquisition of wh-questions, which have been found to present persistent difficulties for children with SLI. The authors investigate a variety of wh-questions including root and long distance wh-questions. In the contributions by *Jakubowicz, de Villiers et al., Friedmann and Novogrodsky, and van der Lely et al.*, wh-questions are addressed from a syntactic perspective, whereas *Schulz and Roeper* examine the semantic properties of wh-questions. The next two papers examine the status of two further areas in children with SLI: *Tuller et al.* study clitic pronouns, and *Mastropavlou and Tsimpli* investigate complementizers and subordination. The final two papers in this special issue explicitly address the question of the possible loci of SLI: *Marinis* argues for the impairment being related to children's difficulty of integrating different types of information at the interfaces in the sense of Jakubowicz' Computational Complexity Hypothesis. *Corréa and Augusto* suggest several loci, ordered on a graded scale of severity of the impairment. In the following, we summarize the main findings of each paper and then suggest strands for future research in SLI.

Jakubowicz' paper *Measuring derivational complexity: New evidence from typically developing and SLI learners of L1-French* discusses the acquisition of various types of wh-questions. Jakubowicz investigates whether the acquisition order and error types can be accounted for by the Derivational Complexity Hypothesis (DCH) and the Derivational Complexity Metric (DCM), which she proposed in earlier work (*Jakubowicz, 2004, 2005*). According to the DCM, which is phrased within the minimalist framework (*Chomsky, 1995, 2001*), derivations of different complexity, defined by the number of internal and external merges they involve, result in graded difficulty of wh-questions. French-speaking typically developing children and children with SLI participated in a production experiment eliciting root wh-questions such as *Qui tu as vu* 'Whom you saw' and direct wh-questions from embedded clauses such as *Qui elle pense que tu as vu* 'Who she thinks that you saw'. In accordance with the DCH, long-distance questions are avoided in the first stages of typical acquisition and in SLI. Moreover, the types of non-target responses produced by both the typically developing and the SLI children can be explained by the DCM. Interestingly, plain wh-in situ structures, which are assumed to be least complex, are unattested in direct questions from embedded clauses. Jakubowicz suggests that this result follows from an independent conflict which arises at LF between the formation of direct questions and the embedded position of in-situ wh-phrases.

de Villiers, de Villiers, and Roeper present in their paper *Wh questions: Moving beyond the first Phase* a feature-checking theory of wh-movement that aims at accounting for the adult grammar as well as for children's acquisition patterns. Phrased

within (post)minimalist terms (Chomsky, 2008) the theoretical account makes use of the notion of local transfer and of the hypothesis that an adult interpretation requires feature projection from the higher verbs. The semantic contribution to the interpretation of the wh-structures is expressed by a bundle of semantic features including Point of View. Two hypotheses are proposed: Full transfer at the CI interface entails closing off the interpretation, and overt wh-expressions trigger interpretation of Edge Features in Spec of CP. Four large groups of typically developing children and children with SLI, speakers of either AAE or MAE dialect, participated in a comprehension task, using wh-questions with medial wh-pronouns such as *Who did the boy ask what to bring* and a production task eliciting direct and indirect wh-questions. The results reveal prolonged difficulties in the SLI group with long distance wh-movement and with resisting medial interpretations of indirect wh-questions. Faster mastery of medial questions in AAE than in MAE is argued to result from the fact that in AAE, children receive unambiguous evidence for indirect questions via inversion. de Villiers et al.'s theoretical account also provides an explanation for the stages in language development known previously, such as the production of medial wh-questions and the incorrect interpretation of wh-questions with a medial wh-pronoun (de Villiers et al., 1990; Roeper and de Villiers, 1994).

Friedmann and Novogrodsky's paper *Which questions are most difficult to understand? The comprehension of Wh questions in three subtypes of SLI* addresses two questions. The first regards the comprehension of wh-questions in children with Syntactic-SLI (SySLI) and the types of wh-questions that are especially difficult for them. The second is whether the deficit in comprehending wh-questions is a general problem in SLI, or whether there are different subtypes of SLI that evince distinct deficit patterns. Hebrew-speaking children with SySLI and typically developing children participated in three picture selection tasks. The results show that children with SySLI understand subject questions better than object questions, and *who* questions better than *which* questions. In line with a recent proposal by Friedmann et al. (2009) for typical language acquisition, the authors suggest that this asymmetry is due to a deficit in the assignment of a thematic role to an element that moved across another argument of the same type. The second part of the study used a battery of syntactic, phonological, lexical, and pragmatic tests that identified distinct types of SLI: syntactic SLI, lexical SLI, phonological SLI, and pragmatic SLI. The results indicated that whereas children with SySLI show a deficit in understanding (object *which*) wh-questions, children with other SLI types might show unimpaired comprehension of wh-questions. Friedmann and Novogrodsky argue that these results emphasize the importance of classification of SLI into subgroups, in which different linguistic modules may be impaired, and at the same time provide support for the modularity of language from a developmental aspect. They further suggest that a semantic SLI should exist as well, a point that is carefully explored in the next paper, by Schulz and Roeper.

