Fast Mapping Deficits During Disambiguation in Children with Specific Language Impairment

Déficit de repérage rapide lors de tâches de désambiguïsation chez les enfants avec trouble spécifique du langage

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Abstract

Research has shown that children with specific language impairment (SLI) are successful fast mapping a nonsense name to a single clear referent; however, they show fast mapping deficits during incidental learning. This investigation used a disambiguation task to determine the ability of children with SLI to quickly map nonsense words to unfamiliar objects given a forced choice. Participants were five children with SLI, five age-matched and five language-matched controls. For phonetically distinct nonsense words, age-matched and language-matched children demonstrated disambiguation; they selected unfamiliar objects. Children with SLI selected unfamiliar objects more often than chance, but significantly less often than control groups. In a phonetically similar condition in which nonsense words sounded like familiar object names, control groups showed variable responses away from disambiguation. Children with SLI, however, consistently selected familiar objects. Perhaps, children with SLI do not infer mutual exclusivity, an assumption that words name one object and objects have one name. Without this assumption, or a similar inference, fast mapping of new words to referents is slowed.

Abrégé

La recherche a montré que les enfants avec trouble spécifique du langage (TSL) repèrent rapidement un mot non-sens pour un référent simple et spécifique mais ils montrent quelques déficits au repérage rapide lors de l'apprentissage accidentel. Cette étude a utilisé une tâche de désambiguïsation pour déterminer l'habilité des enfants avec TSL au repérage rapide de mots non-sens pour des objets non-familiers en donnant un choix forcé. Les participants étaient composés d'un groupe de cinq enfants présentant un TSL, d'un groupe-contrôle de cinq enfants du même âge et d'un groupe-contrôle de cinq enfants de la même langue. Pour des mots nonsens phonétiquement distincts, le groupe-contrôle du même âge et celui de la même langue ont montré des habiletés de désambiguïsation; ils ont choisi des objets non-familiers. Les enfants avec TSL ont aussi choisi des objets non-familiers, mais significativement moins souvent que les deux groupes-contrôle. En utilisant des mots non-sens phonétiquement similaires et à consonance de noms d'objets familiers, les groupes-contrôle ont donné des réponses variables qui ne ressemblaient pas à l'effet de désambiguïsation. De façon constante, les enfants avec TSL, choisissaient les objets familiers. Les enfants avec TSL n'infèrent peut-être pas l'exclusivité mutuelle basée sur la présomption qu'un seul mot désigne un objet et qu'un objet n'est désigné que par un seul mot. Sans cette présomption ou inférence, le repérage rapide de nouveaux mots pour un référent est ralenti.

Key words: specific language impairment, fast mapping, disambiguation, mutual exclusivity, phonetic similarity

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Children with specific language impairment (SLI) show lexical weaknesses. A hallmark of this population is their late acquisition of first words (for a review, see Leonard, 1998). Findings from investigations of fast mapping, although varied, also suggest deficits (Dollaghan, 1987; Rice, Buhr, & Nemeth, 1990; Rice, Oetting, Marquis, Bode, & Pae, 1994). Fast mapping is the term used to describe children's rapid, partial word acquisition given brief, initial encounters (Carey & Bartlett, 1978). Dollaghan (1987) found that four and five-year-olds with SLI could successfully fast map a single, clear referent to a nonsense name (i.e., koob). The children with SLI, however, were significantly poorer than age-matched typically developing (TD) peers for recalling the name. Rice, Buhr, and Nemeth described significant differences in the fast mapping skills of children with SLI compared to two TD groups – children matched for chronological age and a group matched for mean length of utterance (MLU). In their study, fast mapping took place in a quick, incidental learning paradigm. Twenty novel words, including five nouns (e.g., viola, cleaver, and artisan), were introduced within a story corresponding to a video. Taken together, this line of research indicates that children with SLI differ from TD peers for fast mapping. Children with SLI are capable of fast mapping when there is a single, clear referent; however, they are less successful fast mapping multiple new words in an incidental learning context. When children with SLI learn a new word receptively, they are unlikely to show expressive recall.

