

ABSTRACT

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VERB LEARNING PROCESS**

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For early word learners, verbs are more difficult to learn than nouns. Previous research suggests that a simple agent of an action facilitates verb learning. The present investigation was designed to replicate this finding with real-world stimuli. Twenty-four 18-month-old English-learning children participated in one of two conditions. Children either saw a block (simple agent) or a woman (complex agent) perform a novel action named simultaneously as the action occurred. All children were tested in the Intermodal Preferential Looking Paradigm to determine whether they learned the verb. Verb learning was not achieved in either condition; the results indicate that the block did not provide a verb learning advantage at this age. Limitations of the present study and suggestions for future research have been highlighted.

KEEP IT SIMPLE: ACCELERATING THE VERB LEARNING PROCESS

by

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Chapter 1: Introduction

As adults, when we hear someone use a new verb absent from our vocabulary, we can draw upon a variety of resources to decide its meaning: contextual cues, syntactic or morphological cues, facial expressions, even a dictionary. For young children, verb learning is more complex. When a toddler hears an adult say, “Time to brush your teeth,” how does the child know that *brush* refers to the act of brushing? *Brush* may refer to the toothbrush, toothpaste, water, teeth, the act of turning on the water, or the act of putting toothpaste on the toothbrush. Comprehension of the word *brush* may be further complicated when the adult uses the word while brushing one’s hair. The child may then associate the word with another referent, such as bristles or blinking, since they are present during both activities. As illustrated by the example above, caregivers tend to embed verbs in a sentence out of context (Tomasello & Kruger, 1992). In contrast, object labeling in context is a more common activity among caregivers. For example, you may remember pointing to a dog and saying, “Look at the doggie,” to a young child. Perhaps this is why parents report that nouns such as “mama,” “dada,” “ball,” and “doggie” are typical first words in the early vocabularies of English-speaking children. Parents may even note that their children comprehend more nouns than verbs (Dale & Fenson, 1996).

Parental report of a higher proportion of nouns in their young children’s vocabularies is not an illusion; this finding has been supported by research. Cross-linguistic studies have determined that nouns are acquired more rapidly than verbs (Bornstein et al., 2004; Gentner, 1982). Nouns universally populate early lexicons at a disproportionate rate (Gentner, 1982; Imai, Haryu, Okada, Lianjing, & Shigematsu,

2006; Kim, McGregor, & Thompson, 2000). In fact, a “noun bias” has been postulated to explain the greater frequency of nouns present in young children’s lexicons. The “noun bias,” although highly debated, suggests that children have a predisposition to map words onto objects (Tardif, Gelman, & Xu, 1999).

The more rapid early acquisition of nouns compared to verbs (Gentner, 1982) has yielded more attention to object word learning than verb learning by researchers (Merriman & Tomasello, 1995). As a result, the literature on word learning has an abundance of research on noun acquisition. To determine if a noun bias truly exists, research must now turn to the process of verb learning. Furthermore, unexplained differences are found in the proportion of verbs in the lexicons of same-aged children speaking different languages which offers further ground for research. For example, explanations for the greater number of verbs in Korean-speaking children’s lexicons compared to English-speaking children are still being debated (Kim et al., 2000). Before we can examine the explanations for cross-linguistic differences, we must first explore the differences between nouns and verbs, including the properties of verbs that make them more difficult to learn.

Verb Learning is Hard

The difficulties surrounding verb learning are evident when comparing the differences in the age of acquisition of nouns and verbs in English-speaking children. While 90% of children comprehend at least one noun by 8 months, it is not until 15 months that 90% of children comprehend at least one verb. In addition, 50% of 12-month-olds are using nouns expressively, whereas it is not until 19 months that 50% of children have verbs in their expressive vocabularies (Dale & Fenson, 1996).

According to Merriman and Tomasello (1995), a variety of factors make the acquisition of verbs universally more difficult than the acquisition of nouns. First, unlike noun learning, a “canonical novel verb input” does not exist; novel verbs are embedded into commands, questions, or statements. In contrast, nouns are often labeled directly when a child is focusing on the object (e.g., “Look at the doggie”), making it easier for the child to associate the word with its referent. Second, actions are dynamic, and once the action is completed, the referent is no longer visible to allow the child to associate it with the verb label (Merriman & Tomasello, 1995). The final factor noted by Merriman and Tomasello is the self-other distinction: since a child can produce an action by himself or observe another person performing an action, different information is available to the child. For example, when a child jumps, multisensory feedback is available to the child (e.g., the child feels the impact of his or her feet touching the floor). However, this same feedback is not available when he or she observes another person jump. Hence, Merriman and Tomasello suggest that generalization of a self-initiated action to an action performed by another agent further complicates the verb learning process. In fact, it is not until the preschool years that children can compare and contrast between the perspectives and experiences of self and other (Decety & Sommerville, 2003). Since most nouns refer to objects in the external environment, the higher frequency of actions that can be performed by oneself and another person makes verb learning a more complex process.

Additional factors contributing to children’s difficulty acquiring verbs have been proposed by a number of researchers. Gentner (1982) described the variety of

ways to define a verb, known as the “packaging problem”. For instance, verbs can be defined by the instrument involved (e.g., to hammer), or by the result (e.g., to empty). Furthermore, two verbs can be used to describe the same event from two different perspectives (e.g., buy and sell) (Merriman & Tomasello, 1995). Golinkoff, Jacquet, Hirsh-Pasek and Nandakumar (1996) stated that objects have more constant features across different examples compared to actions. For example, running often looks different when performed by people with different athletic abilities. On the other hand, different exemplars of a noun have more constant features apparent to the child (e.g., all zebras have black and white stripes, a tail, and a mane). Despite this claim by Golinkoff et al., it is not clear that it applies to all objects and actions.

An extensive review of the various types of verbs that have been studied yields many different verb types, which can make verb learning more difficult. Naigles (1990) studied transitive verbs, which require a direct object (e.g., the woman broke the plate), and intransitive verbs, which do not require a direct object (e.g., the woman is waving). Transitive verbs have been divided into two classes of verbs: contact verbs and causative verbs. For example, contact verbs, such as *brush*, act on the noun in the object position, but do not cause the object to do anything. In contrast, causative verbs, such as *close*, result in a change in the noun in the object position, as in the movement of a door when a person closes it (Naigles & Kako, 1993). Furthermore, Becker (2005) identified raising (e.g., seems, appears) and control (e.g., want, try) verbs, which both take an infinitive clause complement. However, only control verbs select the subject in the sentence. In other words, the subject of the sentence can be considered a “wanter” (control verb), but not a “seemer” (raising

verb). Raising and control verbs fall into the class of mental state verbs (i.e., verbs that convey motivations, desires, perceptions, beliefs and cognitive states; Fusté-Herrman, Silliman, Bahr, Fasnach, & Federico, 2006). On a continuum defined by the concreteness or imageability of the referent, mental state verbs have been placed on the “difficult” end of the continuum, whereas many nouns have been placed on the “easy” end. Mental state verbs are less bound to context and tend to be learned much later than words that fall at the “easy” end of the continuum (Golinkoff & Hirsh-Pasek, 2006). With this number of verbs to differentiate, it is no surprise that verb learning is hard.

Gillette, Gleitman, Gleitman, and Lederer (1999) proposed that only imageable stimuli (i.e., words that stimulate a “mental picture, sound or other sensory experience”, p. 151) can be acquired through observation, which results in a greater proportion of nouns, particularly those labeling concrete objects, rather than verbs in children’s early vocabularies. Adults, who serve as learning sources, bias the language process by their predominant use of concrete nouns and their more abstract use of verbs that, in turn, lack imageable qualities. In Gillette et al.’s study, words that frequently occur in adult-to-adult and adult-to-infant speech were rated by adults on a 7-point imageability scale, labeled from least to most imageable. Gillette et al. found that 23 of the 24 nouns in this study were rated as more imageable than any of the verbs that were rated. For instance, *elephant* was rated as highly imageable (6.9), whereas *want* was rated low in imageability (2.3). According to Gillette et al., acquisition of abstract verbs requires knowledge of linguistic structures. After children learn a subset of nouns through observation, they can identify the subject in a

clause. The child uses the properties of these known nouns to restrict the possible meanings of a novel verb (Gillette et al.). In the end, for children to learn verbs, they must either first develop a lexicon of nouns, or caregivers must make abstract verbs less prominent in their word choices and imageable verbs more prevalent. Although many of the difficulties surrounding verb learning can be considered universal, children learning other languages have more verbs in their vocabulary than English-speaking children.

