



Published in final edited form as:

J Child Lang. 2014 July ; 41(0 1): 38–47. doi:10.1017/S0305000914000130.

Children with Specific Language Impairment and their Contribution To the Study of Language Development

Laurence B. Leonard

Purdue University West Lafayette, IN USA

Abstract

Children with specific language impairment (SLI) are distinguishable from typically developing children primarily in the pace and course of their language development. For this reason, they are appropriate candidates for inclusion in any theory of language acquisition. In this paper, the areas of overlap between children with SLI and those developing in typical fashion are discussed, along with how the joint study of these two populations can enhance our understanding of the language development process. In particular, evidence from children with SLI can provide important information concerning the role of language typology in language development, the optimal ages for acquiring particular linguistic details, the robustness of the bilingual advantage for children, the role of input in children's acquisition of grammatical details, the unintended influence of processing demands during language assessment, and the study of individual differences in language development.

Not long before the publication of the first issue of the *Journal of Child Language*, there began a period of intense study of children with significant deficits in their ability to acquire their first language. These children were given a variety of labels, though, since the early 1980s, the most common label has been “specific language impairment” (SLI). The language difficulties of children with SLI are not accompanied by deficits in other areas sufficient to warrant an alternative diagnostic label. These children show normal hearing, they earn age-appropriate scores on tests of nonverbal intelligence, they show no evidence of frank neurological damage or disease, and their symptoms fall safely outside the bounds of autism spectrum disorder. Many of these children display subtle weaknesses in areas such as motor development, nonlinguistic working memory and speed of processing, but these are sub-clinical weaknesses (for a recent review of SLI, see Leonard, 2014).

These children represent a puzzle to those who study typical language development. A frequent comment in language acquisition textbooks is that virtually all normal children acquire their first words between 10 and 15 months (or their first word combinations between 15 and 21 months, or exhibit high levels of grammatical accuracy by four years). Children with SLI reach these milestones considerably later, yet this is the only thing that makes them other than normal. One can argue, therefore, that no theory of language development has a sound basis for excluding these children from consideration. Provisions

should be made in these theories for children whose pace and course of language development are not the characteristic ones.

In turn, the study of children with SLI can enrich theories of language development. Those accounts of SLI that are most compatible with the available evidence (e.g. Rice, 2003) are those that describe SLI symptoms in terms of altered developmental processes (e.g. very late emergence, asynchronies across language domains), rather than in terms of violations of natural language properties. The existence of SLI, then, can help scholars determine how essentially normal processes can be bent to create significant language difficulties without defying known biological and linguistic principles.

In this brief reflection, I identify several issues that represent areas of mutual influence between the study of typical language development and the study of children with SLI. The influence is in some instances stronger in one direction than the other but, collectively, they demonstrate how inter-connected the two areas of study are.

SLI and Language Typology

Decades of cross-linguistic research have taught us how the typology of a child's ambient language significantly shapes the relative ease or difficulty with which particular linguistic details are acquired. Immature productions that take the form of an excessive number of bare verb stems, or the over-use of a particular inflected form as a default, or the rigid adherence to only one of several permissible word orders can all be traced to the particular type of language that a child is learning. Even when grappling with a severe language weakness, children with SLI are similarly true to the typology of their language. They are likely to have an exaggerated profile – an especially dramatic version of telegraphic speech in English (Conti-Ramsden, Botting, & Faragher, 2001; Hoover, Storkel, & Rice, 2012; Rice & Wexler, 1996) or an especially protracted period of placing the subject before the verb regardless of the discourse context in Swedish (Hansson, Nettelblatt, & Leonard, 2000). But the errors can clearly be associated with properties of the child's language. For related reasons, Italian-speaking children with SLI will have relatively little difficulty with present tense verb inflections, unlike their counterparts learning Germanic languages. Yet these Italian children, like children with SLI acquiring Spanish and French, will have great difficulty with direct object pronouns – clitics – that must precede the inflected verb (Bortolini, Arfé, Caselli, Degasperis, Deevy, & Leonard, 2006). In English, direct object pronouns (that, like direct object nouns, follow the verb) provide no indication of weakness in children with SLI.