Much of what is understood about fast mapping comes from investigations of fast mapping with TD preschoolers (e.g., Dollaghan, 1985; Katz, Baker, & Macnamara, 1974; Markson & Bloom, 1997; Merriman & Bowman, 1989; Wilkinson & Stanford, 1996). Merriman and Bowman demonstrated TD children's rapid acquisition of novel words in a disambiguation task. That is, TD children selected the unfamiliar object given a nonsense word and one familiar and one unfamiliar object. For example, given pictures of an apple and a salamander and asked to point out the "firsh," children select the salamander (Merriman & Schuster, 1991). Across multiple studies, these researchers have found a strong disambiguation effect for TD four-year-olds given pictures of familiar and unfamiliar objects and a nonsense word that is phonetically distinct from the familiar object name (for an overview, see Merriman, Marazita, & Jarvis, 1995). Additional studies by Merriman and colleagues (Evey & Merriman, 1998; Merriman & Marazita, 1995; Merriman & Stevenson, 1997) have revealed a similar effect by TD two-year-olds in mapping tasks with a nonsense noun and familiar and unfamiliar referents. These researchers concluded that consistent evidence of disambiguation by TD children between two and six years of age points to a mutual exclusivity bias or strategy in their word learning.

Mutual exclusivity is the assumption that objects are named by one word and every word names one object (Markman, 1993). If young children hold an assumption such as mutual exclusivity, then fast mapping is facilitated because this preference constrains meaning decisions. That is, in the context of a novel word and an unfamiliar referent, children can quickly map the two by hypothesizing that the new word names the new object. Overextensions of words and their meanings are avoided because young children prefer single names for individual referents. The precise nature of mutual exclusivity, however, is not agreed upon. This process could represent a specific lexical constraint, a more general cognitive inference, or it could be an outgrowth of social knowledge and theory of mind skills (for reviews, see Bloom, 2000 and Merriman et al., 1995).

Ultimately, TD children must override mutual exclusivity to process and understand synonyms, mispronunciations, and morphological inflections. Merriman and colleagues (Evey & Merriman, 1998; Merriman & Bowman, 1989; Merriman & Schuster, 1991; Merriman & Stevenson, 1997) have investigated several factors that reduce or reverse disambiguation (e.g., object novelty, object typicality, phonological priming, and investigator reinforcement). Of interest here is one factor, phonetic similarity. Merriman and Schuster (1991) found that TD two and four-year-olds showed chance level performance for selecting the unfamiliar object versus the familiar object given a nonsense word phonetically similar to the familiar object (e.g., "cardle" with a car and a scale). Although participants' responses were not a clear reversal of disambiguation, the factor of phonetic similarity weakened their strategy of selecting the unfamiliar object. These findings highlight the complex and flexible nature of TD children's lexical mapping. Flexibility is critical, because after all, a single object, such as a car, can be referred to as "car," "cars," or "racecar" in various communicative interactions. Four-year-old children hear peer productions of "car" that sound like /kar/, /ka/, /tar/, or /ta/, yet, they override these phonetic differences to correctly identify the referent.

This study examined disambiguation by preschoolers with SLI compared to chronological age-matched (CA) and language-matched (L) peers. Given their weaknesses in fast mapping, we hypothesized that children with SLI might not demonstrate disambiguation. That is, they might not quickly infer mapping between a novel referent and a novel word. If children with SLI do not have a preference for associating new words to unfamiliar referents in the environment, then fast mapping would be substantially slowed.

A second word condition incorporating the factor of phonetic similarity was included for several reasons. First, it has been known to disrupt TD children's disambiguation; therefore, inclusion of this second word condition provided a stronger test of the disambiguation effect. Secondly, we hoped to show a clearer reversal of disambiguation given phonetic similarity than previously found by Merriman and Schuster (1991). Finally, it was hypothesized that children with SLI, who have shown relative phonological weaknesses (e.g., Gathercole & Baddeley, 1990), would perform differently than the normal language controls in the phonetically similar word condition suggesting limited or inflexible mapping strategies.

Method

Participants

There were a total of 15 participants. Five children had SLI, two girls and three boys, ages 4;1 to 6;6. There were two groups of normal language controls. The chronological age matched group (CA) consisted of five children matched for chronological age (+/- three months) and gender. The language matched group (L) was five children, ages 3;0 to 3;11, matched with SLI participants on a measure of lexical diversity, Number of Different Words (NDW). Number of Different Words scores were derived from 50-utterance language samples using Systematic Analysis of Language Transcripts (Miller & Chapman, 2000). Matching by NDW (+/- 20 words) limited variability among participants in the area of semantic ability (Watkins, Kelly, Harber, & Hollis, 1995).

