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Speaker Reliability in Verb Acquisition

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Speaker Reliability in Verb Acquisition

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# Speaker Reliability in Verb Learning

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This study explored infants' sensitivity to speaker reliability in verb labeling. Past research has focused primarily on nouns (Koenig & Echols, 2003). The participants in this study were 32 24-month-old infants. Visual stimuli included a group of intransitive verbs that should be familiar to 24-month-olds such as jumping, turning, and waving. These stimuli were shown on a television display. Half of the participants were in a True Labeling Condition, in which they heard labels that correctly matched the familiar actions. The other half of the participants were in a False Labeling Condition, in which they heard familiar labels that did not correspond with the familiar actions they saw. The amounts of time that infants looked at action, labeler, and parent were compared across true and false conditions using t-tests. I expected to find that infants have similar expectations about how labels map to referents for verbs and for nouns, such that they expect speakers to apply consistent labels to both. As a result, infants were expected to look longer to the "false" than "true" labeler. Contrary to predictions, infants failed to look longer at the action in the true condition than the false, or to the speaker in the false condition as compared to the true. The comprehensive results for the studies did not indicate that infants expect accurate labels for actions from humans who are intending to refer, as did previous research with objects.

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## Speaker Reliability in Verb Acquisition

The middle ground between words and grammar, verb learning is particularly vital to language. In Latin, the word “verbum” actually means word. This fact implicitly imparts the significance of verbs in word learning. But more often than not, in the world of developmental psycholinguistics where the noun is paramount, the investigation of verbs takes on an auxiliary role in the study of language acquisition (though see Tomasello & Merriman, 1995, and Hirsh-Pasek & Golinkoff, 2006).

To be successful in word learning, children must coordinate perceptual, social, and linguistic inputs to uncover more precise word meanings. Children are sensitive to both linguistic and social information in the input from a very early age (Hollich et al., 2000). At the very beginning of word learning, around 10 months of age (Hirsh-Pasek et al., 2005), they put initial stock in perceptually salient elements to guide word-to-world mapping. These might include elements highlighted in infant directed speech and concrete objects or actions. As children grow older, social cues become increasingly important in word learning.

Because verbs pertain to events that occur in our environment, verb learning requires that infants must be able to focus on these actions and discern them as separate events. This is likely to be more difficult for verbs than for nouns, which may contribute to the predominance of nouns in early vocabularies.

### *The Noun Bias*

Though there is some debate, most researchers conclude that verbs are universally harder to learn than nouns (Bornstein et al., 2004). A number of studies have documented a “noun bias” in early word learning, such that nouns predominate in early vocabularies

(Gentner, 1982). There is some variation across languages and contexts in the degree to which a noun bias is observed (see e.g., Gopnik, Choi, & Baumberger, 1996), but it appears that the advantage for nouns is pervasive (Bornstein et al., 2004).

### *Difficulties of Verb learning*

The noun bias may be only one indication of the difficulty of verb learning. Verb learning is a complicated and seemingly confusing task for children for a number of reasons. These include issues pertaining to concreteness, mapping, and overlapping problems.

*Concreteness.* Bird, Franklin, and Howard (2001), show that words appearing in the earliest vocabularies are the most perceptually accessible across both verbs and nouns and are those that more readily generate mental images. As nouns are generally more concrete than verbs, it may be easier to create these mental images of objects than actions (Bornstein et al., 2004). Concreteness is only one part of the problem with verb learning, however. Arguments have been made by both Gentner and Boroditsky (2001) and Snedeker and Gleitman (2004) that the problem in verb learning might be more about mapping a specific verb onto an action or event than about learning the underlying relational concepts that the verb or relational term encodes.

*Mapping & Overlapping.* The ability to find actions is necessary to verb learning, but is not sufficient (Hirsh-Pasek & Golinkoff, 2006). Mastery of verb mapping, like noun mapping, requires the use of grammatical and social inputs that lessen the ambiguity of the verb referent. One example of this ambiguity is the perspective problem described by Gleitman (1990). The overlapping aspect of the perspective problem addresses which aspect of a scene the speaker highlights based on the verb used. For

example, “The dog fled from the cat” offers one perspective while the “The cat chased the dog” offers another perspective on the exact same scene. The perspective problem captures the fact that observation of a scene is insufficient to pinpoint the meaning of a verb; additional linguistic information is needed to capture the speaker’s view on an event.

