



KU THE UNIVERSITY OF
KANSAS

SPECIFIC LANGUAGE IMPAIRMENT IN CHILDREN

www.ku.edu

GROWING UP WITH SPECIFIC LANGUAGE IMPAIRMENT

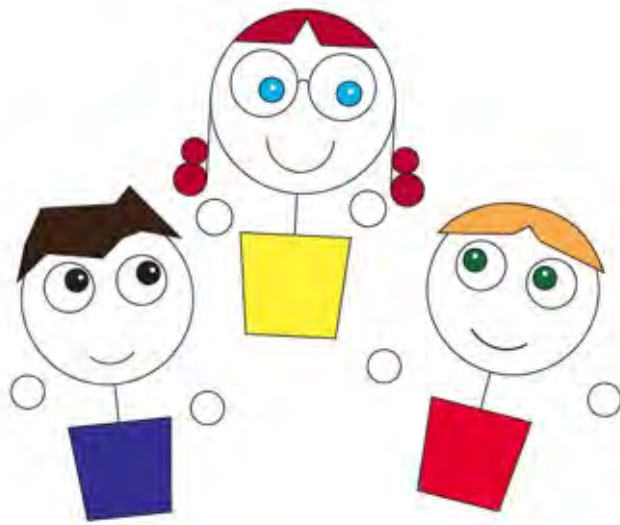
Growing up with Specific Language Impairment can impact a child's development in a number of ways. Professor Mabel Rice of the University of Kansas discusses the issues

Children's language acquisition emerges in a thicket of related abilities that can obscure the underlying central significance of language as an influence on other dimensions of development. Further, as children grow into adolescence and adulthood this close relationship can be misunderstood. This issue impacts children with [Specific Language Impairment \(SLI\)](#) – a language disorder that delays the mastery of language skills in children who have no hearing loss or other developmental delays (affecting 7-10% of children). This condition usually persists into adulthood, although affected children and adults are not likely to be identified for services to help with their language impairment¹.

The thicket of related outcomes includes:

- A high risk for reading impairments
- Lower than expected academic achievement²
- Difficulties in establishing peer relationships
- A heightened risk for peer victimization as a student³
- Increased risk for being identified as having an Attention Deficit Disorder (ADHD) because assessments for ADHD often include items to test language abilities (such as “does not listen to what is being said to him/her”⁴)
- Increased risk for being identified as having an “Auditory Processing Disorder” (APD) because assessments confound language and hearing ability
- Increased risk for ending education at the high school level²
- Increased risk for social anxiety in early childhood⁵
- For females, almost three times the risk for sexual assault in adulthood^{6,7}

The risk of the thicket surrounding language acquisition is that, without realizing it, people can see the individual branches of the thicket and assume that is the nature of the problem and miss the role of language at the core of the thicket. Language ability is central to reading ability, school achievement, peer relationships, negotiation of disputes, social confidence, self esteem, the ways in which we express humor, and strategies to escape dangerous situations. People with SLI are aware that although they wish to be popular with their peers and to do well in school, this is not their experience. In much the same way as is true for children who do not speak the language of their peers, persons with SLI can appear shy because they have limited language abilities, but this is misleading⁸. In other social circumstances their apparent shyness is not evident as they communicate with family and friends.



Social consequences of SLI—feeling anxious and left out

It is vitally important to increase the identification of persons with SLI, to help them cope with the misinterpretations of their language limitations and to provide them with needed help with language and related skills such as reading and peer acceptance. Their opportunities in the work place as adults, and other aspects of life outcomes, depend on it.

References

- 1 Rice ML. Specific Language Impairment in Children. <https://www.openaccessgovernment.org/specific-language-impairment-in-chi> 2017.
- 2 Tomblin JB. Education and Psychosocial Outcomes of Language Impairment in Kindergarten In: *Understanding Individual Differences in Language Development Across the School Years*. New York: Psychology Press; 2014:166-203.
- 3 Redmond SM. Peer victimization among students with specific language impairment, attention-deficit/hyperactivity disorder, and typical development. *Language, Speech, and Hearing Services in Schools*. 2011;42:520-535.
- 4 Redmond SM, Ash AC, Hogan TP. Consequences of co-occurring attention- deficit/hyperactivity disorder on children's language impairments. *Language, Speech, and Hearing Services in Schools*. 2015;46:68-80.

- 5 Brownlie EB, Bao L, Beitchman J. Childhood language disorder and social anxiety in early adulthood *J Abnorm Child Psychol*. 2016;44:1061-1070.
- 6 Brownlie EB, Jabbar A, Beitchman JH, Vida R, Atkinson L. Language impairment and sexual assault of girls and women: Findings from a community sample. *J Abnorm Child Psychol*. 2007;35(4):618-626.
- 7 Brownlie EB, Graham E, Bao L, Koyama E, Beitchman JH. Language disorder and retrospectively reported sexual abuse of girls: severity and disclosure. *Journal of Child Psychology and Psychiatry*. 2017.
- 8 Ash AC, Rice ML, Redmond SM. Effect of Language Context on Ratings of Shy and Unsociable Behaviors in English Language Learner Children. *Language, Speech, and Hearing Services in Schools*. 2014;45:52-66.