Cross-Linguistic Research

While the ease with which children learn nouns extends cross-linguistically, Kim et al. (2000) followed Korean- and English-speaking toddlers (aged 16-18 months) for three to four months and found that the Korean children learned more verbs than English-speaking children, despite that fact that nouns still exceeded verbs in the Korean children's lexicons. Although both English- and Korean-speaking children had a comparable number of nouns in their lexicons, the English-speaking children lagged behind their Korean peers in the number of verbs in their vocabulary. Kim et al. attributed this difference to the caregivers of Korean-speaking children, whose input emphasized verbs. For instance, Korean-speaking caregivers used more verb types than noun types while English-speaking caregivers used more noun types than verb types. Furthermore, the Korean-speaking caregivers used more verb tokens, especially action verb tokens, than English-speaking caregivers. In this study, the utterances produced by the caregivers were rated as naming-oriented (e.g., "This is a chair," p. 236) or activity-oriented (e.g., "Mommy is driving the car," p. 236). The results revealed that the Korean-speaking caregivers used significantly more activity-

oriented utterances than English-speaking caregivers. In turn, these activity-oriented utterances resulted in more verb tokens in caregiver input to their children. Naigles and Hoff-Ginsberg (1998) found that input frequency of verbs positively correlates with children's use of verbs. Hence, the greater frequency of verbs in Korean-speaking caregivers' input provides one plausible explanation for the greater proportion of verbs in Korean children's lexicons.

Another explanation for the difference in the number of verbs in the two populations is the saliency of verbs in the Korean language. Kim et al. (2000) proposed three aspects of the Korean language that may influence verb learning. First, Korean is a pro-drop language, which means pronouns can be omitted without making the sentence ungrammatical or changing its meaning; verbs are the only obligatory constituent in a clause. For example, *ga-ss-ta* ("went" in English) is grammatical without a subject or an object. As a result, single-verb utterances are frequently used by Korean speakers (Kim et al.). English, on the other hand, is a non-pro-drop language, so more noun phrases are necessary for communication. Kim et al. found a significantly greater number of single-verb utterances in Korean-speaking caregivers' input compared to English-speaking caregivers, which may increase the saliency of the verb. Second, Korean input contains morphological cues to verbs. In this study, verbs were inflected with final endings 100% of the time in the Korean samples, whereas verbs were inflected or preceded by auxiliary or modal verbs 28.3% of the time in the English samples. Since a majority of the grammatical morphemes used by the Korean caregivers was limited to six types and the acquisition of grammatical morphemes in the word-final position emerges before age two, use of a

consistent verb form (Verb + X) by Korean caregivers may increase the saliency of verbs. Third, the canonical word order in Korean is subject-object-verb, and the verb is typically placed in the utterance-final position in various sentence types (e.g., questions). The utterance-final position may be more salient to children because it is often lengthened and followed by silence. Seidl and Johnson (2006) demonstrated that infants are better at segmenting words from utterance boundaries than from the middle of an utterance, which they have called the Edge Hypothesis. In addition to the prosodic differences found at the end of an utterance, Seidl and Johnson noted that the recency effect could explain an infant's cognitive bias to remember words at the end of an utterance. Indeed, Kim et al. found that many of the caregivers used the canonical word order, and as a result, verbs were frequently found in the utterance-final position in the Korean speakers' input. In contrast, nouns were frequently found in the utterance-final position in the English speakers' input since the canonical word order in English is subject-verb-object.

Success with verb acquisition is not limited to Korean children. Tardif (1996) found that Mandarin-speaking children, aged 20 to 22 months, produced more verbs than nouns. Verbs often appear in the word-final position in Mandarin. Tardif also found a greater frequency of verbs in the input of Mandarin speakers to their children. While this study challenges the universality of the noun bias, when Tardif included proper and common nouns and all verb types in the analysis, a significant difference between the number of nouns and verbs produced was not found. Despite this limitation, the results from these studies with Korean- and Mandarin-speaking caregivers suggest that input frequency and sentence structure may influence

children's language acquisition, and the noun bias may not be universal. Several theories have been proposed to explain verb acquisition, which may provide further support for a noun bias.

Theories

Although a variety of theories have been developed to account for children's acquisition of nouns (e.g., Woodward, Markman, & Fitzsimmons, 1994), few of these theories have been applied to verb learning. Currently, three theories dominate the field of verb learning: 1) syntactic bootstrapping (Gleitman, 1990); 2) the social-pragmatic approach (Tomasello, 1995); and 3) the lexical principles approach (Golinkoff et al., 1996). Although considered mutually exclusive, these theories describe both the innate and environmental factors influencing the verb-learning process. However, these theories do not resolve debate about why verb learning is more difficult than noun learning.

According to the syntactic bootstrapping hypothesis, children use the relationships between syntactic structure and verb meanings to limit the number of possible verb meanings, hence facilitating verb acquisition (Gleitman, 1990). For instance, Naigles (1990) demonstrated that two-year-old children use the syntax of the input sentence to pair an action with a novel verb. This study utilized the preferential looking paradigm. In this paradigm, children sit on their parent's lap in front of two television monitors. Parents are blindfolded so they cannot influence their child's performance. Auditory stimuli are played over a loudspeaker while the videos play on the two monitors. The auditory stimuli only match one video. The principle behind the paradigm is that children will look longer at the monitor that

matches the auditory stimuli if they comprehend what they are hearing. The children in this study differentiated between causal and non-causal verbs based on the syntax of the input (i.e., transitive versus intransitive sentences, respectively). For example, during the teaching phase of this experiment, the children either heard a transitive sentence (e.g., The duck is gorging the bunny) or an intransitive sentence (e.g., The duck and the bunny are gorging) while watching a television monitor displaying a duck and a bunny performing two actions at the same time. One of the actions was causative (the duck was forcing the rabbit into an odd bending position), and the other action was non-causative (the duck and rabbit made arm gestures at the same time). Following the teaching phase, the two actions were separated. One screen showed the causative action only, and the other screen showed non-causative action only. The children viewed both videos simultaneously, and the accompanying audio asked the child to “Find gorging now!” (Naigles, p. 363). This procedure was repeated with three other novel verb labels. The results revealed that the children who heard the novel verbs in the intransitive sentence looked significantly longer at the monitor showing the non-causative action, and the children who heard the transitive sentence looked longer at the causative action during the test phase.

However, two factors suggest that syntactic bootstrapping may not play a primary role in children’s *early* acquisition of verbs. First, children younger than two years old have a limited amount of syntactic knowledge (Tomasello, 1995). Second, although two-year-olds may use syntactic knowledge to make *general* distinctions between verb forms, as demonstrated by the differentiation between causal and non-

causal verbs (Naigles, 1990), this knowledge likely does not help children learn *specific* verb meanings (Tomasello, 1995).

The social-pragmatic approach suggests that children and adults possess communicative skills that facilitate the verb learning process. Children's social and social-cognitive skills enable active participation in attaining semantic knowledge. Moreover, adults help the process of child word learning by naming objects/actions that the child is currently attending. According to the social-pragmatic theory, children learn some verbs better when the adult describes an action before or after it occurs than while it is occurring. For example, in a verb learning study, children performed significantly better when the verb label preceded the non-continuous action (e.g., "Look, Jason, I'll plunk the man") than when it was explicitly labeled by the experimenter while the action was occurring (e.g., "Look, Jason, I'm plunking the man," (Tomasello & Kruger, 1992, p. 325). Tomasello (1995) has performed a series of studies on verb learning and concluded that children can learn verbs in non-ostensive contexts (i.e., the action is not explicitly labeled, but rather named during conversation), and pragmatic factors facilitate children's acquisition of verbs.

Various supporters of the social-pragmatic theory have conducted studies to explain the noun bias (i.e., why verb learning is more difficult than noun learning). Although Goldfield (2000) found that adults produced more verbs in their own speech, adults prompt their children to produce more nouns than verbs. In addition, nouns occur more often than verbs, at the ends of utterances, in shorter utterances, and with fewer grammatical inflections in the speech of English-speaking mothers (Goldfield, 1993). Hence, caregiver input highlights nouns more than verbs, which

are often irregular, occur in many different forms and are embedded in the middle of an utterance (Goldfield, 2000).