Participants with SLI displayed overall language skills at least 1.25 standard deviations from the test mean (i.e., Total Language Score of 81 or less) on the Preschool Language Scale – 3 (PLS-3; Zimmerman, Steiner, & Pond, 1992). Children in the CA and L groups demonstrated receptive and expressive language skills at or above a standard score of 85 on the PLS-3. All participants, including the children with SLI, demonstrated speech production skills within 1.5 standard deviations of the mean on the PLS-3 Articulation Screener (Zimmerman et al.), and they passed a hearing screening (American Speech-Language-Hearing Association, 1985). All participants displayed nonverbal cognition within normal limits (i.e., standard scores at or above 85) on the Leiter International Performance Scale – Revised, Brief IQ Screener (Rhoid & Miller, 1997). Parent report confirmed the absence of frank neurological or social-emotional impairments and that the primary language in the homes was General American English.

Table 1 depicts group means, ranges, and standard deviations for language testing, NDW, and cognitive screening. As expected, the children with SLI differed significantly from the CA group on all language measures,

Table 1
Mean Performance on Preexperimental Measures for Each Participant Group

	SLI (Mean age = 58)			CA (Mean age = 59)			L (Mean age = 40)		
Measure	***M***	**range**	***SD***	***M***	**range**	***SD***	***M***	**range**	***SD***
Rec. SS	74	68-78	7.6	111	92-126	13.8	119	106-124	7.6
Rec. AE	40	30-56	10.2	66	56-81	10.9	50	41-59	6.4
Exp. SS	78	69-88	7.8	115	96-134	14.0	124	98-141	16.5
Exp. AE	44	29-71	15.8	74	61-82	8.1	53	37-61	10.0
NDW	69	49-80	11.8	105	94-120	10.5	81	67-89	9.3
Cognitive	93	85-103	8.9	113	107-119	4.8	124	107-139	14.2

Note. Language standard scores, from the PLS-3, and the cognitive scores, from the Leiter-R, are based upon M =100, 1 SD = +/-15. Ages and age-equivalent scores are reported in months. Rec. = Receptive; Exp. = Expressive; SS = Standard score; AE = age-equivalent score

Table 2
Number of Selections of Unfamiliar Objects

	PD				PS			
Group	*M*	*SD*	range	*CI*	*M*	*SD*	range	*CI*
SLI	6.50	0.58	6 to 7	5.58 - 7.42	2.50	0.58	2 to 3	1.58 - 3.42
CA	9.50	1.00	8 to 10	7.91 - 11.09	4.25	2.22	2 to 7	0.72 - 7.78
L	9.00	0.82	8 to 10	7.70 - 10.30	4.75	2.22	2 to 7	1.22 - 8.28

Note. *n* = 4 for each group; PD = Phonetically distinct; PS = Phonetically similar

but children with SLI did not differ statistically from the L group for receptive and expressive language age and NDW. Despite their performance in the average range on the Leiter-R, the mean score for the SLI group (93) was significantly lower ($p < .01$) than the means for the L and CA groups (124 and 113, respectively).

Experimental Procedure

The experimental task consisted of nonsense words presented with pairs of familiar and unfamiliar objects in two word conditions, phonetically distinct (PD) and phonetically similar (PS). Phonetically distinct words were distinct from both objects (e.g., "rofe" with a ball and a metal washer). Phonetically similar words sounded similar to the familiar object (e.g., "spund" with a sponge and a sandpaper). Two stimuli lists with 10 PD nonsense words and 10 PS nonsense words were created (see Appendix). Both lists had the same 20 object pairs in the same order and the same 20 nonsense words; however, the PD and PS words were systematically varied between lists so that each object pair was presented in one word condition on List 1 and in the other word condition on List 2. As each participant entered the investigation, he/she was alternately assigned either List 1 or List 2. Words and objects were piloted with typically developing preschool children to assure that unfamiliar objects

Figure 1
Number of Unfamiliar Selections in the Phonetically Distinct (PD) Word Condition by Individual Participants in all Three Groups.