Mabel L. Rice
University of Kansas
Tel: +1 785 864 4570
mabel@ku.edu
www.ku.edu

LANGUAGE DEVELOPMENT: LEARNING FROM WHAT CHILDREN SAY

Mabel L. Rice, Distinguished Professor of Advanced Studies at the University of Kansas argues that children's utterances provide valuable clues about how their language develops and hallmark areas of grammar weaknesses in those with Specific Language Impairment (SLI)

When we want to learn a certain language, we have many kinds of reference materials to consult, benchmarked to the adult language system. In contrast, children's grammar has not yet been fully documented. An important source of information in this area of study is what children say. Early studies were done by parent scientists, keeping diaries of what their child said. In 1973, Roger Brown realised the value of new technologies for recording speech with portable devices for the purpose of studying children's early language in detail; he reported the outcomes in a benchmark book¹ and established new scientific methods for recording child utterances.

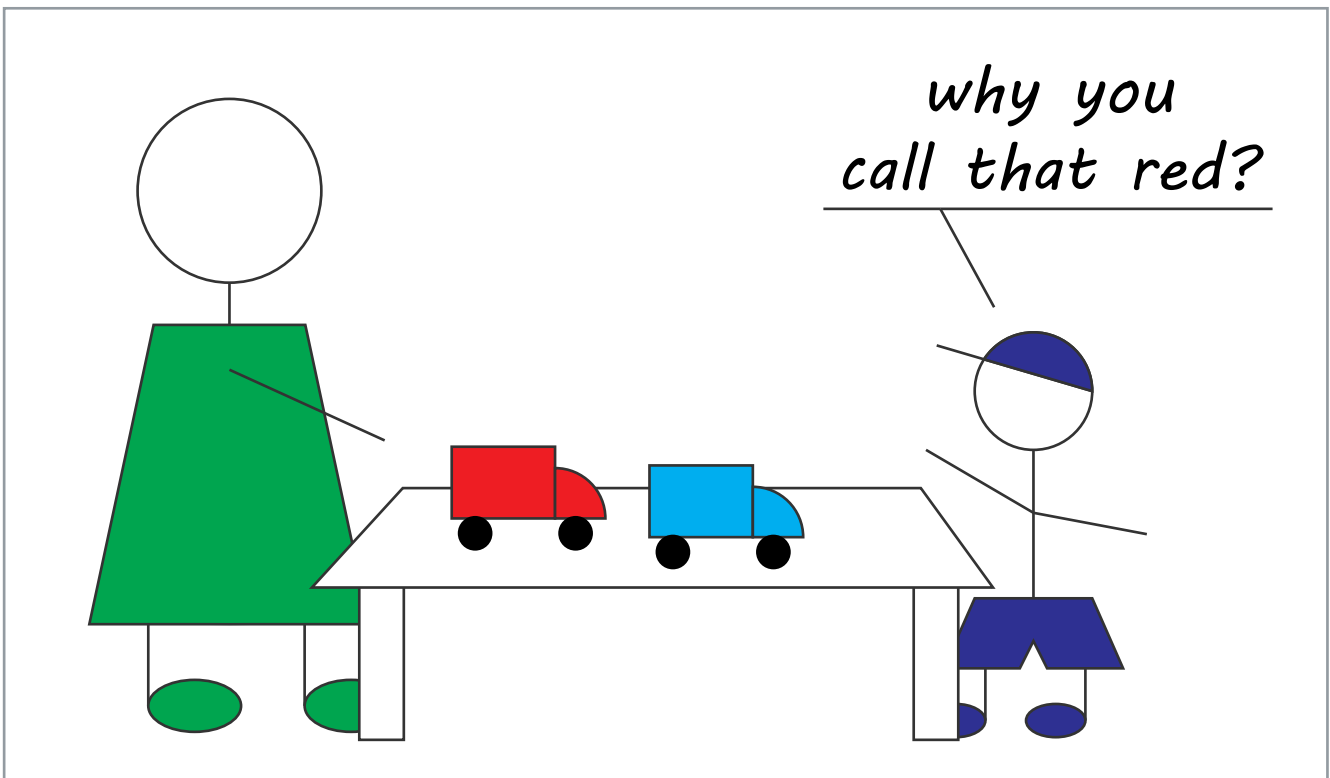
Language appears late in children with [Specific Language Impairment](#) (SLI), although other developmental benchmarks follow age expectations. The causes of delayed language acquisition are unknown. The details in what children say provide valuable clues about weaknesses in their linguistic system. Informative dimensions are what they talk about (i.e., content) and the sentence structures they use (i.e., linguistic form).

For example, during the preschool years, children learn the names of colours. This can take longer than expected for children with SLI. Consider a

six-year-old boy, Stevie, whose language is immature for his age. He does not know the names of colours, which is a limitation in a classroom with colour-coded spaces and signs. For example, an adult tries to teach him the names of the colours "red," "blue," "green" and "yellow," using simple blocks and toy objects and repeatedly asking "what colour is this?" This approach is pursued for several months, with no apparent success. One day, Stevie asks the adult, with genuine bewilderment, "Why you call that red?"

What clues are provided by his question? On the content level, Stevie is perplexed about using a word to refer to the hue of an object, or that this is a meaningful way to differentiate objects (although he certainly knows about broken objects, dirty objects and his versus my objects). Stevie subsequently works this out on his own, without continued prompting and with pride in his accomplishment.

However, his more significant problem with language is less apparent and is at the level of sentence structure. His sentence: "Why ___ you call that red?", is missing the required auxiliary *DO* (the italicised capitalisation conveys the citation form that would include the words "do",



“does,” and “did”). This is often thought of as a “little word” that can be omitted without hampering communication.