The perspective problem is one among several factors that make verbs harder to learn than nouns (Gleitman, 1990; Golinkoff, Jacquet, Hirsh-Pasek, & Nandakumar, 1996). Importantly, these are problems that relate to how children map words onto concepts rather than problems central to the conceptual foundation for relational terms. That is that verbs might be harder to learn than nouns because it is more difficult to figure out the mapping between word and world when relational terms are involved.

A categorization study conducted by Salkind, Sootsman, Golinkoff, Hirsh-Pasek, and Maguire (2002), supports the view that learning verb categories is not the problem. Toddlers 9 to 11 months of age were habituated to video clips of two different females performing the same novel jumping jack action. Results suggested that infants, at least those with the most comprehensive vocabularies, could form a category of action despite a change in the actor. This study makes clear that children’s struggles with the packaging problem are not based solely on conceptual problems in forming categories of actions, as they were able to identify an action across events involving different actors. The problems children encounter appear to be specifically in mapping words to actions, as they readily map words to objects (Gleitman, 1990).

Several other studies converge on the same interpretation. A study by Childers and Tomasello (2002) provides more explicit evidence that disparities in verb learning



derive from disparities with mapping rather than with the conceptual representation of the verb. They attempted to teach 2-year-olds new nouns and verbs with responses in either comprehension or production. Findings revealed that children could learn an action associated with a particular object, but nonetheless demonstrated difficulty learning a word for that action. These findings suggest that children are not having a conceptual problem, but that something about mapping retards verb acquisition. Verbs were considerably more difficult to master (especially to produce) than either nouns or action/object pairings without language.

In fact, even adults have trouble mapping verbs. In Gleitman and colleagues' studies (e.g., Snedeker & Gleitman, 2004), adults viewed a series of silent video clips of a mother and child playing. A beep or nonsense word occurred coincident with either a missing noun or verb. The participants' job was simply to guess what word the speaker might have used in place of the beep. The findings were dramatic. Adults, who presumably had no conceptual difficulties with the objects and events represented on the tapes, correctly guessed the missing nouns in 45% of the cases. In stark contrast, the proportion of correct guesses for verbs was a paltry 15%. In fact, if only responses for mental verbs were considered, the proportion of correct verb "guesses" dropped to zero. Mapping from action or mental state to word is considerably more challenging than mapping from object to word.

It is no wonder that the literature has been shaped by a noun/verb debate in which nouns are deemed easy to learn while verbs are considered difficult. In sum, regardless of age, conceptual abilities, or experience, mapping verb labels is problematic even when

the underlying nonlinguistic category is formed easily. Perhaps speaker's intentions might help in this difficult task to reduce the ambiguity in verb learning.

### *Speaker Intent*

Baldwin (1991, 1993) and others have argued that a fundamental aspect of word learning involves identifying the intentions of a speaker. To sufficiently map a word to its referent, children need to be sensitive to how a speaker intends to use a word. The sensitivity to intentionality in behavior appears to develop early. Research has shown that infants as young as 6 months are attentive to the goals of animate beings (Woodward, 1998). By 15 months, children can imitate the intended actions of others (Meltzoff, 1995). Baldwin (1991, 1993) proposes that infants as young as 16 months can realize that labels are used with intent to refer. Shortly after, they are able to glean referential cues from gaze, body position, facial expression, and eye contact as cues to identify what an adult is referencing (Tomasello & Barton, 1994).

In a study designed to test infants' understanding of referential intent in relation to object labeling, 16-month-olds were exposed to a series either of true (accurate) or false (inaccurate) labels for familiar objects. Infants were shown to be sensitive to the accuracy of the labels, but only when the labeler was human and therefore intentional (Koenig & Echols, 2003). Koenig and Echols argue that not only can infants pick up on labels that are intentionally used as referents, but they expect labels to be used with intent to refer. Their study, like most of the work involving referential intent in labeling, involves objects (though see e.g., Tomasello & Barton, 1994). The present study involved referential intent in verb labeling, which has not been examined as closely, and may prove to have results that differ from similar work dealing with nouns.