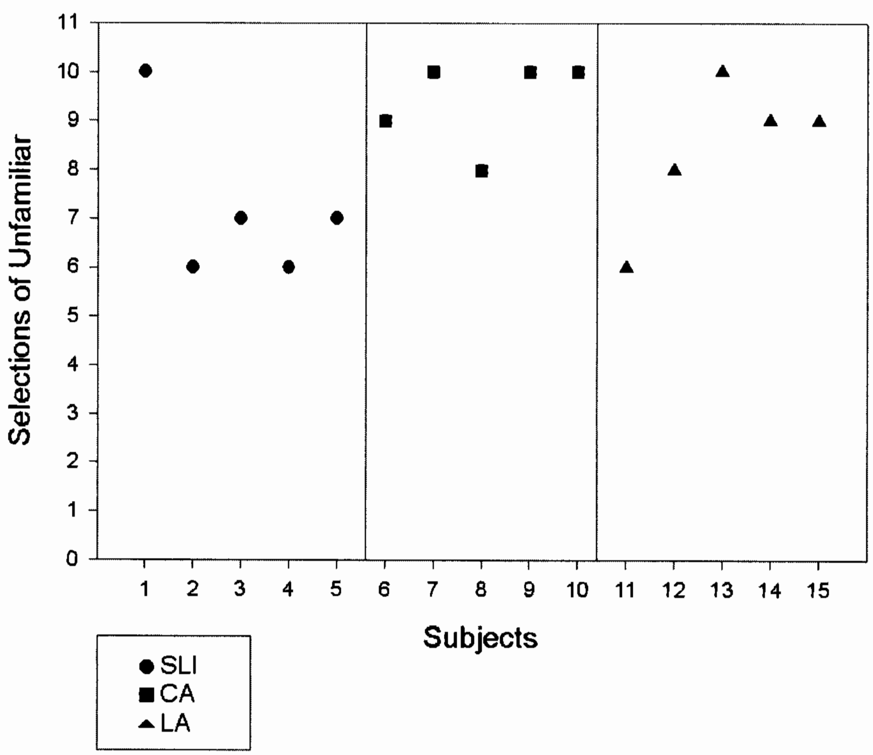
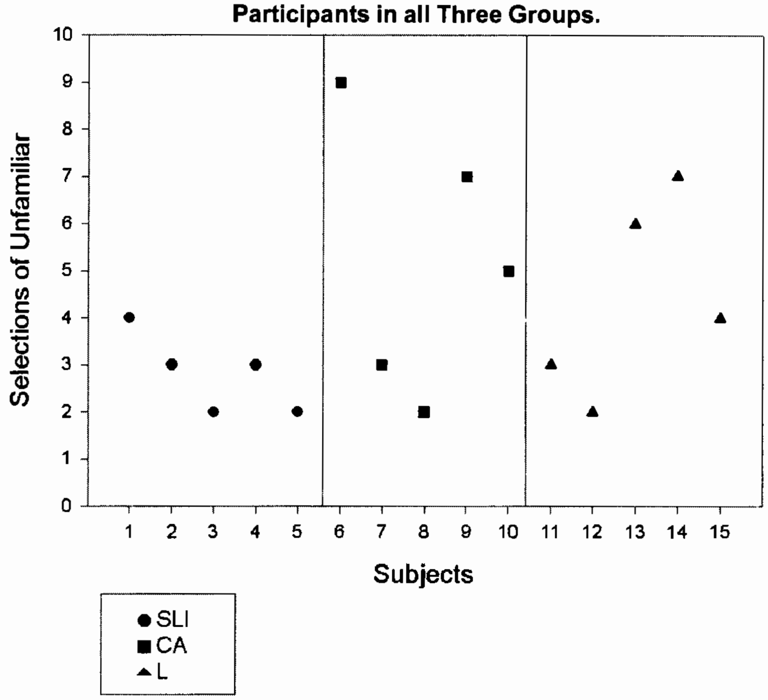


Figure 2
Number of Unfamiliar Selections in the Phonetically Similar (PS) Word Condition by Individual Participants in all Three Groups.



could not be named and that the nonsense words could be discriminated from the familiar object names. Words were recorded in five different carrier sentences (e.g., "Get the...," "Point to the ...").