Although most speakers of English use the rules that apply to the use of auxiliary DO, they rarely know the structure of the underlying rules and are highly unlikely to explain the rules to their children, in contrast to the ways parents often focus on the names of colours. Instead, parents may sense that a six-year-old’s grammar is “immature” if such forms are omitted, although they are unaware of exactly what is missing.

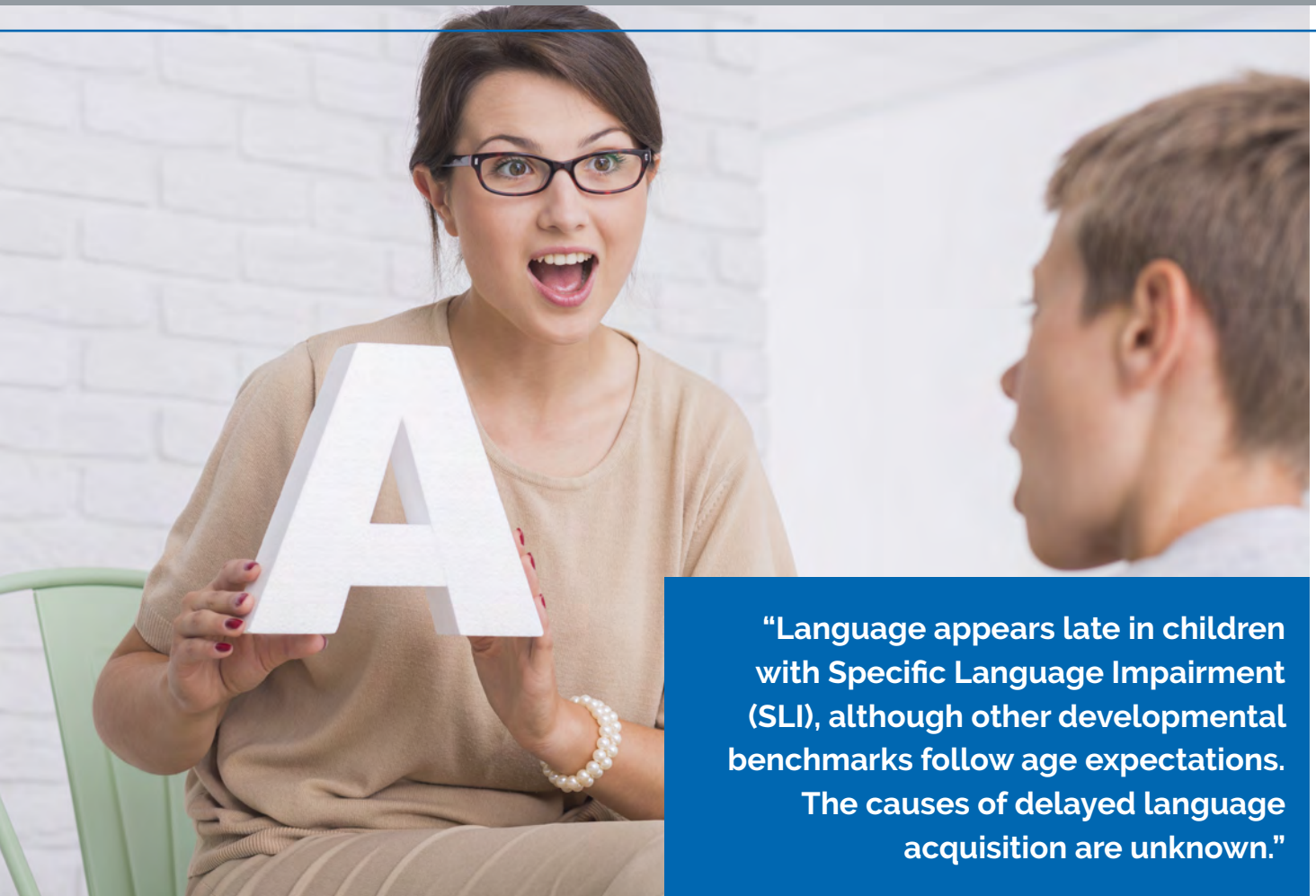
Advances in linguistic theory in the early 1990s identified systematic ways in which young children learn the property of grammar known as “finiteness marking”². In English, a set of forms mark finiteness: Auxiliary DO in questions (but main verb DO is different grammatically), copula and auxiliary BE, past tense -ed, or a default to the citation form of the verb for irregular past tense (“run” instead of “ran”) and third person singular -s, as in “walks”³. In the case of children with SLI, a stage of omission of these forms is likely to persist

into adolescence, long after unaffected children have mastered it⁴. This part of the grammar has served as a reliable clinical marker of children with SLI⁵ with high heritability^{6,7}.

Stevie’s question reveals the need for understanding two distinct dimensions required for language acquisition:

1. Children’s conceptual development as a basis for language concepts expressed in words and sentences.
2. The ways in which grammar works with linguistic constructs such as tense marking, subject/verb agreement and word order requirements, such as the insertion of auxiliary DO in Wh- questions.

Although the meaning part may be more intuitively obvious and more likely to be overtly taught, for most children no explicit teaching is needed for learning grammar. Yet, for children with SLI, the requirement to mark finiteness is not readily learned and instead continues to be



“Language appears late in children with Specific Language Impairment (SLI), although other developmental benchmarks follow age expectations. The causes of delayed language acquisition are unknown.”

treated as optional, even though it is a required element of a well-formed sentence. Perhaps Stevie’s question reminds us that the most obvious “error” is not necessarily the only error or the most important one to note. Our sense of what to notice is affected by our knowledge of where to look, even for something as commonplace as children’s language.

