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How children block learning from ignorant speakers ☆

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ABSTRACT

Preschool children typically do not learn words from ignorant or unreliable speakers. Here, we examined the mechanism by which these learning failures occur by modifying the comprehension test procedure that measures word learning. Following lexical training by a knowledgeable or ignorant speaker, 48 preschool-aged children were asked either a standard comprehension test question (i.e., "Which one *is* the blicket") or a question about the labeling episode (i.e., "Which one *did I say* is the blicket"). Immediately after training, children chose the object labeled by an ignorant speaker when asked the episode question, but not when asked the semantic question. However, the advantage for episode questions disappeared when the same children were asked after a brief delay. These findings show that children encode their experiences with ignorant speakers, but do not form semantic representations on the basis of those experiences.

1. Introduction

Words have communicative value because their meanings are shared among the members of a linguistic community (de Saussure, 1916–1965). This quality of word meaning is sometimes referred to as "conventionality" (Clark, 1993), and it comes with potential advantages and disadvantages for young word learners. One clear advantage is that an appreciation of conventionality can allow word learners to assume that a word learned from one speaker will likely be an effective communicative tool with other expert speakers within that linguistic community (e.g., Henderson & Graham, 2005). Also, conventionality provides a much-needed basis for judging a particular form as "right" or "wrong" (Clark, 1993); a word meaning is likely to be right when it is likely to be shared by members of the linguistic community, and wrong when it is not shared.

The fact that words have communicative value because of conventionality (i.e., their use within a socio-linguistic community) also poses some specific challenges for young word learners. The first is that acquiring word meanings requires exclusive reliance on subjective social agents for relevant information. This exclusive reliance leaves learners somewhat vulnerable to error because subjective individuals might intentionally or unintentionally provide unconventional word-referent links (see e.g., Harris & Koenig, 2006; Koenig, Clement, & Harris, 2004). This problem is compounded by the fact that it is difficult for word learners to verify at the time of learning whether the information about a word-referent link is correct; in many canonical labeling situations, there is no opportunity to immediately see whether the word will be used by other members of the linguistic community (Sabbagh & Henderson, 2007).

If children were to learn words from speakers indiscriminately, they would be at risk for making mapping errors that result from speakers providing unconventional word-referent links. For instance, Henderson and Sabbagh (in press) showed that when confronted with objects that

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they do not know the labels for, parents talking with their preschool-aged children frequently used words that would not be shared by the larger linguistic community. If children subsequently acquired these words, they would be making errors. Lexical errors are problematic because they can, at least in theory, be difficult to correct. For instance, as a number of studies have shown, children tend to prefer categories to be associated with one and only one label; when confronted with a new label, children prefer to map that label to a nameless category (see e.g., Golinkoff & Hirsch-Pasek, 1994; Markman, 1992). Thus, if the first label children learn for a category is made in error, they may be biased to maintain the error over a lengthy period, and correct it only slowly.

Fortunately, children seem to avoid these mapping pitfalls by avoiding word learning any time they perceive clues that a given speaker might be unable, unwilling, or for whatever reason unlikely to provide a shared label (Sabbagh & Henderson, 2007). For instance, Sabbagh and Baldwin (2001) showed that preschoolers did not learn words from a speaker who claimed her ignorance about their correct meanings. Similarly, Birch and Bloom (2002) showed that children learned proper names only from sources who knew the individuals in question, and thus could rightly know their proper names. Finally, a number of studies have shown that when confronted with two sources of information – one generally reliable and the other generally unreliable – children will typically choose to learn words from the reliable sources (Jaswal & Neely, 2006; Koenig et al., 2004; Koenig & Harris, 2005). Together, these findings suggest that children consider their informants' knowledge states during learning and use that information to adaptively avoid learning from ignorant or unreliable sources.