The notion of typology can be viewed from a different perspective to reveal another way that children with SLI will obey characteristics of their input language regardless of the difficulties they face. Children's ability to repeat nonwords seems closely related to the length of real words in their language. Typically developing children in Spanish and Italian, for example, will have greater success with nonwords containing four syllables than will typically developing children acquiring English (Dispaldro, Deevy, Altoé, Benelli, & Leonard, 2011). On average, real words in Spanish and Italian are longer than real words in English. Even though children with SLI will have poorer nonword repetition skills than their

typically developing compatriots in each of these languages, Spanish- and Italian-speaking children with SLI will nevertheless outperform English-speaking children with SLI as nonwords increase in length (Deevy, Wisman Weil, Leonard, & Goffman, 2010; Dispaldro, Leonard, & Deevy, 2013). Clearly, the language of children with SLI will play an important role, even in tasks such as nonword repetition that are stripped of word meaning and syntax. Because their language-specific profiles will be exaggerated, children with SLI might serve as a very appropriate target population for child language researchers interested in the degree to which typology interacts with language development.

Optimal Ages and SLI

Although the idea of a critical period for language learning is no longer cast in absolute terms, the notion of an optimal period for acquiring language seems difficult to dispute. As it turns out, children with SLI represent a relatively common natural experiment in this regard. Unfortunately for these children, SLI is a longstanding problem. There is an abundance of evidence showing that even by adulthood, individuals diagnosed as exhibiting SLI as youngsters are relatively weak in language (Mawhood, Howlin, & Rutter, 2000). This weakness has adverse consequences on these individuals' academic (Catts, Fey, Tomblin, & Zhang, 2002) social (e.g. Fujiki, Brinton, Isaacson, & Summers, 2001), emotional (e.g. Conti-Ramsden & Botting, 2008), and even economic (Law, Rush, Schoon, & Parsons, 2009) well being.

The deficits seen in these individuals at later ages do not appear to be solely attributable to the initial severity of their language disorder. After a period of late emergence, the pace of subsequent lexical and grammatical development does not appear to be appreciably slower than that seen in typical development. However, a plateau effect may start to occur because the late start makes it difficult to reach full mastery at the age when language learning is still efficient (Rice, Smith, & Gayán, 2009). Children with SLI would seem to be appropriate participants in studies aimed at determining the degree to which particular linguistic attainments are constrained by biological age.

Bilingual Children with SLI

If there were still a need to refute the old idea that learning multiple languages can take up mental space needed for other cognitive activities, children with SLI could serve as a convincing test case. Relatively balanced bilingual children with SLI (e.g. French-English) appear to be very similar in their language ability in each language relative to monolingual children with SLI who speak these same languages (Paradis, Crago, Genesee, & Rice, 2003). This finding may be more of a surprise to those working in the area of SLI than those concerned with typically developing children, for there has been a concern that children already experiencing difficulties learning one language would likely experience disproportionate, adverse effects if faced with the task of learning a second language. Clearly, there is not a capacity limit even for children with a language deficit. The problem seems to be one of language aptitude, not mental storage space.

This area seems ripe for future research. For example, we know that typically developing bilingual children have advantages over their monolingual peers in areas that rely on

executive functioning. It will be valuable to learn whether such advantages are seen as well in the bilingual SLI population.

SLI and Language Input

There have been at least two developments in child language that place new importance on the possible role of input in grammatical development. Generative linguists have long assumed that the distinction between a bare-stem language and an inflected language is implicitly recognized very early by young children, with only minimal input required to trigger the proper setting of the parameter for this property of language. However, after noting the quantitative differences among languages in degree of inflection use, and the corresponding quantitative cross-linguistic differences among children in how quickly their own speech unambiguously reflects the setting of their ambient language, Legate and Yang (2007) proposed that children might require more time and exposure to their language before parameter setting occurs.

This possibility also has implications within any single language. Hadley, Rispoli, Fitzgerald, and Bahnsen (2011) asked whether young children whose English-speaking parents produced a greater percentage of overt tense and agreement forms would show faster gains in their own tense and agreement use. The results indicated that this was true. This finding could lead to interventions designed to facilitate the tense and agreement acquisition of children with SLI.

Usage-based approaches have also offered a new look at the role of input in early grammatical development (e.g. Tomasello, 2003). Advocates of this approach have pointed out a very plausible source of young typically developing children's early productions, such as *Me run* and *The baby crying*. If children focus primarily on the propositional value of the nonfinite subject-verb sequences in input utterances such as *Watch me run* and *Is the baby crying?*, they might well inappropriately extract the nonfinite sequences for their own use, as stand-alone utterances. Experiments using novel verbs as input (Theakston, Lieven, & Tomasello, 2003) and studies employing computational modeling (Freudenthal, Pine, Aguado-Orea, & Gobet, 2007) demonstrate the feasibility of this idea.