The social-pragmatic approach explains some aspects of children's early word learning, but this theory alone cannot fully explain the acquisition of verbs. For instance, category development and children's ability to extend labels may be better accounted for through application of lexical principles (Tomasello, 1995). Golinkoff, Hirsh-Pasek, Mervis, Frawley, and Parillo (1995) define lexical principles as strategies that children use to limit the infinite number of possible meanings of a novel word. These principles develop from both innate and environmental factors.

The lexical principles proposed by Golinkoff et al. (1995) include: reference, extendibility, object/action scope, categorical scope, novel name-nameless category, and conventionality. Other researchers have proposed different lexical principles, but most have not been extended to verb learning (e.g., principle of contrast, Clark, 1987). In contrast, Golinkoff et al. (1996) claim their principles, which develop as a result of innate and environmental factors, refer to verbs as well as nouns. The principle of reference states that words symbolize objects, actions, and attributes. The principle of extendibility states that words do not map to a single referent, but to other exemplars that are perceptually similar or are associated with the original exemplar (Golinkoff et al., 1995). The ability to extend a verb to novel exemplars of the action shows true verb learning. The principle of categorical scope states that an action word is extended to a similar action despite a change in agent and minor changes in the manner of the action. The novel name-nameless category principle states that a novel word refers to an unnamed category. For example, given an unnamed action and one

for which a child already knows the word for, a new word should be assigned to the unnamed action. Finally, the principle of conventionality states that children can assume that speakers of the same language will use conventional words, because speakers tend to use the same words to express certain meanings (Golinkoff et al. 1996). To use this principle, children must first learn the conventional words for familiar objects. For example, when presented with a familiar object, a novel object and a novel word, the child assumes that the speaker would use the conventional name the child already knows for the familiar object, so the child associates the novel word with the novel object (Diesendruck, 2005).

These six lexical principles have been organized into two tiers. Tier one includes the first three principles (reference, extendibility, object scope) which are used first in noun learning around the child's first birthday; they are suspected to be used during early verb learning soon thereafter. Tier two consists of the principles of categorical scope, novel name-nameless category, and conventionality. The principles in tier two build on the principles in tier one. For example, the principle of categorical scope refines the principle of extendibility by specifying that extension should be made to referents in the same category as the original referent. The principles in the second tier begin to be used around 30 months and enable the rapid growth in vocabulary at this age (Golinkoff et al., 1995). For example, Golinkoff et al. (1996) demonstrated that 34-month-old children used the lexical principles in tier two to fast map (i.e., mapping a label to a referent after only a single exposure) novel verbs. In particular, children selected the novel action as the referent of the novel verb name (novel name-nameless category principle). Additional verb learning studies involving

children younger than 34 months have also found that children use lexical principles to learn new verbs.

Studies on Verbs and Actions

The principles of reference and extendibility have recently been studied by Maguire et al. (2002) to explain toddler's (aged 18-21 months) mapping of words to actions and events. In a series of three experiments on the comprehension of verbs, Maguire et al. used the preferential looking paradigm to determine how toddlers learn new verb names. Following a training phase, in which a novel action performed by an actress was paired with a novel verb label presented three times, the children were tested on their learning of the verb. During the testing phase, the children heard the same word presented with two new videos. In one, a new agent performed the same action labeled during the training phase. In a second video, another person performed another novel action. Fixation time was recorded to determine if the children looked longer at the screen displaying the action labeled during the training phase when it was named (i.e., could they extend the novel word to another exemplar). The children did not extend the novel verb label to a new agent performing the action when given only one training example of the target action paired with the verb. During experiment two, the children were given four examples of the action performed by four different actors during the training phase, but the children still could not generalize the verb name to a new agent performing the action.

In their final experiment, Maguire et al. (2002) utilized a point-light display during the training phase to simplify the agent of the action and hence, the learning task. A point-light display is a biomechanical display of motion that is created by

affixing light-emitting diodes to the major joints of a person's body (ankles, knees, hips, wrists, elbows, shoulders) and to his or her head and videotaping the person performing an action. The final product is a black screen displaying white dots that move in the same way a person moves (Liu et al., 2000). In other words, the image looks similar to lights in motion that, if connected, could form a stick figure.

Golinkoff et al. (2002) and Liu et al. have also successfully used point-light displays in their research on verbs. For instance, Golinkoff et al. determined that three-year-olds were able to perceive familiar motion verbs in point-light displays. In Maguire et al.'s study, the children were exposed to one trial of the action depicted in a point-light display paired with a novel verb label presented three times during the training phase. During the testing phase, they found that the children generalized the verb name to a real person performing the action. Through point-light displays, Maguire et al. demonstrated that 18-to-21-month-olds use the principles of reference and extendibility. One hypothesis that developed from this experiment is that the point-light display simplifies the visual display. Real life stimuli contain multiple distracting variables for the child to attend to, which makes pairing the label with the action a more difficult task. Hence, the modified input (i.e., simplifying the agent of the action) to the children facilitates their ability to apply the lexical principle of extension.

One limitation of this study is the absence of point-light displays in a child's natural environment. To generalize the findings from this study, further explanation is needed about why point-light displays may facilitate verb learning. The only information available in a point-light display is the overall shape of the light

sequences as they move. Golinkoff et al. (1995) defines shape as the overall configuration of the action that remains consistent across different agents of the action. When a child abstracts the shape of an action or the verbal essence (i.e., “the semantic component of the event that is encoded by the verb,” Maguire et al., 2002, p. 377), he or she loses the specific details of the original exemplar and creates a single representation of the action (Golinkoff et al.). Golinkoff et al. suggested that the shape of the action may be responsible for verb extension by children. Contextual information, such as the agent of the action and the location, is eliminated in a point-light display (Liu et al., 2000). Therefore, a point-light display may facilitate the child’s task of extracting the shape of an action. Since toddlers can extend a novel verb label after a short exposure to the verb while viewing a point-light display of the action, shape appears to be a defining characteristic in facilitating the early acquisition of verbs.

The question that remains is whether adults can facilitate the verb learning process by using real-world stimuli that highlight the shape of the action in a similar manner to the point-light display in Maguire et al.’s (2002) study. Before Maguire et al.’s study can be extended to real-world stimuli, it is crucial to determine whether 18-month-olds can generalize an action performed by one real-world agent to another real-world agent of the action. Although not a study on verb learning, Tomasello, Striano, and Rochat (1999) found that 18-month-olds could generalize the action performed by a simple object to a human’s gesture of the action. For instance, the experimenter used a stick (a simple object) to pretend to draw on the floor. After this demonstration, the experimenter said to the child, “Give me the _____,” and the

experimenter either performed the symbolic gesture of “drawing” with her finger (gesture condition) or held up a crayon (object condition). In each condition the child was supposed to select the stick from a field of four. The 18-month-olds performed significantly above chance in the gesture condition, but not in the object condition. The results of this study suggest that 18-month-olds can focus on the action performed with a simple object and generalize this action to another agent of the action. It is possible that the children could extract the shape of the action being performed with a simple object which led to their better performance on the gesture condition compared to the object condition. The results suggest that 18-month-olds can associate the same action performed by two different agents.

Two aspects of verb learning emerge from the literature review presented above: 1) 18-to-21-month-old children cannot extend a verb label to a new agent of the action, unless the shape of the action is made more apparent (Maguire et al., 2002); and 2) 18-month-old children learning other languages have more verbs in their vocabulary than 18-month-old English-speaking children, which may be linked to environmental input (Kim et al., 2000).

The Present Study

Description, Hypotheses, and Research Questions.

The purpose of the present study was to determine if simplifying the input facilitates verb learning. Within a social-pragmatic approach (i.e., input and pragmatic factors influence vocabulary development), the present study was designed to vary one aspect of the input children receive when learning new verb labels: the agent of the action (i.e., the independent variable in this study). In addition, the

lexical principle of extendibility, which demonstrates true verb learning (Golinkoff et al., 1995), was tested.

The study probed the following questions: 1) Can 18-month-old children extend a new verb label for an action performed by a simple object to new real-world agent of the action?; and 2) Will the initial exposure to a new action performed by a simple object (a block) facilitate verb learning more than if the action during the initial exposure is performed by a real-world agent (a person)? We hypothesized that after the initial exposure to the novel verb, 18-month-olds would generalize the novel verb label for a novel action performed by a block to a person performing the same novel action. On the other hand, we hypothesized that 18-month-olds would not generalize the novel verb label for the novel action when the agent of the action during the initial exposure was a person.

