PART-TERM LEARNING IN PRESCHOOL CHILDREN WITH LOW SOCIOECONOMIC STATUS

By

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CHAPTER I

INTRODUCTION

Word Knowledge in Preschool Children

In the first few years of life, children develop rich and diverse word knowledge, adding new words to their lexicon with incredible speed and efficiency. By the age of six, an average child has a vocabulary of about 10,000 words (Anglin, Miller, & Wakefield, 1993). A child's word knowledge encompasses knowledge of the meaning of individual words and also the relation between words (e.g., superordinate category) and the syntactic roles of a word (Carey, 1978). The accomplishment of developing word knowledge is impressive, especially when one considers that preschool children develop word knowledge largely through incidental learning rather than through direct instruction (see for a review Bloom, 2000). Incidental learning is influenced by linguistic and nonlinguistic input; word learning strategies allow children to make use of linguistic input.

Researchers and policy makers have identified word knowledge as a critical area for intervention with preschool children. Word knowledge, much of which is gained initially in spoken language, is an important contributor to academic success, particularly in reading comprehension (Beck, McKeown, & Kucan, 2002; Hemphill & Tivnan, 2008; McCardle, Scarborough, & Catts, 2001). The report of the National Early Literacy Panel (2008) identified preschool word

knowledge, specifically the ability to define words, as a predictor of later literacy achievement. Early Reading First (United States Department of Education, 2001), a federal preschool initiative, identified vocabulary as one of five critical areas of early literacy instruction for all children, and particularly important for children at risk for reading disability.

Methods to Study Word Knowledge in Preschool Children

Multiple methods have been developed to examine word knowledge in preschool children. Many measures are designed to measure the acquired word knowledge of children; these static evaluation measures quantify extant vocabulary knowledge, often relative to same-age peers. To measure acquired word knowledge, norm-referenced instruments are commonly used. On these instruments, children are asked to, for example, point to pictures (e.g., Peabody Picture Vocabulary Test; Dunn & Dunn, 1996), label pictures (e.g., Expressive One-Word Picture Vocabulary Test; Gardner, 1981), provide definitions (e.g., Test of Language Development - Primary; Newcomer & Hammill, 1997), or identify synonyms (e.g., Expressive Vocabulary Test; Williams, 1997). Language sample analysis also provides a context for measurement of acquired word knowledge; researchers can derive measures of lexical diversity (e.g., number of different words) from samples of spontaneous language.

Other methods such as experimental word learning tasks are designed to measure the development of word knowledge, specifically, to observe the process by which new information is added to the lexicon. Many of these

methods focus on an initial part of the process of word learning: fast mapping. Fast mapping refers to the rapid associations that children can form during an initial exposure to a new word (Carey & Bartlett, 1978; Dollaghan, 1985).

Fast-mapping studies provide insight into a particularly intriguing aspect of word learning: the first 'guesses' that children make about the meaning of a word. Fast mapping tasks provide a unique opportunity to examine word learning in a controlled context. Researchers introduce new words to children under a particular condition and then measure the influence of the condition by assessing children's word learning. Further, researchers can examine the performance of children to infer the word learning strategies available to children to make use of the linguistic input. To ensure that children are forming new links between words and referents, fast-mapping tasks use words that are new to the child, either novel words (nonsense words like 'hahn' or 'nepp'; Storkel, Armbruster, & Hogan, 2006) or unfamiliar words (rare words like 'viola' or 'artisan'; Rice & Woodsmall, 1988).

Researchers have used fast-mapping tasks to examine the learning of different types of words under varying conditions. With respect to word stimuli, there are studies of labels for whole objects (e.g., nouns; Dollaghan, 1985), of words that describe attributes of an object (e.g., shape, material, or part, Deak, 2000), and of verbs (e.g., Brackenbury & Fey, 2003). Early studies of fast mapping were focused tests of the ability of children to fast map; children were exposed to a single new word in an explicit context (e.g., Carey & Bartlett, 1978). For example, children were shown a novel object and provided with a single new

word, such that the association the children were meant to make between object and referent was made obvious, and immediately tested. Later studies sought to examine the success of children at fast mapping under more diverse conditions. Researchers manipulated the presentation of the new word(s) to examine the influence of aspects of linguistic input, for example, by varying the number of presentations of a new word (Rice, Oetting, Marquis, Bode, & Pae, 1994) or by inserting a pause before a target word (Rice, Buhr, & Oetting, 1992). Other manipulations have been made by presenting the word with a form class cue (Hall, Quantz, & Persoage, 2000) or in a syntactic frame that provides information about the meaning of a word (Deak, 2000). To assess children's fast mapping, outcome measures usually have included comprehension of the new words, for example, the child's ability to recognize the new word(s) and referents (e.g., Dollaghan, 1985). Occasionally production of the new word has been an outcome measure (e.g., Dollaghan, 1987).

There is a wealth of research that has validated fast-mapping as a way to study how children learn words. Fast-mapping studies have illustrated that children fast map different types of words, including nouns, verbs and adjectives (Brackenbury & Fey, 2003; Rice & Woodsmall, 1988). Children form associations between words and referents that include multiple semantic attributes (e.g., color of an object or the speed of an action; Alt, Plante, & Creusere, 2004). Children initially may attend to semantic attributes which are not important to the adult representations of words (e.g., types of movement that do not affect verb meaning; Brackenbury & Fey, 2003). Children appear to be able to fast map

nonlinguistic information, such as the location of an object (Dollaghan, 1985) suggesting that fast mapping is not exclusive to the process of word learning. However, children are more efficient at fast mapping linguistically encoded information (Markson & Bloom, 1997), making fast mapping a crucial process in the initial stages of word learning.

Development of Word Knowledge in Children from Families with Low Socioeconomic Status

The language development of children from low SES families has been a concern of researchers and policy makers for decades (e.g., Anastasiow & Hanes, 1976; Feagans & Farran, 1982; Schweinhart, Montie, Xiang, Barnett, & Nores, 2005; Whitehurst, 1997). It is well-established that SES is related to language development and that, as a group, children from families with low SES have limited language skills (Hart & Risley, 1995), and slower rates of language development (Dollaghan et al., 1999) compared to children from families with middle and high SES. The National Research Council and Institute of Medicine (2000) recommended that a current research aim should be to identify the factors that mediate the relationship between SES and development.

Researchers have emphasized linguistic input as a key SES-related influence on the development of word knowledge (Hoff, 2003; Whitehurst, 1997). Whitehurst (1997) argued that the environment of children from low SES families lacks rich language input, important for the development of a large and diverse lexicon. Hoff (2003) supported a similar hypothesis: individual differences in linguistic experiences result in different rates of word knowledge development.

Several key pieces of evidence are necessary to support linguistic input as a mediator of SES on the development word knowledge. First, it is necessary to establish that children from low SES families have limited word knowledge. Second, there must be evidence of differences in linguistic input for children from low SES families compared to children from families with middle and high SES. Third, these differences in linguistic input must be demonstrated to be a mediating factor for the influence of SES on word knowledge development. The following paragraphs summarize the evidence to support these three points.

First, empirical evidence supports that, as a group, children from low SES have limited word knowledge relative to children with middle and high SES. Children from low SES families have scores on norm-referenced measures that are substantially lower than the normative sample, ranging from .5 to 1.5 standard deviations below the normative mean (Hadley, Simmerman, Long, & Luna, 2000; Hart & Risley, 1995; Horton-Ikard & Ellis Weismer, 2007; Qi, Kaiser, Milan, & Hancock, 2006; Snow, Barnes, Chandler, Goodman, & Hemphill, 1991; Whitehurst, 1997). For example, in the Qi et al. (2006) study of nearly 500 preschool children from low SES families, means on the PPVT-III for African American children (M = 77.88, SD = 13.19) and European American children (M = 81.90, SD = 16.00) were substantially below the published normative mean of the test (d = 1.57 and 1.17). Washington and Craig (1999) reported a mean on the PPVT-III .68 standard deviations (M = 91.0, SD = 11) below the normative mean for a group of at-risk preschool African-American children. Within the Washington and Craig (1999) sample, children with caregivers with the least

amount of education, less than a high school education, had a mean of 77.3 (*SD* = 10.7), 1.74 standard deviations below the PPVT-III normative mean.

On measures of word knowledge derived from language samples, preschool children from low SES families also perform poorly relative to peers with middle and high SES. Hart and Risley (1995) reported that children from families with low SES produced the fewest number of different words. Dollaghan et al. (1999) reported similar findings; in a spontaneous language sample, preschool children with lower SES produced an average of 118 different words, fewer than children with middle and high SES (*d* = .38, *d* = .78).

In a follow-up of Hart and Risley, Walker, Greenwood, Hart, and Carta (1994) documented that SES-related differences in preschool word knowledge persist. The number of different words produced at 36 months was strongly correlated to receptive and expressive language (*r* = .48 to .74) in kindergarten through third grade as well as measures of reading in third grade (*r* = .43 to .62). Importantly, the findings of Walker et al. suggest that early differences in word knowledge are related to academic outcomes that predict vocational success.

Although group means on measures of word knowledge of children from low SES families are low relative to normative samples, there is nevertheless wide within-group variability. Qi et al. (2006) and Washington and Craig (1999) reported normal distributions of scores on the PPVT-III. Hence, children from low SES families are overrepresented at the low end of the population distribution. Qi et al. reported a range of scores from 40-118 for the African American low-income sample; 29.5 percent of the sample had standard scores 70 or below (2

standard deviations below the normative mean of 100), 36 percent had standard scores between 70 and 100, and only 7 percent of the sample scored above the normative mean of 100. In the general population, 27% of children would be expected to score below 91 on a standard measure. But in Washington and Craig (1999), 41% of participants scored below the group mean of 91. In sum, children from low SES families demonstrate within-group variability on the PPVT-III similar to the population; however, the distribution is such that an unexpected proportion of children from low SES families have scores below population age expectations.

Second, there is evidence of differences in linguistic input provided children from low SES (Hart & Risley, 1995; Hoff-Ginsberg, 1991, 1998). SES-related differences have been reported for multiple aspects of linguistic input, such as the number of words (Hart & Risley, 1995; Hoff-Ginsberg, 1991), use of rare words (Weizman & Snow, 2001), and type of utterance (e.g., utterances directing behavior versus utterances continuing topic of conversation; Hart & Risley, 1995)). Hart and Risley (1995) documented that children from low SES families heard an average of 620 words per hour; children with middle SES heard twice as many words per hour (1,250 words), and children with high SES heard more than three times as many words per hour (2,150 words). Extrapolating these hourly differences, Hart and Risley suggested that by age 3, the children from low SES families heard 12 million fewer words than children with middle SES. Hoff-Ginsberg (1991; 1998) provided similar evidence; in approximately 30-minute interactions with their child, mothers with lower SES produced fewer

different word roots, an average of 168, than mothers with higher SES, an average of 190 different word roots (*d* = .49).

Linguistic input also differs by the type of utterances that caregivers use. Hart and Risley (1995) reported that for children from low SES families, caregiver utterances were frequently used to prohibit child behavior, an average of 11 per hour. In contrast, children from high SES families heard prohibitions an average of only 5 times per hour. Hoff-Ginsberg (1991; 1998) reported that mothers with lower SES used more behavior directives (an average of 22.3) compared to mothers with higher SES (an average of 15.8, *d* = .97). Mothers with lower SES used fewer utterances that continued the topic of conversation and questions that elicited conversation (an average of 29.6) compared to mothers with higher SES (an average of 33.7, *d* =.45). When the differences captured in these brief interactions are extrapolated across the preschool years, consistent with Hart and Risley (1995), Hoff-Ginsberg's (1991; 1998) findings suggest dramatically different experiences with linguistic input for children with lower SES and children with higher SES. Researchers who have examined aspects of mother-child interaction above and beyond linguistic input, for example, engagement during social interactions, have also reported similar SES related differences (Farran & Haskins, 1980; Farran & Ramey, 1980; Ramey, Farran, & Campbell, 1979).

Third, there is empirical support that SES-related differences in linguistic input contribute to differences in word knowledge. Hoff (2003) systematically studied the mediating role of linguistic input (measures of maternal speech) on the influence of SES on children's word knowledge development, indexed by the

number of different words produced. Hoff first tested the association of SES and the word knowledge of the child; see Figure 1, Model A. When included in the multiple regression model, SES contributed significantly to prediction of the variance in child word knowledge. Next, she established that SES also related to maternal speech; mothers with lower SES produced fewer different words and fewer word types than mothers with higher SES (d = .72, d =.85). Next, she reported that characteristics of maternal speech correlated with child word knowledge (r = .23 to .39, $p \leq .05$). Finally, when the hypothesized mediating variable, linguistic input provided by maternal speech, was included in the regression analyses, SES no longer predicted unique variance in child word knowledge. Thus, the requirements for demonstration of mediation (Holmbeck, 1997) were met, suggesting that linguistic input is a mediator of the effect of SES on word knowledge development. Figure 1, Model B, illustrates this relationship; linguistic input is included as a mediator on the relation of SES on word knowledge.

MODEL A

MODEL B

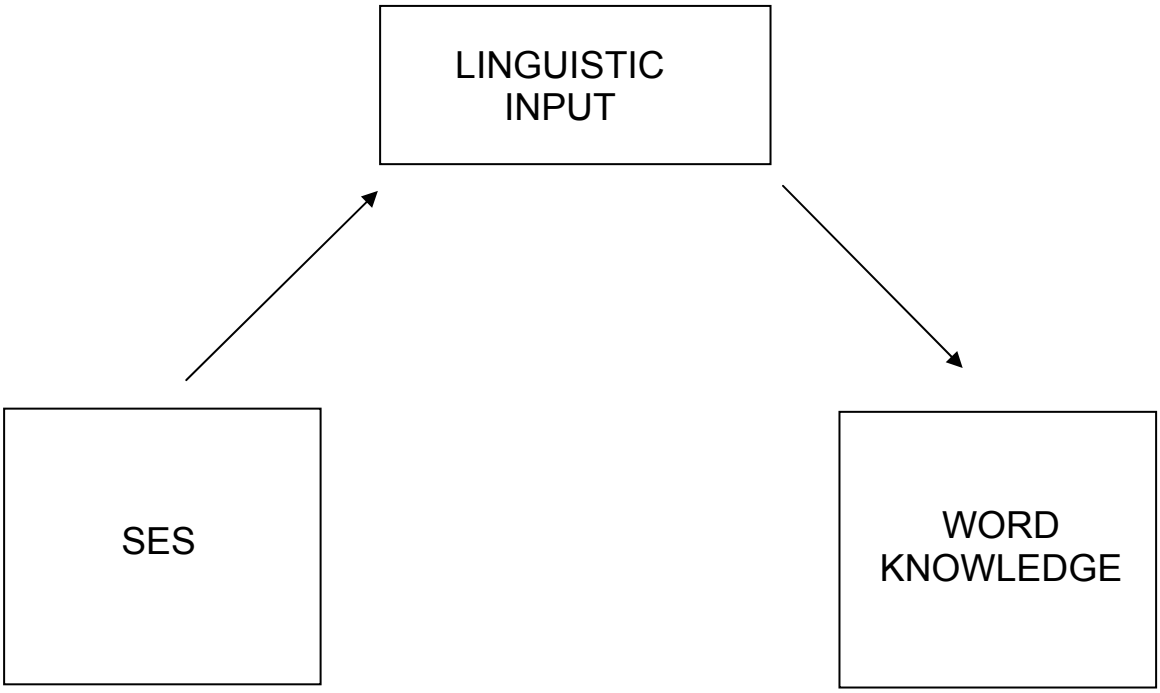


Figure 1. Models A and B illustrate the hypothesized influence of SES on word knowledge. Model A depicts a relationship of SES on word knowledge. Model B includes linguistic input as a mediator of SES on word knowledge.