Schulz and Roeper's paper *Acquisition of Exhaustivity in Wh-Questions: A Semantic Dimension of SLI?* investigates how the exhaustivity property of single wh-questions like *Who is sitting* and multiple wh-questions like *Who is sitting where* develops in normal and impaired acquisition. Starting from the observation that answers to multiple wh-questions are obligatorily exhaustive, the authors suggest a unified semantic approach where exhaustivity is rooted in the question meaning, and exhaustivity in single and multiple wh-questions is treated within the same framework. Focusing on the children's answer strategies, the authors tested German-speaking typically developing children and children with SLI with a question-with-picture task, using wh-questions with and without the quantifying question particle *alles* 'all' as well as paired and conjoined wh-questions. The study reveals that exhaustivity appears in a systematic way, first in single and then in paired wh-questions, with plural errors being absent in both SLI and typically developing children. While at age five, typically developing children have acquired exhaustivity in single and multiple wh-questions, the children with SLI master only wh-questions with the overt exhaustivity marker. Attributing exhaustivity to universally exhausting the question domain, Schulz and Roeper claim that (at least some) children with SLI do not possess this property. The authors conclude that the difficulties with exhaustivity they found in children with SLI may be related to general problems with quantification and may indicate a semantic deficit, pointing to the existence of a subtype of semantic SLI (cf. Schulz, 2010).

van der Lely, Jones, and Marshall's paper **Who did Buzz see someone? Grammaticality judgment of wh-questions in typically developing children and children with Grammatical-SLI* investigates subject and object wh-questions in English. The authors explore whether children with Grammatical-SLI (G-SLI) are impaired in hierarchical structural dependencies at the clause level. Following the Computational Grammatical Complexity hypothesis (van der Lely, 1998, 2005), they suggest that the impairment of individuals with G-SLI lies in the syntactic computational system itself rather than in more general processes such as working memory capacity. Individuals with G-SLI and younger typically developing children judged matrix wh-subject and object questions with different types of wh-words that were grammatical, ungrammatical, or semantically inappropriate. Ungrammatical questions contained various violations regarding the wh-trace (e.g., *What did Popeye move something*) and tense marking (e.g., *Who kiss Miss Piggy*). The study indicates that individuals with G-SLI, like the younger typically developing children, correctly evaluate grammatical questions and semantically inappropriate questions, while only the G-SLI children have difficulty recognizing ungrammatical wh-questions. van der Lely et al. conclude that the grammaticality judgment results are in line with previous data using different methodologies and support the view that G-SLI children have a deficit in the computational system as opposed to an overarching performance deficit, or deficits in working memory or processing.

The paper *Clitic pronoun production as a measure of atypical language development in French* by Tuller, Delage, Monjauze, Piller, and Barthez explores the production of various types of object clitics in French in adolescents with different pathologies: SLI, adolescents who at a young age had mild-to-moderate hearing loss (MMHL), and adolescents who had

Rolandic epilepsy at a young age. Extending previous work on object clitics in French (e.g., Hamann et al., 2003), they investigate whether the problem with clitic production could be used as a (clinical) marker of developmental pathologies affecting first language acquisition in French. Adopting the notion of computational complexity suggested by Jakubowicz (2005, *this issue*), the authors argue for increased complexity of clitic arguments. The three pathological groups and the typically developing children participated in an elicited production task, probing accusative clitics and the specificity of third person accusative clitics (*Elle le lave* 'She's washing it'). The study shows that in all three groups of adolescents with a history of impaired language acquisition, accusative clitic production remains weak long after childhood and low production rates are mainly restricted to third person accusative clitics. The strong age-effect found for the typically developing children aged 6 and 11 is argued to result from non-optimal functioning of extra-linguistic systems, which are sensitive to the complexity of linguistic operations, rather than from an immature linguistic system. The authors conclude that the difficulty with third person accusative clitics stems from non-optimal functioning of extra-linguistic systems which are sensitive to the complexity of linguistic operations.

Mastropavlou and Tsimpli's paper *Complementizers and subordination in typical language acquisition and SLI* focuses on the patterns of use of different complementizers in Greek. Following the Interpretability Hypothesis (Tsimpli, 2001; Tsimpli and Stavrakaki, 1999), according to which SLI impedes the acquisition of LF-uninterpretable features, the authors explore the encoding of intrinsic LF interpretable features on different complementizers and relate the different encodings to the way subordination emerges in SLI grammar. The spontaneous speech of children with SLI and age-matched and language-matched typically developing children is analyzed for frequency and accuracy of use of subordinate clauses introduced by *na*, *oti* or *pos*, *pu* and *an*. The study reveals that children with SLI omit more often complementizers with low semantic specification than complementizers that are richer semantically (such as *pu*, which bears the semantic interpretable feature 'definiteness'). However, the fact that they do not overgeneralize complementizers in inappropriate contexts, indicates that the selectional requirements of the complementizers are unimpaired in SLI. The authors conclude that the lexical representation of complementizers is not affected in SLI, but that children with SLI have difficulties with C elements that are less specified in terms of LF interpretability and use them optionally to a much greater extent than is seen in typical language acquisition.

