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Specific Language Impairment Across Languages

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Abstract

Children with specific language impairment (SLI) have a significant and longstanding deficit in spoken language ability that adversely affects their social and academic well-being. Studies of children with SLI in a wide variety of languages reveal diverse symptoms, most of which seem to reflect weaknesses in grammatical computation and phonological short-term memory. The symptoms of the disorder are sensitive to the type of language being acquired, with extraordinary weaknesses seen in those areas of language that are relatively challenging for younger typically developing children. Although these children's deficits warrant clinical and educational attention, their weaknesses might reflect the extreme end of a language aptitude continuum rather than a distinct, separable condition.

Keywords

specific language impairment; grammar; phonological short-term memory

Children with specific language impairment (SLI) are impaired in language ability, yet they hear normally, score at age-appropriate levels on tests of nonverbal intelligence, and show no neurological damage or disease. These children fall safely outside the autism spectrum and have no oral structural anomalies that would prevent adequate use of spoken language. About 7% of 5-year-olds have SLI (Tomblin et al., 1997). Although children with SLI can improve in treatment and, like all children, benefit from maturation, the problem is longstanding. These children are at risk socially, emotionally, academically, and, in the long-term, economically (e.g., Catts, Fey, Tomblin, & Zhang, 2002; Conti-Ramsden, Botting, & Durkin, 2008; Fujiki, Spackman, Brinton, & Hall, 2004; Jerome, Fujiki, Brinton, & James, 2002; St. Clair, Pickles, Durkin, & Conti-Ramsden, 2011).

In this article, I summarize some of the recent research on SLI. I begin with some of the genetic evidence for this disorder and the related language symptoms for children acquiring English. I then discuss how the language symptoms change across languages and how this suggests alternative ways of interpreting the genetic contributions to SLI.

Genetic Studies of SLI

Both twin studies and studies of molecular genetics reveal a genetic contribution in many cases of SLI. However, the cause of this disorder is apparently multifactorial, as no variant or mutation of any single gene produces the symptoms of SLI. Studies of children acquiring English have identified two classes of symptoms that meet the criteria for heritability (Bishop, Adams, & Norbury, 2006). One is a weakness in grammatical computation, seen in a poor command of grammatical inflections expressing tense and subject-verb agreement, and poor comprehension of sentences with complex syntactic structure. The other is apparently related to weak phonological short-term memory, seen, for example, when children have difficulty repeating nonwords (nonsense words) of three or four syllables. These are not the only difficulties of children with SLI; often these children exhibit a mild to moderate deficit in areas such as vocabulary. However, the symptoms of weaknesses in grammatical computation and phonological short-term memory are usually the most prominent (Leonard, in press), which may be why these symptoms have been identified as having a genetic basis.

The Cross-Linguistic Study of SLI

When systematic cross-linguistic research on SLI began, scientists hoped that such research would uncover the common denominator—the factor that distinguished children with SLI from their typically developing peers, regardless of the language being learned. This hope was understandable given that much of the work on SLI had focused on English and the potential confounds facing researchers of this language were abundant. For example, the well-documented deficits in using tense and agreement inflections could be exacerbated by the fact that grammatical inflections are sparse in English, they are not systematic (e.g., an inflection exists for present third person singular, as in *she jumps*, but not for the other person-number combinations in present tense, thus *I jump* and *they jump*), and they are expressed in the form of word-final consonants (as in *jumps* and *jumped*). By examining languages that lack some of these characteristics, one could determine how much of the problem could be attributed to the grammatical features themselves, apart from the regularity with which they appear in the input or the challenges they pose for production.

However, cross-linguistic research showed that the relative strengths and weaknesses of children with SLI were influenced by the characteristics of the ambient language. For example, problems with tense and agreement were attenuated in certain languages, supplanted by other weaknesses not seen in English. These findings altered our sense of how common denominator should be defined. It now appears that, in any given language, those features that pose a learning challenge for young typically developing children will prove to be an area of dramatic weakness in children with SLI. Such findings might seem to widen the range of potential factors that contribute to SLI, but they could also make the case for viewing this disorder in a different light. Instead of treating SLI as a condition that represents a break from normal functioning, we might try to explain SLI as an extreme variation of the same factors that influence language learning in all children. Such an approach integrates SLI with broader theories of language acquisition, yet is quite

compatible with findings of heritable classes of symptoms such as weaknesses in grammatical computation and phonological short-term memory.