Children with specific language impairment go through a protracted period of producing utterances of this type (Rice, Wexler, & Hershberger, 1998). The extended period of such usage has enabled investigators to consider what details in the input might promote this inappropriate extraction of nonfinite subject-verb sequences. One promising possibility is that these children fail to recognize the structural dependencies between a nonfinite subject-verb sequence appearing later in an input sentence and the particular verb form that appears earlier in the sentence (Leonard & Deevy, 2011). The problem does not seem to be restricted to any one syntactic construction. For example, some children with SLI produce accusative case pronouns in place of nominative case pronouns, as in *Him hold the worm*, and *Her eating my candy*, which could be derived from input sentences such as *Let's make him hold the worm* and *I saw her eating my candy*. However, others use nominative case pronouns appropriately, as in *He hold the worm* and *She eating my candy*, which could emerge from *Did he hold the worm?* and *Was she eating my candy?* The essential feature appears to be a

constraint that an earlier-appearing verb form (e.g. *make, saw, did, was*) places on the finiteness of a later-appearing verb in a subject-verb sequence.

Children with SLI might go through a protracted period of not understanding this dependency and therefore might treat the subject-verb sequence as unconstrained, available for use as an independent utterance. Leonard and Deevy (2011) and Purdy, Leonard, Weber-Fox, and Kaganovich (in press) provide comprehension data consistent with this interpretation, and Leonard and Deevy also give examples of how this same assumption can lead to well documented word order errors in languages such as German and Swedish. As can be seen, the protracted period of children with SLI making errors such *Him hold the worm* and *She eating my candy* has enabled investigators to propose specific hypotheses about the nature of inappropriate input extraction. These hypotheses, in turn, could be applied to younger typically developing children, as the same misinterpretations of input might occur but get resolved more quickly in these children.

Processing Demands on Language Performance

In years past, the notion of processing limitations was associated with the debate about the extent to which young children's limited language output is a function of competence versus performance. However, there is another sense of processing that is relevant even to those attributing full linguistic competence to young children. This sense of processing is seen especially in the literature on SLI but translates easily to the study of typical language development. Researchers in the area of SLI have sought to determine the degree to which children's language test scores reflect their actual language knowledge as opposed to their ability to handle the processing demands that the test items place on them. A sentence comprehension experiment by Leonard, Deevy, Fey, and Bredin-Oje (2013) can serve as an example.

These investigators assessed children's ability to point to appropriate pictures when responding to a set of adjectives, a set of simple subject-verb-object sentences, and a set of subject-verb-object sentences containing superfluous adjectives, as in *The yellow dog washes the white pig* where all the dogs depicted were yellow and all the pigs were white. Selecting those children with SLI who demonstrated high levels of comprehension on these items, Leonard et al. (2013) then presented similar sentences to the children, but in this instance, the adjectives were contrastive. For example, along with the target picture and one depicting the opposite relationship (a white pig washing a yellow dog), there was a picture of a yellow dog washing a pink pig, and of a brown dog washing a white pig. On this last set of items, the accuracy levels of the children with SLI dropped significantly. But so did that of a group of typically developing three-year-olds. Should the latter group's performance be interpreted to mean that these children did not comprehend subject-verb-object sentences with modifying adjectives? Without a battery of preliminary items demonstrating the children's command of the lexical content and syntax, such a conclusion might be reasonable. However, in this case, the problem was likely one of requiring the children not only to interpret the syntax, but also to hold in memory the particular attributes associated with the subject and object while they inspected four pictures that showed very similar and potentially interfering scenarios. In clinical work with children with SLI, processing

demands of this type must be considered every time children's language ability is assessed. A child's language test score (and with it, his or her diagnosis) can vary considerably depending on the particular type of foils employed in the test selected for use. Of course, typically developing children's perceived language status will not change as a result of their score on a research task, but the same care in detecting the task's processing demands should probably be exercised.