Rather than comparing children with differing SES, Weizman and Snow (2001) and Pan et al. (2005) examined the contributions of linguistic input to word knowledge development within groups of children from low SES families. Drawing from participants of the Home-School Study of Language and Literacy Development (Snow, Dickinson, & Tabors, 1989), Weizman and Snow (2001) reported that maternal use of rare words (e.g., words that fell outside of the 3,000 most common words of English, such as *cholesterol* or *vehicle*) and maternal use of supportive contexts for rare words were predictors of word knowledge for children. Children whose mothers used rare words more frequently and provided instructional contexts for those words had higher scores on the Peabody Picture Vocabulary Test - Revised (PPVT-R; Dunn & Dunn, 1981) than children whose mothers provided fewer rare words and fewer instructional contexts. Maternal use of rare words predicted 34% and 39% of the variance in PPVT-R scores at kindergarten and second grade, respectively; each additional rare word used by the mother per 1,000 words predicted a 1.6 point increase on the standard score of the PPVT-R. Maternal use of supportive, instructional contexts for rare words predicted 35% and 29% of the variance in PPVT-R in kindergarten and second grade; each additional use of an instructional context predicted a 2.0 point increase in PPVT-R score at kindergarten and a 1.6 difference at second grade.

Pan et al. (2005) found that between 14 and 36 months, diversity of vocabulary in maternal speech, measured by the number of different words, predicted rate of expressive vocabulary growth for children from low SES families. When the differences in individual growth rates were illustrated at a

single timepoint (24 months), in a 10-minute interaction, a mother in the 90th percentile of vocabulary diversity used 221 different words; her child used 33.5 different words. In contrast, a mother in the 10th percentile of vocabulary diversity used 87 different words; her child used 24.5 different words. Thus, Wiezman and Snow (2001) and Pan et al. (2005) provide evidence that, within the population of children from low SES families, linguistic input provided by maternal speech influences word knowledge. Importantly, there was wide variation in word knowledge of children as well as linguistic input provided by mothers.

To summarize, children from low SES families, as a group, have limited word knowledge when compared to peers with middle and high SES. But, there is variation within the population of children from low SES families; some children from low SES families have word knowledge similar to peers with middle and high SES; others have limited word knowledge. Research that explains the influence of SES on word knowledge development has focused on the contributions of linguistic input. Children from low SES families receive linguistic input that is limited in comparison to the linguistic input received by children with middle and high SES. Also, there is evidence that linguistic input mediates the relationship of SES on word knowledge.

Although research on the influence of linguistic input has contributed greatly to an understanding of word knowledge development in children from low SES families, this explanation is incomplete. An explanation of the influence of SES on word knowledge must consider the contributions of other factors. Carey

(1978) argued that the development of word knowledge can only be accounted for by acknowledging the contributions of the child as a word learner, specifically the word learning skills of a child. Children are not passive participants in the process of word knowledge development; rather they are active word learners, equipped with cognitive and linguistic skills. Specifically, children use word learning strategies to make use of information in linguistic input. Children's use of word learning strategies has been widely evaluated by researchers interested in word learning, but these methods have not been applied to the study of children from low SES families. To more thoroughly understand word knowledge development in children from low SES families, study of word learning in children from low SES families is critical. In Figure 2, Model C, the child's ability to use word learning strategies is proposed as a mediator of the influence of SES on word knowledge.

MODEL C

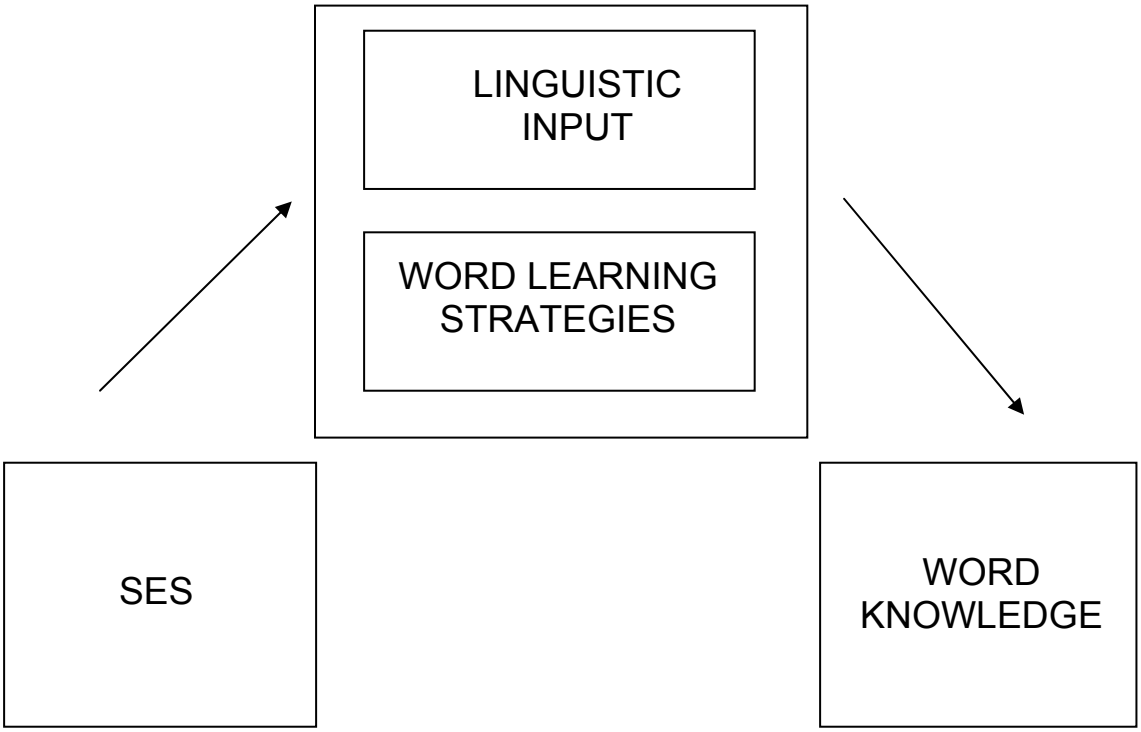


Figure 2. Model C illustrates hypothesized relationship of SES and word knowledge. In this model, both linguistic input and word learning strategies are depicted as mediators of the influence of SES on word knowledge.

There has been only limited study of word learning in children from low SES families. Horton-Ikard and Ellis Weismer (2007) provided an examination of word learning in children from low SES families (PPVT-III *M* = 92.73, *SD* = 7.24). In a fast-mapping task, toddlers were presented with two new words as labels for two unfamiliar objects with the phrase "*Here's a* [new word]." Toddlers with low SES performed no differently than toddlers with middle SES on this very explicit fast-mapping task. The authors concluded that children from low SES families are as able as peers with middle and high SES to fast map. However, several issues raise questions about the validity of this conclusion. First, the fast-mapping task was likely subject to floor effects; children provided no more than

one correct answer of a maximum of 3. Second, the study may have been underpowered with only 15 participants in each group. The small sample size lead to a limited range (80 - 103) of scores on the PPVT-III; participant PPVT-III scores did not represent the population of children from low SES families (cf. Qi et al., 2006). To further understand word learning in children from low SES families, research that samples a large group of children with vocabulary scores that are representative of the population of children from low SES families is necessary.

Word Learning in Preschool Children

Research that explores word knowledge development in children from low SES families must be guided by a thorough understanding of the extant body of knowledge on word learning in preschool children (see for a review; Bloom, 2000). To examine word learning, researchers have targeted children who are considered 'typical' language learners, excluding those at risk for language difficulties due to impairment or SES. Thus, what is known about word learning in preschoolers appears to have been gained from the study of children who are typical language learners from middle and high SES families (e.g., participants were recruited from a wealthy area, Palo Alto; Markman & Watchel, 1988; middle class, Taylor & Gelman, 1988). This research has provided insight into the word learning strategies available to the preschool child to make use of information available in linguistic input. It can inform investigations of word learning in subgroups of children, including children from low SES families.

Linguistic input provides information that children can use to learn words. This information comes from various sources: semantic information may be provided by a familiar word, syntactic information may be provided by a particular sentence structure; pragmatic information may be provided by a speaker's use of a particular sentence frame. Researchers have examined the contributions of specific sources of information to word learning, focusing on specific semantic, syntactic, and pragmatic cues (Naigles, 1990; Naigles & Kako, 1993; Soja, 1992; Soja, Carey, & Spelke, 1991; Taylor & Gelman, 1988).

The child appears to make use of the information provided by these cues in linguistic input using word learning strategies. Children's general cognitive skills contribute to the development of word knowledge: for example, social-pragmatic skills such as joint attention allow children to interpret a speaker's intent (Tomasello & Farrar, 1986). Children also appear to be equipped with cognitive strategies that are specific to word learning. Researchers have suggested that children have word learning biases that guide the decisions they make when presented with a new word. For example, young children appear to have a whole object bias; when presented with a new word and an unfamiliar object, children generally assume that the new word refers to the whole object, rather than an attribute or part of the object (Markman, 1990).

It is not a given that children make use of the information provided by linguistic input; the information could be present in the input but a child might lack the strategy or knowledge necessary to make use of it. To examine the influence of information in linguistic input, researchers have used word learning tasks that

provide children with cues that are hypothesized to be useful to children because the cues tap into particular word learning strategies. If the presentation of these cues leads children to learn new words, researchers can infer that children have made use of the hypothesized word learning strategies.

To explain preschool word learning, Hollich et al. (2000) proposed the emergent coalitionist model, a model that asserts that children use multiple sources of information and multiple strategies to learn the meaning of words. The model includes the contributions of the attentional, social, and linguistic cues available in linguistic input to consider the ways that children make use of these cues to learn words. The multiple cues available in linguistic input allow children to make use simultaneously of multiple word learning strategies. Within the emergent coalitionist model, it is posited that, over the course of development, children differentially make use of cues. A very young child might rely on an object's perceptual salience to assign a referent to a word, whereas an older child might use a social cue of pointing to determine the meaning of a word. Strategies emerge as children develop; for example, with experience, children might learn to recognize a particular syntactic structure as a cue. By the preschool years, children have access to a number of strategies to make use of the linguistic input. Many experimental word learning studies have focused on the effects of a single source of information, such as syntactic cues (Soja et al., 1991) or a specific strategy, such as mutual exclusivity (Markman & Watchel, 1988). By isolating the influence of specific sources of information and specific word learning strategies, these studies have established a base for research that

more closely replicates real world word learning. Thus, the process of word learning can now be examined by investigations that replicate real-world word learning and consider the contributions of multiple sources of information and many strategies in combination.

Part-Term Learning

Part-term learning provides a valuable context to examine the ways that children make use of single and multiple sources of information. To learn a part term, a label for part of a whole object, (e.g., handle of a cup, tail of a cat), children can make use of multiple word learning strategies to integrate information from multiple cues in order to assign a referent to a word. Whereas the learning of a whole object term has been explained by the use of a single word learning strategy, multiple word learning strategies appear to contribute to the learning of part terms (see for example: Markman & Watchel, 1988; Saylor & Sabbagh, 2004; Saylor, Sabbagh, & Baldwin, 2002). Of the many cues available to children for part-term learning, three cues have been emphasized as contributors to part-term learning: (a) a familiar whole object, (b) possessive syntax, and (c) whole - term juxtaposition (Saylor & Sabbagh, 2004). In the next section, each cue is explained, the hypothesized strategies that children employ to make use of each cue are discussed, and evidence from research is summarized.

Familiar Whole Object

A familiar whole object can serve as a cue for the learning of part terms by activating a child's mutual exclusivity assumption. The mutual exclusivity assumption leads a child to hypothesize that each object has a single word that refers to it (Markman & Wachtel, 1988). When a child hears a new word in the context of an object for which he has a label, a child will resist the new word as a second label for the familiar object and search for another referent for the new word. When the child seeks an alternate referent for the new word, the child might choose an interesting attribute of the whole object, another whole object, or a part of the whole object. For example, when presented with the new word *axle* while playing with a familiar toy truck, a child can use the mutual exclusivity assumption to decide that *axle* is not another label for the truck; seeking out an alternative referent. The child might assign the term *axle* to an attribute of the truck, such as the plastic material of the truck, or to a part of the truck.

Markman and Watchel (1988) reported a series of studies that investigated children's use of mutual exclusivity in part-term learning. In the first study, when children were presented with a new term in the presence of an unfamiliar object, they assigned the label to the whole object, as predicted by the whole object bias. In the second study, when presented with a new term in the presence of a familiar object; children were more likely to assign the new term to a part, suggesting that the familiar object activated the mutual exclusivity assumption.

In the third study, Markman and Watchel (1988) presented children with an unfamiliar whole object (*lung*) with an unfamiliar part term (*trachea*). One group of children was familiarized with the referent of the unfamiliar whole term (e.g., *lung*). When these children were presented with the second unfamiliar term (e.g., *trachea*), they were more likely to assign it to a part of the whole object rather than the whole object. A second group of children were presented with only the unfamiliar part term; these children assigned the part term to the whole object. Familiarization with the whole term activated the mutual exclusivity assumption for children, and led children to assign the novel term to the part.

Possessive Syntax

Linguistic input provides rich syntactic information that helps children learn the meaning of words (Gleitman & Gillette, 1995; Hall, Waxman, & Hurwitz, 1993). Specific to part-term learning, possessive syntax, often present in language directed at children (e.g., *See the car? It has a tailpipe*; Masur, 1997), can serve as a cue for children. Children can draw on their knowledge of possessive syntax as a strategy to infer that a new word refers to a part of a whole object.

Deak (2000) demonstrated that the cue of possessive syntax leads children to assign a new term to a part of a whole object. Children were asked to generalize a new term to apply to a second object. When the new term was presented with possessive syntax, children were more likely to generalize the new term to an object with a similar part. Possessive syntax influenced the

meaning children assigned to the new words, suggesting that children drew on their syntactic knowledge.

Whole-part Juxtaposition

A third cue children used in the learning of part terms is whole object-part term juxtaposition. Whole-part juxtaposition is the presentation of the part term in the context of the whole object label (e.g., *see the cup? Here's the rim*). Whole-part juxtaposition is hypothesized to serve as a pragmatic cue that assists children to infer the intention of a speaker. Parents frequently include whole-part juxtaposition in spontaneous speech to their children (Masur, 1997). By presenting the label of the whole object (e.g., *cup*), the parent provides a pragmatic cue that orients the child to the focus of the utterance and helps children infer the referent of the new word (the part term).