I return to this argument following a review of some of the differences seen in the SLI profile as a function of the language being learned. I focus on four types of language for which SLI data are fast accumulating: 1) the Romance languages, Italian, Spanish, and French; 2) the Germanic languages, German, Dutch, and Swedish; 3) the Uralic languages, Hungarian and Finnish; and 4) the Chinese languages, Mandarin and Cantonese. Collectively, these languages cover a wide range of typologies and thus provide a representative picture of SLI symptoms. This picture becomes even richer when, after discussing these four language types, we examine data from bilingual children with SLI.

Grammatical Computation

Romance languages—In Romance languages, verbs are always inflected and, in Italian and Spanish in particular, the inflection system is quite transparent and simple phonologically. In these languages, children with SLI do not show the serious deficits in using tense and agreement inflections that are seen in English (e.g., Bedore & Leonard, 2001; Bortolini, Caselli, & Leonard, 1997). In children with SLI, the more serious difficulties acquiring these languages can be seen in the use of unstressed direct object pronouns that must precede the verb rather than follow it (e.g., *Anna vede Gina* [*Anna sees Gina*] but *Anna la vede* [*Anna her sees*] in Italian). Extreme difficulty with these types of pronouns constitutes a reliable means of identifying preschoolers with SLI in Romance languages (Bedore & Leonard, 2001; Bortolini et al., 2006; Jakubowicz, Nash, Rigaut, & Gérard, 1998).

Germanic languages—The largest stumbling block for children with SLI learning such languages as German, Dutch, and Swedish is the verb-second property of these languages (Leonard, Hansson, Nettelbladt, & Leonard, 2004; Rice, Noll, & Grimm, 1997; Wexler, Schaeffer, & Bol, 2004). For example, in Swedish, sentences beginning with the subject show the same word order as in English, as in *Birgitta äter glass* (*Birgitta eats ice cream*). However, if the sentence begins with a word other than the subject, the verb must appear after the first word, with the subject moved to a different position, as in *Sen äter Birgitta glass* (*Then eats Birgitta ice cream*). Swedish-speaking children with SLI go through an extended period of preserving the subject-verb-object word order, even when a different word precedes the subject, as in the ungrammatical **Sen Birgitta äter glass* (Hansson, Nettelbladt, & Leonard, 2000).

Uralic languages—In languages such as Hungarian and Finnish, a different type of error is common in children with SLI. In these languages, a sequence of inflections can appear at the end of nouns and verbs. Some of these inflections are fusional—simultaneously marking features such as first person and plural. However, these are joined in the sequence by other inflections, such as those marking past tense. For example, in Hungarian, *We are pushing* is expressed as *tolunk* (*tol-unk*), whereas *We were pushing* contains the past tense inflection *-t* as in *toltunk* (*tolt-unk*). It gets more complicated because, in Hungarian, the verb must agree

with the direct object in definiteness, where the verb inflection for *We were pushing the car* differs from that used for *We were pushing a car*.

Hungarian- and Finnish-speaking children with SLI have no difficulty using inflections in the proper sequence; they will always show the correct sequence of past tense + agreement and never the reverse, for example. However, because of the complexity of the verb inflection system, these children are prone to committing what might be termed near-miss errors (Lukács, Leonard, Kas, & Pléh, 2009). For example, an inflection sequence requiring past tense, third person plural, and definite (corresponding to *They were pushing the car*, for example) might instead be produced with a sequence reflecting past tense, third person singular, and definite (corresponding to *He was pushing the car*) or past tense, third person plural, and indefinite (corresponding to *They were pushing a car*).

Chinese languages—Special problems also arise when children with SLI must make use of a grammatical device that may be optional in the language. For example, in Mandarin and Cantonese, temporal notions are expressed through the use of aspect rather than tense. In Cantonese, a perfective aspect marker is placed after the verb to express completion of the action. Such a marker after the verb *eat* could mean *has eaten*, *had eaten*, or *will have eaten*; the distinction between these will depend on context or the use of adverbs such as *yesterday* or *tomorrow*. Aspect markers provide temporal precision, but for every sentence in which an aspect marker appears, one can find a context in which the same sentence is grammatical without an aspect marker. Nevertheless, one can find contexts in which most Cantonese speakers choose to include an aspect marker. And here is where children with SLI err: They underuse these markers in places where even younger typically developing peers use them (Fletcher, Leonard, Stokes, & Wong, 2005).