A block was used as the simple object because it is devoid of visually distracting variables, suggesting that it might allow the shape of the action to be highlighted similar to the point-light display. A person is more complex than a block because of his or her visual characteristics (e.g., hair, face, eyes, fingers, etc.). An intransitive continuous verb, which describes non-causative actions, was used because this type of verb is present in 90% of 16-month-olds' receptive vocabularies, does not require another object, and its action can continue for an infinite amount of time (Dale & Fenson, 1996). Hence, the properties of continuous intransitive verbs suggest that they may be easier to learn. The novel verb the children heard was referred to as "klagging." The present progressive tense was chosen since this tense is acquired early in language acquisition (Brown, 1973). This novel word, created by

the experimenter, was used because it abides by the phonetic rules of the English language. Verb learning was measured by the ability to generalize the verb name to a new agent of the action (Golinkoff et al., 1995).

It is worth noting that the present study is not dependent on children's ability to recognize the simple object (e.g., a block) as a symbolic representation of its real-world referent. Although some researchers have found that 18 months marks the emergence of symbolic play with objects, the age of acquisition for symbolic play has been debated. For instance, Harris and Kavanaugh (1993) found that 18-month-old children demonstrate an understanding of pretend play actions. On the other hand, DeLoache (1991) showed that two-to-three-year-olds cannot use objects as symbols. The children in DeLoache's study were shown an adult hiding a small doll in a miniature doll house and then shown a larger identical doll and an identical life-size room. They were told that the doll was hidden in the same place in the real room as in the miniature doll house, but the children could not use the small room as a symbol of the larger room to find the doll in the big room. Tomasello et al. (1999) argued that DeLoache's task involves more representational complexity than early symbolic play. However, as noted above, Tomasello et al. did not find that 18-month-old participants could comprehend that the stick was a symbolic representation of a crayon. The controversy around the emergence of symbolic play is why the present study avoided an examination of children's ability to see the block as a representation of a person, but rather focused on whether naming the action performed by a simple object facilitates generalization of the verb name to a new agent performing the same action.

Rationale for Subject Selection.

Eighteen-month-olds were used in the present study because previous research suggests that 18 months may mark the beginning of verb extension. Casasola and Cohen (2000) determined that 18-month-old children can associate a novel label with a novel action within a few minutes, but 14-month-olds did not demonstrate this ability. These results suggest that children younger than 18 months would not be able to extend a novel action label to a new agent performing the action. In addition, Maguire et al. (2002) concluded that 18-month-old children can extend an action label when given a simplified presentation of the action, and Tomasello et al. (1999) demonstrated that 18-month-old children can extend an action performed by a simple object to a gesture of the action. Finally, Poulin-Dubois and Forbes (2006) reported that extension of verb labels for motion verbs begins between 18 and 21 months.

To note, one limitation of Maguire et al.'s (2002) studies is the wide age range (17.92-21.07 months) of their participants. Maguire et al. concluded in their discussion that 18-month-olds learned the verb when the point-light-display served as the agent of the action, but not when the person was the agent. However, the mean age of participants was actually 19 months in all of their experiments. Although not explicitly stated, we assumed that they analyzed the data of the individual participants to ensure that even their youngest participants showed the effect. Despite this discrepancy, additional researchers also have cited Maguire et al.'s findings as pertaining to 18-month-olds (Imai et al., 2006). Therefore, a narrower range of ages was recruited to determine if a simplified agent truly facilitates verb learning in 18-month-olds.

Design.

The present study is a between-subjects design, so each child participated in only one condition of the study. This design was chosen to decrease memory requirements and the amount of time the children were required to maintain attention to the tasks. Furthermore, the between-subjects design allowed us to use the same novel verb in both conditions, since each child was exposed to only one condition. Two conditions were established for this study. In one condition (Block Group), the children learned a novel verb label for a novel action performed by a simple object (a block). In the second condition (Person Group), the children learned a novel verb label for a novel action performed by a person. The person wore white and khaki colored clothing so the contrast between the agent of the action and the dark background was consistent across conditions. All children were exposed to the verb label during a training phase and then the children's ability to extend the novel verb label to a new agent of the action was tested during a testing phase.

Chapter 2: Method

Participants

Twenty-four 18-month-old children (16 male and 8 female; age range 17.43-18.7 months; mean, 18.12 months) participated in the present study. A study size of twenty-four was selected because this number of participants has been used in other studies on verb learning and has been found to be sufficient to obtain effects (e.g., Naigles, 1990). Recruitment was conducted through phone calling to parents of children between the ages of 17 to 18 months who have agreed to be contacted about studies at the University of Maryland. The contact information was obtained from a database shared by three laboratories at the University of Maryland which contains names and addresses of children from a variety of ethnic, socio-economic and racial backgrounds in the Washington, D.C.-Baltimore Metro Region. Eligible participants were healthy, typically-developing children whose caregivers speak English to them 80% or more of the time. An additional two children participated in the study, but their data were discarded because one child was diagnosed with cerebral palsy and another child's eye movements were difficult to code. Of the 21 participants whose parents provided information about their child's race, 76% of the children were Caucasian, 19% were African-American, and 5% were Hispanic. Parental education was used as a measure of socio-economic status. Of the 23 participants whose parents provided information about their highest level of education, 22% had their doctoral degree, 38% had their master's degree, 31% graduated from a four-year college, 4% attended some college, 2% graduated from a two-year college/trade school, and 2% received their high school diploma. Overall the sample included a majority of

Caucasian participants whose parents attained a high level of education. All caregivers who agreed to allow their child to participate in the study were mailed the *Language Development Survey* (Rescorla, 1990), an expressive vocabulary checklist, for them to complete prior to their visit to the laboratory. This checklist was used to determine if any correlations between current vocabulary level and ability to learn the novel verb in the present study existed. Hearing status was determined through parental report. Parents were asked if their child currently had an ear infection prior to scheduling the appointment and on the day of the study, and if their child had a history of ear infections. Two children with mild ear infections were included in the study, because we determined that the novel verb would sound the same to them throughout the study. The children were randomly divided into the two groups (Block and Person Groups) to represent the two conditions described above. There were 12 children in each group. Each group consisted of eight males and four females. The groups did not significantly differ in the total number of words [$t(22) = 0.92, p > .05$] nor the number of action words [$t(22) = 0.56, p > .05$] in their expressive vocabularies as reported on the *Language Development Survey*.

Materials

Six separate videos were created, four for the training phase and two for the test phase. During the training phase, each child saw one of the four possible videos. Each video portrayed one of two different novel actions created for this study: the first is a 3 jump motion that involves jumping in a triangular pattern, and the second is a twisting jump motion. The twisting jump required that the actress face the right wall, jump in a half-circle to face the left wall, and then jump back to face the right

wall. At all times, the actress jumped toward the camera so her back was never facing the camera. The two actions were performed either by a rectangular wooden block or by a woman. Thus, children saw one of two actions performed by one of the two agents. The action presented to the children was counterbalanced across individuals within a group. The remaining two videos were used during testing and consisted of a different woman performing each of the two actions.

The specific actions were chosen because they could be performed both by a block and a person. These actions require that the person remain in a straight position without moving his or her arms or legs away from her body; hence, these actions look similar when performed by the block or the person. To note, the experimenter moved the blocks to perform the action, but her hand was not visible on the videos.

Procedure

Children were tested in the Intermodal Preferential Looking Paradigm because this method has been used successfully in the past to test young children's comprehension (Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987; Hirsh-Pasek & Golinkoff, 1996). In addition, Maguire et al. (2002) successfully used the preferential looking paradigm with 18-to-21-month-old children to study verb learning. As previously described, children sit on their parent's lap in front of two television monitors. In this study the parent wore headphones playing masking music so he or she could not influence the child's performance. Auditory stimuli were played over a loudspeaker while the videos played on the two monitors. The auditory stimuli only matched one video. The principle behind the Intermodal Preferential Looking Paradigm is that children will look longer at the monitor that matches the auditory

stimuli if they comprehend what they are hearing over the loudspeaker. In the present study, the auditory stimuli were the verb labels that the children were exposed to in the training phase embedded in carrier phrases during the testing phase (e.g., Which one's klagging?). To eliminate the confounding factor of a preference for right or left orientation, assignment of video to the left or right monitor was counterbalanced throughout the study. Each child participated in both phases of the study described below.