Saylor et al. (2002) demonstrated that children make use of whole-part juxtaposition in the learning of part-terms. When children were presented with whole-part juxtaposition (e.g., *See this butterfly? What color is the thorax?*), children were more likely to assign the new term (*thorax*) to the part of the whole object than when the new term was presented without whole-part juxtaposition (e.g., *See this? What color is the thorax?*). Juxtaposition of the whole object with the part term appeared to provide children with information that made the part term easier to interpret. To examine the specific strategy that children employed to make use of whole-part juxtaposition, Saylor et al. (2002) also presented whole-part juxtaposition in a nonlinguistic (gestural) form. Children were more

likely to infer that the new word referred to a part when provided with gestural whole-part juxtaposition (e.g., a gesture towards the whole object followed by a point to the part) than when provided with a neutral gesture (e.g., an ambiguous point only). Because children were able to make use of whole-part juxtaposition in a nonlinguistic presentation, Saylor and colleagues concluded that pragmatic inference, rather than other word learning strategies, led children to infer the intentions of a speaker and assign the new word to the part.

Part-term Learning in Preschool Children

Saylor and Sabbagh (2004) examined the contributions of these three specific cues (a familiar whole object, possessive syntax, and whole-part juxtaposition) to part-term learning in preschool children (mean age of 3 years, 11 months). The participants were from families with middle and high SES (e.g., parents with professional employment; M. Saylor, personal communication, June 8, 2009). In a fast-mapping task, children were presented with new part terms and asked to make an inference about the referent of the new words. Visual stimuli were constructed so that when children were directed to identify the color of the part term (e.g., *See this? Do you see a thorax? What color is it?*), they were constrained to two possible responses: the color of the whole object or the color of the part.

Each child completed the part-term task in one of four experimental conditions: Baseline, Possessive Syntax, Whole-Part Juxtaposition, and Possessive Syntax + Whole-Part Juxtaposition. All the part terms were unfamiliar

words (unknown, real worlds as well as nonsense words). Half of the stimuli were familiar whole objects (e.g., *butterfly*) with an unfamiliar part (e.g., *thorax*). The other half of the stimuli were novel objects, nonsense objects created for the task, (e.g., *modi*) with a novel part (e.g., *fep*). In the Baseline condition, the part terms were presented in a neutral verbal script (e.g., *See this? See a thorax?*). In the Possessive Syntax condition, the verbal script included possessive syntax (e.g., *See this? It has a thorax*). In the Whole-Part Juxtaposition condition, the verbal script included whole–part juxtaposition (e.g., *See the butterfly? Wow! A thorax*). In the Possessive Syntax + Whole-Part Juxtaposition, the verbal script included both possessive syntax and whole-part juxtaposition (e.g., *See the butterfly? It has a thorax.*) The study design is summarized in Table 1.

Between-group (experimental condition) and within-subject (familiar vs. novel whole object) comparisons were conducted. Children were more likely to assign the new term to the part when new words were presented with cues than when no cues were presented. Children were most likely to respond with the color of the part when provided with multiple cues, for example, whole-part juxtaposition and possessive syntax. A familiar whole object did not influence part-term learning when familiarity was the only cue (e.g., a butterfly with a thorax in the Baseline condition). However, when familiarity was presented in combination with other cues, children were more likely to respond with the color of the part than when the whole object was novel.

Table 1

Illustration of Study Design from Saylor and Sabbagh (2004)

Condition (between subjects)	Object Familiarity (within subjects)	
	Familiar	Novel
Baseline	ME only	
Whole-part juxtaposition	ME + pragmatics	Pragmatics only
Possessive syntax	ME + syntax	Syntax only
Possessive syntax + Whole-part juxtaposition	ME + syntax + pragmatics	Syntax + pragmatics

Note. Hypothesized strategies used by children for part-term learning are presented. ME = mutual exclusivity. From "Different Kinds of Information Affect Word Learning in the Preschool Years: The Case of Part-Term Learning" by M. Saylor & M. Sabbagh, 2004, *Child Development, 75,* p. 397. Copyright 2004 by the Society for Research in Child Development, Inc. Adapted with permission of author.

Saylor and Sabbagh (2004) also conducted a similar experiment with a group of younger children (mean age of 2 years, 8 months). The influence of cues was somewhat different than for the older children. For the younger children, a familiar whole object led to more part-term responses in the Baseline condition (where whole object familiarity was the only cue). Possessive syntax did not lead the younger children to respond with the color of the part term. However, like the older children, the younger children responded most frequently with the color of the part term when presented with the three cues in

combination, a familiar whole object, possessive syntax, and whole-part juxtaposition.

The work of Saylor and Sabbagh provides strong evidence for the influence of a familiar whole object, possessive syntax, and whole-part juxtaposition on part-term learning in preschool children with typically developing language. The authors hypothesized that children employ the strategies of mutual exclusivity, syntax, and pragmatic inference to make use of these cues. Their findings support a model of world learning in which children have available multiple strategies to make use of multiple sources of information to learn words.

Word Learning in Children with Language Impairment

To review, children from low SES families have limited word knowledge; there is evidence to suggest that limited linguistic input is the cause of this limited word knowledge. It is well-documented that children employ word learning strategies to make use of information in linguistic input, although researchers have not yet examined the contributions of word learning strategies to the development of word knowledge in children from low SES families. In the next section, a sample of the research on word learning in children with language impairment is summarized briefly. Word learning studies of children with language impairment suggest that differences in word learning skill contribute to limited word knowledge. Thus, for children from low SES families it is possible that word learning skill might be a contributor to limited word knowledge.

Research on word learning has reported the robust word learning of preschool children. However, evidence from research on children with language impairment provides evidence that some children may be less robust word learners. Many, although not all, children with language impairment have limited word knowledge relative to peers with typical language (Leonard, 1998) and these children perform poorly relative to typically developing peers on fast-mapping tasks (e.g., Gray, 2004; Nash & Donaldson, 2005). When presented with a single new word, preschool children with language impairment in Dollaghan (1987) were equally able to assign the new word to a whole object as same-age peers but less able to accurately produce the new word. In contrast, Gray (2004) found that children with language impairment comprehended fewer new object labels as compared to children with typical language (d = .82). No group differences were reported for production of the new words; both groups produced less than 2 of the new words.

Dollaghan (1987) and Gray (2004) used fast-mapping tasks in which children are presented with a new word and new object with minimal information *(*e.g.*, This is the* [new word]; Gray, 2004*).* Other studies of word learning in children with language impairment have used fast mapping paradigms in which features of linguistic input are varied. For example, Rice and colleagues have used a quick incidental word learning paradigm (QUIL) designed to duplicate the incidental environmental exposure to new words that children receive (Oetting, 1999; Rice, Buhr, & Nemeth, 1990; Rice, Cleave, & Oetting, 2000; Rice & Woodsmall, 1988). In the QUIL paradigm, children are presented with unfamiliar

words in the context of a short video. In addition to the nonlinguistic information provided by the video itself, the verbal script of the video provided linguistic information about the meaning of the word (e.g., *He takes his viola*).

In Rice's QUIL studies, children with language impairment performed poorly relative to peers with typical language development. In Rice et al. (1990), children with language impairment comprehended fewer unfamiliar words than typical same-age peers (d = 2.20) and younger peers matched for mean length of utterance (d = .74). Rice et al. (1994) varied the frequency of exposures of unfamiliar words in the videos. Children with language impairment and children with typical language demonstrated a benefit of frequency, comprehending more words when presented with the word 10 times rather than 3 times. However, at post test, children with language impairment comprehended fewer words than same-age peers with typical language regardless of number of exposures (d = .92, d = .89) (Rice et al., 1994). In Rice et al. (2000) children were provided with syntactic cues (e.g., determiner *the* for a count noun and the determiner *some* for the mass noun), children with typical language demonstrated improved performance relative to a neutral syntax condition. However, children with language impairment did not demonstrate a benefit of syntactic cues, performing similarly when unfamiliar words were presented with or without syntactic cues (Rice et al., 2000).

Researchers generally have not argued for limited linguistic input as a source of limited word knowledge in children with language impairment; these children do not appear to experience impoverished linguistic input in their

environments (Leonard, 1998). In studies of children with language impairment, SES has not always been reported. In studies that have reported SES (e.g., average maternal education of some post-high school education; Gray, 2004) or participant recruitment strategies (e.g., from community preschools; Dollaghan, 1987), the general impression is that the children in these studies are mostly from middle and high SES families. Only subtle differences in parental input to children with language impairment have been reported compared to children with typical language development (Leonard, 1998).

Goals of the Present Study

There is evidence that the quantity and quality of linguistic input explains substantial variability in word knowledge of children from low SES families, but there is a lack of research that has considered the ways that children from low SES families make use of information in the linguistic input. Fast-mapping tasks that present new words in the context of specific cues provide a means to examine the strategies that children from low SES families employ to make use of information available in the linguistic input.

The goal of the present study was to examine the use of word learning strategies by preschool children from low SES families to inform an understanding of limited word knowledge in this population. Participants completed a part-term fast-mapping task in which specific cues were provided to children in linguistic input using standard verbal scripts. By examining

participants' responses on the task, inferences could be made about children's use of strategies to make use of information provided by the linguistic input.

The present methods, adapted from Saylor and Sabbagh (2004), included three experimental conditions (Baseline, Possessive Syntax, and Whole-Part Juxtaposition + Possessive Syntax). There was no experimental condition in which the verbal script included only whole-part juxtaposition. The study employed a within-subjects design; each child completed the part-term task in each of the three experimental conditions.

The study addressed the following research questions:

1. Do children from low SES families demonstrate use of cues of a familiar whole object, possessive syntax, and whole-part juxtaposition on a part-term learning task?
2. Are children from low SES families and limited word knowledge less accurate than children from low SES families and age-appropriate word knowledge on a part-term learning task when presented with cues of a familiar whole object, possessive syntax and whole-part juxtaposition?

It was hypothesized that preschool children from low SES families would demonstrate a pattern of performance on the part-term task similar to the children studied by Saylor and Sabbagh (2004). Children from low SES families would be more likely to accurately assign the new word to the part term when provided with cues of a familiar whole object, possessive syntax, and whole-part juxtaposition. This finding would provide evidence that children from low SES

families use word learning strategies in a similar manner to children with middle and high SES.

However, it was hypothesized also that children from low SES families and limited word knowledge, indexed by score on the PPVT-III, would be less accurate on the part-term task than children from low SES families and age-appropriate word knowledge. This finding would provide evidence that children's ability to make use of word learning strategies can be implicated as a contributor to poor word knowledge.

CHAPTER II

METHOD

Participants

The participant group included 46 children, mean age of 54 months (*SD* = 3.98 months, Range = 47 months to 63 months). The majority of children were African-American (82.6%); other children were Caucasian (10.9%), biracial (4.3%), or Hispanic (2.2%), Children who spoke a non-mainstream dialect (e.g., African-American English) were included in the study. The target participant group was children in their pre-kindergarten year (eligible to begin kindergarten in the 2009-2010 school year). The majority of participants were kindergarten eligible (*n* = 34). However, at some centers, prekindergarten or 4-year-old classrooms included 4-year-old children who were not kindergarten eligible. Thus, 12 children were recruited whose birthdates were outside the kindergarten eligibility range. Because these 4-year-old children did not differ from the kindergarten-eligible children on the PPVT-III, $F(1, 44) = 1.22$, $p = .28$, they were included in the present study. See Appendix A for detailed description of recruitment procedures. Demographic characteristics of participants are reported in Table 2.

Participants were recruited from community-based centers whose missions were to provide childcare to children from low income families. A total of 137 preschool children at five preschools were eligible to participate; parents of

65 children provided informed consent. Of the children whose parents provided consent, 46 were included in the final participant group. To verify socioeconomic status of individual children, parents were asked to report maternal education level on a case history form. Parents were contacted by phone, mail, and in person to collect maternal education information; despite best efforts, this information was available for only 21 of the 46 participants (46%).

As an alternate method of capturing participant SES, information was provided by the participating centers that verified that the population of children served was overwhelmingly from families with low SES. For example, the annual report of one center reported that 90% of the children served met federal requirements for low-income status, 94% qualified for free or reduced meals, 56% lived in public housing, and 89% were from single-parent homes ("Annual Report of the Fannie Battle Day Home for Children," 2007).

To be included in the study, children were required to pass a color term pretest. Children were asked to label the color of four solid-color sheets of paper (red, blue, yellow, and green). Eight children were excluded from the study because they did not meet inclusion criteria for the study: six children were found ineligible because they did not pass the color term pretest; one child was ineligible because she did not meet criterion on CONTROL items (see p. 47); and one child was ineligible because his home language was Spanish.

Three language measures and a nonverbal IQ measure were administered to all children for descriptive purposes (see Table 3). Children completed the Peabody Picture Vocabulary Test – Third Edition (PPVT-III; Dunn

& Dunn, 1996), a commonly used measure of receptive vocabulary.[1] In addition to describing participants, the PPVT-III served to identify two subgroups of participants; children with limited word knowledge and children with age-appropriate word knowledge (see p. 61). Children completed the Expressive Vocabulary Test (EVT; Williams, 1997), a measure of expressive vocabulary, the Test of Early Language Development - Third Edition (TELD-3; Hresko, Reid, & Hammill, 1999), an omnibus language measure, and the Leiter International Performance Scale - Revised Brief Scale IQ (Leiter-R; Roid & Miller, 1997), a measure of nonverbal intelligence.

Table 2

Demographic Characteristics of the Participant Group

Demographic Characteristics	n	Percentage
Gender		
Male	20	43.5
Female	26	56.5
Maternal Education Level		
GED	1	<1
High school graduate	6	13
Some 4-year college	5	11
Associate Degree	2	4
Bachelor's Degree	4	9
Graduate Degree	3	7
Not Reported	25	54

Note: Not reported category describes participants for whom maternal education information was not available (e.g., child in foster care, parent declined to complete form).

Table 3

Participant Performance on Descriptive Measures

Measure	Mean (SD)	Range
PPVT-III	93.80 (11.37)	69 – 121
EVT	96.15 (10.19)	76 – 118
TELD – 3	90.61 (13.20)	67 – 126
Leiter - R	101.83 (11.37)	74 – 126

Note. PPVT-III = Peabody Picture Vocabulary Test - III, EVT = Expressive Vocabulary Test, TELD - 3 = Test of Early Language Development - 3, spoken language quotient, Leiter - R = Leiter International Performance Scale - Revised, brief scale IQ composite score.

Part-Term Task

Summary

The part-term task was a fast-mapping task; children were presented with new words and asked to form rapid inferences about the meaning of the new words. New words were either unfamiliar but real monosyllabic or multisyllabic words (e.g., *pedicel*) or monosyllabic nonsense words (e.g., *hahn*). The part-term

task was constructed so that children were constrained to two possible meanings for each new word; the new word could refer to either a whole object (e.g., cup) or a part of an object (e.g., handle). Each participant completed the part-term task in three experimental conditions (Baseline, Possessive Syntax, Possessive Syntax + Whole-Part Juxtaposition); each experimental condition provided different cues to the children.