Bilingual children—Research on bilingual children with SLI has provided unique insights into this disorder. Studies of differences in the same child as a function of the language spoken provide a built-in within-subjects design. The grammatical profiles of bilingual children with SLI look very similar to those of monolingual children with SLI. For example, Spanish-English bilingual children with SLI do not omit grammatical inflections from verbs when speaking Spanish, even though the same children will frequently omit verb inflections when speaking English. French-English bilingual children with SLI have the expected difficulty with French direct object pronouns, given their noncanonical sentence position, but have no difficulty with English direct object pronouns that occupy the same postverb position as direct object nouns (Paradis, Crago, & Genesee, 2005). These within-child differences illustrate the important role of language in dictating the grammatical profile of a child with SLI.

Characterizing the weaknesses in grammatical computation—In these examples, we see special difficulties with details of grammatical computation that vary greatly from language to language. Common to all is that the features are relatively challenging among young typical language learners, because they require an alteration of usual word order (e.g., moving the verb in front of the subject; using a direct object pronoun in front of the verb), or are unusually complex (marking tense, person, number, and definiteness on the verb) or used only selectively (the use of optional aspect markers). These exceptional features run

counter to the biases that young typically developing children bring to the language learning process (Slobin, 1985).

Phonological Short-Term Memory

The other class of symptoms assumed to be heritable can be traced to weaknesses in phonological short-term memory, especially when measured through nonword repetition tasks. Findings from English and a variety of other languages suggest that nonword repetition tasks can reveal weaknesses in many children with SLI. These include the Romance languages, Italian, Spanish, and French (Dispaldro, Leonard, & Deevy, 2013; Elin Thordardottir et al., 2011; Girbau & Schwartz, 2007), and the Germanic languages, Dutch and Swedish (Rispen & Parigger, 2010; Sahlén, Reutersköld, Nettelbladt, & Radeborg, 1999). However, cross-linguistic differences are apparent. For example, whereas English-speaking preschoolers with SLI produce three- and four-syllable nonwords with approximately 55% and 35% accuracy, respectively, the corresponding values for Italian-speaking preschoolers with SLI are 80% and 70% (Deevy, Wisman Weil, Leonard, & Goffman, 2010; Dispaldro et al., 2013). This finding is attributable to the fact that Italian words are longer on average than English words, and Italian children—even those with SLI—are more accustomed to producing longer words.

Studies of bilingual children illustrate the same point. Bilingual Spanish-English children with SLI are more accurate in producing four-syllable nonwords from a Spanish nonword list than from an English nonword list, even though these children are less accurate than typically developing bilingual children on each list (Windsor, Kohnert, Lobitz, & Pham, 2010). On average, words in Spanish, as in Italian, are longer than words in English. These within-child differences speak to the important role of language in a child's level of performance, even in tasks purportedly measuring the same type of ability.

Just as a particular feature of grammar may be diagnostic of SLI in one language and not another, so too we can find languages for which nonword repetition is not diagnostic of SLI. In one study, nonword repetition tasks did not sharply distinguish Cantonese-speaking children with SLI from their typically developing peers (Stokes, Wong, Fletcher, & Leonard, 2006). This finding can be attributed to characteristics of the language. As a tone language, Cantonese employs a full tone for each syllable, so all syllables in a multisyllabic string are quite salient.

Characterizing the weaknesses in phonological short-term memory—Although nonword items have no semantic or grammatical content, cross-linguistic differences in nonword repetition nevertheless are apparent in the SLI literature. For tone languages, this type of measure may not be diagnostically useful. In languages for which nonword repetition is diagnostically meaningful, cross-linguistic differences are still evident and take the form of differences in absolute accuracy. Such differences seem attributable to the fact that children with SLI in certain languages must acquire words of greater length.

Cross-Linguistic SLI Data and the Language Ability Continuum

Despite their limitations, children with SLI produce sentences that respect the grammatical principles of the typology of their language and repeat nonwords that reflect the length of their language's lexicon. Furthermore, their symptoms have a common theme: All areas of special weakness correspond to details of language that are relatively difficult for typically developing children to acquire. These areas seem to represent the fault lines in each of the languages, detectable but of no particular concern under ordinary conditions. However, in the case of children with limited language skills, they spell serious trouble.