Children were seen in a sound-proof room that was brightly lit and furnished with a child-sized table and chairs. A ceiling-mounted video camera and microphone were used to audio and video record all sessions. Preexperimental sessions consisted of standardized testing, language sampling, and peripheral hearing screening. Before the experimental task, eligible children were exposed to the 40 objects to decrease novelty. The investigator and each child manipulated, held, and visually inspected the items with the stated goal to sort them into piles based upon their size, big versus little. None of the objects were named nor were their typical functions modeled.

During the experimental task, the investigator and child sat across from one another at a table. For each trial, the pair of objects was placed on the table in random positions (right versus left) and the child was cued to listen. Audio stimuli, for example "Show me the batig," were presented one time each via an audiocassette player with an external speaker. Neutral verbal and tangible reinforcement were administered after every response regardless of the child's choice. Selections were scored by the investigator during administration and later rescored using the videotape. Intra- and interjudge reliability were 100% item-by-item agreement.

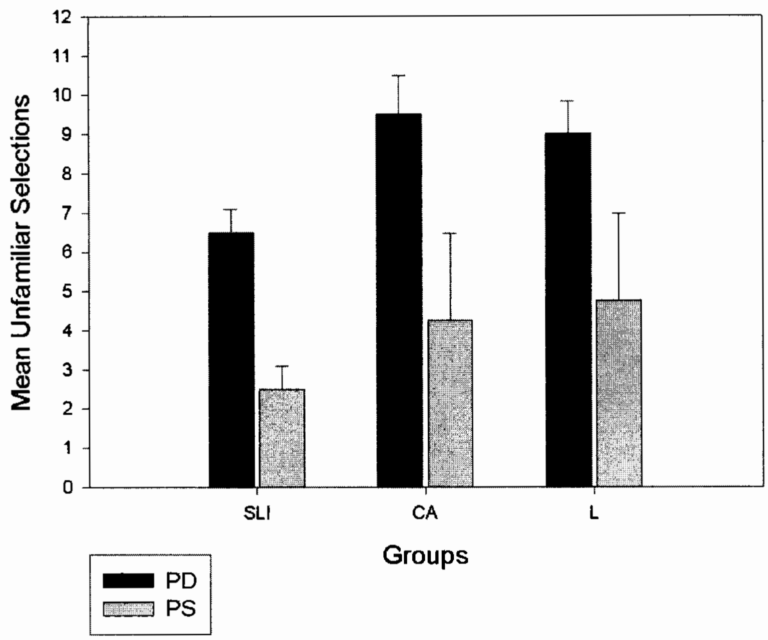
Results

The dependent variable was number of selections of unfamiliar objects. Given a forced-choice response with 10 trials in each word condition, PD and PS, the total possible number of unfamiliar selections was 10. Results for all 15 participants are displayed in Figures 1 and 2.

Examination of the raw data in the PD condition revealed a possible outlier. One child with SLI displayed consistent disambiguation, 10/10 selections of the unfamiliar object. This was unlike the other four children with SLI who selected the unfamiliar object six or seven times. Notably, this child was the only six-year-old SLI participant. She was also the only participant in school, her second year of kindergarten. Means and statistics exclude this participant and her matches.

Means, standard deviations, ranges, and 95% confidence intervals for participant groups in both PD and PS are shown in Table 2. In the PD condition, selection of unfamiliar objects did not overlap chance for any of the three groups. In the PS condition, the two normal language control groups overlapped chance with ranges from two to seven unfamiliar selections (see Table 2 and Figure 3). Unfamiliar selections by children

Figure 3.
Mean Number of Unfamiliar Selections by the Three Participant Groups in Both the PD and PS Word Conditions. PD = phonetically distinct; PS = phonetically similar



with SLI did not overlap chance; the range was two to three.

A 3 (group) X 2 (word condition) ANOVA with repeated measures on the factor of word condition revealed a significant main effect of group (F [2,9] = 5.26, p = 0.031) and a significant main effect of word condition (F [1,9] = 101.72, p = 0.000). The interaction term was nonsignificant (F [2, 9] = 0.733, p = 0.507). Post hoc testing was performed using a Tukey multiple comparisons measure. CA and L groups were not significantly different (p = 1.000); however differences between SLI versus CA and SLI versus L groups were significant (both p values were 0.049).