Phase 1: Training Phase.

During the training phase, children in both groups were exposed to the novel verb “klagging”. The Block Group saw a block performing the action, while the Person Group saw a woman performing the action. Within each group, half of the children heard the verb while viewing the 3 jump action, and half of the children were trained while viewing the twisting action. Thus, children either saw a block or a person performing one of the two actions.

Each training phase consisted of two trials, lasting 10 seconds each. The child heard the verb three times during each of two trials, for a total of six exposures to the verb. The action was labeled while the child viewed the video (e.g., “Wow, look, the block/woman is klagging.”). In one trial, the video played on the left monitor, and on the other trial it played on the right monitor. This prevented the children from expecting the action to appear on one monitor in particular. Which monitor showed the action first was counterbalanced across individuals within a group.

Phase 2: Test Phase.

Immediately following the training phase, the testing phase began. This phase was designed to determine if the children had successfully learned the action-naming

pairing in the training phase. There were 12 test trials, each lasting 7.5 seconds, during the testing phase. This number of trials was used to ensure that the children would have numerous opportunities to show their comprehension of the verb. The television monitors played simultaneously. Assignment to the left or right monitors was counterbalanced. During half of the trials, the child heard an auditory stimulus that instructed him or her to look generally (e.g., “Wow, look!”). These are called the baseline trials. During the other half of the trials, the child heard an auditory stimulus that instructed him or her to look at the video of the action labeled during the training phases (e.g., “Which one’s klagging?”), called the experimental trials. The baseline trials were included to measure looking time to each monitor that would be expected by chance. By comparing the mean looking time during the experimental versus the baseline trials we eliminate the confounding factor of preference (i.e., the children merely preferred one video over the other during the experimental trials). The 12 test trials were divided into six blocks such that each block included the presentation of the stimuli from one baseline and one experimental trial. The order of presentation of the auditory stimuli was randomly distributed within each block to prevent a pattern of stimuli presentation. While in the testing booth, the children were videotaped to allow for offline coding.

Data Coding and Analysis

The videos of the children watching the television monitors were used to code fixation time offline. The experimenter, who was trained to code videos in the Language Development Lab at the University of Maryland and is considered an expert coder, watched the videos with the sound off so she could not bias the results.

While coding, time (seconds) spent looking in any direction away from either television screen was subtracted from the total looking time in seconds, for each trial separately (See Formula A below).

Formula A.

$$\begin{aligned} & \text{Total looking time (seconds)} \\ & - \text{Time looking away from monitors (seconds)} \\ & = \text{Time looking at any monitor (seconds)} \end{aligned}$$

The first question addressed whether children in either group were able to generalize the verb name. We hypothesized that children in the Block Group would learn the verb, whereas children in the Person Group would not learn the verb. We first determined the proportion of total time (seconds) spent watching the matching video (i.e., the video displaying the action named during the training phase) versus the mismatching video for each group (See Formula B below). Mean proportions were calculated separately for the experimental and baseline trials. Proportions were used because they account for the time the child spent watching the matching video relative to the time spent watching the mismatching video. If the children could generalize the verb, we would expect that they would watch the matching video for a greater percentage of time longer during the experimental trials (when the verb was named) than during the baseline trials. A paired *t*-test was performed separately for the Block and the Person Groups.

Formula B.

$$\text{Proportion time looking at matching video} = \frac{\text{Time looking at matching video}}{\text{Total time looking at either monitor}}$$

All comparisons also were made based on the single longest look at the matching video on each trial, because this may be a more sensitive measure of toddlers' preferences than measures involving overall looking times (Schafer &

Plunkett, 1998). While coding fixation time, the longest look time to each monitor during each of the test trials was recorded. This value was used to calculate the proportion of the longest look time at the matching video during the experimental and baseline trials for both groups.

Comparisons using the longest look and total looking measures were originally made based on the data from all 12 test trials. Twelve trials may have exceeded the number of trials needed to determine if the children generalized the verb name. The children may have become bored after the first half of the testing phase and turned their attention to the novel action being displayed on the other monitor. Therefore, comparisons based on the first six test trials were also conducted using the total looking and longest look measures.

The second question examined whether a significant difference between the Block Group and the Person Group existed. If the block facilitated the children's ability to generalize the verb name, as hypothesized, the Block Group would generalize the verb name significantly more than the Person Group. These comparisons were made using total looking time and the longest look measures. A two-factor ANOVA was used to determine if there was a main effect of group (Block Group versus Person Group) and/or trial (experimental versus baseline) and/or an interaction effect. A significant interaction would indicate that one of the groups generalized the verb name significantly more than the other group.

The final question investigated whether expressive vocabulary development correlates with a child's ability to comprehend a new verb. Correlations were calculated to determine if the number of words in the children's expressive

vocabularies, measured by the *Language Development Survey* (Rescorla, 1990), correlated with their performance during the testing phase. The difference between the total time spent looking at the matching video during the experimental trials versus the baseline trials was correlated with the total number of words and the total number of action words in the children's expressive vocabularies. These correlations also were calculated using the longest look measure.

Chapter 3: Results

We cannot draw any conclusions about the role that simplification of the agent of the action has on verb learning unless either of the groups were able to generalize the verb name. Therefore, the first analysis determined if verb learning was achieved by either group. Using total looking times, children in the Block Group did not watch the matching video significantly longer when it was named during the experimental trials compared to the baseline trials [$t(11) = -0.24, p > 0.05$]. The children in the Person Group also did not learn the verb [$t(11) = 0.42, p > 0.05$]. These results indicate that neither group generalized the verb name. The paired t -tests on the longest look measure revealed nonsignificant results for the Block [$t(11) = -0.22, p > 0.05$] and Person Groups [$t(11) = 0.37, p > 0.05$]. Paired t -tests using the data from the first half of the trials also revealed nonsignificant results for the Block [$t(11) = 0.04, p > 0.05$; $t(11) = 0.75, p > 0.05$] and Person [$t(11) = 0.89, p > 0.05$; $t(11) = 0.08, p > 0.05$] Groups using the total looking and longest look measures respectively. Data from all the measures for all 12 trials can be seen in Table 1. Data based on the first six trials can be seen in Table 2. The overall matching results based on all 12 trials can be seen in Figure 1 and Figure 2 for the total and longest look measures respectively.

A comparison across conditions did not yield a significant result for a main effect of group or trial or an interaction effect, which could be predicted from the mean values in Table 1; however, the analysis was still performed for this master's thesis. There was no main effect of trial type. Eighteen-month-olds did not show a larger proportion of looking to the matching video when the verb was named (experimental trials) compared to the baseline trials [$F(1,23) < 1$]. Nor was there any

effect of group [$F(1,23) < 1$]. Finally, there was no interaction between the groups and trial types [$F(1,23) < 1$]. The block did not facilitate verb learning; the hypothesis was not supported. Similar results were shown with the longest look measure [$F(1,23) < 1$].

Since the above results indicated that neither group learned the verb, we conducted an additional *t*-test to determine if the children watched the matching video more than the mismatching video during the baseline trials. This comparison was conducted to determine if the children merely remembered the action that they saw during the training phase. If they remembered the action, the children would have watched the matching video significantly longer than the mismatching video when the verb was not named during the baseline trials. However, we did not find a significant result for the Block [$t(11) = -0.94, p > 0.05$; $t(11) = -0.15, p > 0.05$] nor the Person [$t(11) = -0.30, p > 0.05$; $t(11) = -0.31, p > 0.05$] Groups on the total looking and longest look measures respectively; the children did not match the action viewed during the training phase to the same action viewed during the testing phase.

The *Language Development Survey* (Rescorla, 1990), completed by parents, was used to calculate the number of words in each participant's expressive vocabulary. There was a wide range (2-236 words) of vocabulary produced by the 18-month-olds in this sample. Expressive language development, as measured by this survey, did not correlate with performance during the testing phase for the total look measure ($r = -0.17$) or for the longest look measure ($r = -0.13$). Total number of action words (range 0-31 action words) produced by the children also did not correlate with performance during the testing phase for the total look measure ($r = -$

0.059) or for the longest look measure ($r = -0.013$). Expressive vocabulary or the number action words produced by the children did not correlate with verb learning.