We might expect to see differences between nouns and verbs in regard to cues used in referential labeling in that the overlapping problem of verbs might make expectations about verb labels less stringent. For example, in the case of “the dog fled from the cat” versus “the cat chased the dog,” a child might accept a number of verb labels, as there are numerous options for mapping on to. Referencing labels for objects, which are more concrete, may be more straightforward and lead to stronger expectations about speaker reliability. A cat is a cat whether it is chasing or fleeing. As children may have trouble assigning a label to an action, they might be less likely to recognize inconsistency in said labeling.

So, how discerning are children about the accuracy of the labels they receive? It would seem that children also need a speaker to be consistent in order to glean adequate information required for word learning. Given the ambiguity in verb meanings, children might be especially attentive to referential intent cues and speaker reliability in verb learning.

To test whether children are attentive to speaker reliability in verb learning, a variant of the Koenig and Echols study (2003) was conducted in which children received either “false” inaccurate labels or “true” accurate labels for actions performed on a video screen. Because children learn verbs later than nouns, 24-month-olds were used in the study. Looking times to a human speaker/labeler, the screen, and the child’s parent were then used to gauge each child’s ability to recognize inaccuracy in verb labeling. If infants spend more time looking to the speaker in the “false” condition, as was observed in previous research with nouns, it would suggest that infants may in fact expect labelers of

actions to be reliable. When actions are labeled falsely, infants may refer to the speaker for explanatory cues, like directional gaze.

If there are no differences in looking times between false and true conditions, it may be that children's expectations are not the same for verbs as for nouns, perhaps due to specific characteristics of verb meanings, such as overlapping. It is also possible that infants could fail to recognize that the labeler is being unreliable.

I believe that social cues play an integral role in label learning, whether dealing with nouns or verbs. Social cues could help clarify ambiguity associated with verbs. With the aid of a labeler, referring with social and linguistic cues, actions might be learned more easily. Consequently, the noun bias notwithstanding, I believed that children, who are two years of age and have familiarity with the actions displayed, would be able to recognize when they are receiving incorrect labels for verbs with which they are familiar with.

## Method

The design and procedure for the proposed experiment resembled those of Koenig and Echols (2003), in which infants' sensitivity to referential cues, particularly speaker reliability, was tested. The primary difference here is that instead of using objects as the items to be named, labels were given to actions.

### *Participants*

All participants were recruited from the participant database maintained at the Children's Research Lab. All participants were healthy infants who reached full-term and have no hearing loss. The participants used were 32 24-month-old infants. Eight additional participants were omitted for not completing 12 full trials. Equal numbers of

boys and girls were included in each condition. Parents gave their informed consent prior to the study.

### *Stimuli*

Visual stimuli were a group of actions that should be familiar to 24-month-old infants. In the English language, verbs often express an object's movement in an intrinsic manner (Jackendoff, 1987). Intrinsic motions convey actions that generate a path of movement. Words like *throw* and *kick* describe movements of the extremities in relation to the body. The MacArthur Communicative Development Inventory, along with vocabulary checklists completed by participants in prior research, was used to pinpoint verbs that 24-month-olds were familiar with. Those verbs that were identified that displayed intrinsic actions were used in the experiment: jump, wave, sit, turn, clap, and dance. A female actor was videotaped performing these actions, and the videotaped sequences were displayed through a video feed. Two alternate orders of actions were used, with equal numbers of children seeing each order.

### *Procedure*

Prior to each experiment, each parent was given a vocabulary inventory to fill out for his or her child that included the words used in the experiment. All of the children who participated in the experiment had all six of the stimuli in their vocabularies.

Children were tested in a testing room containing a table with three chairs, one facing the television display and one directly behind it for the parent. To the right of the first chair was a third chair, also facing the table, for the experimenter. Children sat in the chair facing the television, with the parent sitting behind them. Each action was then played sequentially for the child. For each action, the experimenter looked at the child

and then at the screen before labeling the action. The labels were stated six times by the speaker during each trial. The labels were presented every 4 s. A trial lasted approximately 20 s. A total of 12 trials were presented, with each of the six stimuli and labels being presented twice.