References

- 1 Brown R. *A first language: The early stages*. Cambridge, MA: Harvard University Press; 1973.
- 2 Quirk R, Greenbaum S, Leech G, Svartvik J. *A comprehensive grammar of the English language*. New York: Longman, Inc.; 1985.
- 3 Wexler K. Optional infinitives, head movement and the economy of derivations. In: Lightfoot D, Hornstein N, eds. *Verb movement*. Cambridge, England: Cambridge University Press; 1994:305-350.
- 4 Rice ML, Hoffman L, Wexler K. Judgments of omitted BE and DO in questions as extended finiteness clinical markers of specific language impairment (SLI) to 15 years: A study of growth and asymptote. *Journal of Speech, Language, and Hearing Research*. 2009;52:1417-1433.

5 Tager-Flusberg H, Cooper J. Present and future possibilities for defining a phenotype for specific language impairment. *J Speech Lang Hear Res*. 1999;42:1275-1278.

6 Rice ML, Zubrick SR, Taylor CL, Hoffman L, Gayan J. Longitudinal study of language and speech of twins at 4 and 6 years: Twinning effects decrease; zygoty effects disappear; and heritability increases. *J Speech Lang Hear Res*. 2018;61:79-83.

7 Dale PS, Rice ML, Rimfeld K, Hayiou-Thomas ME. Grammar clinical marker yields substantial heritability for language impairments in 16-year-old twins. *Journal of Speech, Language, and Hearing Research*. 2018;61:66-78.

Mabel L. Rice
University of Kansas
Tel: +1 785 864 4570
mabel@ku.edu
www.ku.edu

MATERNAL EDUCATION AND SPECIFIC LANGUAGE IMPAIRMENT IN CHILDREN: NOT A ROBUST RELATIONSHIP

It has long been held that a mother's education is a key factor in the development of their child's language. However, the link may not be as strong as previously thought, writes Mabel L Rice

Children develop language as they interact with parents, siblings, and people in the neighbourhood. For decades, the extent of mother's education has been recognised as an important indicator of the resources of the home related to children's social, cognitive and vocabulary development¹.

Recently, the New York Times featured an [article on its front page](#) that tied higher levels of maternal education to maternal age, due to the additional years of schooling, which in turn delays the start of families but adds to the family financial resources. The age that women become mothers also varies by geography and in the U.S., these factors are also linked to socioeconomic status and urban versus rural residency. In turn, these differences are linked to political decisions and public health policies.

Given the current spotlight on maternal education, it is time to revisit what is known about the relationship of maternal education with children's language acquisition and whether it plays a role in risk for [Specific Language Impairment](#) (SLI), defined as a language disorder that delays the mastery of language skills in children who have no hearing loss or other developmental delays.

It would be tempting to think that maternal education could play a large role in children's language acquisition, broadly across all dimensions of language, or in accounting for SLI or providing ways for a child to overcome SLI. Such

interpretations would not be consistent with available evidence, however, which shows a more complicated picture of the relationship between maternal education and children's language acquisition.

Effects of maternal education differ depending on the dimension of language studied. For example, relations between maternal education and children's language differ for words compared to grammar. Comparing the relationship of maternal education and language outcomes in children with and without SLI reveals surprising outcomes that work against simple models of causality or ways to overcome SLI.

Mothers' education and children's word learning

The best evidence comes from long-term longitudinal studies of children with and without SLI. In a study of 240 children with SLI and 279 unaffected children that included longitudinal measures from two-and-a-half to 21 years of age, across all participants children of mothers with higher education had higher performance on vocabulary tests over time²; however, the effect was weak, accounting for 1.3% of the variance on the vocabulary test.

A study of 1,255 twins at four and six years of age reported that children of mothers with higher levels of education had higher scores across multiple outcome measures (vocabulary and

grammar)³. On the other hand, an epidemiological study of 1,766 24-month children reported that risk for late appearance of words was not associated with particular strata of parental educational levels or socioeconomic resources⁴. Perhaps a longer span of word learning is more sensitive to influences of maternal education, or perhaps the effects are not as strong for predicting low levels of word acquisition.

Mother's education and grammar

An accumulating body of evidence suggests that maternal education does not predict grammar outcomes. In a study of 69 children at risk for delayed language acquisition, because they were treated in neonatal care units at birth, at four years of age, maternal age predicted vocabulary/semantic outcomes but did not predict grammar outcomes⁵.

Another programme of study focused on the finiteness requirement of verb conjugation in English and other languages⁶. This is the requirement for well-formed sentences to mark past tense, the third person singular -s, conjugated forms of BE copula and auxiliary, and insertion of DO auxiliary in questions such as "What do you want?"

These grammar markers appear in the speech of toddlers, although English-speaking children tend to omit them inconsistently throughout the toddler period and beyond.

In a detailed study of toddlers' utterances, mothers' education did not predict change in their toddlers' use of these markers⁷. In addition, a longitudinal study found that mothers' education levels do not predict growth in the production of finiteness markers for children with SLI or typically developing children ages 2;6-8;9⁸.