Stimuli

Stimuli consisted of visual stimuli (pictures) and spoken words that labeled the pictures. Visual stimuli were constructed out of paper such that the whole object was one solid color and the part was another solid color (e.g., spider constructed from green paper and pedicel from yellow paper). See Figure 3 for sample stimuli. Four colors of paper were used: red, blue, green, and yellow. Half of the experimental stimuli were familiar whole objects with a part (e.g., a familiar whole object *spider* with a real word part *pedicel*; variable name [FAMILIAR]); the other half of the stimuli were novel whole objects with a part (e.g., a novel whole object *hahn* with a nonsense-word part *nepp*; variable name [NOVEL]). The majority of stimulus words (24 of 32) were selected from previous studies of word learning (Saylor & Sabbagh, 2004; Saylor et al., 2002; Storkel et al., 2006);[2] the remaining words were generated for the present study.

Figure 3. Examples of stimuli used in part-term task: FAMILIAR: a familiar whole object *spider* with a real word part *pedicel;* NOVEL: a novel whole object *hahn* with a nonsense-word part *nepp.*

Three stimuli books were created for the word learning task. Each book had a unique set of pictures and words. Children completed the part-term task with each of the three books; one book in each of the three experimental conditions. Each stimulus book could be matched with the verbal script for any of the three conditions. Stimulus books were counterbalanced across children for the three experimental conditions. For example, child A completed Book 1 in the Baseline condition, Book 3 in the Possessive Syntax condition, and Book 2 in the Possessive Syntax + Whole-Part Juxtaposition condition. Child B completed Book 2 in the Baseline condition, Book 1 in the Possessive Syntax condition, and Book 3 in the Possessive Syntax + Whole-Part Juxtaposition condition.

Prior to the study, stimuli were tested and refined with a group of 17 preschool children. Based on the responses of the group of children, small changes were made to the visual stimuli and the words that labeled the pictures. For example, the visual stimulus for the butterfly was originally constructed with a green whole object (*butterfly*), a yellow part (*thorax*), and small black lines drawn

for antennae; a few children responded with the color of the antennae (black). Thus, the antennae were removed from the stimuli in order to limit the responses to either the color of the whole or the color of the part. Nine of the children participated in feasibility testing to determine if there were substantial differences in the difficulty of the three stimulus books. Each child was assigned to a single experimental condition (e.g., Possessive Syntax) and completed all three stimulus books in that condition. The order of stimulus books was counterbalanced across children so that an equal number of children completed the task with the books in the same order. Performance was examined across children to detect possible order effects. The feasibility group was too small to complete statistical analysis; however, visual inspection of the data indicated no discernable differences in difficulty across stimulus books.

Each stimuli book included eight experimental items. Four items were familiar whole objects with unfamiliar parts ([FAMILIAR]); four items were novel whole objects with novel parts ([NOVEL]). Each stimuli book also included eight control items ([CONTROL]). Table 4 provides sample stimulus items for each stimulus type. All control items were familiar part terms with a familiar whole object (e.g., cat with a tail). Within each book, stimuli were presented in a standard presentation sequence: two control items were followed by two experimental items (a familiar whole with novel part [FAMILIAR] and a novel whole with novel part [NOVEL]). The presentation sequence of control items remained the same within each book. For the experimental items, four presentation sequences were used that varied the order of presentation of

experimental items. For example, in sequence 1, butterfly-thorax and hahn-nepp were the first two experimental items. In sequence 2, butterfly-thorax and hahn-nepp were presented as the final two experimental items. The four presentation sequences were balanced across participants. A complete list of stimuli is included in Appendix B.

Table 4

Sample Items for Each Stimuli Type

Stimuli type	Items per book	Variable name	Example
Familiar object with novel part	4	FAMILIAR	Spider with a pedicel
Novel object with novel part	4	NOVEL	Hahn with a nepp
Familiar object with familiar part	8	CONTROL	Cat with a tail

Presentation

Each item (experimental and control) was presented with a verbal script. For experimental items ([FAMILIAR] [NOVEL]), the script asked children to provide the color of the part term (e.g., *Do you see the pedicel? What color is it?*). Anticipated responses included either the color of the part term (scored as correct) or the color of the whole object (scored as incorrect). The sample script below, from the Baseline condition, provides an example.

Child is presented with visual stimulus of a yellow spider with green pedicel.

Examiner: *"Do you see this? See a pedicel? Wow. Look, a pedicel. Do you see a pedicel? What color is it?"*

For CONTROL items, half of the items were presented with a script that asked participants to identify the color of the whole object (e.g., *Do you see a cat? What color is it?*) and half of the items were presented with a script that asked participants to identify the color of the part term (e.g., *Do you see a tail? What color is it?*). The CONTROL items served to verify that children were able to perform the task, specifically to identify the color of either the part or the whole in response to the verbal script. Because the CONTROL items were whole objects and parts with familiar labels, the control items also allowed children to experience success. Only children who responded correctly to 75% of the CONTROL items (18 of the total 24 items) across the three books were included in the final analysis set. As a group, children were 92% accurate on CONTROL items. As noted above, only one child did not meet the CONTROL item criteria.

To familiarize children with the experimental task and reduce the likelihood children providing multicolor responses (cf. Saylor & Sabbagh, 2004), participants completed a training task. They were shown a training picture that depicted familiar items with familiar parts (e.g., a red house with a green window and a yellow door). The picture was constructed out of the same colored paper as the experimental task visual stimuli. The examiner asked each participant to label items in the picture (e.g., *What color is the house? What color is the door?)*)

and emphasized the direction to "*tell me one color*." Most participants provided single color responses. When participants provided multicolor responses, (e.g., labeled the house "*red, yellow, and green*"), the examiner repeated the prompt "*tell me one color*" and restated the question. This training procedure appeared to be successful; only rarely in the experimental task did children provide multicolor responses. In these instances, participants were prompted with "*tell me one color*" and were successful in providing a single color response.

Experimental Conditions

All children completed the part-term task in three experimental conditions in a standard order: Baseline, Possessive Syntax, Possessive Syntax + Whole-Part Juxtaposition. Each experimental condition had a distinct verbal script. Table 5 provides sample scripts for each condition. Complete scripts are included in Appendix C.

In the first experimental condition, Baseline, the verbal script was neutral in that it presented the new word with no verbal cues (e.g., *See this?*). Within the Baseline condition, it was anticipated that children would respond more frequently with the color of the part term when the whole object was familiar than when the whole object was novel (e.g., hahn).

Table 5

Experimental Conditions and Sample Scripts for Part-term Task

Condition	Verbal Script
Baseline	Do you see this? See, a pedicel. Wow! Look, a pedicel. Do you see a pedicel? What color is it?
Possessive Syntax	Do you see this? See, it has a pedicel. Wow! Look, it has a pedicel. Do you see a pedicel? What color is it?
Possessive Syntax + Whole-part Juxtaposition	Do you see this spider? See, it has a pedicel. Wow, a spider! Look, it has a pedicel. Do you see a pedicel? What color is it?

In the second experimental condition, Possessive Syntax, all stimuli were presented with a verbal script that included possessive syntax (e.g., *See this? It has a pedicel.*) When stimuli were presented with possessive syntax, it was anticipated that children would respond more frequently with the color of the part term than when no possessive syntax was presented (i.e., as compared to Baseline).

In the third experimental condition, Possessive Syntax + Whole-Part Juxtaposition, stimuli were presented with a verbal script that included both possessive syntax and whole object-part term juxtaposition (e.g., *See this spider? It has a pedicel.)* The hypothesis was that when stimuli were presented

with possessive syntax and whole-part juxtaposition, children would respond more frequently with the color of the part term as compared to the Baseline or Possessive Syntax condition.

Scoring

Child responses on the part-term task were recorded in real time as well as audiorecorded. For all experimental items, when a child responded with the color of the part, the child received a score of 1. When a child responded with the color of the whole object, the child received a score of 0. Rarely, children responded with unscorable multicolor responses (e.g., *red and green*). Children were prompted to produce a scorable single color response. This strategy was successful in eliminating unscorable responses.

Familiarity Posttest

After the part-term task, children completed a familiarity posttest to test for comprehension of the labels for whole objects in the FAMILIAR stimuli. The posttest ensured that each child had the labels for the whole objects in his/her comprehension vocabulary. Children were presented with a plate of four black and white line drawings, a whole object from a FAMILIAR item and three whole-object foils. Whole object foils were familiar whole objects used in CONTROL items. Children were asked to point to the picture that matched the word the examiner said (e.g., *Point to spider*). All participants demonstrated

comprehension of all familiar terms (12 out of 12 correct) on the familiarity posttest.

Whole Object Task

The whole object task, created for the present investigation, provided a simple measure of each child's ability to fast map, to associate a new word with a whole object. It was important to establish that participants could fast map in order to interpret the findings of the part-term task. The task included four picture plates with two pictures on each plate - a familiar object and a novel object created by the author. The examiner presented each picture plate, produced a new word (e.g., *wug*), and asked the child to point to the picture that matched the new word. The whole object task indicated that all participants could fast map, all children matched the new word to the novel object for at least 3 of the 4 items. There was very little variability in performance on the whole object task; 39 of the 46 participants performed at ceiling level (4 out of 4).

Reliability

The author scored the norm-referenced measures and a trained research assistant checked the scoring. Scoring discrepancies were resolved by mutual consensus.

The examiner scored the part-term task online and calculated total scores for NOVEL, FAMILIAR, and CONTROL items. All calculations were double-checked by the author. A trained research assistant checked ten percent of the

responses on the part-term task for accuracy of online response recording. The research assistant compared audiorecordings to recorded online responses. The research assistant and the author were in agreement for more than 99% of the response.

Spontaneous Language Sample

A twenty-minute audiorecorded spontaneous language sample was collected from each child; the language sample was not analyzed for the present study. Children participated in a picture description task and dyadic play with the examiner using a standard set of toys (a PlayMobil® cottage, furniture, and family). Two pictures of action scenes were selected to be familiar to children: a busy playground and a birthday party (Amery & Cartwright, 2002).

General Procedures

General procedures are outlined in Table 6. Children were seen individually for three visits at their preschool. At the first visit, children completed the color term pretest, the part-term task training, the part-term task in the Baseline condition, the PPVT-III, the EVT, and the TELD-3. At the second visit, children completed the part-term task in the Possessive Syntax condition and the Leiter-R. At the third visit, children completed the part-term task in the Possessive Syntax + Juxtaposition condition, the Familiarity Posttest, the Whole Object Task, and the language sample. Occasionally, due to classroom scheduling or child inattention, study activities were divided across more than

three visits (e.g., child required two visits to complete the Leiter-R). Nevertheless, children always completed the part-term tasks in the same order and on three different days.

Table 6

General Procedures of the Study

Visit	Procedures
1	Color Term Pretest
	Part-term Task - Training
	Part-term Task – Baseline
	PPVT-III
	EVT
	TELD-3
2	Part-term Task – Possessive Syntax
	Leiter-R
3	Part-term Task – Possessive Syntax + Whole-Part Juxtaposition
	Familiarity Posttest
	Whole Object Task
	Language Sample

PPVT-III = Peabody Picture Vocabulary Test - III, EVT = Expressive Vocabulary Test, TELD - 3 = Test of Early Language Development - 3, spoken language quotient, Leiter - R = Leiter International Performance Scale - Revised, brief scale IQ composite score.

CHAPTER III

RESULTS

Performance on the PPVT-III

The PPVT-III served as a measure of acquired word knowledge of participants. Participants were selected to represent a broad range of PPVT-III scores. Performance on the PPVT-III approximated a normal distribution (see figure 3) with a mean of 93.80 and standard deviation of 11.37. The mean of the participant group was lower than the published norms of the PPVT-III, $t(1, 45) = .70$, $p = .001$, $d = .47$; this difference was expected.

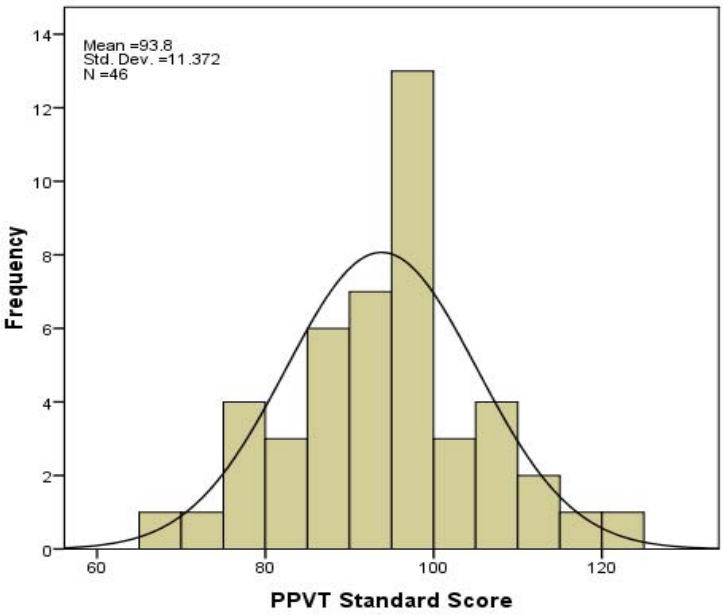


Figure 4. Histogram of participant standard scores on the Peabody Picture Vocabulary Test - III.

Data Analysis

The study employed a within-subjects design. The dependent variables were derived from the number of part-term responses for each participant. The total number of part-term responses in all conditions of the part-term task was calculated (max. 24), as well as the number of part-term responses for FAMILIAR items in all conditions and the number of number of part-term responses for NOVEL items. Each child received six subscores, the number of part-term responses for FAMILIAR items (max. 4) in each of the three experimental conditions and the number of part-term responses for NOVEL items (max. 4) in each of the three experimental conditions. Table 7 summarizes participant performance on the part-term task.

Experimental Conditions

An analysis was conducted to compare the number of part-term responses in the three experimental conditions (Baseline, Possessive Syntax, and Possessive Syntax + Whole-Part Juxtaposition). The hypothesis was that the number of part-term responses for each participant would increase across experimental conditions; children would have the fewest number of part-term responses in the Baseline condition and the most part-term responses in the Possessive Syntax + Whole-Part Juxtaposition condition. To address this hypothesis, a repeated measures MANOVA was conducted using SPSS GLM

Repeated Measures with experimental condition as the within-subjects factor and the total number of part-term responses in each condition as the dependent variable. The SPSS GLM Repeated Measures syntax can be modified to specify contrasts; the Repeated contrast was specified to compare each condition to the adjacent conditions (i.e., Baseline to Possessive Syntax, Possessive Syntax to Possessive Syntax + Whole-Part Juxtaposition).

As hypothesized, there was a significant main effect of experimental condition; the number of part-term responses increased across the three experimental conditions, $F(2, 42) = 63.55$, $p = .001$, partial eta squared = .74. Children were the least likely to respond with the color of the part-term in the Baseline condition, more likely to respond with the color of the part-term in the Possessive Syntax condition, and most likely to respond with the color of the part-term in the Possessive Syntax + Whole-Part Juxtaposition condition.