Marinis' paper *On the nature and cause of Specific Language Impairment: New evidence from sentence processing and infant research* discusses the loci of SLI by reviewing recent research in both areas in SLI. The basic premise of his paper is that on-line processing studies and longitudinal infant research hold the keys for understanding the cause of SLI. Based on an overview of the linguistic and non-linguistic difficulties of SLI reported in off-line studies and of linguistic and processing accounts to SLI, Marinis argues that studies using off-line methods have difficulty in distinguishing between a deficit in the linguistic system itself and deficits in attention, memory, etc. On-line tasks, on the other hand, are implicit and thus are claimed to provide more direct access to the cause of SLI. His review of on-line studies reveals that children with SLI do not show sensitivity to grammatical morphemes with low phonetic saliency and show longer reaction times than age-matched typically developing children. In addition, the longitudinal infant project GLAD provides evidence that a later risk for SLI may be related to a history of auditory delay and impaired processing of prosodic information in the first months of the children's life. Marinis concludes that both types of results support accounts of SLI that link early deficits in the processing of phonology and later language deficits, like the Computational Complexity Hypothesis (Jakubowicz, 2003, *this issue*).

Corrêa and Augusto's paper *Possible loci of SLI from a both linguistic and psycholinguistic perspective* presents a novel approach to the understanding of SLI by integrating insights from language acquisition and language processing. Phrased within minimalist theory (Chomsky, 1995, 2001), four different loci of SLI are proposed: difficulties with the process of identification of the specific properties of formal features, problems with access to these features, difficulties with the actual conduct of on-line computation, and post-syntactic processes such as morpho-phonological encoding. This severity scale is claimed to be ordered, with the most severe syndrome, identification of formal features, including the difficulties predicted by the less severe ones. Assuming this theoretical background, Corrêa and Augusto evaluate results from previous studies on SLI against the predictions derived from their proposed integrative view of language. Grouped according to the four loci of language impairment, their review focuses on a wide range of phenomena, including agreement, subject omission, thematic role assignment, non-canonical word-order, determiners, and verbal affixes. The authors conclude that the initialization of a linguistic computational system on the basis of the perception of closed class elements corresponding to functional categories is crucial for normal language development.

The contributions to this Special Issue differ in many ways. Covering a wide range of typologically different languages, the studies also use different methods to assess children's language competence, including production, comprehension, and judgment tasks. The majority of studies are devoted to the area of *wh*-questions, while some studies explore other areas known to be difficult in impaired acquisition such as clitics and complementizers. Participants range in age from four to 20, and SLI is compared with typical development and in Tuller et al.'s paper also with the acquisition in individuals with a history of MMHL and Rolandic Epilepsy. Moreover, van der Lely et al. and Friedmann and Novogrodsky emphasize that children with SLI do not constitute a homogeneous group and identify subgroups of SLI.

Regarding the possible loci of SLI, all contributions share the view that the specific difficulties observed in children and adolescents with SLI are specific to language and can be best accounted for in a generative linguistic framework. Children's difficulties are not attributed to pure processing deficits, but rather to difficulties with the representational and/or derivational mechanisms responsible for identification, access, and application of grammatical operations.

As distinct properties of SLI, the contributions suggest difficulties with derivationally complex structures (Jakubowicz, Tuller et al., Marinis, Correa and Augusto), prolonged periods of local transfer (de Villiers et al.), deficits in the assignment of thematic roles across similar elements (Friedmann and Novogrodsky), lack of universal quantification (Schulz and Roeper), impairment in hierarchical structural dependencies (van der Lely et al.), and problems with feature interpretability (Mastropavlou and Tsimpli, Correa and Augusto). From this list of properties it is evident that more research is needed to better characterize the difference between representational and derivational deficits and to develop a comprehensive theory of their relation within the language faculty. Phrased in generalizable terms, these properties invite examining them across languages, populations, and methods. Ultimately, these properties may also help define new subtypes of SLI.

The cross-linguistic and theoretically informed perspective on SLI documented here reveals properties of grammatical systems, which could go unnoticed if solely the adult system and typical language acquisition were considered. Given that children with SLI show a protracted period of development which for certain grammatical domains often does not reach the end state, the studies in this Special Issue reveal subtle distinctions in the acquisition process, distinctions that may remain hidden in typical language development and that point to loci in the human language faculty that are vulnerable to impairment.



Celia Jakubowicz in a conference on SLI in Lisbon, 2006 (photographed by Naama Friedmann).

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