It should be noted that there is a real sense in which children's resistance to learning in these cases is surprising and impressive. The paradigms in all of the foregoing cases provide children with an several cues that typically promote word learning including statistically reliable covariation of the word and referent, clear signs that the speaker is attending to the object, and clear evidence that the utterance is intended to be about the object (see Sabbagh and Baldwin (2005) for a review). Yet, despite the presence of these compelling learning cues, children resist learning when there are clear signs that the speaker is not likely to be providing a conventional word-referent link. The main goal of the present study is to better understand the cognitive mechanism by which children resist learning in what would otherwise be optimal conditions for learning.

Some hint about the form this mechanism might take comes from work by Sabbagh, Wdowiak, and Ottaway (2003) who tested the strength of the representations of words provided by ignorant speakers in a proactive interference paradigm. In that study, children first saw either a knowledgeable or ignorant speaker attach a novel word to one of three possible novel referents. Then, a second knowledgeable speaker entered and attached the same novel word to a different one of the three novel referents. If children had some semantic representation of the word-referent link taught by the ignorant (first) speaker, then there should have been some cost associated with subsequently acquiring the link presented by the knowledgeable (second) speaker, due to proactive interference. Results showed clearly that there was no such interference thereby suggesting that exposure to the ignorant speaker's link did not result in a semantic representation of that link (see also Sabbagh and Baldwin (2001)). This suggests that children resist learning from ignorant speakers by blocking or "gating" the typical processes that underlie the formation of semantic representations.

There are at least two possibilities for how children might block the typical processes that are associated with creating semantic processes. One possibility is that children simply do not attend to ignorant speakers, and that the failure of attention results in the failure of sufficiently encoding the new information (Craik, Govoni, Naveh-Benjamin, & Anderson, 1996). The attentional difficulty might be posed by ignorant speakers themselves. Research has shown that ignorance is typically associated with a variety of paralinguistic cues in speech including hesitancy, disfluencies, tempo slowing, a decline in fundamental frequency, and falling or flat prosodic contours (e.g., Brennan & Williams, 1995; Smith & Clark, 1993). It is intriguing to note that some of these characteristics contrast directly with characteristics of infant-directed speech that are generally thought to promote learning, such as rising prosodic contours and a increase in fundamental frequency (e.g., Kemler-Nelson, Hirsh-Pasek, Jusczyk, & Cassidy, 1989). Although most studies attempt to control these factors when comparing learning from ignorant and knowledgeable speakers (e.g., Sabbagh & Baldwin, 2001), it seems possible that subtle variations in the naturalistic speech characteristics of an ignorant speaker make their utterances less salient, less attended and less learned.

Attention might also affect children's encoding of words from ignorant speakers more strategically. That is, children might implicitly or explicitly recognize that ignorant speakers are unlikely to provide reliable labels, and as a result actively ignore what the speaker has to say. The ability to selectively attend to stimuli based upon their relevance is a well-documented phenomenon that begins to emerge in experimental paradigms in the preschool years (see Enns, Brodeur, and Trick (1998) for a review).

If children's resistance to learning from ignorant speakers is attributable to a lack of attention, then children would not be expected to encode anything about an ignorant speaker's labeling event. However, there is an alternative possibility. To form a semantic representation from a labeling event, children presumably have to attend to and encode the speaker's intention to label (i.e., "*She called* that thing a blicket") and create from that event representation a conventional semantic representation (i.e., "*That thing is* a blicket"). It could be that when faced with an ignorant speaker, children act in a way that allows for the encoding of the labeling event, but specifically disrupts the processes that are responsible for creating the conventional semantic representation. This approach might be especially adaptive in that it would provide a basis for establishing a "local" understanding of how a particular speaker names things, which in turn can make future uses of the term by that speaker more interpretable. This representation of the labeling event, however, might be relatively segregated from the relevant aspects of semantic memory because the subject of its propositional contents concerns the speaker and her actions (i.e., "*She called* it a blicket") and not the object itself (i.e., "*It is* a blicket"). Because of this segregation, relevant subsequently presented word-referent links that are more worthy of committing to semantic memory would not have to compete with links offered by ignorant speakers. Thus by following this semantic-specific gating strategy, children might both adaptively communicate with ignorant speakers and still avoid lexical mapping errors.