How should we characterize these exaggerated profiles, in which the relatively fragile areas in each language constitute areas of serious deficit in children with SLI? Some interpret the especially serious problems as reflecting a qualitatively distinct impairment (e.g., van der Lely & Battell, 2003; van der Lely & Stollwerck, 1996). However, the evidence that special weaknesses are more than quantitative departures from these children's other weaknesses is not compelling (see Bishop, Bright, James, Bishop, & van der Lely, 2000; Tomblin & Pandich, 1999). An alternative interpretation is that the exaggerated profiles are a natural outcome of a continuum of language aptitude. It would not be surprising if children who find language learning effortful in the first place find the less accessible details of language to be almost indecipherable.

Two lines of evidence are compatible with this differences-in-aptitude view. The first comes from studies that employ taxometric analyses—analyses of distributions of scores that might provide evidence for separable, nonarbitrary categories. Thus far, studies of (English-speaking) children with SLI have suggested that the scores of these children differ from those of other children in degree but not kind (Dollaghan, 2004, 2011). However, the language measures used in these studies have not yet centered on grammatical computation or phonological short-term memory.

The second line of evidence can be traced to the methods used to identify affectedness in genetic studies of SLI. In both twin studies and molecular genetic studies, children are initially classified as affected or unaffected on the basis of a cutoff score on a test or experimental measure. The use of a cutoff score opens up the possibility that any genetic factors identified are responsible for producing a continuum of ability rather than a disorder-nondisorder dichotomy. In fact, the heritability estimates for language test scores and nonword repetition scores in particular appear to be no different for the lower end of ability (where children with SLI reside) than for the average range (Bishop, 2001; Bishop & Hayiou-Thomas, 2007). Collectively, this evidence suggests that although children with SLI have crossed a boundary that puts their social and academic well-being at risk, this boundary might not constitute a distinct and nonarbitrary category.

I noted earlier that cross-linguistic studies have tried to clarify how children with SLI differ from their typical peers. However, instead of revealing clear lines of demarcation, this work may have brought the two groups closer together. Children with SLI seem to differ from their peers primarily in their slower pace of language development and their greater vulnerability to the more challenging details of the language they are learning. These vulnerabilities seem to fall in the areas of grammatical computation and phonological short-

term memory, but may well represent low points on an ability continuum rather than markers of a separable condition.

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References

- Bedore L, Leonard L. Grammatical morphology deficits in Spanish-speaking children with specific language impairment. *Journal of Speech, Language, and Hearing Research*. 2001; 44:905–924.
- Bishop DVM. Genetic and environmental risks for specific language impairment in children. *Philosophical Transactions of the Royal Society, London*. 2001; 356:369–380.
- 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.
- Bishop DVM, Bright P, James C, Bishop S, van der Lely H. Grammatical SLI: A distinct subtype of developmental language impairment? *Applied Psycholinguistics*. 2000; 21:159–181.
- Bishop DVM, Hayiou-Thomas ME. Heritability of specific language impairment depends on diagnostic criteria. *Genes, Brain and Behavior*. 2007; 7:365–372.
- 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]
- Bortolini U, Caselli MC, Leonard L. Grammatical deficits in Italian-speaking children with specific language impairment. *Journal of Speech, Language, and Hearing Research*. 1997; 40:809–820.
- 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, Durkin K. Parental perspectives during the transition to adulthood of adolescents with a history of specific language impairment. *Journal of Speech, Language, and Hearing Research*. 2008; 51:84–96.
- Deevy P, Wisman Weil L, Leonard L, Goffman L. Extending the use of the NRT to preschool-age children with and without specific language impairment. *Language, Speech, and Hearing Services in Schools*. 2010; 41:277–288.
- Dispaladro 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.
- 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.
- Dollaghan C. Taxometric analyses of specific language impairment in 6-year-old children. *Journal of Speech, Language, and Hearing Research*. 2011; 54:1361–1371.
- Elin, Thordardottir, Kehayia, E.; Mazer, B.; Lessard, N.; Majnemer, A.; Sutton, A.; Trudeau, N.; Chilingaryan, G. Sensitivity and specificity of French language and processing measures for the identification of primary language impairment at age 5. *Journal of Speech, Language, and Hearing Research*. 2011; 54:580–597.
- Fletcher P, Leonard L, Stokes S, Wong AM-Y. The expression of aspect in Cantonese-speaking children with specific language impairment. *Journal of Speech, Language, and Hearing Research*. 2005; 48:621–634.
- Fujiki M, Spackman M, Brinton B, Hall A. The relationship of language and emotion regulation skills to reticence in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*. 2004; 47:637–646.