Table 7

Mean Number of Part-term Responses for FAMILIAR items, NOVEL items, and Total items

	FAMILIAR Max. 4	NOVEL Max. 4	Total Max. 8
Experimental Condition	M (SD)	M (SD)	M (SD)
Baseline	.80 (1.19)	.59 (.83)	1.39 (1.80)
Possessive Syntax	2.46 (1.20)	2.00 (1.50)	4.46 (2.41)
Possessive Syntax + Whole-Part Juxtaposition	3.11 (1.08)	2.72 (1.30)	5.83 (2.15)

To determine if there was an effect of experimental condition for FAMILIAR as well as NOVEL items, the number of part-term responses was tested separately for the two stimuli types. As hypothesized, within each stimuli type, the number of part-term responses increased across experimental

conditions. For FAMILIAR items, children were the least likely to respond with the color of the part-term in the Baseline condition, more likely to respond with the color of the part-term in the Possessive Syntax condition, and most likely to respond with the color of the part-term in the Whole-Part Juxtaposition + Possessive Syntax condition, F (2, 44) = 52.67, p = .001, partial eta squared = .71. Part-term responses for NOVEL items likewise increased across experimental condition, F(2, 44) = 52.68, p = .001, partial eta squared = .71. The means for these analyses are illustrated in Figure 5.

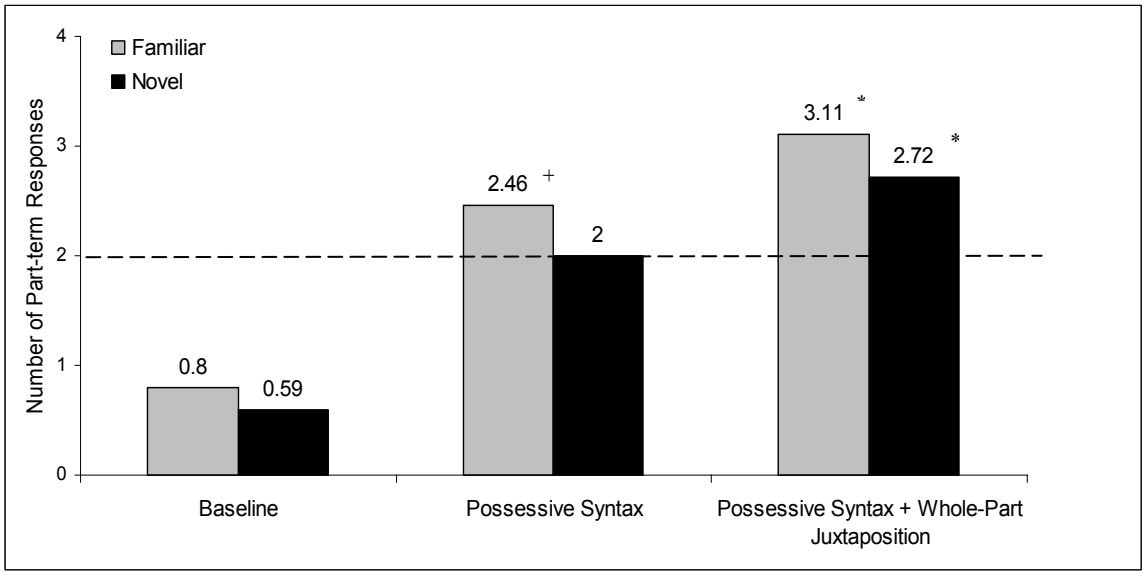


Figure 5. Part-term responses by stimuli type and experimental condition. Dotted line indicates chance-level performance; marked bars differ from chance at ^{+}p = .04, (uncorrected) and $^{*}p$ = .001, (Bonferroni correction).

Familiarity

The next set of analyses explored the influence of familiarity on the number of part-term responses. For FAMILIAR items (familiar whole objects with unfamiliar parts), the familiar whole object was hypothesized to serve as a cue to children. Because children had a label for the familiar whole object in their vocabulary, the word learning assumption of mutual exclusivity should lead children to seek another referent for the new word. Thus the child should respond with the color of the part term. For NOVEL items, children did not have a label for the whole object. The whole object assumption should lead children to assign the new word to the whole object. Thus, it was hypothesized that children would be more likely to assign the new word to the part term for FAMILIAR items than for NOVEL items. Paired t-tests compared the number of part-term responses for FAMILIAR and NOVEL items first, collapsed across the three experimental conditions and then, within each experimental condition.

There was a main effect for stimulus type. When the total number of part-term responses for FAMILIAR items (max. 12) was compared to the total number of part-term response for NOVEL items (max. 12), children were more likely to provide a part-term response for FAMILIAR items (M = 6.37, SD = 2.50) than for NOVEL items (M = 5.30, SD = 2.76), $t(1, 45) = 2.85$, $p = .007$, $d = .92$. Next, the number of part-term responses for FAMILIAR and NOVEL items was compared within each experimental condition. In the Baseline condition, there was no significant difference between the number of part-term responses for FAMILIAR items (M = .80, SD = 1.19) compared to NOVEL items (M = .59, SD = .83),

t(1,45) = 1.50, *p* = .14, *d* = .21. In contrast, an effect for stimulus type was apparent in the Possessive Syntax condition and the Possessive Syntax + Whole-part Juxtaposition Condition; children were more likely to respond with the color of the part term for FAMILIAR items (*M* = 2.46, *SD* = 1.20) than NOVEL items (*M* = 2.00, *SD* = 1.50), *t*(1, 45) = 2.65, *p* = .01, *d* = .34. In the Possessive Syntax + Whole-Part Juxtaposition condition, children were more likely to respond with the color of the part term for FAMILIAR (*M* = 3.11, *SD* = 1.08) items than NOVEL items (*M* = 2.72, *SD* = 1.30), *t*(1,45) = 2.85, *p* = .001, *d* = .33.

Tests Against Chance

As in Saylor and Sabbagh (2004), analyses were conducted to compare participant performance to chance level performance for each stimulus type in each experimental condition. Within FAMILIAR or within NOVEL items, chance level performance was 2 out of 4 part-term responses per experimental condition. As illustrated in Figure 5, t-tests revealed that part-term responses exceeded chance level performance for FAMILIAR items in the Possessive Syntax condition, *t*(1,45) = 2.57, *p* = .01, and for FAMILIAR items and NOVEL items in the Possessive Syntax + Whole-Part Juxtaposition condition, for FAMILIAR *t*(1,45) = 6.97, *p*<.00 and for NOVEL *t*(1,45) = 3.87, *p* = .001. When a Bonferronni correction was applied, only FAMILIAR items and NOVEL items in the Possessive Syntax + Whole-Part Juxtaposition condition exceeded chance level performance.

Part-Term Learning and Word Knowledge

A series of analyses were conducted to explore the relation between acquired word knowledge (i.e., PPVT-III) and performance on the part-term task. As hypothesized, PPVT-III raw score was significantly, positively correlated to total part-term responses (r = .31, p = .04). Raw score on the EVT was also correlated to the total number of part-term responses (r = .31, p = .04). No other descriptive measures were correlated to performance on the part-term task. Table 8 reports intercorrelations between descriptive measures, age, and total number of part-term responses.

Table 8

Intercorrelations between Descriptive Measures, Age, and Total Part-term Responses

Measure	1	2	3	4	5	6	7	8
1. PPVT-III Raw	_	.93**	.51**	.47**	.74**	.52**	.002	.31*
2. PPVT-III Standard		_	.44**	.58**	.78**	.61**	.35*	.24
3. EVT Raw			_	.84**	.43**	.33*	.17	.31*
4. EVT Standard				_	.51**	.49*	.33*	.25
5. TELD-3 Quotient					_.	.31*	.27	.24
6. Leiter-R IQ						_	.35*	.13
7. Age in Months							_	.09
8. Total Part-term Responses								_

Note. PPVT-III = Peabody Picture Vocabulary Test - III, EVT = Expressive Vocabulary Test, TELD - 3 = Test of Early Language Development - 3, spoken language quotient, Leiter - R = Leiter International Performance Scale - Revised, brief scale IQ composite score. ** Correlation is significant at the .01 level (2-tailed), * Correlation is significant at the .05 level (2-tailed).

Part-term Learning and Children with Limited Word Knowledge

To examine part-term learning of children with limited word knowledge, two groups of participants were identified in the present study: children with PPVT-III scores at or below 85 (Low; *n* = 10) and children with PPVT-III scores at or above 100 (High; *n* = 11). The remaining 25 participants were not included. Children in the Low group were selected to represent a group of children at risk for academic difficulties due to limited word knowledge; the score of 85 or below

was one standard deviation below the normative mean. The High group was selected to represent a group of children who had sufficient word knowledge for academic success; the score of 100 or above identified a group of children at or above the 50th percentile of the normative sample. Characteristics of the two subgroups are summarized in Table 9. Performance on the part-term task for these two groups is illustrated in Figure 5.

Both groups demonstrated a main effect of experimental condition, for Low, $F(1, 9) = 6.75$, $p=.02$ and for High, $F(1, 10) = 15.62$, $p = .001$. Both groups had the least number of part-term responses in the Baseline condition, more in the Possessive Syntax condition, and the most in the Possessive Syntax + Whole-Part Juxtaposition condition, for both FAMILIAR and NOVEL items. Both the Low group and High group had few part-term responses in the Baseline condition (of max. 8, Low: $M = 1.70$, $SD = 1.89$; High: $M = 1.72$, $SD = 2.57$). However, visual analysis of Figure 5 suggested that the Low group was less proficient than the High group in the Possessive Syntax and Possessive Syntax + Whole-Part Juxtaposition condition. Thus, post-hoc between-group comparisons were conducted for each of these two conditions. The comparison for the Possessive Syntax condition was not statistically significant; however, this comparison was underpowered; an estimated sample size of 36 participants would have revealed a significant difference (at an alpha level of .80). In the Possessive Syntax condition, children in the Low group did not have fewer part term responses (of max. 8: $M = 4.20$, $SD = 2.10$) than the High group ($M = 5.36$, $SD = 2.77$), $F(1, 20) = 1.16$, $p = .30$, $d = .49$. In the Possessive Syntax + Whole-

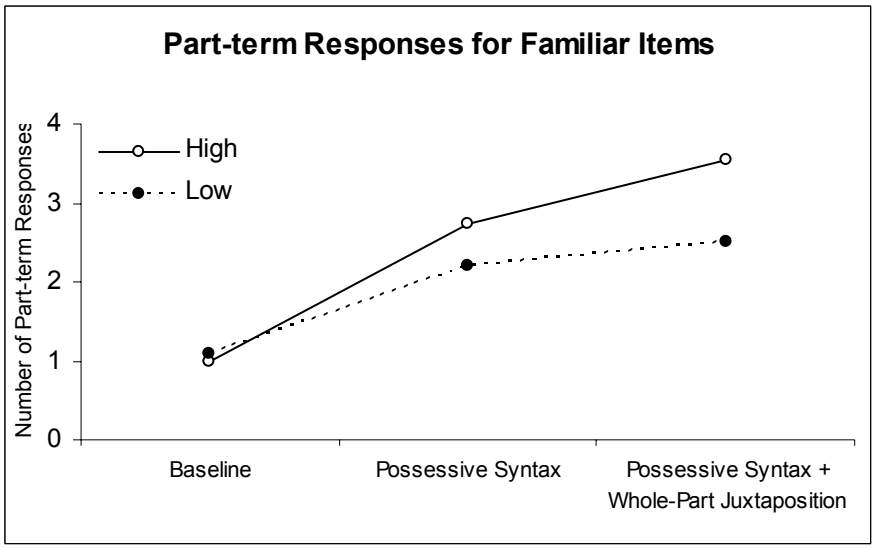
Part Juxtaposition condition, children in the Low vocabulary group had significantly fewer part-term responses than the High group (of max. 8, Low: M = 4.60, SD = 2.01; High: M = 6.55, SD = 1.81*),* $F(1, 20) = 5.45$*,* $p = .03$*,* $d = .54$.

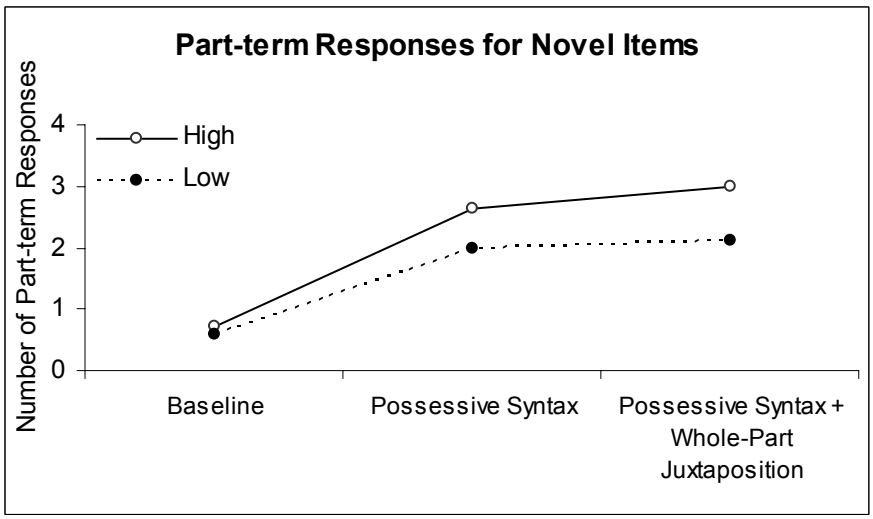
Table 9

Mean Scores on Descriptive Measure for Participants in the Low and High Groups

	Low (*n* = 10)		High (*n* = 11)	
	Mean (SD)	Range	Mean (SD)	Range
Age	57.30 (3.83)	51-63	54.00 (4.17)	49-60
PPVT-III	78.10 (4.78)	69-85	108.18 (6.34)	100-121
EVT	85.20 (6.76)	76-99	100.82 (11.78)	80-118
TELD - 3	76.20 (7.48)	67-93	102.82 (12.60)	88-126
Leiter - R	92.80 (9.74)	74-109	111.09 (10.99)	95-126

Note. PPVT-III = Peabody Picture Vocabulary Test - III, standard score reported, EVT = Expressive Vocabulary Test, standard score reported, TELD - 3 = Test of Early Language Development - 3, spoken language quotient reported, Leiter - R = Leiter International Performance Scale - Revised, brief scale IQ composite score reported. Low = children with PPVT=III standard scores $\leq$ 85 and High = children with PPVT-III standard scores $\geq$ 100.





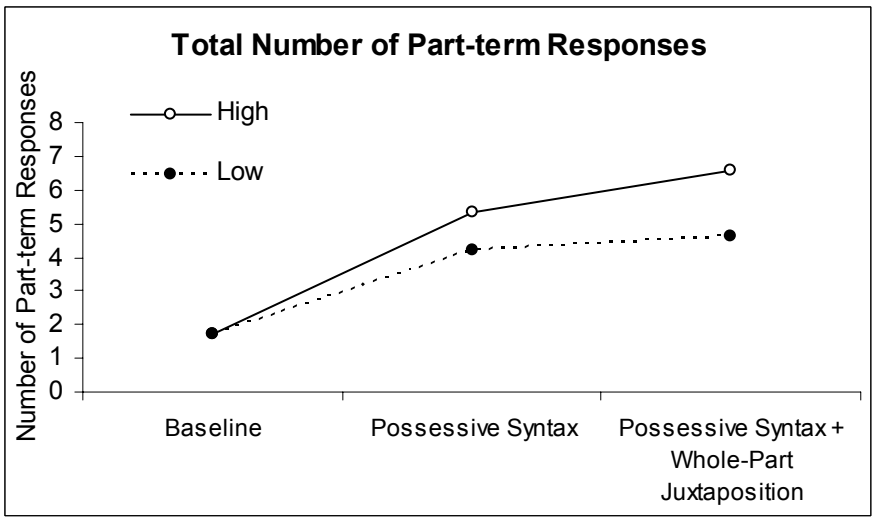


Figure 6. Mean part-term responses for two participant subgroups. Low = children with PPVT=III standard scores $\leq$ 85 and High = children with PPVT-III standard scores $\geq$ 100.