The goal of the present paper was to determine whether children resist learning from ignorant speakers either by ignoring them altogether, or by specifically blocking the formation of conventional semantic representations. We tested these possibilities by asking a group of children whether they remembered ignorant speakers' labeling events (i.e., "Which one *did I say* is the blicket") even when they do not select the target in a standard semantic comprehension test (i.e., "Which one *is* the blicket). We reasoned that if children's resistance was implemented by simply ignoring ignorant speakers' utterances, then they would show poor memory for the labeling event. In contrast, if children gated learning by a more specific failure to create a semantic representation, then they might show strong performance when asked about the labeling event, but poor performance when asked the standard comprehension test question.

2. Method

2.1. Participants

Forty-eight normally developing English-speaking monolingual preschoolers (28 girls) between the ages of 49 months and 71 months ($M = 59.83$, $SD = 6.71$) participated. Participants were recruited from a database drawn from a primarily white, middle-class population in Eastern Ontario, Canada. All children received a $10 gift certificate as thanks for their participation.

2.2. Materials

2.2.1. Toys

During a brief warm-up session, the experimenter played with the participant in a playroom consisting of puzzles and toy animals. For the experimental trials, two sets of three unfamiliar (i.e., novel and nameless) toys were used as stimuli. Toy set A included a brightly coloured, hard plastic tube that made a noise when shaken (the "tube"); a hard, plastic bell attached by a rivet to a handle with two strikers on either side (the "bell"); and a red, corrugated plastic cylinder that squeaks when compressed (the "squeaker"). Toy set B included a tightly tied string of multicoloured, prism-shaped blocks that could be twisted into interesting shapes (the "snake"); a hard, plastic cylinder covered with coloured suction cups (the "ninja"); and a toy with two ball-ended, plastic levers conjoined so that the two levers move in tandem to make the ball ends collide (the "clacker"). The toys within each set were chosen to be distinctive from one another and had been balanced for salience in pilot research.

2.2.2. Novel words

Children were introduced to two novel words, *modi* and *dawnoo*, selected because they are unfamiliar and follow the phonotactic constraints of English.

2.2.3. Experimental props

Children were tested at a small table in a quiet room on a university campus. On the table there was a mailbox pasted with pictures of a parrot hand puppet ("Birdie"), an answering machine, and a mock speakerphone consisting of a push-button desk telephone with the receiver mounted upside down in the cradle and one small stereo speaker attached to a portable tape player that was hidden under the table.

2.3. Design

A between-subjects design was employed with two crossed factors. The first factor was the knowledge state of the speaker (knowledge vs. ignorant) and the second factor was the kind of comprehension question (semantic vs. episodic).

Children participated in two trials. They heard the word modi on the first trial and then dawnoo on the second trial. For each child, a pair of toys, one from set A and one from set B, served as target toys – one toy was the target in Trial 1 and the other was the target in Trial 2. Toys were assigned as three target pairs: (1) the tube from set A and the snake from set B, (2) the bell from set A and the ninja from set B, and (3) the squeaker from set A and the clacker from set B. Across children, all toys served as targets in all conditions equally often. Further, all toys were targets in Trials 1 and 2 equally often. The position of the target at time of labeling (left, center, or right) was counterbalanced across children with the constraint that the position differed across trials for any given participant. Finally, in a final comprehension test, the question that was asked first (modi or dawnoo) was counterbalanced across children.

2.4. Procedure

The procedure was modeled closely on that of Sabbagh and Baldwin (2001). Children first had a 10-min warm-up task that involved playing with puzzles and plastic animals before beginning the experimental task. Both experimental trials had the same four-episode structure: (1) label introduction, (2) play session, (3) label training, and (4) 3-item comprehension test. After the first trial was completed, the second trial began. At the end of the second trial, the experimenter administered a 6-item comprehension test involving the novel words and toys from both trials combined. For brevity, only the first trial and the 6-item comprehension test are described in detail.