Using a similar task, a study of 130 SLI children, 100 non-specific language impairment (children with low nonverbal IQs), 73 low cognition children

(passed language and hearing testing but had low nonverbal IQ) and 117 unaffected controls reported initial test levels in kindergarten for all four groups and longitudinal outcomes for the other three groups between six and 10 years. Mother's education did not predict accuracy on the grammar marker in kindergarten or growth in accuracy between six and 10 years in any of the groups⁹.

Another study used tasks requiring children between the ages four and eight to make judgments of sentences similar to sentences they produce with omitted finiteness markers and compared children with SLI, younger controls and same age controls. Mothers' education did not predict growth in children's judgments of errors for any of the groups¹⁰.

A further study documented ongoing acceptance of omitted BE and DO in questions, in children with SLI but not their unaffected peers aged six to 15. Mother's education did not predict performance for either group of children on this grammar task¹¹.

In a large sample of 16-year-old twins, the correlation of mothers' education with grammaticality judgments for the question finiteness task was .16, statistically significant but low, accounting for only .0256% of the variance¹².

Another measure of young children's early language is their mean length of utterances, measured in words and morphemes such as finiteness markers and others such as plurals and prepositions. In a longitudinal study of an SLI group and a younger MLU-matched group, mother's education did not predict growth for either group in vocabulary scores or MLU between three and 10 years¹³.

A study of MLU in 306 children ages three to nine with SLI (170) and without SLI (136) found no evidence of an advantage in MLU growth for the

children of higher educated mothers at the initial times of assessment. Further, there were low correlations between siblings within the families of the target children¹⁴.

Revisiting the focus on mother's education

Although mother's education is surely an important factor in a family's social and economic resources and in many aspects of children's lives, it appears that the influence of this metric on children's language acquisition and the developmental trajectories of various linguistic manifestations of SLI is modest at best.

Children's acquisition of grammar, in the metrics of MLU in early childhood and in the likelihood of finiteness marking throughout childhood, appears to be unaffected by maternal education levels. This is consistent with the observation that young children around the world, across diverse levels of maternal education, acquire their native languages usually without explicit teaching. It also assures us that it is very unlikely that low levels of maternal education are the cause of SLI.

References

- 1 Entwisle DR, Astone NM. Some practical guidelines for measuring youths' race/ethnicity and socioeconomic status. *Child Dev.* 1994;65(6):1521-1540.
- 2 Rice ML, Hoffman L. Predicting vocabulary growth in children with and without Specific Language Impairment (SLI): A longitudinal study from 2 1/2 to 21 years of age *Journal of Speech, Language & Hearing Research.* 2015;58:345-359.
- 3 Rice ML, Zubrick SR, Taylor CL, Hoffman L, Gayan J. Longitudinal study of language and speech of twins at 4 and 6 years: Twinning effects decrease; zygosity effects disappear; and heritability increases. *J Speech Lang Hear Res.* 2018;61:79-83.
- 4 Zubrick SR, Taylor CL, Rice ML, Slegers D. Late language emergence at 24 months: An epidemiological study of prevalence, predictors, and covariates. *J Speech Lang Hear Res.* 2007;50:1562-1592.
- 5 Rice ML, Spitz RV, O'Brien M. Semantic and morphosyntactic language outcomes in biologically at-risk children. *Journal of Neurolinguistics.* 1999;12:213-234.
- 6 Rice ML. Language development: Learning from what children say. Open Access Government. 2018.
- 7 Hadley PA, Holt J. Individual differences in the onset of tense marking: A growth curve analysis. *Journal of Speech, Language, and Hearing Research.* 2006;49:984-1000.
- 8 Rice ML, Wexler K, Hershberger S. Tense over time: The longitudinal course of tense acquisition in children with specific language impairment. *J Speech Lang Hear Res.* 1998;41:1412-1431.
- 9 Rice ML, Tomblin JB, Hoffman L, Richman WA, Marquis J. Grammatical tense deficits in children with SLI and nonspecific language impairment: Relationships with nonverbal IQ over time. *J Speech Lang Hear Res.* 2004;47:816-834.
- 10 Rice ML, Wexler K, Redmond SM. Grammaticality judgments of an extended optional infinitive grammar: Evidence from English-speaking children with specific language impairment. *J Speech Lang Hear Res.* 1999;42:943-961.
- 11 Rice ML, Hoffman L, Wexler K. Judgments of omitted BE and DO in questions as extended finiteness clinical markers of specific language impairment (SLI) to 15 years: A study of growth and asymptote. *Journal of Speech, Language, and Hearing Research.* 2009;52:1417-1433.
- 12 Dale PS, Rice ML, Rimfeld K, Hayiou-Thomas ME. Grammar clinical marker yields substantial heritability for language impairments in 16-year-old twins. *Journal of Speech, Language, and Hearing Research.* 2018;61:66-78.
- 13 Rice ML, Redmond SM, Hoffman L. MLU in children with SLI and young control children shows concurrent validity, stable and parallel growth trajectories. *J Speech Lang Hear Res.* 2006;49:793-808.
- 14 Rice ML, Smolik F, Perpich D, Thompson T, Rytting N, Blossom M. Mean length of utterance levels in 6-month intervals for children 3 to 9 years with and without language impairments. *Journal of Speech, Language, and Hearing Research.* 2010;53:1-17.