Table 1: Proportions of Looking Time (in seconds) for All 12 Trials

	Group			
	Block		Person	
	Mean	Standard	Mean	Standard
		Error		Error
Proportion of looking				
To experimental trials	0.48	0.04	0.54	0.05
To baseline trials	0.49	0.04	0.51	0.07
Proportion of longest looks				
To experimental trials	0.47	0.03	0.50	0.04
To baseline trials	0.48	0.04	0.48	0.07

Table 2: Proportions of Looking Time (in seconds) for First 6 Trials

	Group			
	Block		Person	
	Mean	Standard	Mean	Standard
		Error		Error
Proportion of looking				
To experimental trials	0.48	0.05	0.54	0.06
To baseline trials	0.48	0.04	0.48	0.06
Proportion of longest looks				
To experimental trials	0.48	0.04	0.49	0.04
To baseline trials	0.44	0.02	0.49	0.07

Figure 1: Preference for Matching Video: Total Looking Times (all 12 trials)

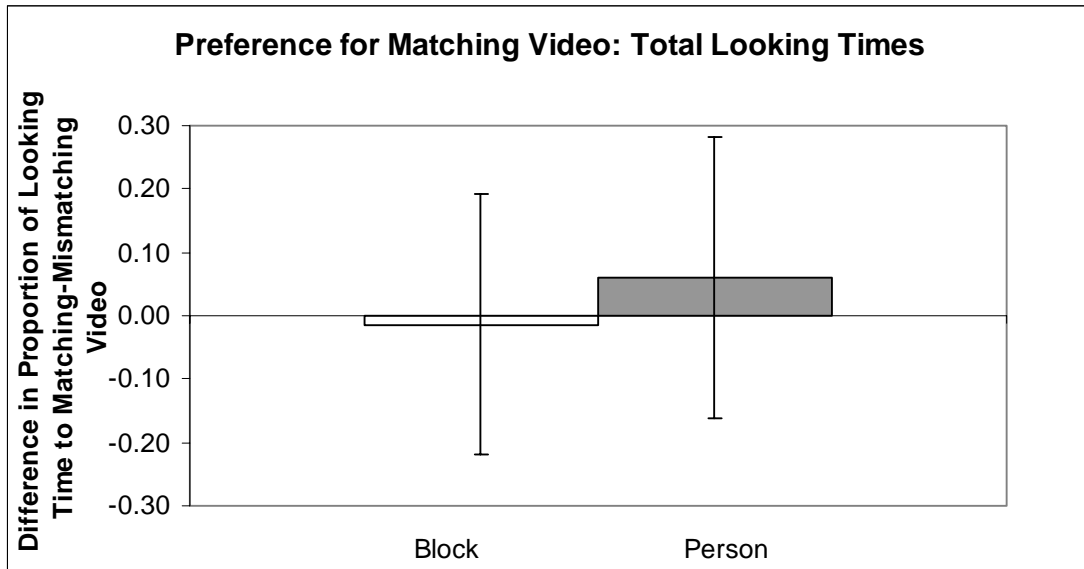
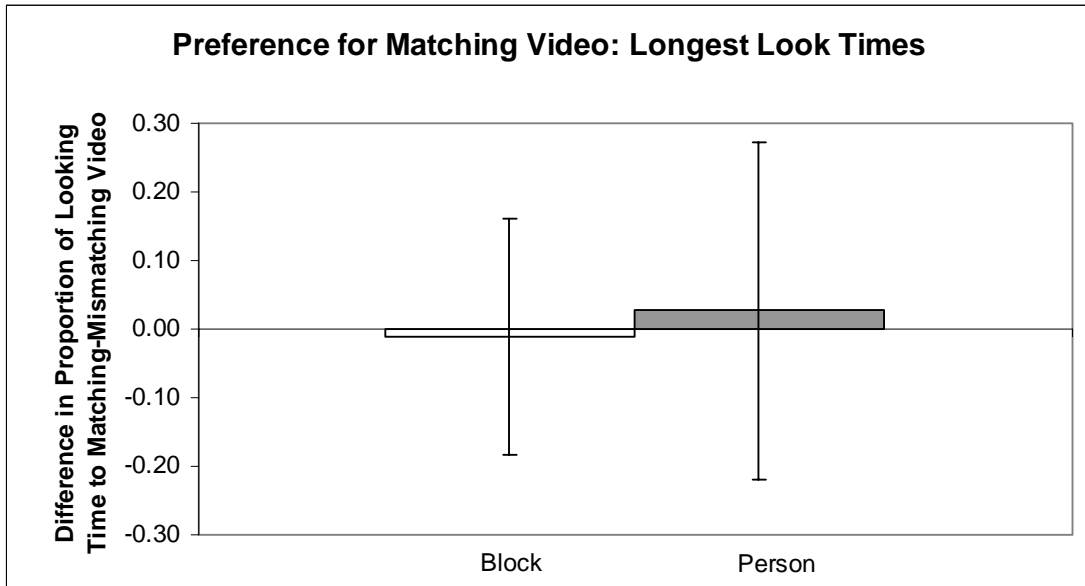


Figure 2: Preference for Matching Video: Longest Look Times (all 12 trials)



Chapter 4: Discussion

A current trend in the literature on language development has been to expand the research on verb learning, but many questions about how children learn verbs have been unanswered. Specifically, cross-linguistic differences in verb learning are still being debated. In addition, Maguire et al. (2002) concluded that English-speaking 18-month-olds learn verbs more readily when exposed to a simplified computer-generated agent of the action. However, additional research with 18-month-old English-learning children exploring the effect of a simplified input on verb learning had not been conducted prior to the present study.

We hypothesized that a simple real-world agent performing a novel action would facilitate verb learning in 18-month-olds. Golinkoff et al. (1995) suggested that extraction of the shape of the action may be responsible for verb extension by children. Thus, we predicted that a simple wooden block may make it easier for children to extract the shape of a novel action and associate it with the verb label than if a person is the agent of the action. Therefore, half of the children saw a block perform the action and half of the children saw a person perform the action. However, our hypothesis was not supported by the results of this study; children in the Block Group did not learn the verb, and there were no significant differences between the two groups. Furthermore, the results did not show any trend to suggest that using a simple object facilitates verb learning in 18-month-olds. In fact, the present results suggest that the block may have made the task of generalization more difficult than when the person was the agent of the action. These findings imply that a block does not provide the same verb learning advantage as a point-light display at this age.

Modification of one input factor (i.e., simplification of the agent) did not facilitate verb learning and the social-pragmatic approach was not supported by these results.

However, it is important to note that the social-pragmatic approach may be too vague to test directly and independent of the principles set forth by other theories of verb learning. For instance, in the present study we explained that a significant finding would support both the social-pragmatic approach and the lexical principles approach. If significant results were found, we could argue that the children benefited from the simplified environmental input (social-pragmatic approach), and they used lexical principles to learn the verb. Furthermore, although it has been suggested that the syntactic bootstrapping hypothesis does not apply to early word learners, the children could have used syntactic factors (i.e., the sentence in the present study did not have a direct object) to link the novel verb with the continuous action.

Unfortunately, the present findings do not support any of these theories. However, the present study does suggest that the three main theories of verb learning (social-pragmatic approach, lexical principles approach, syntactic bootstrapping) cannot always be considered mutually exclusive. It is likely that children use social-pragmatic factors, lexical principles, and syntactic bootstrapping to learn novel words.

We also predicted that children in the Person Group would not generalize the verb. This hypothesis was supported; children in the Person Group did not generalize the verb name to another agent of the action. Eighteen-to-twenty-one-month-olds cannot generalize a verb following the initial exposure to a novel action performed by

a person and the novel verb label (Maguire et al., 2002). Therefore, it is not too surprising that verb learning was not achieved by children in the Person Group.

As shown in Table 1, the difference between the mean proportion of looking time during the experimental trials and the baseline trials is greater for the Person Group than the Block Group. When looking at the data from all twelve trials, the Block Group watched the matching video slightly less than chance and the Person Group watched the matching video slightly more than chance. This pattern suggests that children in the Person Group performed slightly better than children in the Block group, which contradicts the present hypothesis. The differences were minimal, but they do deserve an explanation. One limitation of the present study is the similar appearance of the women in the training and testing phases, which may account for the superior performance of the Person Group. If the women were mistaken as the same, the children in the Person Group may have watched the matching video longer, because they thought it was the exact same video they viewed during the training phase. Thus, we cannot conclude that the Person Group performed any better on the task of verb learning. To note, the Block Group watched the matching video slightly longer during the experimental trials versus the baseline trials when the comparison was based on the longest look measure during the first six test trials (Table 2). This suggests that after the first half of the testing phase the children may have turned their attention to the novel video. As such, future research using only six test trials is warranted to determine how children would perform on this task when confounding factors are eliminated.