Half of the participants were in a True Labeling Condition, in which they only heard labels that correctly matched the familiar actions. The other half of the participants were in a False Labeling Condition, in which they saw the same set of familiar actions and heard the same set of familiar labels, but the labels and actions were mismatched. A video camera, angled to capture infant faces, was used to record the experiment. The dependent variables were the amount of time the children looked to the speaker, the screen, and the parent.

## Results

Analyses were based on the total looking summed across trials. For the participants who completed 12 trials, a two-tailed *t* test assuming unequal variances revealed no significant differences at  $p = .05$  or  $p = .01$  in looking to the speaker between the true ( $M = 8.46$  s) and false ( $M = 9.76$  s) conditions. In looking to the screen, no significant differences were found between the true ( $M = 187.2$  s) and false ( $M = 169.2$  s) conditions. Also, no significant differences were found between true ( $M = 7.47$  s) and false ( $M = 6.63$  s) conditions in looking to the parent.

Koenig and Echols (2003) found stronger effects in the first six trials of their study, so the first six trials were analyzed for those participants included in the first analysis. Over the first six trials, in looking to the speaker in the true condition, the mean

sum was 6.83 s. The false condition yielded  $M = 7.23$  s in looking to the speaker. The difference was not significant. In looking to the screen over the first six trials, the difference was not significant either, with true condition  $M = 136.4$  s and false condition  $M = 129.3$  s. In looking to the parent, no significant differences were found between the true ( $M = 6.01$  s) and false ( $M = 4.66$  s) conditions.

### *Discussion*

Overall, the data did not support our hypothesis. Children did not look to the speaker more in the false condition to a significant degree, and therefore did not show that they were aware of the inaccurate labels given by the speaker. The failure to find longer looking to the false labeler in this experiment is open to various interpretations. One possibility is that 24-month-olds have similar expectations about how labels map to referents for verbs and for nouns, such that they expect speakers to apply consistent labels to both, but that this experiment failed to demonstrate that expectation. Across both ways of analyzing the data, infants showed a slight tendency to look longer to the false labeler, though the difference was never significant. This could hint that children's expectations about word-label relationships do not actually differ for nouns and verbs. The question then, is why the effects were not revealed in this study.

One limitation to the study is that there might not have been a large enough sample size to get significant differences in any particular condition, particularly given the high variability in looking times. If further research is done in relation to this study, a larger sample size might prove fruitful in observing greater differences between conditions.

Another limiting factor in the experiment could be the television, in that the mesmerizing effect of the video screen may have adversely affected results. This possibility is suggested by the long looking times to the screen: Means were 187 s and 169 s for the true and false conditions, respectively, meaning that infants were on average looking at the screen for roughly 15 of the 20 seconds of each trial. The children may have become enamored by the television image and the action occurring on it, so they were not attending to the labels enough. Alternatively, children may have noticed that the labels being given did not quite match up with what they were seeing, but the effect of the television screen was so intriguing they could not pull their attention away from it. One way to attempt to solve this problem would be to implement live actors or dolls instead of using video. This approach might make the actions more salient to the participants, while also removing the contextual element of the video screen.

Alternatively, it is altogether possible that 24-month-olds are not yet fully capable of recognizing inaccuracy in verb labeling. Due to the complexities of verb learning, even common verbs might not have been fully acquired by this later stage in development. One way to test this would be to try this same experiment with older children, for example children who are 36 months or so of age. One might expect that by this age, experience will have alleviated some of the problems with mapping, enabling children to recognize that the speaker is unreliable.

On the other hand, it might be the case that verbs simply work differently than nouns when it comes to label learning. Nouns and verbs serve different purposes for the developing child, so it may not be far-fetched to believe that the mechanisms used to learn them vary. Nouns and objects tend to be more static and salient. In contrast, by the



time a child finishes hearing the label that is to be applied to a verb, the corresponding action may have changed entirely. Thus, a speaker's reliability may not factor into the equation as prominently. The issue is a complex one and not likely to be fully addressed by one set of experiments, but finding out what label learning aspects verbs and nouns have in common, and where they differ, may be a step in the right direction.

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## Vita

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