CHILD DEVELOPMENT

Child Development, March/April 2012, Volume 83, Number 2, Pages 581–590

The Influence of Speaker Reliability on First Versus Second Label Learning

Sheila Krogh-Jespersen
University of Chicago

Catharine H. Echols
University of Texas at Austin

Children's confidence in their own knowledge may influence their willingness to learn novel information from others. Twenty-four-month-old children's (N = 160) willingness to learn novel labels for either familiar or novel objects from an adult speaker was tested in 1 of 5 conditions: accurate, inaccurate, knowledgeable, ignorant, or uninformative. Children were willing to learn a second label for an object from a reliable informant in the accurate, knowledgeable, and uninformative conditions; children were less willing to apply a novel label to a familiar object if the speaker previously was inaccurate or had expressed ignorance. However, when the objects were novel, children were willing to learn the label regardless of the speaker's knowledge level.

Learning the meanings of words requires that children rely on information from adults. Children must decide whether the information is both relevant and referential, in addition to identifying the specific entity to which the word refers. A substantial literature suggests that children use cues to a speaker's goals and intentions to infer the referential nature of the language they hear (e.g., Baldwin, 1993; Sabbagh & Baldwin, 2001; Sabbagh, Wdowiak, & Ottaway, 2003). Beyond this, interpreting language input also may require evaluating the source of the information—whether or not the speaker is likely to provide informed and reliable labels. A burgeoning literature reveals that 3- to 4-year-old children are quite attentive to information, such as past reliability, that might indicate the trustworthiness of an adult as a source of information (Birch, 2005; Birch & Bloom, 2004; Birch, Vauthier, & Bloom, 2008; Corriveau, Fusaro, & Harris, 2009; Corriveau & Harris, 2009a, 2009b; Jaswal, 2004; Jaswal & Malone, 2007; Jaswal & Neely, 2006; Koenig, Clément, & Harris, 2004; Koenig & Harris, 2005). Less is known about the degree to which children younger than 3 years attend to and use this information. Additionally, willingness to accept new information from an adult is likely to be influenced by children's existing knowledge: Prior research suggests that young children's knowledge of word labels influences their acceptance of new labels (Au & Glusman, 1990; Baldwin, 1993; Clark, 1987; Markman, 1990; Mervis & Bertrand, 1994; Sabbagh & Baldwin, 2001; Sabbagh et al., 2003) and affects their willingness to accept the testimony of an adult (Clément, Koenig, & Harris, 2004). Again, little is known about how prior knowledge interacts with speaker reliability in children younger than 3 years.

Research exploring the relation between speaker reliability and novel word learning has offered insight into children's ability to monitor the labeling behavior of a speaker and use a history of labeling behavior to assess the likelihood of current accuracy. Four-year-old children are more willing to accept a novel label from a previously accurate labeler than from a previously inaccurate labeler (Koenig & Harris, 2005). Indeed, children as young as 3 years of age are more likely to endorse an accurate speaker than one who previously has made an error when labeling familiar objects (Pasquini, Corriveau, Koenig, & Harris, 2007). Three-year-old children also remember information regarding a speaker's accuracy over a period of days and continue to use such information in their judgments of reliability (Corriveau & Harris, 2009a). Speaker reliability appears to influence the strength of a representation for a word in children

Support for this research was provided by National Science Foundation Grant 044718 to Catharine H. Echols. We appreciate the statistical help of Greg Hixon, as well as comments on earlier versions from Jacqueline Woolley, Leslie Cohen, and two anonymous reviewers. We thank the families who participated in this study and the undergraduate research assistants who contributed to the data collection.

Correspondence concerning this article should be addressed to Sheila Krogh-Jespersen, Department of Psychology, University of Chicago, Chicago, IL 60615. Electronic mail may be sent to skrogh@uchicago.edu.

 0009-3920/2012/8302-0017
DOI: 10.1111/j.1467-8624.2011.01713.x

as young as 2 years: Although they may learn a new label from an inaccurate labeler, children fail to use that label with a different person or after a delay (Koenig & Woodward, 2010).