2.4.1. Label introduction

The experimenter began by explaining that the playroom is a room shared with Birdie who is out playing on the playground, and that Birdie sometimes called the experimenter to ask her to send her toys. The experimenter then proceeded to play a prerecorded answering machine message from Birdie who explained that she had left her modi in the playroom and would like the experimenter to send it to her. The experimenter then asked children to say the word themselves ("Did you hear that? Birdie said she forgot her modi. Can you say modi?").

When the speaker was knowledgeable, the experimenter said, "You know, I'd really like to help my friend Birdie, and I know right where her modi is. It's in this box here" while pointing to a large index card box with Birdie's picture on it that contained the toys. In the speaker-ignorant conditions, the experimenter said, "You know, I'd really like to help my friend Birdie, but I don't know what a modi is. Hmmm." Then after appearing to search around for a moment, the experimenter picked up Birdie's box and said, "Maybe it's in this box, here."

2.4.2. Play session

The experimenter took three toys out of a box, placed them in a row, and encouraged the child to play with them. During the play session (~2 min), the experimenter indirectly reinforced her knowledge or ignorance by communicating her relative familiarity with the toys both verbally and non-verbally. In all conditions, she spoke enthusiastically about each of the toys and care was taken to ensure that children played with each of the toys equally.

2.4.3. Label training

After the play session, the experimenter put the toys out of the children's reach and labeled the target. For conditions in which the speaker was knowledgeable, the experimenter said, "You know, I'd really like to help my friend Birdie, and I know just which one's her modi. It's this one [touching the target toy]. This one's her modi [touching the target toy]. Could you put it in the mailbox to send to Birdie?" The child then put the target toy in the mailbox and the experimenter closed the mailbox saying, "Good, now Birdie will get her modi." For conditions in which the speaker was ignorant, the experimenter said, "You know, I'd really like to help my friend Birdie, but I don't know what a modi is. Hmmm. Maybe it's this one [touching the target toy]. Maybe this one's her modi. Could you put it in the mailbox to send to Birdie?" The child then put the toy in the box and then the experimenter said, "Good, now maybe Birdie will get her modi." In all conditions, the experimenter provided labeling utterances with sufficient enthusiasm to maintain the children's attention.

Also, in all conditions, to ensure that the experimenter's level of physical contact with the target toy was equal to that of the distracter toys, the distracters were also put into the mailbox by saying, "You know what? Maybe we should send these to Birdie, just in case."

2.4.4. 3-Item comprehension test

The key experimental manipulation here concerned how children were asked the comprehension test questions. A 3-item comprehension test came after a two-minute delay, during which children solved a simple jigsaw puzzle. All three toys used in Trial 1 were taken out of the mailbox and arranged in a row. The children were then asked to touch each toy, one at a time. For children who received the standard "semantic" comprehension test, the experimenter looked directly at the child and asked, "Which one of these things is the modi?" For children who received the "episodic" test question, the experimenter asked "Which one *did I say* is the modi?" In both conditions, after children pointed to one of the objects, the experimenter asked them to put their selection into the mailbox.

Trial 2: After the 3-item comprehension test, there was a brief filler task in which children coloured for about 5 min. They then participated in a second trial, which was the same as the first except that children overheard a scripted speakerphone call instead of an answering machine message asking for another toy.

2.4.5. 6-Item comprehension test

After the comprehension test for Trial 2, children coloured again for about four minutes before a final comprehension test. Here, all six toys used across both trials were taken out of the mailbox and arranged randomly on the table in a 2 (row) $\times$ 3 (column) array. After the toys were arranged, children were asked to touch each of the toys one time. For children in the standard test condition, the experimenter looked directly at the child and asked, "Which one of these things is the [modi/dawnoo]?" [child pointed] "Can you put that in the mailbox?" [child put toy in mailbox], once for each novel word. For children in the episodic test condition, the experimenter instead said, "Which one did I say is the [modi/dawnoo]?" [child pointed] "Can you put that in the mailbox?" [child put toy in mailbox]. The toy selected in response to the first question was not removed from the mailbox before the second comprehension question was asked, and thus was not present when the second question was asked.