CHAPTER IV

DISCUSSION

Group Performance on the Part-term Learning Task

The purpose of this study was to conduct an initial exploration of word learning in children from low SES families, a vastly understudied area. Researchers have demonstrated limited word knowledge in children from low SES families and examined the contributions of linguistic input to word knowledge development in children from low SES families. However, with the exception of Horton-Ikard and Ellis Weismer (2007), there have been no experimental studies focused on word learning of children from low SES families. Study of word learning can contribute to the understanding of the impact of SES on word knowledge development, with eventual intervention implications.

This study sought to describe part-term learning in preschool children from low SES families and, within the group of children from low SES families, to compare the performance of children with limited word knowledge to children with age-appropriate word knowledge. The study examined the effect of cues on part-term learning to understand how the ability to use word learning strategies might contribute to limited word knowledge in children from low SES families.

Initial analyses described performance of the entire group of children from low SES families and allowed for comparison to Saylor and Sabbagh (2004) who conducted a comparable study with typical preschoolers with middle to high SES.

The part-term learning of children from low SES families was affected by three types of information: a familiar whole object, possessive syntax, and whole-part juxtaposition. As in Saylor and Sabbagh (2004), participants were more likely to provide a part-term response for familiar whole objects than for novel whole objects. They were more likely to provide a part-term response when stimuli were presented in a verbal script that included possessive syntax or both possessive syntax and whole-part juxtaposition than when no cues were presented. Participants were most likely to provide a part-term response when presented with multiple cues in combination: a familiar whole object presented with possessive syntax and whole-part juxtaposition.

As hypothesized, children from low SES families, as a group, performed similarly to the children with higher SES in Saylor and Sabbagh (2004). This finding suggests that children from low SES families employ word learning strategies to make use of cues in linguistic input in a manner similar to children with high SES. Participants appeared to use the mutual exclusivity assumption, knowledge of syntax, and pragmatic inference to interpret cues in the linguistic input. In the next section, the performance of participants is discussed relative to the use of particular word learning strategies.

The Role of Familiarity

Familiarity of the whole object influenced part-term learning of participants. Children were more likely to provide a part-term response for FAMILIAR stimuli than for NOVEL stimuli, appearing to use the mutual exclusivity assumption to

infer the meaning of part terms. However, when familiarity was the only source of information available to the child, as in the Baseline condition, familiarity did not affect the number of part-term responses. The lack of an effect of familiarity when presented alone suggests that, for the part-term task, the mutual exclusivity assumption was not sufficient to guide children to a part-term response. Saylor and Sabbagh (2004) also found, for a group of preschool children of a similar age (mean age 3;11) but higher SES, that familiarity was only effective when presented in combination with other cues. However, this finding appears to contrast with other examinations of mutual exclusivity.

For example, Markman and Watchel (Study 2; 1988) argued for a strong effect of familiarity, reporting that the single cue of a familiar whole object led children to assign a new term to a part. When children were presented with a familiar whole object and a new word, 57% of responses indicated that participants assigned the new word to a part. However, Markman and Watchel (1998), provided the verbal prompt to assign the new term saying "*this whole thing*" or "*just this part*" and the examiner provided gestures. The verbal script and gestures likely added cues that, in combination with a familiar whole object, led children to assign the new term to the part. In the present study, the Baseline condition provided a more stringent test of mutual exclusivity in that the familiar whole object was the only cue available. Children appeared unwilling to rely on the mutual exclusivity assumption alone to lead them to a part-term response.

One possible explanation for mutual exclusivity failing to lead children to a part-term response, in the present study and in Saylor and Sabbagh (2004)

Study 1, is provided by evidence of developmental change in the role of the mutual exclusivity assumption (e.g., Merriman, Bowman, & MacWhinney, 1989). When Saylor and Sabbagh (Study 2; 2004) examined the part-term learning of younger preschool children (Mean age = 2 years, 8 months), familiarity when presented in isolation did, in fact, influence part-term learning. It appears that beyond two years of age children become less willing to rely on the mutual exclusivity assumption. This is not to suggest that children abandon use of mutual exclusivity. Rather, as the emergent coalitionist model (Hollich et al., 2000) suggests, the influence of cues, and the word learning strategies that children employ to make use of cues, change as children develop more sophisticated strategies. Thus, as they learn to make use of other cues, children may weigh the mutual exclusivity assumption less heavily. Saylor and Sabbagh (2004) argued that older children, based on experience with language, expected speakers to include additional cues, such as possessive syntax, when referring to part terms and thus were unwilling to use familiarity as a cue when presented in isolation.

Thus, in the present investigation children from low SES families made use of the mutual exclusivity assumption in a manner similar to same-age peers with higher SES. Although their level of word knowledge is similar to younger higher SES children, the children from low SES families did not utilize mutual exclusivity similar to this group. They were not immature in their use of word learning strategies.

The Role of Possessive Syntax

Possessive syntax influenced the part-term learning of children from low SES families, suggesting that children from low SES families use knowledge of syntax as a word learning strategy. Children were more likely to respond with color of the part-term when presented with possessive syntax than when the verbal script was neutral for both FAMILIAR stimuli and NOVEL stimuli. Similar to peers with higher SES, children appeared to use syntactic knowledge as a word learning strategy in isolation, as well as in combination with mutual exclusivity.

The Role of Whole-part Juxtaposition

Whole-part juxtaposition was always presented in combination with other cues; thus, it is not possible to infer whether children could use pragmatic inference on part-term learning when it was the only cue available. However, the additive positive influence of whole-part juxtaposition in combination with possessive syntax, compared to possessive syntax alone, suggested that the children from low SES families made use of pragmatic inference as a word learning strategy. The use of pragmatic inference was evident in the Possessive + Whole-Part Juxtaposition condition for FAMILIAR as well as NOVEL items.

The Role of Multiple Cues

As hypothesized, children were most likely to respond with the color of the part-term when presented with the three cues in combination. Responses exceeded chance levels when the three cues were presented and performance

approached ceiling levels (M = 3.11 of a maximum 4); 47.8% (22 out of 46) of participants provided the maximum number of part-term responses. Multiple cues had an additive effect.

Summary

Participants with low SES performed similarly to previously studied children with higher SES. Horton-Ikard and Ellis Weismer (2007) provided similar evidence in a study of African-American toddlers, reporting that participants with differing SES performed similarly on the fast-mapping task. This finding is encouraging; children from low SES families appear to have sufficient word learning skills to develop adequate word knowledge. For many children from low SES families, linguistic input appears to be further implicated as a source of limited word knowledge development. However, the wide within-group variability in word knowledge of children from low SES families makes critical the examination of the word learning skills of subgroups of children from low SES families. Thus, a goal of this study was to compare the part-term learning of children with limited word knowledge to those with age-appropriate word knowledge.

Part-term Learning in Children with Limited Word Knowledge

As hypothesized, children with limited word knowledge (Low) provided fewer part-term responses than children with age-appropriate vocabulary (High). Both groups demonstrated an effect of experimental condition and provided more

part-term responses when presented with cues, with the exception of the familiar whole object in the Baseline condition. The groups performed similarly in the Baseline condition; part-term responses were rare in the Baseline condition, means of $\leq$ 1.1 for Low and High children. It is remarkable that the Low children were influenced by familiarity in isolation in the same manner as their same-age peers; they did not perform like younger children (cf. Saylor & Sabbagh, 2004). In the Possessive Syntax as well as the Possessive Syntax + Whole-Part Juxtaposition Condition, children in the Low group appeared less proficient than children in the High group. Although the group comparison in the Possessive Syntax + Whole-Part Juxtaposition condition was statistically significant, it was not significant in the Possessive Syntax condition. However the effect sizes were comparable (d = . 54; d = .49). The lack of statistical power in the non-significant finding in combination with the moderate effect size is noteworthy. We conclude that the group comparisons provide preliminary support for a difference in proficiency in word learning abilities within this group of children from low SES.

The study provides insight into the use of word learning strategies by children with limited word knowledge. The differences in performance between the Low children and the High children are best explained in terms of word learning efficiency, rather than an all-or-nothing approach. Children in the Low group were able to make use of cues, suggesting that they could employ word learning strategies. However, children in the Low group were less proficient at making use of the cues, and thus, less efficient word learners than children in the High group.

The conclusion of inefficient word learning is bolstered by examination of individual children in the Low group. For the FAMILIAR items in the Possessive Syntax condition, 2 of the 10 children in the Low group performed at ceiling level (providing 4 of a possible 4 part-term responses) and the majority of children (8 of 10) provided at least two part-term responses. Although two part-term responses would indicate chance level performance, children were more likely to provide a part-term response in the Possessive Syntax condition than in the Baseline condition. The pattern of performance was similar for NOVEL items. A bimodal distribution in which children provided either no part-term responses or the maximum number or part-term responses would indicate that possessive syntax was useful to only some children. Instead, most children demonstrated some use of possessive syntax as a cue. Rather than concluding that possessive syntax was not a cue for Low children, it is more likely that children with Low group were less efficient in using possessive syntax as a cue during the task. Performance in the Possessive Syntax + Whole-Part Juxtaposition condition also suggests inefficient word learning. Most of the Low children provided at least two part-term responses (8 of the 10 for Familiar items, 7 of the 10 for Novel items), suggesting that most of the Low children were able to make at least some use of the possessive syntax and whole-object juxtaposition provided as cues.

Inefficient word learning in children with limited word knowledge could be explained in a number of ways. In Saylor and Sabbagh (2004), the authors explained the differences in performance of younger and older children in terms of processing resources. It is clear that word learning places demands on the

processing resources of children; to make use of cues in linguistic input, children have to attend to cues, make quick judgments about the meaning of cues, and integrate and apply knowledge of the meaning of cues. To make use of possessive syntax and whole-part juxtaposition, children must make efficient use of knowledge of syntax and make quick judgments about a speaker's meaning. For children in the Low group, inefficient word learning might indicate that processing resources of speed, memory, and attention were taxed by the task.

An explanation of inefficient word learning in children with limited word knowledge also can be drawn from research on children with language impairment. To explain the inability of children with language impairment to make use of syntactic cues, Rice et al. (2000) suggested that children with language impairment lack the knowledge of syntax necessary to make use of certain syntactic cues. Because children with limited word knowledge demonstrated an effect of experimental condition, it is unlikely that they had no knowledge of possessive syntax or whole-part juxtaposition. However, children with limited word knowledge may lack the depth of knowledge of syntax or pragmatics that is necessary to support efficient word learning. There is evidence to suggest that children with limited word knowledge not only know fewer words, but also know less about the words in their lexicon than children with age-appropriate word knowledge (Curtis, 1987). A similar argument might be made for children's knowledge of syntax and pragmatics. For example, a child with limited word knowledge might have the possessive syntax structure "*It has a"* as part of his knowledge base, but might have a shallow representation or restricted meaning

of the structure. Thus, the child might be less able to draw on the knowledge of syntax as a word learning strategy.

Other explanations of word learning inefficiency are plausible. Some researchers have explained the poor performance of children with language impairment as resulting from a deficit in phonological memory (Dollaghan, 1987; Gray, 2004). The present study did not include measures of phonological memory; thus, it is not possible to explore a phonological memory deficit as an explanation. Nonverbal IQ may also contribute to inefficient word learning; the Low and High groups had significantly different group means on the Leiter-R, $F(1,20) = 16.16$, $p = .001$.

It is difficult to determine if children in the Low group would meet generally accepted criteria for language impairment. Several research groups have raised the need for culturally and linguistically fair assessments for the purpose of diagnosis of language impairment, particularly for speakers of a non-mainstream dialect (Craig & Washington, 2000; de Villiers, 2004; Horton-Ikard & Ellis Weismer, 2007). Recommendations have been made for the use of measures derived from spontaneous language samples to diagnose language impairment (Craig & Washington, 2000; Dunn, Flax, Sliwinski, & Aram, 1996); analysis of the language samples of participants may shed light on this issue. However, the descriptive measures in the present study provide insufficient information to determine language impairment status. Regardless, children in the Low group demonstrate differences in word learning that are worthy of further study.

Performance on the part-term task suggested differences in word learning skill between Low children and High children. The whole object task, however, failed to capture any differences in word learning ability. Performance on the whole object task suggested that participants were equally able to use the mutual exclusivity assumption for the learning of whole object labels; all children demonstrated similar ability to fast map whole-object labels. Horton-Ikard and Ellis Weismer (2007) also used a whole-object fast-mapping task and found no differences in performance between two groups of children with differing SES, although the groups performed differently on the PPVT-III. The whole object task indicates that children from low SES families, even those with limited word knowledge, have the ability to fast map under explicit conditions. However, fast mapping under other conditions, when children may be called on to apply multiple word learning strategies, may capture differences in word learning skill. These findings suggest that continued study of word learning in children from low SES families may be fruitful for understanding the vocabulary limitations of these children and for exploring intervention options. However, this line of research must include fast-mapping tasks that are complex enough to parallel word learning challenges in the everyday settings.

SES and Word Knowledge Development

To effectively inform policy and practice, it is not sufficient to explain that SES impacts development; rather, it is necessary to explain the process by which SES influences development (National Research Council and Institute of

Medicine, 2000). Researchers have established that SES influences word knowledge development. Next, researchers must explore the ways in which SES influences word knowledge development. To address this goal, the present study sought to examine word learning skill as a contributor to limited word knowledge development of children from low SES families. Two key study findings provide insight to the contributions of word learning skill. First, children from low SES families, as a group, demonstrated efficient use of word learning strategies. Thus, many children from low SES families have sufficient word learning skill to develop age-appropriate word knowledge when provided with adequate linguistic input. Second, children from low SES families and limited word knowledge demonstrated inefficient word learning. This preliminary evidence suggests that children from low SES families and limited word knowledge lack the word learning skills necessary to develop age-appropriate word knowledge even when linguistic input is adequate.

Models that explain the impact of SES on development have used a cumulative model of risk (see for example, Hooper, Burchinal, Roberts, Zeisel, & Neebe, 1998; Sameroff, Seifer, Baldwin, & Baldwin, 1993). These models suggest that no single factor places a child at risk; rather, it is the cumulative effect of multiple risks that places a child at risk. A model of cumulative risk can explain the ways that low SES impacts a child's word knowledge development. Limited linguistic input is a risk factor for limited word knowledge, but it is the combination of this risk and additional risks, such as inefficient word learning, that begins to explain child outcomes in word knowledge.

Implications for Future Research and Practice

In the next section, the study's implications for practice and future research are discussed. These implications draw on the findings and observations of the present study as well as evidence from extant research. First, extensions of the present study are described. Second, suggestions are made for the application of other methods to the understanding of word knowledge development in children from low SES families. Third, implications for instruction, intervention, and assessment are discussed.