Treatment Designs

In the literature on SLI, there is increasing emphasis on the importance of treatment in the form of randomized controlled trials (e.g. Law, Garrett, & Nye, 2004). Certainly some of the design components in randomized controlled trials would be valuable ingredients in research on typical language development, such as random assignment of children to experimental conditions and data scoring conducted by judges who are blind to the conditions to which children were assigned. However, the core of treatment – providing the child with opportunities to learn new linguistic material in a shortened period of time – seems to be under-utilized in language research with typically developing children. The basic idea is that if a theory assumes that Structure A is meaningfully related to Structure B but not to Structure C, then providing children with significant exposure to Structure A should result in the children acquiring Structure B as well as Structure A, with no appreciable gains in Structure C. (To be certain that Structure C is a fair comparison structure, a similar group of children could be given significant exposure to Structure C. If the children make gains on Structure C but not on Structure A or B, the assumptions of the theory would be strengthened further.) Certainly child language researchers have employed clever tasks of, for example, presenting novel verbs in novel structures to determine how the children will subsequently use these verbs. However, by selecting children at the right stage of language development and choosing a strong treatment design, it might be possible to pursue a wider range of experimental and theoretical questions.

Genetics, Individual Differences, and SLI

Findings from twin studies show a clear genetic basis for abilities such as nonword repetition and tense/agreement morpheme use (e.g. Bishop, Adams, & Norbury, 2006). Given that these are areas of weakness in children with SLI, these heritability findings might have served as a signal that SLI is a disorder that can be kept distinct from typical language development. However, subsequent molecular genetic studies appear to show that SLI is a multifactorial disorder. Much of the basis for SLI may be genetic, but in the form of small contributions from multiple genes, possibly in interaction with subtle environmental factors. Of significance, though, is that it has not yet been established that the genetic factors that contribute to SLI are different from those that are responsible for differences in language ability in the normal range. In these studies, “risk” is usually defined by a language score on a continuum of scores. Thus, these studies seem to have identified genetic factors that distinguish better from poorer language skills. It is not yet clear if this work has specifically identified factors that distinguish impairment from non-impairment.

The genetic factors may not be the only connection between children with SLI and children exhibiting typical language development. Some investigators have made the case that children with SLI differ from their peers in their language symptoms primarily in degree rather than in kind. For example, Dollaghan (2004) employed taxometric analysis to examine the distribution of a large number of language test scores from three- and four-year-old children. She found that the scores distributed in a dimensional rather than categorical fashion. We do not yet know if these results are widely generalizable, because the languages measures used were measures of vocabulary and utterance length, not grammar, and older children might be found to show a more categorical breakdown. However, based on the available data, there is a strong possibility that children with SLI fall on the weak end of a language ability continuum. To be sure, the longstanding nature of this condition and the adverse collateral effects on these children's academic, social, and emotional functioning, make it imperative to provide these children with clinical and educational services. However, the manner in which these children differ from their peers – in the later age of their language attainments and in their exaggerated rather than qualitatively different profiles – suggests that studies seeking to better understand language development would do well to include these children. By having a wider range of abilities represented in the participant pool, new insights might emerge.

References

- Bishop DVM, Adams C, Norbury CF. Distinct genetic influences on grammar and phonological short-term memory deficits: Evidence from 6-year-old twins. *Genes, Brain and Behavior*. 2006; 5:158–169.
- Bortolini U, Arfé B, Caselli MC, Degasperi L, Deevy P, Leonard L. Clinical markers for specific language impairment in Italian: The contribution of clitics and nonword repetition. *International Journal of Language and Communication Disorders*. 2006; 41:695–712. [PubMed: 17079223]
- Catts H, Fey M, Tomblin JB, Zhang X. A longitudinal investigation of reading outcomes in children with language impairments. *Journal of Speech, Language, and Hearing Research*. 2002; 45:1142–1157.
- Conti-Ramsden G, Botting N. Emotional health in adolescents with and without a history of specific language impairment. *Journal of Child Psychology and Psychiatry*. 2008; 49:516–525. [PubMed: 18221347]
- Conti-Ramsden G, Botting N, Faragher B. Psycholinguistic markers for specific language impairment. *Journal of Child Psychology and Psychiatry*. 2001; 42:741–748. [PubMed: 11583246]
- Deevy P, Wisman Weil L, Leonard L, Goffman L. Extending the use of the NRT to preschool-aged children with and without specific language impairment. *Language, Speech, and Hearing Services in Schools*. 2010; 41:277–288.
- Dispaldro M, Leonard L, Deevy P. Real-word and nonword repetition in Italian-speaking children with specific language impairment: A study of diagnostic accuracy. *Journal of Speech, Language, and Hearing Research*. 2013; 56:323–336.
- Dispaldro M, Deevy P, Altoé G, Benelli B, Leonard L. A cross-linguistic study of real-word and nonword repetition as predictors of grammatical competence in children with typical language development. *International Journal of Language and Communication Disorders*. 2011; 46:564–578.
- Dollaghan C. Taxometric analyses of specific language impairment in 3- and 4-year-old children. *Journal of Speech, Language, and Hearing Research*. 2004; 47:464–475.
- Freudenthal D, Pine J, Aguado-Orea J, Gobet F. Modeling the developmental patterning of finiteness marking in English, Dutch, German, and Spanish using MOSAIC. *Cognitive Science*. 2007; 31:311–341. [PubMed: 21635299]