Mabel L. Rice

University of Kansas

Tel: +1 785 864 4570

mabel@ku.edu

www.ku.edu

SPECIFIC LANGUAGE IMPAIRMENT (SLI) VERSUS SPEECH SOUND DISORDERS (SSD)

The important differences between Specific Language Impairment (SLI) in children and Speech Sound Disorders (SSD) in children are placed under the spotlight by Mabel L. Rice, Fred & Virginia Merrill Distinguished Professor of Advanced Studies at the University of Kansas

Around the world young children are expected to learn the language they overhear in conversations around them. This is a robust, spontaneous ability of humans, unlike, for example, reading, which must be explicitly taught. One prominent scholar of children's language acquisition once put it this way: "...there is virtually no way to prevent it from happening short of raising a child in a barrel."¹

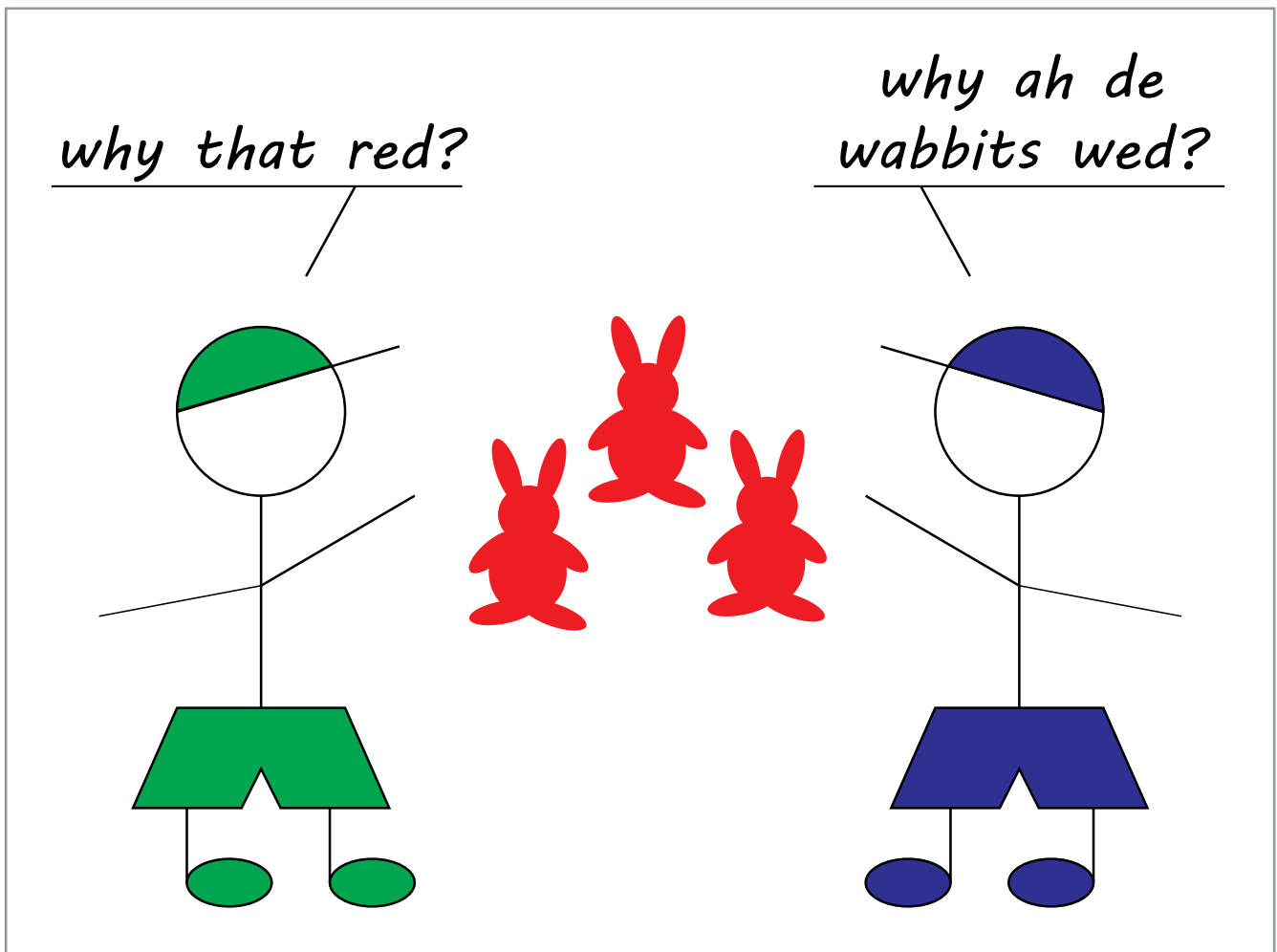
Although true of most children, children with Specific Language Impairment (SLI) are the exceptions to this assumption. These are children who do not have overt neurodevelopmental disorders, hearing impairments, or other obvious causes of developmental disorders and who live in ordinary families. Yet they are later than other children in learning a language and are at risk for persistent [low language abilities into adulthood](#). The best estimates for the prevalence of SLI are 7-10% of children at school entry (5-6 years).^{2,3}

SLI is often confused with Speech Sound Disorders (SSD) in children. Between one and five years of age children are learning two distinctly different parts of the human language capacity. One is the production of speech sounds needed in their native language. In the beginning, children can produce more sounds than they need for the language or languages they are hearing. Their first job is to refine them to match the ones they need and to drop the ones that may not matter and to develop the motor control needed to do that.

Humans at birth are equipped with motor movements for breathing, sucking and swallowing (basic functions for survival), along with a wide range of sounds. Some vocalisations serve communicative purposes, and some are biological (such as burps or coughs). Between one and two years of age, babies master more refined tongue, lips and palatal movements needed for speaking the words and sentences of a language. This requires a fine-tuned synchrony of muscles, sound perception and the cognitive centres of the brain. The output is a sequenced speech pattern, such as what we hear in a phone conversation.