There are two possible explanations for the lack of significant results: 1) the children did not learn the verb during the training phase; or 2) the children learned the verb during the training phase, but failed to generalize the verb to a new agent during the testing phase. If the former, it suggests that 18-month-olds cannot learn a novel verb after the initial exposure to the verb and a real-world agent performing the action. The children in this study did not use lexical principles (i.e., the principle of reference and the principle of novel-name nameless category) to learn the verb. Moreover, a simple agent did not facilitate verb learning at this age.

In contrast, the second explanation implies that the 18-month-olds were able to learn the verb during the training phase, but could not apply the principle of extendibility. This explanation suggests that the 18-month-olds in this study may have applied the lexical principles of reference and novel-name nameless category to learn the verb during the training phase. Because we did not retest the trained item during the test phase, we cannot determine for certain which explanation is correct. However, there are reasons to believe that the children may have failed to learn the word at all. First, Maguire et al. (2002) concluded that 18-month-olds can learn and generalize a novel verb when the agent of the action is simplified, but the Block Group in the present study did not generalize the verb, suggesting that the differences between a block and a point-light display may have made it more difficult to learn and generalize the verb. The present study was designed to replicate the findings of Maguire et al.'s (2002) experiments using real-world stimuli; however, there are numerous differences between a block and a point-light display. A point-light display is created by affixing light-emitting diodes to the major joints of a person's body. The

result is an image that looks like a moving stick figure. Arms, legs, and a head are present in a point-light display of a human, whereas a block shows no resemblance to a person. The block did not have any features that could make it appear animate, such as appendages, eyes, or a mouth, which is likely to contribute to the difference in the results obtained from the two studies. Perhaps the children knew that the block is inanimate and cannot perform actions by itself. According to the probable-event strategy, children use their knowledge about probable and improbable events to interpret sentences, and two-year-old children have difficulty interpreting sentences that involve improbable events (Strohner & Nelson, 1974). If the block had eyes and a mouth, the children may have been more likely to accept it as an animate object, since children often see personified inanimate objects perform actions on popular television shows. In fact, Jones and Smith (2002) claimed that eyes are a potent cue for animacy.

An additional difference between a block and a point light display is that every joint movement can be captured in a point-light display. Although every attempt was made by the actresses to keep their arms and legs in a straight line like a block, slight movements of the extremities could not be avoided. Finally, a point-light display may be more interesting to a child than a block; if so, children may have attended more to the stimuli during Maguire et al.'s study, contributing to better learning. The differences between a block and a point-light display do not suggest that the results from Maguire et al.'s study cannot be replicated with real-world stimuli. These differences imply that generalization from a point-light display to a person is an easier task than generalization from a block to a person, and the point-

light display allows the child to capture the shape of the action, whereas the block did not provide that same effect. The differences between the block and the point-light display may have made both the task of verb learning and generalization more difficult. Perhaps, children slightly older than 18 months would benefit from the simplification of the block that has eyes and a mouth when learning verbs.

Second, the age differences between the samples used in the present study and Maguire et al.'s studies (2002) may explain why the children did not learn the verb. As previously stated, Maguire et al. concluded that 18-month-olds learned the novel verb while viewing the point-light display; however, their participants included children between the ages of 18 and 21 months. In contrast, current participants were all at the younger end of this range. Since previous research suggested that 18 months may mark the beginning of verb learning (Casasola & Cohen, 2000) and extension (Poulin-Dubois and Forbes, 2006), and a number of studies on language acquisition have included a sample of 18-month-olds (Poulin-Dubois and Forbes, 2006), the present study was designed to determine if 18-month-olds can learn and extend a novel verb when the agent during the initial exposure is simplified. Despite this rationale, the age difference may have made it less likely that children would be able to learn the verb in the current study. Maguire et al. did not report their results by age group, so the effect of verb learning could have been driven by the older participants in their study. If so, it would suggest that slightly older participants may benefit from the simplification.

Third, the number of exposures to the novel verb in Maguire et al.'s study may have exceeded the number of exposures in the present study, which would

explain a lack of learning in our study. The testing phase in Maguire et al.'s study consisted of one trial lasting 24 seconds. We included two trials, lasting 10 seconds each, to match the length of our audio, because this was the length of our actual recordings. As a result, the children in the present study were exposed to the novel verb six times while viewing the novel action for 20 seconds. Since 12-month-olds are able to learn a novel noun following five exposures to the noun (Brand, 2000), it was predicted that six exposures to the novel verb would be sufficient. However, it is unclear whether Maguire et al. matched the length of their video to their audio. Maguire et al. reported that the children heard the novel verb embedded in three different carrier phrases, but they did not state whether these phrases were repeated during the 24 second trial. We assumed that each phrase was stated one time for a total of three exposures to the novel verb. If so, there was likely a large section of video unaccompanied by audio. But another possibility is that they repeated the audio phrases throughout the 24-second trial. The text of the paper is unclear on this aspect. If these phrases were repeated, the children in Maguire et al.'s study may have been exposed to the novel verb more than the children in the present study. Hence, a lack of verb learning in the present study may be explained by too few exposures to the novel verb.

Finally, previous research suggests that the nature in which the verb was named in the present study also may explain why the children did not learn the verb. The action in the present study was labeled as the action occurred. Tomasello and Kruger (1992) found that twenty-four-month-olds learned verbs better when the labeling occurred either before or after the action occurred. Compared to a static

object, a dynamic action may be more visually distracting and interesting to a toddler. Tomasello and Kruger argued that children may focus on the novel action and ignore the auditory stimuli, which could have occurred in the present study. When the verb is named before or after the action occurs, the child is able to focus on both the action and the verb label at separate times. Tomasello and Kruger's study may provide one explanation for the children's difficulties learning the verb in both the block and person conditions. However, Tomasello and Kruger used a non-continuous action (i.e., a doll rolled down a ramp into a hole), which means that once the action was completed it was no longer visible. In contrast, the action in the present study was continuous, which gave the children more time to attend to both the action and the verb label. A failure to attend to both the verb and action also could be explained by the amount of time allotted to each trial in the training phase rather than the simultaneous presentation of the auditory stimuli and the action. Several limitations of the present study also suggest that the children failed to learn the verb.

Limitations

Given that this is the first study using real-world stimuli designed to test the hypothesis that simplification of the agent of the action facilitates verb learning, several limitations surfaced. Limitations that may have impacted the results include: 1) the similarities between the women in the training and testing videos; 2) the short length of the training phase; and 3) assignment of the verb name to the block rather than to the action. These limitations also suggest that the children did not learn the verb during the training phase.

As previously stated, the children in the Person Group performed slightly better than children in the Block group, which contradicts the present hypothesis. However, careful examination of the training and testing videotapes led to the conclusion that the two women on these videos looked very similar in appearance. Both women were thin, with curly hair, and wore the same clothes. Eighteen-month-olds with fleeting attention may have mistaken the women as the same. In addition, the length of each trial was short (7.5-10 seconds), which may not have been enough time to allow the children to notice the subtle differences between the actresses. The slightly better performance by the Person Group can be explained by the similarities between the women in the videos. If the women were mistaken as the same, the task of generalization would have been eliminated. However, were that the case, we would have expected any child who had learned the word to watch the matching video significantly longer when it was named. Thus, this limitation actually provides some evidence that children did not learn the verb during the training phase.

The second limitation is the length of time allotted to each trial during the training phase. The training phase exposed the children to the novel action and verb for two trials lasting 10 seconds each. This may not have been enough time to allow the children to attend to the video and the auditory stimuli, and therefore they were not able to learn the verb during the training phase. This design was chosen to resemble the design used in Maguire et al.'s (2002) studies, which exposed the children to one trial of the novel verb and action. Since 92% of 16-month-olds have at least one verb in their receptive vocabulary, it is expected that if the children were given more time to associate the novel verb with its referent and more exposures to

the novel verb, verb learning would eventually be achieved in a sample of 18-month-olds (Dale & Fenson, 1996).