Extensions of the Present Study

With regard to the part-term task in the present study, more detailed analyses could be conducted to provide additional information about the development of word knowledge in children from low SES families. The role of animacy was not examined in the present investigation, previous investigations reported no effect of animacy on the number of part-term responses by children (Saylor & Sabbagh, 2004). However, examiner experiences suggest that children might be more willing to accept a second label for an animate object. Children's verbal comments during the part term task suggested that they had experience with multiple labels for the familiar whole objects. For example, one child mentioned, "*you can also call it a fish*" when prompted to label the color of the dorsal. As children develop word knowledge, they must learn to assign multiple labels to animate objects, specifically superordinate and subordinate categories; this requires children to abandon the mutual exclusivity assumption in specific

word learning situations. For example, a child must learn to accept that a dog can be a beagle and can be called Fido. A comparison of part-term responses on animate and inanimate FAMILIAR and NOVEL items might provide insight into the role of the mutual exclusivity assumption.

With regard to stimuli in the part-term task, responses to the part-term task could also be analyzed at the item level. Characteristics of the stimuli, in addition to animacy, might have resulted in variable response rates for individual items. Item-level analysis, although not necessary to interpret present findings, could lead to refinement of stimuli for future investigations of part-term learning.

Children from low SES families and limited word knowledge appear to be inefficient word learners; this evidence warrants further investigation of word learning in children from low SES families and limited word knowledge. A first step would be to apply the methods of the present study to a larger group of children from low SES families and limited word knowledge. The group difference in the Possessive Syntax condition was underpowered; research with a larger group of participants would better examine this difference. Also, it is possible that there are differences in word learning skills within the group of children from low SES families and limited word knowledge. Subgroup characteristics could be explained better with a larger group of children. A second step in this line of research would include fast-mapping tasks that manipulate the types of words (e.g., verbs, attributes) and the types of cues (e.g., syntactic). The present study indicates that children from low SES families and limited vocabulary have difficulty drawing on knowledge of syntax as a word learning strategy; this finding

is limited to the possessive syntax structure examined here. Other research groups have examined syntactic cues that distinguish between types of words, such as attributes (Deak, 2000), or distinguish within a word class, types of verbs (Naigles, 1990) or types of nouns (Soja et al., 1991). These cues can be examined in word learning of children from low SES families and limited word knowledge to understand syntactic knowledge as a word learning strategy in this population.

Application of Other Methods

The present study used an experimental fast-mapping task to examine word learning in children from low SES families, with the goal of understanding why children from low SES families have limited word knowledge. Other approaches and methods can be applied to address this general question. The methods of other word learning tasks can be applied to the study of children from low SES families to understand the process by which children add words to their lexicon. Fast-mapping tasks can be manipulated to more closely resemble real world incidental learning, for example, the QUIL methodology of Rice and colleagues (e.g., Rice et al., 1990; Rice & Woodsmall, 1988). Other research groups have developed word learning tasks in which children are provided multiple exposures to new words over several days (Gray, 2004) or in supported-learning contexts (Kiernan & Shelley, 1998). Application of these methods to the population of children from low SES families and limited vocabulary can inform understanding of limited word knowledge in children from low SES families.

An understanding of word knowledge in children from low SES families can be provided by study of word learning, but researchers should also explore other aspects of word knowledge. Specifically, researchers can examine ways that children from low SES families organize and store their word knowledge. For example, studies of semantic priming have been used to examine the lexical associations that children form, such as words related by category or by function (Nation & Snowling, 1999). Study of lexical associations in children from low SES families and limited word knowledge might be informative to the nature of limitations in word knowledge.

As discussed, word knowledge of children from low SES families also can be examined by study of spontaneous language samples. Researchers have examined the lexical diversity of children by deriving the number of different words from spontaneous language samples (e.g., Dollaghan et al., 1999) to provide evidence of limited word knowledge in children from low SES families. The database from this study provides a unique opportunity to compare static word knowledge, measured by the PPVT-III or the EVT, word learning skill, measured by the part-term task, and word knowledge use, measured by the number of different words in the language sample. Thus, analyses of the language samples from the participants of the present study will provide additional information for understanding the word knowledge of children from low SES families and limited word knowledge.

Implications for Enrichment, Intervention, and Assessment

In this section, a distinction is made between word knowledge enrichment and word knowledge intervention. Enrichment refers to an increase in linguistic input such that children have more opportunities to develop word knowledge. Intervention refers to specialized linguistic input and explicit teaching approaches tailored to the needs of individual or small groups of children, such that children have both an increase in opportunities to develop word knowledge and an increase in their ability to make use of these opportunities.

Many of the children from low SES families demonstrated efficient use of word learning strategies and age-appropriate word knowledge. For these children, word knowledge enrichment that provides rich linguistic input may be sufficient to bolster word knowledge. The provision of rich linguistic input must consider both quantity and quality; research and practice have begun to address this goal. Enrichment of linguistic input provided to children from low SES families has addressed broad goals of increased linguistic proficiency (e.g., Roberts & Rabinowitch, 1989); this enrichment has been generally effective. Enrichment programs have also specifically targeted the development of word knowledge in children from low SES families (e.g., Beck, 2007; Dickinson & Smith, 1994; Hadley et al., 2000); these programs have increased word knowledge of children from low SES families. For example, Hadley et al. (2000) reported a pretest-posttest increase of nearly 13 standard score points on the PPVT-III (d = .65).

For children from low SES families and limited word knowledge, improving linguistic input, although necessary, may not sufficiently address the needs of these children. Children from low SES families and limited word knowledge demonstrate inefficient word learning and appear to have difficulty making use of information in linguistic input. Thus, instruction that enriches the linguistic input may fail to improve word knowledge sufficiently in children from low SES families and limited word knowledge unless word learning skill is considered as well.

There has been little empirical study of ways to intervene on word learning skill in preschool children; recommendations for intervention strategies are made here. Word learning intervention might compensate for word learning inefficiency by manipulating the linguistic input. Children from low SES families and limited word knowledge provided more part-term responses when linguistic input included multiple cues; thus, intervention that provides children with multiple cues to learn new words might be effective in boosting word knowledge. Other intervention strategies might be to provide children with multiple exposures to new words. Rice et al. (1994) demonstrated frequency effects for children with language impairment; intervention that provides additional exposures to new words could improve word knowledge. For example, small group intervention might provide explicit experience with new vocabulary words to supplement classroom exposures. Rather than compensating for inefficient word learning, intervention might explicitly teach word learning strategies. For example, children from low SES families and limited word knowledge could be taught the syntactic

and pragmatic knowledge necessary to make use of the related word learning strategies.

Research on word learning could inform the development and application of measures to assess word knowledge in children. There has been criticism of the use of standardized measures as an indication of language impairment in culturally and linguistically diverse populations (e.g., de Villiers, 2004; Horton-Ikard & Ellis Weismer, 2007). Most standardized measures assess extant word knowledge, which may emphasize the word learning experiences rather than the word learning skills of children. Because children from low SES families may have limited word learning experiences, they may be over-identified as language impaired. A measure of word learning skill might differentiate between children with limited word learning experiences and children with limited word learning skills.

The present study also illustrates the need for information to describe differences within the group of children from low SES families. The group mean of participants on the PPVT-III was higher than reported by other research groups; suggesting that there is substantial variation in word knowledge of the group of children from low SES families. Research and policy vary widely in the methods for defining SES and it is not clear which components of SES are important for different aspects of development. The performance of participants in the present study suggests a need to refine definitions of SES to include subgroups of low-income children; these subgroups may have different skills and thus, different instructional needs.

Caveats

Participants

The group of participants in the present study was not selected to be a representative sample of the population of children from low SES families. Rather, participants were selected to represent children from low SES families with a range of word knowledge. As detailed in the appendix, children were selected from community based preschool centers, most requiring parents to be working or enrolled in school or job training. The enrollment requirement imposed by the centers might have resulted in a select group of families represented at the center: families with low income status but perhaps with other available resources. Also, only a portion of eligible children at each center participated in the study. Parents of children who returned consent forms might represent a more motivated, involved group of parents. Finally, at one preschool, only children who had low vocabulary scores participated in the study.

An inclusionary criterion for the study was that children could label colors (*red, blue, green*, and *yellow*). Six children were found to be ineligible to participate in the study because they could not reliably label colors. These children had, as a group, low scores on the PPVT-III, (Standard score range: 60-87). Thus, the eligibility requirements of the study made it impossible to capture the word learning skills of all consented participants. It is possible that the group of children who had low vocabulary scores and were able to label colors might have word learning skills that were different from the children with low vocabulary

scores and were unable to label colors. Future studies of word learning in this population, such as studies of frequency effects, would not require color-term knowledge and thus, could address word learning skill of these children. These caveats indicate that generalizations from the group of participants to the population of children from low SES families must be made cautiously.

Methods

The part-term task used a within-subjects design; each child completed the task in three experimental conditions. All children completed the experimental conditions in the same order: Baseline first, Possessive Syntax second, and Possessive Syntax + Whole-Part Juxtaposition third. The experimental conditions were arranged in this order so that each condition provided increasing cues; more cues were available in the Possessive Syntax + Whole-Part Juxtaposition condition than in the Possessive Syntax condition, and more cues were available in the Possessive Syntax condition than the Baseline condition. One possible limitation of the experimental design is that children could potentially 'learn' from the experience of completing the part-term task multiple times. Through experience with the task, children might deduce that the task was asking them to provide the color of the part. However, findings do not support an effect of learning in the part-term task. Importantly, the study results mirror the results of Saylor and Sabbagh (2004). Saylor employed a between subjects design; children completed the experimental task in only one experimental condition eliminating the possibility of an effect of experience of the task.

Several aspects of the study design make the possibility of an effect of experience unlikely. Children received only neutral feedback during the part-term task. Correct and incorrect responses were equally accepted by the examiner; the examiner prefaced the task with instructions that encouraged the child to guess. Occasionally, a child asked the examiner for clarification (e.g., "*What's a nepp?*") and the examiner responded with a smile, shrug of the shoulders and the statement, "*What do you think?*" Thus, the examiner did not encourage a bias towards part-term responses.

The CONTROL items (familiar whole objects with familiar parts) also served to reduce the possibility of an effect of experience. In each book, half of the CONTROL items asked children to provide the color of the part term and half of the CONTROL items asked children to provide the color of the whole object. The CONTROL items were presented throughout the book, interspersed with the FAMILIAR and NOVEL items, and alternated asking for the color of the whole object and the color of the part. To respond correctly to the CONTROL items, children had to attend to the changing verbal script. Presumably, a child who was demonstrating an effect of experience, for example learning to respond with the color of the smaller item, would respond with the color of the part term for all items. To be included in the study, children had to respond correctly to 75% of the CONTROL items; this criterion required that children respond with the color of the whole object for a majority of the CONTROL items that asked for a whole object response. Only one child was excluded from the study for failing to meet

this eligibility requirement; her errors were random and evenly divided between responding with a whole or a part.

In addition to precautions against an effect of experience in the study design, an additional eleven children participated in an exploration of the effect of experience in the part-term task. Children were recruited from one of the participating preschools; all children had age-appropriate scores on the PPVT-III (M = 99.45, SD = 5.32). To test if children were demonstrating an effect of experience of completing the task, children completed the part-term task in three conditions, the Baseline condition on the first visit, the Possessive Syntax condition on the second visit, and the Baseline condition again on the third visit.

The verbal script of the Baseline condition was neutral and provided no additional cues to the child. Thus, an effect of experience in the Baseline condition, with carryover to the Possessive Syntax condition was not a concern. The verbal script for the Possessive syntax condition included verbal cues for the child to respond to the part. If an effect of experience occurred across conditions in the part term task, carryover would be expected from the Possessive syntax condition to the subsequent condition. If children who were learning from the Possessive Syntax condition, performance would be higher in the Baseline condition that followed the Possessive Syntax condition.

Across children, the most common response pattern was a low number of part-term responses in the first Baseline condition, an increase in part-term responses in the Possessive Syntax condition, and a return to Baseline level performance in the second baseline condition. For FAMILIAR items, three of the

11 children demonstrated a pattern of response that could possibly be attributed to an effect of experience: more part-term responses in the second Baseline condition. For FAMILIAR items, eight children demonstrated a clear return to baseline levels (*n* = 5) or equal number of part-term responses across conditions (*n* = 3). For NOVEL items, just one child demonstrated a pattern of response that might be attributed to experience with the task. One child demonstrated a response bias for part terms across conditions; the other nine children demonstrated a return to baseline level of performance of a random response pattern. The findings of this exploration indicate that it is unlikely that children were experiencing an effect of carryover across experimental conditions.

CHAPTER V

CONCLUSION

The findings of the present study provide initial information about the contribution of word learning to the development of word knowledge in children from low SES families. In the part-term task, cues of a familiar whole object, possessive syntax, and whole-part juxtaposition were effective in guiding children to accurately assigning a new word to a part term. As a group, participants in the study, children from low SES families, demonstrated a pattern of performance that was similar to the children with middle to high SES studies by Saylor and Sabbagh (2004). This finding suggests that, as a group, children from low SES families make use of word learning strategies in a manner similar to peers with higher SES.

Children from low SES families and limited word knowledge provided fewer part-term responses than peers with age-appropriate word knowledge when verbal scripts included cues of possessive syntax and whole-part juxtaposition. Children from low SES families and limited word knowledge appeared to be less able than peers to employ word learning strategies to make use of cues. Children from low SES families and limited word knowledge may be inefficient word learners. For these children then, word learning skill may be a contributor to limited word knowledge.

Other research groups have suggested that differences in linguistic input explain the substantial within-group variability in word knowledge of children from low SES families (Pan et al., 2005; Weizman & Snow, 2001). The findings of this study do not contradict this argument; rather, this study provides evidence that additional variability in word knowledge of children from low SES families can be explained by differences in children's ability to make use of word learning strategies.

Additional research is important to describe word learning in children from low SES families to provide a more complete understanding of word knowledge development in this population. Future studies can examine the influence of other cues on fast mapping as well as apply other methods to word learning in children from low SES families. Researchers also should examine the interaction of linguistic input and word learning skill in the development of word knowledge to identify critical contributors to limited word knowledge in children from low SES families and low vocabulary. Ultimately, programmatic research in this area could lead to an understanding of the word learning needs children from low SES families, advising the development of more effective vocabulary instruction and intervention for preschool children from low SES families. This line of research also could inform the design and application of word knowledge assessments, with particular utility for children from culturally and linguistically diverse backgrounds.

APPENDICES

APPENDIX A

RECRUITMENT PROCEDURES AND CHARACTERISTICS OF PARTICIPATING CENTERS

Recruitment

The target participants were preschool children from families with low socioeconomic status. Recruitment focused on children in their pre-kindergarten year of preschool: children eligible to begin kindergarten in Tennessee in fall of 2009 with birthdates between October 1, 2003 and September 29, 2004. Data was collected from September 2008 - March 2009; kindergarten eligible were between the ages of 4 years 0 months and 5 years 7 months

An initial step in recruitment was to identify preschools in the Nashville community serving children from low income families. I identified these centers through internet searches and recommendations from other researchers and contacted the directors of these centers through emails and phone calls. I explained the details of the study, what would be required of the center, and arranged visits to the center for those directors who were willing to meet with me. One potential recruitment setting was the Metropolitan Action Commission Head Start; however, the director declined to participate in the study. In addition to Metropolitan Action Commission Head Start, I contacted ten preschools, arranged visits with eight preschools, and received letters of cooperation from seven of the directors. Of these seven preschools, two participated in feasibility

testing of the methods; the remaining five preschools participated in the main study.