One-way ANOVAs to compare group performances within each of the two word conditions, PD and PS, were performed. For the PD condition, the SLI group had a significantly lower mean number of unfamiliar selections than the CA group (p = 0.001) and the L group (p = 0.005). In the PS condition, group differences were nonsignificant (p = 0.246). Nonsignificant findings were likely due to large variability in performance among CA and L participants in the PS condition. Recall that the confidence intervals for these normal language groups overlapped chance in the PS condition, unlike the SLI group which showed a tendency to select the familiar object.

Discussion

Given phonetically distinct (PD) nonsense words, both normal language groups demonstrated disambiguation. That is, they consistently selected the unfamiliar object as the referent for the nonsense word. SLI participants also selected the unfamiliar object more often than chance in the PD condition. However, they selected the unfamiliar object significantly less often than the TD children, including the language-matched (L) controls. Because the SLI group and the younger L group were matched for NDW, vocabulary diversity cannot explain the SLI group's performance. Matching for a lexical measure such as NDW provides a conservative test given that the experimental task requires a lexical decision. That is, children with SLI would be expected to perform similarly to younger, normally developing peers with similar lexical skills. Instead, the children with SLI displayed significantly fewer unfamiliar object selections than the younger, language-matched children.

It is possible that children with SLI do not consistently infer mutual exclusivity. Inconsistent disambiguation, or more specifically, inconsistent application of mutual exclusivity, could be the basis for children with SLI's slowed mapping of new words to referents during incidental learning. Unlike TD children, children with SLI do not consistently infer an association between unfamiliar referents and novel words. They are capable of fast mapping, but fast mapping is less reliable and slowed. Thus, children with SLI require additional exposures to novel words and referents in order to acquire vocabulary.

A second word condition, with nonsense words phonetically similar (PS) to familiar objects, was included in this investigation, and all groups showed significant differences compared to the PD condition. Rather than displaying a strong disambiguation effect in the PS condition, normal language controls, CA and L peers, had performance ranges that overlapped chance. Although this chance level of performance cannot be considered a reversal of the disambiguation effect, it demonstrates the effect of phonetic similarity on lexical processing. Variability among the TD children suggests multiple response patterns. Some TD children may have chosen to override detected differences, assuming the PS word was a variant of the familiar object name or a mispronunciation. This decision would result in selecting the familiar object. Typically developing children who selected the unfamiliar object might have done so because they considered even slight phonetic differences to be important lexically. This decision could reflect a less mature learner, one who is still very bound by a constraint such as mutual exclusivity. Or, it could represent a more sophisticated word learner who has a good understanding that relatively discrete phonetic differences often point to unique referents (e.g., "pan" versus "plan").

Like the normal language controls, children with SLI chose fewer unfamiliar objects in the PS condition than in the PD condition. Unlike the TD children, the SLI group's performance did not overlap chance. SLI participants consistently selected the familiar object. Our conclusion is that the factor of phonetic similarity strengthened a familiar object bias by children with SLI. One possibility is that the children with SLI were unable to process the differences between the nonsense words and their familiar counterparts. Such a processing problem could be based in perceptual or processing limitations of children with SLI (see Leonard, 1998 for review). It might also reflect the nature of the task. Children had to hold the auditory stimulus (e.g., "spund") in memory, compare it to lexical entries for the two objects (e.g., a sponge and sandpaper), make a decision regarding a lexical match, and respond by selecting an object. Children with SLI could be expected to show weaknesses in any one of several critical skills required in this task – auditory processing, phonological working memory, word retrieval, or overall processing capacity. Thus, the children with SLI simply may have processed the PS words as the familiar object names.