Expectations about a speaker's accuracy derive not only from that speaker's past reliability but also from that speaker's level of knowledge. In a study by Koenig and Harris (2005), 3-year-old children were less willing to learn from a speaker who indicated a lack of knowledge about the objects being presented than from a speaker who was knowledgeable. A possible confound in this study is that the ignorant speaker never provided a label to compete with the accurate speaker's label during the familiarization trials. Children may have learned to rely on the speaker who provided labels, regardless of accuracy, and to ignore the speaker who did not name objects when determining from whom they should learn novel words. Using a method that did not rely on labeling to establish credibility, Sabbagh et al. (2003) found that 3- to 4-year-old children disregarded information provided by an ignorant speaker while attending to and learning from more knowledgeable speakers. Children also respond to cues that are more subtle than overt expressions of ignorance, treating speakers who convey uncertainty, distraction, or hesitation as less reliable sources of information (Jaswal & Malone, 2007; Sabbagh & Baldwin, 2001). Children as young as 2 years of age learn more readily from an adult who acts confidently when providing new information than one whose nonverbal cues suggest a lack of confidence (Birch, Akmal, & Frampton, 2010). Moreover, children take into account the speaker's access to information when determining the reliability of the testimony presented (Nurmsoo & Robinson, 2009a; though see Nurmsoo & Robinson, 2009b, for evidence that children do not always excuse inaccurate labelers whose errors could be attributed to lack of visual access). These findings indicate that young children are not passively accepting or disregarding information based solely upon accuracy; rather, they are attentive to a variety of factors that might predict a speaker's level of accuracy.

One question that has not been addressed directly in prior research is the nature of children's initial expectations. Koenig and Harris (2005) had observed that earlier studies (e.g., Povinelli & DeBlois, 1992; Robinson & Whitcombe, 2003) treated the reliability of the speaker as a temporary or fleeting trait dependent on the circumstances of the experiment. They interpreted their results to support the view that children have a ''default trust'' (p. 1275) that a speaker will be a reliable labeler. This ''default trust'' is an adaptive bias that could develop from infancy, as suggested by Jaswal, Croft, Setia, and Cole (2010), and would lead children to accept the testimony of others. When the speaker violates that trust, then children are less likely to rely on that speaker for information. However, the idea that children have a default trust in adults has not been tested directly.

Another question that warrants consideration is that of how children interpret speaker behavior in light of their own knowledge and, specifically, when that knowledge allows them to selectively disregard information provided by a speaker. There are indications that children's prior knowledge influences their acceptance of information from speakers: Clément et al. (2004) have shown that when the testimony of previously accurate and inaccurate labelers conflicts with children's first-hand observations, both 3- and 4-year-olds are more likely to rely on their own knowledge than information provided by either accurate or inaccurate labelers. Additionally, Robinson and Whitcombe (2003) found that 3- to 4-year-olds would update their existing knowledge when the experimenter was better informed than they were; however, they would maintain their existing belief when the experimenter was less informed.

Research in the area of mutual exclusivity has focused on the circumstances under which children are willing to accept a second label for a familiar object (e.g., Au & Glusman, 1990; Jaswal & Hansen, 2006; Liittschwager & Markman, 1994; Markman, 1990; Markman & Wachtel, 1988; Markman, Wasow, & Hansen, 2003; Merriman & Stevenson, 1997). Mutual exclusivity is one of a number of different biases, assumptions, or principles that have been proposed to help children home in on which specific referent to associate with a particular word (Clark, 1983, 1987; Golinkoff, Mervis, & Hirsh-Pasek, 1994; Markman, 1990; Mervis & Bertrand, 1994; Mervis, Golinkoff, & Bertrand, 1994). Markman (1990) proposed that mutual exclusivity leads children to expect only one label for an object, which should reduce the number of possible referents for a new word by excluding any entities for which the child already has a name. Mutual exclusivity can be viewed as a default assumption, which can be overridden when there is prominent evidence that it is not appropriate (Markman & Wachtel, 1988). Indeed, 2-year-olds can interpret a new word as a second basic-level category label—not as referring to a different taxonomic level or a part—when input from the speaker indicates that it

is appropriate to do so (Mervis et al., 1994). Cues, such as gaze and pointing, that strongly indicate the speaker's intent to assign the second label to an object can lead children as young as 2 years of age to learn a second label for a familiar object (Jaswal, 2010), though they fail to do so when weaker cues (e.g., gaze or pointing alone) are provided (Jaswal & Hansen, 2006).