Table A1 describes participating centers. Of the five preschools who participated in the study, four were community-based centers whose mission was to provide childcare to the children of low income families, specifically the children whose parents are working, in job training, or in school. These four centers receive some funding from the United Way. Two of these four centers had classrooms that were part of a Head Start contract; two had classrooms as part of the Metropolitan Nashville Public Schools. The fifth preschool did not have specific parental requirements but was a contract site for the Metropolitan Nashville Social Services and the Tennessee Department of Human Services Child Care Assistance Programs. In summary, these centers served children from low-income families, primarily the children of parents who were working, in job training, or in school.

Table A1

List of Participating Centers, Center Characteristics, Eligible Participants, and Number of Consents Obtained

Center	Classroom types	Description	Number of eligible participants	Number of consents obtained
1	Preschool Head Start MNPS	parental requirements for work, job training, or school	50	16
2	Preschool Head Start	parental requirements for work, job training, or school	35	13
3	Preschool	parental requirements for work, job training, or school	20	11
4	MNPS	parental requirements for work, job training, or school	22	18
5	Preschool	contract site for DHS and MSS	10	7

Note. Number of eligible participants at these sites is approximate. Head Start = Head Start classroom ; MNPS = Metropolitan Nashville Public Schools classroom;. DHS = Tennessee Department of Human Services Childcare Assistance Program; MSS = Metropolitan Nashville Social Services.

At each preschool, I met with the director to identify recruitment strategies that would be most appropriate for the center. As a first step at each preschool, I provided teachers with packets that included a brightly colored, parent-friendly letter and the IRB-approved informed consent. Teachers sent packets home with children and asked parents to return them. The return rate varied by preschool. For example, at one preschool, informed consents were returned for seven of ten children in the preschool classroom (70% return rate). At another, informed consents were returned for six of fifty eligible children (12% return rate). Next, I met with teachers individually to answer questions about the study and to provide teachers with extra consent forms. Teachers often kept these consent forms near where parents signed students out and reminded interested parents to complete the forms. I also made myself available to parents during afternoon pick-up time. As parents picked up their children, I introduced myself and explained briefly that that I would be working with some of the children at that center as part of a research study. These strategies increased the consent rate at most schools. For example, at one school the consent rate increased from six to seventeen of fifty eligible children.

As stated previously, the target group of participants was children who were eligible to begin kindergarten in the 2009-2010 school year. I asked directors to identify pre-kindergarten classrooms and consents were provided to all children in the identified classrooms. However, at most participating preschools, children were grouped in class by age (e.g., four-year-old classroom). Thus, initially unclear to me, some children in the identified pre-

kindergarten class had birthdates that did meet the established kindergarten eligibility cut-off.

Parents of 12 children who were not eligible to begin kindergarten in 2009-2010 provided consent to participate in the study. Because I did not initially realize the children were not kindergarten eligible, the children completed the data collection procedures. After examination of children's results (see Table A2), I decided to include these children in the study. The group of kindergarten-ineligible children (n = 12) were not significantly different from the kindergarten-eligible children (n = 34) on the PPVT-III, $F(1, 44) = 1.22$, $p = .28$. All kindergarten-ineligible children were at or close to four years of age.

The completion of the study relied on having a broad range of word knowledge (indexed by PPVT-III standard scores) represented across the group of participants from families with low SES. In particular, it was essential to have a substantial group of children with low PPVT-III standard scores. Recruitment at the first four preschool centers resulted in a participant group with a broad range of scores (75 - 121) but included few children (n = 5) with low scores ($\leq$ 85) on the PPVT-III. To increase the number of participants with low PPVT-III scores, participant selection at the fifth preschool was modified so as to increase the number of participants with limited word knowledge. At this school, all children whose parents provided consent (n = 18) were seen for an initial screening visit in which they completed the color screening test and the PPVT-III. But only the children who had scores on PPVT-III standard scores less than or equal to 85 and who passed the color screening test (n = 6) participated in the study.

Table A2

Performance of Kindergarten-ineligible (n = 12) and Kindergarten-Eligible (n = 34) Children on Descriptive Measures

	Kindergarten-Ineligible		Kindergarten-Eligible	
Measure	Mean (SD)	Range	Mean (SD)	Range
Age in months	49.83 (1.19)	47 - 51	55.79 (3.41)	50-63
PPVT-III	96.92 (10.82)	83 -121	92.71 (11.51)	69-118
EVT	99.33 (11.10)	78 - 116	95.03 (9.77)	74-126
TELD-3	95.67 (12.66)	71 - 119	88.82 (13.10)	76-118
Leiter - R	101.33 (10.33)	91 -123	102.00 (10.69)	69-126

Note. PPVT - III = Peabody Picture Vocabulary Test - III, standard score; EVT = Expressive Vocabulary Test, standard score, TELD - 3 = Test of Early Language Development - 3, spoken language quotient, Leiter - R = Leiter International Performance Scale - Revised, brief scale IQ composite score.

In summary, a total of 137 preschool children at the five preschools were eligible to participate; parents of 65 children provided informed consent. Of the children whose parents provided consent, 46 were included in the final participant group and 34 met the original criteria of kindergarten eligibility in 2009-2010.

APPENDIX B

STIMULI FOR PART-TERM TASK

Table B1

Complete List of Stimuli by Book for Part-term Task

Stimulus type	Book 1	Book 2	Book 3
FAMILIAR	Spider - Pedicel	Fish - Dorsal	Lion - Pelage*
	Butterfly - Thorax	Frog - Abdomen*	Turtle - Plastron*
	Boat – Crank	Train - Coupler	Ball - Valve*
	Key – Groove	Shoe - Instep	Fork - Tine*
NOVEL	Peem – Yone	Wahf - Moog	Watt - Hupp
	Hahn – Nepp	Heef - Nout	Peen - Kofe
	Yame – Fayg	Yibb - Pabe	Nowb - Jeem
	Fowg – Yudd	Mekk - Wadd	Moyd - Jaype
CONTROL	Cat – Tail	Cow - Tummy*	Bug - Spot*
	Horse – Leg	Dog - Tongue*	Sheep - Mouth*
	Pig – Ear	Bear - Eye	Shark - Tooth*
	Bunny – Nose	Mouse - Foot*	Monkey - Finger*
	Shirt – Pocket	Coat - Button*	Hat - Bow*
	House - Window	Door - Knob*	Tricycle - Seat*
	Car – Door	Bike - Wheel*	Plant - Leaf*
	Cup – Handle	Table - Leg*	Bottle - Lid*

Note. * stimuli created by the author. Other stimuli from Storkel and colleagues (2001, 2006), Saylor and colleagues (2002, 2004).

APPENDIX C

SAMPLE SCRIPTS FOR EXPERIMENTAL CONDITIONS

Table C1

Sample Script for Baseline Condition

Stimuli type	Target response	Verbal script
F/F	P	1. Do you see this? See, a tail! Wow! Look, a tail! Do you see a tail? What color is it?
F/F	W	2. Do you see this? See, a car! Wow! Look, a car! Do you see a car? What color is it?
X -F/N	P	3. Do you see this? See, a pedicel! Wow! Look, a pedicel! Do you see a pedicel? What color is it?
X -N/N	P	4. Do you see this? See, a pabe! Wow! Look, a pabe! Do you see a pabe? What color is it?
F/F	W	5. Do you see this? See, a cup! Wow! Look, a cup! Do you see a cup? What color is it?
F/F	P	6. Do you see this? See, a leg! Wow! Look, a leg! Do you see a leg? What color is it?
X -N/N	P	7. Do you see this? See, a fayg! Wow! Look, a fayg! Do you see a fayg? What color is it?
X -F/N	P	8. Do you see this? See, a thorax! Wow! Look, a thorax! Do you see a thorax? What color is it?

Stimuli type	Target response	Verbal script
F/F	P	9. Do you see this? See, a nose! Wow! Look, a nose! Do you see a nose? What color is it?
F/F	W	10. Do you see this? See, a house! Wow! Look, a house! Do you see a house? What color is it?
X - F/N	P	11. Do you see this? See, a groove! Wow! Look, a groove! Do you see a groove? What color is it?
X - N/N	P	12. Do you see this? See, a nepp! Wow! Look, a nepp! Do you see a nepp? What color is it?
F/F	W	13. Do you see this? See, a shirt! Wow! Look, a shirt! Do you see a shirt? What color is it?
F/F	P	14. Do you see this? See, an ear! Wow! Look, an ear! Do you see an ear? What color is it?
X - N/N	P	15. Do you see this? See, a yudd! Wow! Look, a yudd! Do you see a yudd? What color is it?
X - F/N	P	16. Do you see this? See, a crank! Wow! Look, a crank! Do you see a crank? What color is it?

Note. Stimuli type: X = Experimental items; X - F/N = FAMILIAR items: Familiar whole items with unfamiliar parts; X - N/N = NOVEL items: Novel items with novel parts; F/F = CONTROL items: Familiar wholes with familiar parts. Target response: P = color of the part term, W = color of the whole object.

Table C2

Sample Script for Possessive Syntax Condition

Stimuli type	Target response	Verbal script
F/F	P	1. Do you see this? See, it has a tail! Wow! Look, it has a tail! Do you see a tail? What color is it?
F/F	W	2. Do you see this? See, a car! Wow! Look, a car! Do you see a car? What color is it?
X -F/N	P	3. Do you see this? See, it has a pedicel! Wow! Look, it has a pedicel! Do you see a pedicel? What color is it?
X -N/N	P	4. Do you see this? See, it has a yone! Wow! Look, it has a yone! Do you see a yone? What color is it?
F/F	W	5. Do you see this? See, a cup! Wow! Look, a cup! Do you see a cup? What color is it?
F/F	P	6. Do you see this? See, it has a leg! Wow! Look, it has a leg! Do you see a leg? What color is it?
X - N/N	P	7. Do you see this? See, it has a fayg! Wow! Look, it has a fayg! Do you see a fayg? What color is it?
X - F/N	P	8. Do you see this? See, it has a thorax! Wow! Look, it has a thorax! Do you see a thorax? What color is it?
F/F	P	9. Do you see this? See, it has a nose! Wow! Look, it has a nose! Do you see a nose? What color is it?

Stimuli type	Target response	Verbal script
F/F	W	10. Do you see this? See, a house! Wow! Look, a house! Do you see a house? What color is it?
X - F/N	P	11. Do you see this? See, it has a groove! Wow! Look, it has a groove! Do you see a groove? What color is it?
X - N/N	P	12. Do you see this? See, it has a nepp! Wow! Look, it has a nepp! Do you see a nepp? What color is it?
F/F	W	13. Do you see this? See, a shirt! Wow! Look, a shirt! Do you see a shirt? What color is it?
F/F	P	14. Do you see this? See, it has an ear! Wow! Look, it has an ear! Do you see an ear? What color is it?
X - N/N	P	15. Do you see this? See, it has a yud! Wow! Look, it has a yud! Do you see it has a yud? What color is it?
X - F/N	P	16. Do you see this? See, it has a crank! Wow! Look, it has a crank! Do you see a crank? What color is it?

Note. Stimuli type: X = Experimental items; X - F/N = FAMILIAR items: Familiar whole items with unfamiliar parts; X - N/N = NOVEL items: Novel items with novel parts; F/F = CONTROL items: Familiar wholes with familiar parts. Target response: P = color of the part term, W = color of the whole object.

Table C3

Sample Script for Possessive Syntax + Whole-Part Juxtaposition Condition

Stimulus type	Target response	Possessive + Juxtaposition condition - Stimulus Book 1
F/F	P	1. Do you see this cat? See, it has a tail! Wow a cat! Look, it has a tail! Do you see a tail? What color is it?
F/F	W	2. Do you see this? See, a car! Wow! Look, a car! Do you see a car? What color is it?
X -F/N	P	3. Do you see this spider? See, it has a pedicel! Wow a spider! Look, it has a pedicel! Do you see a pedicel? What color is it?
X -N/N	P	4. Do you see this peem? See, it has a yone! Wow, a peem! Look, it has a yone! Do you see a yone? What color is it?
F/F	W	5. Do you see this? See, a cup! Wow! Look, a cup! Do you see a cup? What color is it?
F/F	P	6. Do you see this horse? See, it has a leg! Wow a horse! Look, it has a leg! Do you see a leg? What color is it?
X - N/N	P	7. Do you see this yame? See, it has a fayg! Wow a yame! Look, it has a fayg! Do you see a fayg? What color is it?

Stimuli type	Target response	Verbal script
X - F/N	P	8. Do you see this butterfly? See, it has a thorax! Wow a butterfly! Look, it has a thorax! Do you see a thorax? What color is it?
F/F	P	9. Do you see this bunny? See, it has a nose! Wow, a bunny! Look, it has a nose! Do you see a nose? What color is it?
F/F	W	10. Do you see this? See, a house! Wow! Look, a house! Do you see a house? What color is it?
X - F/N	P	11. Do you see this key? See, it has a groove! Wow, a key! Look, it has a groove! Do you see a groove? What color is it?
X - N/N	P	12. Do you see this hahn? See, it has a nip! Wow, a hahn! Look, it has a nepp! Do you see a nepp? What color is it?
F/F	W	13. Do you see this? See, a shirt! Wow! Look, a shirt! Do you see a shirt? What color is it?
F/F	P	14. Do you see this pig? See, it has an ear! Wow a pig! Look, it has an ear! Do you see an ear? What color is it?
X - N/N	P	15. Do you see this fowg? See, it has a yud! Wow a fowg! Look, it has a yud! Do you see it has a yud? What color is it?

Stimuli type	Target response	Verbal script
X - F/N	P	16. Do you see this boat? See, it has a crank! Wow a boat! Look, it has a crank! Do you see a crank? What color is it?

Note. Stimuli type: X = Experimental items; X - F/N = FAMILIAR items: Familiar whole items with unfamiliar parts; X - N/N = NOVEL items: Novel items with novel parts; F/F = CONTROL items: Familiar wholes with familiar parts. Target response: P = color of the part term, W = color of the whole object.

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Footnotes

[1] Researchers have evaluated the validity of the PPVT-III for use with children from low SES backgrounds. Washington and Craig (1999) concluded that the PPVT-III was appropriate for use with the population of low SES African American children. Qi et al. (2006) found no difference in the performance of low SES African American children and low SES European American children. (A fourth edition of the PPVT was published in 2007. However, because there were no published independent evaluations of the PPVT-IV, the PPVT-III was used in the present study.)

[2] Phonotactic probability, neighborhood density, and word length were controlled for across conditions. The study did not specifically examine the effects of phonotactic probability, neighborhood density, or word length on word learning, although evidence exists for their influence on word learning in children (Garlock, Walley, & Metsala, 2001; Storkel, 2001). The twelve novel part term-novel whole objects stimuli were composed of 24 single syllable words drawn from an investigation of phonotactic probability and neighborhood density (Storkel et al., 2006). The twelve pairs were high phonotactic probability-high neighborhood density, high phonotactic probability-low neighborhood density, low phonotactic probability-high neighborhood density, low phonotactic probability-low neighborhood density. One pair of each type was included in each of the three stimulus books.