3. Results

3.1. Preliminary analyses

Preliminary analyses showed that there were no significant differences in the ages of participants across the conditions. Additionally, we found no main effects of sex, nor did sex interact with any of the independent variables of interest. Thus, all analyses are conducted collapsing across sex.

3.2. 3-Item comprehension test

We conducted a 2 (test question: episodic vs. semantic) $\times$ 2 (knowledge: knowledgeable vs. ignorant) ANOVA with children's combined performance in the two 3-item comprehension tests as the dependent measure. This analysis revealed significant main effects of both knowledge and test question. As expected, children showed better performance overall when the speaker was knowledgeable

($M = 1.96$, $SD = .20$), as opposed to ignorant ($M = 1.29$, $SD = .86$), $F(1, 44) = 27.61$, $p < .001$, $\eta^2 = .39$. Also, children showed better performance overall when the speaker asked the episodic question ($M = 1.96$, $SD = .20$) as opposed to the semantic question ($M = 1.29$, $SD = .86$), $F(1, 44) = 27.61$, $p < .001$, $\eta^2 = .39$. We were surprised to see that the main effects were of exactly the same magnitude (with the same mean differences, etc.) and thus, we double-checked the data against the videotapes to confirm their accuracy. Indeed, this pattern can be expected in a 2×2 design in which one cell is different from the other three, which are themselves nearly identical (near ceiling performance).

More important, these main effects were qualified by a significant interaction, $F(1, 44) = 21.14$, $p < .001$, $\eta^2 = .33$ (see Fig. 1a). Tests of simple effects showed that the effect of knowledge was present in conditions in which children were asked the standard semantic question, $F(1, 46) = 31.08$, $p < .001$, but not when the test question was asked in the episodic format, $F(1, 46) = .08$, $p = .76$. Performance on the episodic test question was excellent in knowledgeable and ignorant conditions.

Because children had a .33 chance of correct performance on either trial, the expected chance mean for the population was .67 out of 2. A series of one-sample t-tests showed that children's performance in the comprehension test exceeded chance in all cases, except when an ignorant speaker trained the word and asked a semantic question, $t_{crit}(11) = 2.98$, $p < .05$, corrected. In sum, these findings show that children can remember the details of ignorant speakers' labeling episodes. However, memory of the labeling episode does not seem to affect children's performance on a standard comprehension test question.

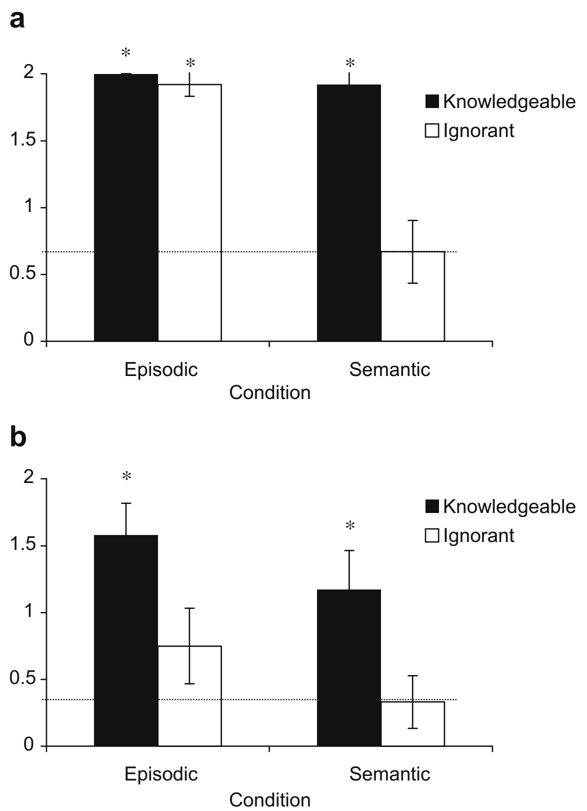

Fig. 1. Mean performance in the (a) 3-item, and (b) 6-item comprehension tests by condition. Note: Dotted line represents chance performance; * mean is different from chance, $p < 0.05$.