The second part of the human language capacity is more covert, a matter of cognitive processes in the brain that do not require a speech production system. For example, deaf children can acquire a language system that can be expressed in physical signs of the hands, face and body postures. Language emerges in young children first in short utterances that lengthen with age. In English, language emerges as one or two words at a time, which relatively quickly expand to phrases or sentences.

SSD can be obvious to adult listeners of young children. Young children's attempts to talk can be unintelligible, especially when they are very young. If unintelligibility persists as children age, it becomes noticeable and a matter of concern because it is not "typical." Some mispronunciations



Two 5-year-old boys, one with SLI and one with SSD

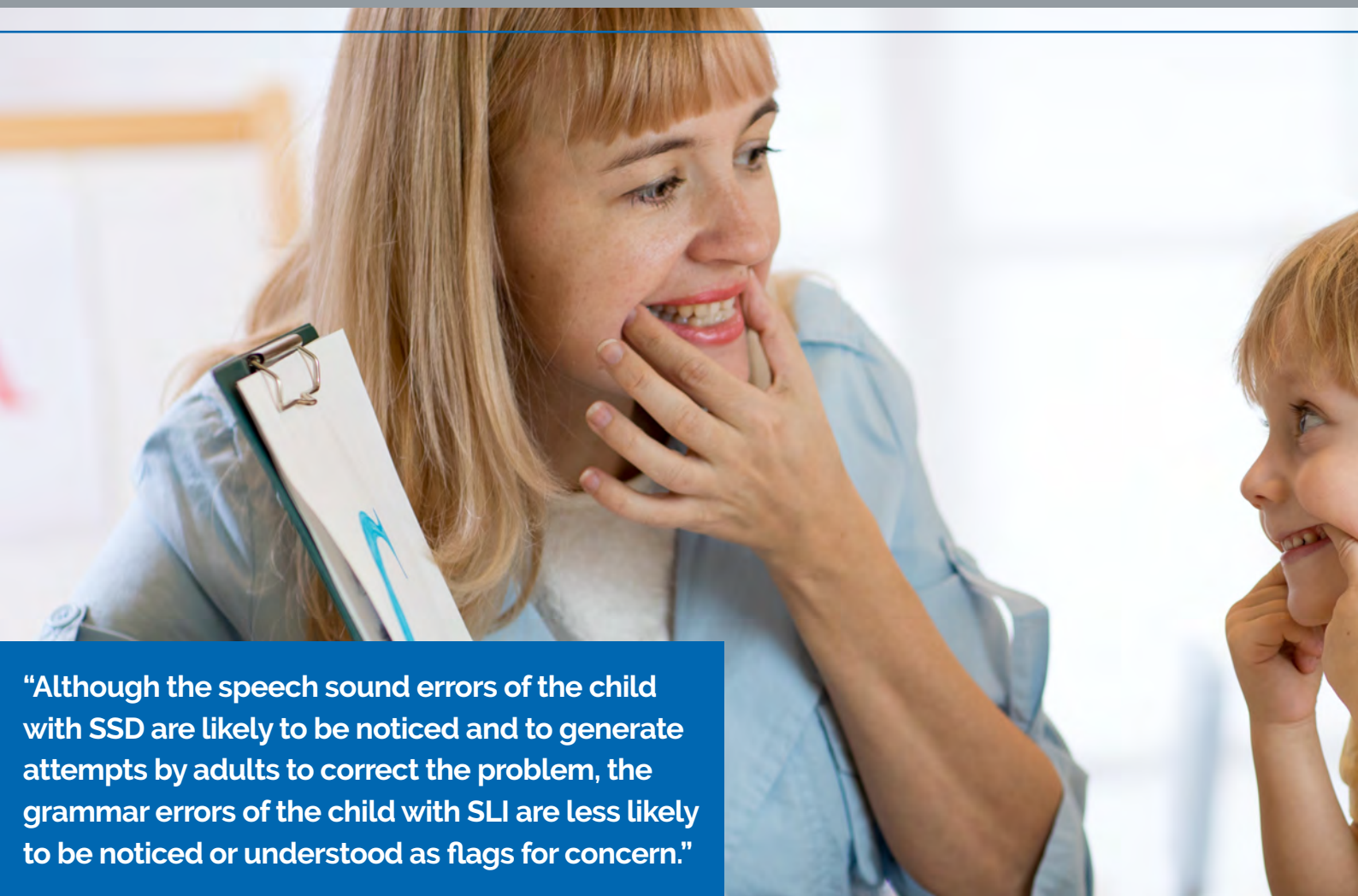
are understandable but regarded as immature, such as “wabbit” for “rabbit”, “thoup” for “soup”, or “bawoon” for “balloon.” Scholars have tracked the order in which children learn their speech sounds and have developed age norms for evaluating whether a child meets age expectations⁴. The prevalence of SSD in 4-6-year-old children in population-based cohorts is approximately 3-6%⁵ and the condition appears to resolve in 75% of children by age 6⁶.

People often assume SSD is the same as SLI, such that children’s speech abilities reflect their underlying language abilities or vice versa. This is not true. In the most precise study of a population-based sample of 5-year-old children, the co-occurrence of speech and language impairments, once adjusting for age expectations, was estimated at less than 2%⁵. For the children with SLI, speech impairment was evident in

approximately 5-8% of the children. The authors concluded that SSD and SLI are independent; they are not likely to co-occur. Thus, SSD is not a diagnostic marker of SLI and presumably, the two conditions do not share a common causal pathway.