The interesting finding in Maguire et al.'s study was that the children learned the same novel verb after only one trial of a point-light display performing the action. This finding provided the incentive for carrying out the present study and the decision to expose the children to the novel action and verb for a short amount of time. Nevertheless, the differences between the block and the point-light display, and the possibility that the children in Maguire et al.'s study were exposed to the novel verb more than six times suggest that the 18-month-olds in the present study may have needed more than 20 seconds to associate the verb name with the action during the training phase.

Another concern is that the children may have taken the new word to refer to the noun, rather than the verb. To try to avoid this, we used a familiar object as the agent (the block) and we included the word "block" in the auditory stimuli, which we assumed was a word in 18-month-olds' receptive vocabularies. The novel nameless category principle claims that a novel word refers to an unnamed category (Golinkoff et al., 1996). If the children applied this principle, they would associate the novel word (klagging) with the novel action, since they already know the name for the block. We also eliminated the possibility that the children would assume the novel word was another name for the block by including the word "block" in the auditory stimuli. However, comprehension was not assessed through testing or parental report, so we cannot conclude that all of the children understood the word "block", in which case two novel words may have been present in the auditory stimuli. As a result, the

children may have assigned the verb to the block, which would result in a failure to learn the verb. An alternative explanation is that 18-month-olds have not yet learned to apply the principle of novel name-nameless category. Future researchers should ask parents whether “block” and “woman” are in their child’s receptive vocabulary. An alternative would be to conduct an informal receptive vocabulary test using pictures and/or objects.

Cross-linguistic Research

Prior research has suggested that putting a target word at the end of a sentence makes it easier to learn (Seidl & Johnson, 2006). This has been argued to be one explanation for why children learning languages with a subject-object-verb canonical word order have more verbs in their vocabularies (Kim et al., 2000). Goldfield (1993) found that English-speaking children had more nouns than verbs in their vocabularies, and that nouns occurred at the ends of utterances more often than verbs in the speech of English-speaking mothers. Altogether these findings suggest that the type of lexical class typically found in the utterance-final position may be responsible for the cross-linguistic differences in the number of nouns and verbs in the vocabularies of early word learners, and the disproportionate rate at which English-speaking children learn nouns and verbs.

The present study tried to capitalize on these findings, by putting the target verb in the utterance-final position. Despite this fact, children did not learn the verb. This suggests that the word-final position may not be sufficient to facilitate verb learning and account for cross-linguistic differences in verb learning. Since performance was not compared to a sentence with a noun in the utterance-final

position, we cannot draw any conclusions about the effect of the utterance-final position on word learning. The present results do suggest that cross-linguistic differences may originate from a variety of factors that differ among languages and cultures.

Correlations with Expressive Language

Surprisingly, we did not find any relationship between children's performance and their receptive vocabulary. Since receptive language development precedes expressive language development, we predicted that a greater expressive vocabulary would correlate with a greater difference between the experimental and baseline trials. The correlation was actually slightly negative for the total looking time and longest look measures, indicating that children with smaller expressive vocabularies actually performed slightly better than their verbose peers. For instance, the child with 236 words in his vocabulary watched the matching video less when it was named than during the baseline trials. On the other hand, the opposite results were achieved for a child with four words in his vocabulary. Since the correlations were not significant and differences between the time spent watching the matching video during the experimental and baseline trials was minimal for both groups, it is difficult to draw any conclusions about the correlation between expressive vocabulary and ability to comprehend a new verb. Furthermore, the *Language Development Survey* (Rescorla, 1990) is based on parental report which lends itself to the possibility of bias on the part of individual parents. As a result, caution should be made when drawing conclusions based on this survey. To note, most of the children had not advanced far enough in their vocabulary to show any learning. In a receptive

language task, Forbes and Poulin-Dubois (1997) found that children with high expressive vocabularies generalized a familiar verb to a novel agent, but children with low expressive vocabularies did not. Therefore, a correlation may appear if older children or children with more advanced vocabularies had been included in the sample.

Future Research

By 18 months, most English-learning children are comprehending verbs, but *how* these verbs are entering their lexicons remains a mystery. The hypothesis that a simplified agent facilitates verb learning should not be discarded based on the present study. Results from Maguire et al.'s (2002) studies and the present study shed light on several questions related to early verb learning that deserve further investigation: 1) How would 18-month-olds learning a pro-drop language, such as Korean, perform in the block and person conditions?; 2) Will older children perform better with the block, given the differences between the point-light display and a block?; and 3) How will the results change if the verb is presented before or after the action has occurred?

Since we know that children learning Korean and Mandarin have more verbs in their vocabulary than English-learning children (Kim et al., 2000; Tardif, 1996), how would they perform on the tasks in the present study? A failure to find any correlations between the number of action words produced by the children in the present study and their performance during the testing phase suggests that a larger vocabulary of verbs does not relate to the ability to learn a new verb. However, the limitations of the present study and the fact that most of the children in the present study were not advanced in their language development does not allow us to predict

how Korean- or Mandarin-speaking children's would perform in future studies utilizing the same tasks. As such, a study similar to the present study with children learning a pro-drop language may give further insight about cross-linguistic differences in verb learning.

Future research also should test the hypothesis on a population of children slightly older than 18 months. On a verb learning continuum where a complex agent such as a person is on the difficult end and the point-light display is on the easy end, a block may be next to the point-light display. The differences between a point-light display and a block have already been highlighted and may have contributed to the present findings. Furthermore, the children in Maguire et al.'s (2002) studies were slightly older than the children in the present study, which may have contributed to the differences in results. Twenty or twenty-four-month-old children may reap the benefits of a simplified agent such as a block, whereas the task was too difficult for 18-month-olds. We know that eventually children's vocabularies expand and they become rapid word learners. Golinkoff et al. (1996) demonstrated that 34-month-old children can use the lexical principles in tier two to fast map novel verbs, so we can conclude that by 34 months, children are fast mapping verbs when the actions are performed by complex real-world stimuli and verb learning is no longer so difficult at this age. Given this fact, we would expect that 34-month-olds would be able to successfully learn the verb in the block and person conditions. Hence, we do not need to simplify the verb learning process for children older than 33 months. Therefore, an investigation with twenty- and twenty-four-month-old children using the same design with a different actor performing the action during the training phase has begun in the

Language Development Lab. This study is designed to determine if early word learners slightly older than 18 months will benefit from a simplified agent when learning a new verb. A different actor is being used to eliminate the confounding factor of the similarities between the two women actresses used in the present study, the block has eyes and a mouth, the duration of the training trials has been increased, and the number of test trials has been reduced. Finally, receptive vocabulary is being measured in addition to the *Language Development Survey* (Rescorla, 1990).

A final suggestion for future research is to present the novel verb before or after the action occurs. Tomasello and Kruger (1992) argued that children may learn verbs better in these contexts. As previously explained, we presented the novel verb in an ostensive context while the action occurred. Therefore, an interesting investigation using the same design and hypotheses as the present study may involve introducing the verb before or after the action occurs. However, as previously noted, Tomasello and Kruger used a non-continuous action in the aforementioned study making it difficult to generalize his findings to continuous actions. Thus, it is important to first extend the length of the trials and include children older than 18 months in a future study with the same conditions and design as the present study.

If a future study determines that verb learning is facilitated by the simplification of the agent, this notion could be applied to therapy provided to children with language impairments. Of course caution should be taken when generalizing any findings to a different population of children, but a future study could test the effects of teaching verbs to a population of late talkers using simple objects in therapy.

Conclusions

We now return to the two explanations presented at the beginning of the discussion. Did the children fail to learn the verb, or did they learn the verb, but fail to generalize the verb to a new agent? The differences between Maguire et al.'s study and the present study, the nature in which the verb was named, and the limitations of the present study suggest that the children in both groups did not learn the verb during the training phase. Future research must examine how we can facilitate learning during the training phase by accounting for the limitations in the present study. This can be accomplished in various ways, but we are first going to investigate how older children perform on the same tasks with a longer training phase and shorter testing phase, actors whose visual characteristics are noticeably different (i.e., we will be using a tall male wearing colorful clothing and a short female wearing white and beige clothing), and a block with eyes and a mouth.

In conclusion, the present findings have not provided any evidence to suggest that simplification of the agent of an action will facilitate verb learning. However, we have established the groundwork for future research on verb learning with typically-developing children. What we do know is that English-speaking toddlers are not fast verb learners. Whether they can do better, is left to future research.

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