3.3. 6-Item comprehension test

An important question concerned whether the advantage conferred by the episodic test question extended to the end of the test session. A 2 (knowledge) $\times$ 2 (test question) ANOVA revealed only a significant main effect of knowledge, $F(1, 44) = 11.64$, $p = .001$, $\eta^2 = .21$. As above, children showed better performance in the knowledgeable ($M = 1.38$, $SD = .88$) relative to the ignorant conditions ($M = .54$, $SD = .83$). The main effect of test question was significant only at trend level, $F(1, 44) = 2.91$, $p = .095$, $\eta^2 = .06$. Specifically, children showed somewhat better performance in response to episodic test questions ($M = 1.17$, $SD = .96$) relative to semantic test questions ($M = .75$, $SD = .90$).

In contrast to the early comprehension test in which there was a strong, significant interaction between the knowledge and test question factors, there was no such interaction in the delayed comprehension test, $F(1, 44) = .00$, $p = 1.00$ (see Fig. 1b). Indeed, a simple effects analysis showed that the magnitude of the knowledge effect was identical for the episodic and semantic questions, both $Fs(1, 46) = 5.08$, $p = .029$. Moreover, although the means appeared to show that there was some advantage for episodic questions in the knowledgeable and ignorant conditions, the simple effects analyses showed that neither of these differences reached statistical significance, both $Fs(1, 46) = 1.17$, $p = .29$. Again, the surprising equivalences in the data compelled us to double-check the data against the videotapes and confirm their accuracy.

The probability of selecting the target object by chance was one-sixth on the first trial and one-fifth on the second trial. Thus, the mean we expected if children selected objects simply by chance was $M = .33$ out of 2 in each group. One-sample t-tests showed that children responded systematically only in the knowledgeable speaker conditions (episodic question: $t(11) = 5.48$, $p < .001$; semantic question: $t(11) = 3.09$, $p = .01$). Children showed no evidence for systematic responding in either of the ignorant speaker conditions.

3.4. Comparison of 3- and 6-item tests

The different patterns of results from the 3- and 6-item comprehension tests suggested that children's initially good performance in the ignorant/episodic condition declined over the course of the experiment. Unfortunately, a direct statistical test of the raw 3- and 6-item test data was not appropriate; scores in the 6-item test were expected to be lower than those from the 3-item test because of the lower baseline probability of correct responding by chance in the 6-item test. However, because characterizing such a decline was of clear interest, we attempted to make the data from the two tests comparable. To do this, we transformed individual participants' raw scores in each test (0, 1, or 2) to their percent-rank within the chance distribution for each test. Children with raw scores of 0 were given 0 in the percent-rank transformation for both tests. Children with raw scores of 1 or 2 in the 3-item test were given a .44 or a .89, respectively. Children with raw scores of 1 or 2 in the 6-item test were given a .67 or a .97, respectively. This transformation equated the means expected by chance in the 3- and 6-item comprehension test. Preliminary analyses showed that for the whole sample, performance on the 3-item test was correlated with performance on the 6-item test, $r_{spearman}(46) = .39$, $p = .006$.

These percent-rank transformed scores were submitted to a mixed-design 2 (knowledge) × 2 (question type) × 2 (test: 3-item vs. 6-item) ANOVA with test as a within-subjects factor. This analysis powerfully recapitulated the main effects of knowledge, $F(1, 44) = 25.95$, $p < .0001$, and question type, $F(1, 44) = 12.36$, $p = .001$, in patterns consistent with the previously reported analyses. This analysis also showed no statistically significant main effect of time, $F(1, 44) = 3.18$, $p = .08$, though, inspection of means suggested that children tended to perform a little better on the 3-item than on the 6-item tests. More intriguing, we found a significant 3-way interaction, $F(1, 44) = 4.07$, $p = .05$ (see Fig. 2). Follow-up analyses showed that the interaction was attributable to the fact that children in the ignorant-episodic condition showed a significant decline from the 3-item to the 6-item test, $t(11) = 2.77$, $p = .009$, which was not shown in any of the other groups. These findings confirm that the advantage conferred by the episode test question in the ignorant experimenter condition declined over the course of the experiment.