The non-overlap of SLI and SSD carries implications for public health services and for scientific studies of the nature and origins of SLI and SSD.

- A big issue for public health services is that children with SLI are likely to be overlooked as needing language intervention services, perhaps in part because of the fact that SSD may be obvious to adults/caregivers, but SLI is not⁷.
- SSD is likely to resolve with age (children are likely to “outgrow” it) whereas SLI is likely to persist into adulthood⁷.



“Although the speech sound errors of the child with SSD are likely to be noticed and to generate attempts by adults to correct the problem, the grammar errors of the child with SLI are less likely to be noticed or understood as flags for concern.”

At school entry, SLI predicts later reading impairments⁸ whereas SSD predicts weakly, if at all, once adjusted for co-occurring language impairments.^{9, 10}

Scientific studies of children’s communication problems in medical conditions should differentiate between SLI and SSD. A recent study of children exposed to Human Immunodeficiency Virus (HIV) is the first report of SSD outcomes compared to primary language impairments (i.e., without other developmental disorders). The risk for language impairments in the children was higher than population norms but the risk for SSD was not elevated.¹¹

Examples of how children talk can illustrate the differences between SLI and SSD. Consider two 5-year-old boys. They are talking about a picture of red rabbits. One, dressed in purple, has an SSD, apparent in his mispronunciations of the speech sounds needed to say “why are the rabbits red.”

Within his speech system, he says “why ah de wabbits wed?” The substitution of w/r in “rabbit” and “red”, along with the omission of the final /r/ in the word “are,” are not unusual speech errors in the speech of young boys.

Such errors are quite noticeable although they often do not interfere with adults’ understanding of the intended meanings. The other boy, dressed in green, asks a question formulated in the adult grammar as: “why is/are that rabbit/those rabbits red?” The boy says “Why that red?”, a sentence consistent with the grammar rules for children this age with SLI⁷. He demonstrates a deficiency in sentence structure, with the omission of the obligatory copula form of BE (“is” or “are”) and the substitution of a pronoun (“that”) for the common noun “rabbit.” Furthermore, the specification of singular versus plural for the noun phrase is vague because the noun information is underspecified. His articulation of speech sounds is at adult levels and his meaning is effectively conveyed.



Although the speech sound errors of the child with SSD are likely to be noticed and to generate attempts by adults to correct the problem, the grammar errors of the child with SLI are less likely to be noticed or understood as flags for concern. Yet it is the child in green who is at higher risk of adverse developmental outcomes than the child in purple, who is more likely to “outgrow” the SSD and less likely to encounter problems with literacy, school achievement, or long-term persistence of subtle but very important elements of grammar and vocabulary. Our research and our service systems will be improved by increased recognition of the important differences between SLI and SSD.

References

- 1 Pinker S. Language learnability and language development. Cambridge, MA: Harvard University Press; 1984.
- 2 Tomblin JB, Records NL, Buckwalter P, Zhang X, Smith E, O'Brien M. The prevalence of specific language impairment in

- kindergarten children. *J Speech Hear Res.* 1997;40:1245-1260.
- 3 Norbury CF, Gooch D, Wray C, et al. The impact of nonverbal ability on prevalence and clinical presentation of language disorder: evidence from a population study. *Journal of Child Psychology & Psychiatry.* 2016;57(11):1247-1257.
- 4 Goldman R, Fristoe M. Goldman Fristoe Test of Articulation-2 (2nd Edition). Circle Pines, MN: American Guidance Service; 2000.
- 5 Shriberg LD, Tomblin JB, McSweeney JL. Prevalence of speech delay in 6-year-old children and comorbidity with language impairment. *J Speech Lang Hear Res.* 1999;42:1461-1481.
- 6 Shriberg LD. Five subtypes of developmental phonological disorders. *Clinical Communication Disorders* 1994;4:38-53.
- 7 Rice ML. Specific Language Impairment in Children. <https://www.openaccessgovernment.org/specific-language-impairment-in-children/40152/> 2017.
- 8 Catts HW, Fey ME, Weismer SE, Bridges MS. The relationship between language and reading abilities. In: Tomblin JB, Nippold MA, eds. *Understanding individual differences in language development across the school years* New York City, New York: Psychology Press; 2014:144-165.
- 9 Sices L, Taylor HG, Freebairn L, Hansen A, Lewis B. Relationship between speech-sound disorders and early literacy skills in pre-school-age children: Impact of comorbid language impairment. *J Dev Behav Pediatr.* 2007;6:438-447.
- 10 Hayiou-Thomas ME, Carroll JM, Leavett R, Hulme C, Snowling MJ. When does speech sound disorder matter for literacy? The role of disordered speech errors, co-occurring language impairment and family risk of dyslexia. *Journal of Child Psychology and Psychiatry.* 2017;58(2):197-205.
- 11 Rice ML, Russell JS, Frederick T, et al. Risk for speech and language impairments in pre-school aged HIV-exposed uninfected children with in utero combination antiretroviral exposure. *The Pediatric Infectious Disease Journal.* Accepted Dec 2017.

Mabel L. Rice

University of Kansas

Tel: +1 785 864 4570

mabel@ku.edu

www.ku.edu



KU THE UNIVERSITY OF
KANSAS

www.ku.edu