- Girbau D, Schwartz R. Non-word repetition in Spanish-speaking children with specific language impairment (SLI). *International Journal of Language and Communication Disorders*. 2007; 42:59–75. [PubMed: 17365086]
- 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.
- Jakubowicz C, Nash L, Rigaut C, Gérard C-L. Determiners and clitic pronouns in French-speaking children with SLI. *Language Acquisition*. 1998; 7:116–160.
- Jerome A, Fujiki M, Brinton B, James S. Self-esteem in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*. 2002; 45:700–714.
- Leonard, L. *Children with specific language impairment*. 2nd ed.. MIT Press; Cambridge, MA: in press
- Leonard L, Hansson K, Nettelbladt U, Deevy P. Specific language impairment in children: A comparison of English and Swedish. *Language Acquisition*. 2004; 12:219–246.
- Lukács Á, Leonard L, Kas B, Pléh C. The use of tense and agreement by Hungarian-speaking children with language impairment. *Journal of Speech, Language, and Hearing Research*. 2009; 52:98–117.
- Paradis J, Crago M, Genesee F. Domain-specific versus domain-general theories of the deficit in SLI: Object pronoun acquisition by French-English bilingual children. *Language Acquisition*. 2005; 13:33–62.
- Rice M, Noll K, Grimm H. An extended optional infinitive stage in German-speaking children with specific language impairment. *Language Acquisition*. 1997; 6:255–295.
- Rispens J, Parigger E. Non-word repetition in Dutch-speaking children with specific language impairment with and without reading problems. *British Journal of Developmental Psychology*. 2010; 28:177–188. [PubMed: 20306630]
- Sahlén B, euterskiöld-Wagner C, Nettelbladt U, Radeborg K. Non-word repetition in children with language impairment – Pitfalls and possibilities. *International Journal of Language and Communication Disorders*. 1999; 34:337–352. [PubMed: 10884905]
- Slobin, D. Cross-linguistic evidence for the language-making capacity.. In: Slobin, D., editor. *The cross-linguistic study of language acquisition*. Volume 2: Theoretical issues. Erlbaum; Hillsdale, NJ: 1985. p. 1157-1256.
- St. Clair M, Pickles A, Durkin K, Conti-Ramsden G. A longitudinal study of behavioral, emotional and social difficulties in individuals with a history of specific language impairment. *Journal of Communication Disorders*. 2011; 44:186–199. [PubMed: 20970811]
- Stokes S, Wong AM-Y, Fletcher P, Leonard L. Nonword repetition and sentence repetition as clinical markers of specific language impairment: The case for Cantonese. *Journal of Speech, Language, and Hearing Research*. 2006; 49:219–236.
- Tomblin JB, Pandich J. Lessons from children with specific language impairment. *Trends in Cognitive Sciences*. 1999; 3:283–285. [PubMed: 10431178]
- Tomblin JB, Records N, Buckwalter P, Zhang X, Smith E, O'Brien M. Prevalence of specific language impairment in kindergarten children. *Journal of Speech, Language, and Hearing Research*. 1997; 40:1245–1260.
- van der Lely H, Battell J. Wh-movement in children with grammatical SLI: A test of the RDDR hypothesis. *Language*. 2003; 79:153–181.
- van der Lely H, Stollwerck L. A grammatical specific language impairment in children: An autosomal dominant inheritance? *Brain and Language*. 1996; 52:484–504. [PubMed: 8653392]
- Wexler K, Schaeffer J, Bol G. Verbal syntax and morphology in typically developing Dutch children and children with SLI: How developmental data can play an important role in morphological theory. *Syntax*. 2004; 7:148–198.
- Windsor J, Kohnert K, Lobitz K, Pham G. Cross-language nonword repetition by bilingual and monolingual children. *American Journal of Speech-Language Pathology*. 2010; 19:298–310. [PubMed: 20601622]