Given the cognitive processing demands of the task, we must address the unexpected cognitive differences between the SLI group and the younger, language-matched TD group. The children with SLI were within the normal range but significantly below their L peers on four nonverbal subtests from the *Leiter-R*. Perhaps disambiguation, or a mutual exclusivity inference, is directly related to cognitive processing skill; such that, the L group but not the SLI group had achieved this prerequisite knowledge. Interestingly, selection of unfamiliar kinds by two-year-olds (age range of 1:11 to 2:3) in Merriman and Schuster's (1991) investigation was the same as our group of children with SLI (i.e., 68% and 65%, respectively). Therefore, it appears that four-year-old children with SLI show fast mapping similar to much younger, typically developing two-year-old children and less consistent than younger, typically developing three-year-old children matched for lexical diversity.

Up to this point, we've framed the disambiguation effect in typically developing children as evidence of a mutual exclusivity bias. As stated earlier, however, the presence and development of a mutual exclusivity bias is not agreed upon. The term bias implies the existence of an innate, linguistic constraint. We are not proposing that. Instead, it is possible that children develop a mutual exclusivity assumption as an outgrowth of general cognitive processes and language learning. This second proposal is more consistent with our viewpoint of language acquisition. A third theory is a social-pragmatic perspective that emphasizes children's use of social cues for word learning. One proponent of this, Bloom (2000), suggested that the disambiguation effect could be the result of personal-social knowledge or theory of mind ability. Specifically, Bloom proposed the following type of internal dialogue, modified here to fit our task.

1. Child sees a pair of objects, one familiar (e.g., ball) and one unfamiliar (e.g., metal washer). Child hears "Show me the rofe."

2. Child thinks, "There's a ball. She didn't say 'ball.' She must want me to pick this other thing."

3. Child chooses the unfamiliar object (disambiguation).

Frankly, Bloom's interpretation has a certain intuitive appeal. Our investigation did not attempt to test this hypothesis, but it's interesting to speculate about how this internal dialogue would vary for children with SLI. First, one has to imagine children with SLI making use of internal dialogues given their extreme difficulty with "external" dialogues. For children with SLI, step one in the above dialogue is the same. The child sees two objects, one familiar (e.g., ball) and one unfamiliar (e.g., metal washer) and hears "Show me the rofe." Here the scenario for the children with SLI likely deviates. Children with SLI often are unable to comprehend the entire message, and they may be limited in personal-social knowledge that would enable them to think about what their conversational partner intends to communicate. In response to incomplete processing or comprehension, children with SLI frequently employ comprehension strategies. For example, young children with SLI will use eye gaze and joint focus of attention to select target objects despite poor comprehension of the linguistic message. Eye gaze cues were not available in this investigation, so participants were unable to employ that strategy. Similar to a probable event strategy for comprehension, children with SLI might prefer to select the familiar object. Likewise, personal-social knowledge could lead children with SLI to the familiar object. In their experiences, the familiar object is the object that they have knowledge of in common with the conversational partner. Thus, the child with SLI might think, "I know what a ball is, and she knows what a ball is. That's the one she's talking about." Rather than disambiguating, the child with SLI chooses the familiar object.

In conclusion, it appears that children with SLI have a familiar object bias that interferes with disambiguation, the association of new words to unknown referents, such that fast mapping is slowed. Findings are considered preliminary due to the low number of participants, and continued investigations are underway. Nonverbal cognitive matching is needed to diminish any cognitive advantage. A third, no-word condition is being added to examine SLI participants' familiar object bias. Additional participants, including six-year-olds with school exposure, are being investigated to determine if the outlier's performance in this study was representative. Our aim is to outline the development of fast mapping in children with SLI from inconsistent disambiguation as preschoolers to consistent disambiguation after kindergarten. Furthermore, we are interested in developing intervention strategies for children with SLI that might improve their fast mapping success in incidental paradigms. Perhaps explicit instruction regarding mapping a novel referent to a novel word would enhance vocabulary acquisition for children with SLI. Although we have not applied the disambiguation paradigm in intervention with children with SLI, it has been adapted for teaching sight words and symbols to individuals with mental retardation and users of augmentative communication (Wilkinson & Albert, 2001; Wilkinson, Albert, & Green, 1999).

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References

American Speech-Language-Hearing Association. (1985). Guidelines for identification audiometry. *Asha, 27,* 49-53.

Bloom, P. (2000). *How children learn the meanings of words.* Cambridge, MA: MIT Press.

Carey, S., & Bartlett, E. (1978). Acquiring a single new word. *Papers and Reports on Child Language Development* (Stanford University), 15, 17-29.