- Fujiki M, Brinton B, Isaacson T, Summers C. Social behaviors of children with language impairment on the playground. *Language, Speech, and Hearing Services in Schools*. 2001; 32:101–113.
- Hadley P, Rispoli M, Fitzgerald C, Bahnsen A. Predictors of morphosyntactic growth in typically developing toddlers: Contributions of parent input and child sex. *Journal of Speech, Language, and Hearing Research*. 2011; 54:549–566.
- Hansson K, Nettelbladt U, Leonard L. Specific language impairment in Swedish: The status of verb morphology and word order. *Journal of Speech, Language, and Hearing Research*. 2000; 43:848–864.
- Hoover J, Storkel H, Rice M. The interface between neighborhood density and optional infinitives: Normal development and specific language impairment. *Journal of Child Language*. 2012; 39:835–862. [PubMed: 22123500]
- Law J, Garrett Z, Nye C. The efficacy of treatment for children with developmental speech and language delay/disorder: A meta-analysis. *Journal of Speech, Language, and Hearing Research*. 2004; 47:924–943.
- Law J, Rush R, Schoon I, Parsons S. Modeling developmental language difficulties from school entry into adulthood: Literacy, mental health, and employment outcomes. *Journal of Speech, Language, and Hearing Research*. 2009; 52:1401–1416.
- Legate J, Yang C. Morphosyntactic learning and the development of tense. *Language Acquisition*. 2007; 14:315–344.
- Leonard, L. *Children with specific language impairment*. Second edition. MIT Press; Cambridge, MA: in press
- Leonard L, Deevy P. Input distribution influences degree of auxiliary use by children with specific language impairment. *Cognitive Linguistics*. 2011; 22:247–273. [PubMed: 23750074]
- Leonard L, Deevy P, Fey M, Bredin-Oje S. Sentence comprehension in specific language impairment: A task designed to distinguish between cognitive capacity and syntactic complexity. *Journal of Speech, Language, and Hearing Research*. 2013; 56:577–589.
- Mawhood L, Howlin P, Rutter M. Autism and developmental receptive language disorder – A comparative follow-up in early adult life. I: Cognitive and language outcomes. *Journal of Child Psychology and Psychiatry*. 2000; 41:547–559. [PubMed: 10946748]
- Paradis J, Crago M, Genesee F, Rice M. French-English bilingual children with SLI: How do they compare with their monolingual peers? *Journal of Speech, Language, and Hearing Research*. 2003; 46:113–127.
- Purdy JD, Leonard L, Weber-Fox C, Kaganovich N. Decreased sensitivity to long-distance dependencies in children with a history of specific language impairment: Electrophysiological evidence. *Journal of Speech, Language, and Hearing Research*. in press.
- Rice, M. A unified model of specific and general language delay: Grammatical tense as a clinical marker of unexpected variation. In: Levy, Y.; Schaeffer, J., editors. *Language competence across population: Toward a definition of SLI*. Lawrence Erlbaum Associates; Mahwah, NJ: 2003. p. 63-94.
- Rice M, Smith S, Gayán J. Convergent genetic linkage and associations to language, speech, and reading measures in families of probands with Specific Language Impairment. *Journal of Neurodevelopmental Disorders*. 2009; 1:264–282. [PubMed: 19997522]
- Rice M, Wexler K. Toward tense as a clinical marker of specific language impairment in English-speaking children. *Journal of Speech, Language, and Hearing Research*. 1996; 39:1239–1257.
- Rice M, Wexler K, Hershberger S. Tense over time: The longitudinal course of tense acquisition in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*. 1998; 41:1412–1431.
- Theakston A, Lieven E, Tomasello M. The role of input in the acquisition of third person singular verbs in English. *Journal of Speech, Language, and Hearing Research*. 2003; 46:863–877.
- Tomasello, M. *Constructing a language: A usage-based theory of language acquisition*. Harvard University Press; Cambridge, MA: 2003.