4. Discussion

Our goal was to investigate how young children might resist learning from ignorant speakers. Through a simple modification of the standard comprehension test that is typically used to assess word learning, we showed that shortly after hearing words from ignorant speakers, children gave correct responses to questions about the labeling episodes (i.e., "which one did I say is...?") but not to standard comprehension questions (i.e., "Which one of these things is...?"). Moreover, children's memories for ignorant speakers' labeling episodes seemed to decline rapidly. Indeed, in a test that came at the end of the protocol, children who heard labels from ignorant speakers no longer evidenced systematic performance in response to questions about the labeling episode.

From the outset, we suggested that there were two mechanisms that might account for children's resistance to learning from ignorant speakers. This first was that children might not attend to utterances made by ignorant speakers, either because the stimulus of an ignorant speaker is not sufficiently salient, or because they strategically divert their attention. The overall pattern of findings goes some distance to ruling out this explanation. When confronted with either an ignorant or a knowledgeable speaker, children remembered the details of the labeling event, which could only be possible if they attended to and encoded the labeling event itself.

The second possibility we discussed was that children have a mechanism that allows them to adaptively block the process by which children make the connection between the representation of labeling event ("She called that a blicket") to the conventional semantic representation ("That thing is a blicket"). It is worth noting that although we can presume that some process of connecting labeling events with semantic representations must be at play in word learning and other kinds of learning, the mechanisms that support children's making this connection have not been explored in the literature. One possibility for characterizing this mechanism is based upon the long-standing distinction between episodic and semantic memory (see Tulving (2002) for a review). On this model, the initial experience of an attended event leads to temporary storage in episodic memory systems, probably instantiated by neural systems located within hippocampal and parahippocampal regions of the medial temporal lobe. Over some amount of time, the length of which depends greatly on the nature and relevance of the event, the

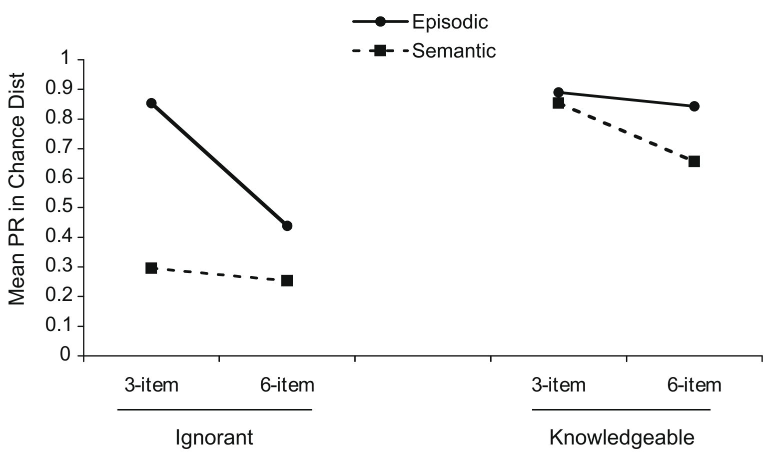

Fig. 2. Direct comparison of performance in the 3- and 6-item comprehension tests by condition using percent-rank scores.

episodic memory becomes re-represented (or "consolidated") in the neo-cortical regions associated with semantic memory (Moscovitch, Nadel, Winocur, Gilboa, & Rosenbaum, 2006). As part of the consolidation process, information about the learning context, such as source, is gradually forgotten while the propositional contents concerning the fact are retained. Put in the language of this model, children's good performance on the question about the labeling episode may reflect that they have established an initial episodic representation of the ignorant speaker's labeling event. But then did not engage (i.e., "gated") the processes that would normally have led to the consolidation of that initial episodic representation into a conventional semantic representation.