Dollaghan, C. A. (1985). Child meets word: Fast mapping in preschool children. *Journal of Speech and Hearing Research, 28,* 449-454.

Dollaghan, C. A. (1987). Fast mapping in normal and language impaired children. *Journal of Speech and Hearing Disorders, 52,* 218-222.

Evey, J. A., & Merriman, W. E. (1998). The prevalence and the weakness of an early name mapping preference. *Journal of Child Language, 25,* 121-147.

Gathercole, S. E., & Baddeley, A. D. (1990). Phonological memory deficits in language disordered children: Is there a causal connection? *Journal of Memory and Language, 29,* 336-360.

Katz, N., Baker, E., & Macnamara, J. (1974). What's in a name? A study of how children learn common and proper names. *Child Development, 45,* 469-473.

Leonard, L. B. (1998). *Children with Specific Language Impairment.* Cambridge: MIT.

Markman, E. M. (1993). Ways in which children constrain word meanings. In Esther Dromi (Ed.), *Language and Cognition: A Developmental Perspective* (pp.61-87). Norwood, NJ: Ablex.

Markson, L., & Bloom, P. (1997). Evidence against a dedicated system for word learning in children. *Nature, 385*(6619) 813-815.

Merriman, W. E., & Bowman, L.L. (1989). The mutual exclusivity bias in children's word learning. *Monographs of the Society of Research in Child Development, 55*(3-4, Serial No. 220).

Merriman, W. E., & Marazita, J. (1995). The effect of hearing similar-sounding words on young 2-year-olds' disambiguation of novel noun reference. *Developmental Psychology, 31,* 973-984.

Merriman, W. E., Marazita, J., & Jarvis, L. (1995). Children's disposition to map new words onto new referents. In M. Tomasello & W. E. Merriman (Eds.), *Beyond names for things: Young children's acquisition of verbs* (pp. 147-183). Hillsdale, NJ: Erlbaum.

Merriman, W. E., & Schuster, J. M. (1991). Young children's disambiguation of object name reference. *Child Development, 62,* 1288-1301.

Merriman, W. E., & Stevenson, C. M. (1997). Restricting a familiar name in response to learning a new one: Evidence for the mutual exclusivity bias in young two-year-olds. *Child Development, 68,* 211-228.

Miller, J., & Chapman, R. (2000). *Systematic Analysis of Language Transcripts* (Research Version 6.1) [Computer software]. Madison, WI: Language Analysis Laboratory of the University of Wisconsin.

Rice, M. L., Buhr, J. C., & Nemeth, M. (1990). Fast mapping word-learning abilities of language-delayed preschoolers. *Journal of Speech and Hearing Disorders, 55,* 33-42.

Rice, M. L., Oetting, J. B., Marquis, J., Bode, J., & Pae, S. (1994). Frequency of input effects on word comprehension of children with specific language impairment. *Journal of Speech and Hearing Disorders, 37,* 106-122.

Rhoid, G. H., & Miller, L. J. (1997). *Leiter International Performance Scale - Revised.* Wood Dale, IL: Stoelting.

Watkins, R. V., Kelly, D. J., Harber, H. M., & Hollis, W. (1995). Measuring children's lexical diversity: Differentiating typical and impaired language learners. *Journal of Speech and Hearing Research, 38,* 139-1355.

Wilkinson, K. M., & Albert, A. (2001). Adaptations of fast mapping for vocabulary intervention with augmented language users. *Augmentative and Alternative Communication, 17,* 120-132.

Wilkinson, K. M., Albert, A., & Green, G. (1999, November). *Fast mapping of sight-word vocabulary: A case study.* Poster presented at the Annual Meeting of the American Speech-Language-Hearing Association, San Francisco, CA.

Wilkinson, K. M., & Stanford, S. A. (1996). Mechanisms of fast mapping in preschool children. In A. Stringfellow, D. Cahana-Amitay, E. Hughes, & A. Zukowski (Eds.), *Proceedings of the 20th Annual Boston University Conference on Language Development* (pp. 828-836). Somerville, MA: Cascadilla.

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (1992). *Preschool Language Scale - 3.* San Antonio, TX: Psychological Corporation.

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