Our speculation that judgments about ignorance caused children to resist learning by blocking the typical process by which labeling events become semantic representations has an intriguing flipside. Namely, when there is no reason to doubt the conventionality of a newly presented word-referent link, children might make the connection between the labeling episode and the conventional semantic representation very rapidly. This proposal is similar to that of other researchers who have suggested that young children might be subject to a "semantic bias" wherein they treat communicative endeavors as intended to convey generalizable knowledge that is about the world (Csibra & Gergely, 2009). Thus, when learning words, children might be biased to not encode information about the source of the words, which could in turn facilitate their assumption of conventionality. One implication of this proposal is that children might show source amnesia for words soon after they are first presented, because as noted above, the semantic consolidation process typically results in a loss of the contextual information that surrounded the acquisition of the knowledge in the first place.

At first blush, our findings might be taken to not support this prediction – we did not find evidence that children memory for the labeling event declined when the speaker was knowledgeable. However, we do not think that our method provides the clearest test of source amnesia in the knowledgeable condition. Specifically, it seems possible that after having learned from a knowledgeable speaker which of the referents *is* the blicket, their response to the labeling event question might bas been based on a guess (and not an actual memory) that the speaker used the conventional word-referent link when she labeled the objects herself. A more appropriate test for the hypothesis that infants are source amnesic for words they have learned might come from adapting methodologies that have been used in the study of eyewitness testimony in young children, as these paradigms are better designed to dissociate children's knowledge of what they learned and how they learned it (see e.g., Roberts (2000) for a review).

Of course, it should be noted that a failure to consolidate is not the only possible account for the present findings. For instance, it could be that the pattern of results we obtained might be attributable to children's varying or grading the strength of the lexical representation according to the knowledge or ignorance of the speaker (see e.g., Munakata, 2001). Children might have formed a very weak semantic representation of a word-referent link offered by the ignorant speaker, but formed a very strong semantic representation for words offered by the knowledgeable speaker. Within this framework, children might have performed well in the early test about the labeling event because the question includes an explicit reminder of the labeling event which may in turn have served to scaffold the mnemonic recognition processes at stake in the comprehension test paradigm. We know of no work that has directly investigated the extent to which children can strategically vary the strength of a given representation. Indeed, most paradigms that investigate graded representations tend to focus on explicitly non-strategic factors, such as the number of times a word was presented, how the contexts for presentation vary, and so forth (see e.g., Yu & Smith, 2007), all of which were consistent across the conditions of the present study. Nonetheless, exploring this alternative explanation more fully is an important direction for future research.

A second important direction for future research concerns understanding whether this same pattern of results would obtain with younger children. Previous research has shown that children substantially younger than those tested here (i.e., 3-year-olds, across several studies) also avoid learning from ignorant speakers. It would be interesting to know whether they do so by the same mechanisms we have shown here of older children. In this regard, it is interesting to note that mechanisms similar to semantic gating have been proposed to account for a variety of phenomena with much younger children, including speech learning in 10-month-olds (Kuhl, 2007), and perseverative search errors in 1-year-olds (Topal, Gergely, Miklosi, Erdohegyi, & Csibra, 2008). If these proposals are correct, then they provide some suggestion that semantic gating might be a mechanism available to the youngest children who have shown an ability to resist learning from ignorant speakers.

Finally, we would like to reiterate that a semantic gating mechanism like the one we have proposed here is not only cognitively feasible, but it also provides particular communicative advantages to young children. By specifically gating the semantic representation while maintaining a brief episodic representation, children have a mechanism that can both avoid potentially costly errors and still facilitate communication and learning with that speaker, or potentially another speaker, in the same context. For instance, if the same ignorant speaker used the same label again, children might have a basis for consolidating a more speaker-specific semantic representation that explicitly encodes information about the source (i.e., "She thinks this is a blicket"). Similarly, if a second speaker used the same label, children might have a basis for elaborating the episodic representation to encode the possibility of multiple sources of information (i.e., "They call this a blicket"). These kinds of non-decontextualized representations might enable children to communicate effectively within highly circumscribed contexts, while avoiding errors outside of them.

In summary, then, we have shown that children resist learning from ignorant speakers by specifically blocking or gating the creation of a semantic representation from the labeling event. Although more research is required to rule out alternative hypotheses, the findings do clearly join others in showing that children treat sources of lexical information in a way that is potentially adaptive with respect to communicating with others and building a lexicon.

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