There are some indications that speaker reliability enters into children's willingness to override mutual exclusivity: Three- to 4-year-old children avoid applying a second label to an object that previously had been labeled by an accurate speaker, suggesting that the past reliability of a speaker who provides a first label influences children's willingness to subsequently accept a second label for that object (Birch et al., 2008). Koenig and Woodward's (2010) study hints that speaker reliability might selectively influence 2-year-olds' willingness to learn second labels, but the effect was fragile, being found only for high-vocabulary children in one of the three experiments in which label familiarity was manipulated.

The present study extends past research in several ways: First, it explores how children's prior knowledge of object names interacts with indications of a speaker's reliability as children determine whether or not to accept a speaker's name for an object. Second, the study tests children's responses to several cues associated with reliability, including not only accuracy and inaccuracy but also statements of knowledge or lack of knowledge. Third, it tests the question of whether children have a default expectation that adults are accurate by including a condition in which the speaker provides no information about his or her accuracy or knowledge level. Finally, because relatively little is known about the degree to which children younger than 3 years make use of previous reliability, this study focuses on 24-month-old children.

To test these questions, children interacted, during an initial reliability-establishing period, with speakers who displayed varying levels of knowledge about an object providing children with either labeling information or mental state knowledge as indications of their reliability in five conditions: The speaker labeled the objects either correctly or incorrectly, established either knowledge or ignorance about the objects and their labels, or provided no information about either reliability or knowledge level. Following this initial reliability-establishing period, prior knowledge was manipulated by teaching either first or second labels (i.e., a novel label for an object that was unfamiliar to the children or for an object for which they already had a label). Children's learning of the novel labels was then tested by asking them to select the target object from a set of novel and familiar objects. Given that our 24-month-old participants are younger than those tested in most prior research, we made reliability cues offered by the speaker highly salient and, to simplify the memory demands, we had a single labeler providing either true or false labels (in contrast to the procedure developed by Koenig, Harris, and colleagues, which uses two labelers).

When speaker reliability cues support the expectation that an adult is knowledgeable about objects, children may accept novel label information about both novel and familiar objects, learning a second label for the familiar object. However, when speaker reliability cues do not support the expectation that a speaker is a credible source of information, children may choose to reject the information provided by the speaker and rely instead on their own knowledge.

Method

Participants

One hundred and sixty children (80 males and 80 females) aged 24–25 months (M = 24.5 months, range = 23.7–25.9 months) participated in this study. The sample was primarily Caucasian (78% Caucasian, 13% Hispanic/Latino, 6% Asian American, 3% Other) and predominately middle class. The dominant language in participating children's environments, as indicated by parental report, was English. Participants were recruited from a database maintained at a university research laboratory; families were sent a letter describing the study, which was followed up by a phone call. Parents provided informed consent at the laboratory immediately prior to their child's participation in the experiment. Each child participated individually in one 30-min experimental session. Children were given a small token of appreciation (e.g., a t-shirt) for their participation.

Design and Materials

In this study, both speaker type (i.e., the reliability or apparent knowledge level of the speaker) and label type (first vs. second labels) were manipulated between subjects. There were 5 speaker type conditions in which the level of information the speaker provided was varied. These were: accurate,

inaccurate, knowledgeable, ignorant, and uninformative. These conditions were further subdivided by the type of label: Children in the first label conditions heard a novel label applied to a novel object whereas children in the second label conditions heard a novel label applied to a familiar object. Each of the 10 conditions created by crossing speaker type and label type had a total of 16 participants, with equal numbers of males and females within each condition.

Prior to the study, parents completed a vocabulary checklist to indicate their children's knowledge of the stimuli and the labels being used. The checklist consisted of a list of toys and household items selected from MacArthur-Bates Communicative Development Inventories (Fenson et al., 1993) that had been completed by previous research participants and from suggestions from participants in prior studies. Six objects, for which the parent indicated that the child knew the labels, were selected for use in the first phase of the study. Four additional objects, two targets and two distracters, were used for novel label and test trials.

For first label test trials, the target objects consisted of one of two sets of novel objects for which a 24-month-old is unlikely to know a label. The two sets of novel objects were: (a) a half of a purple spiky ball and an abstract bird stamp and (b) a spinning top and a wooden bell-shaped toy. One set of novel objects was used as the target objects and the other set was used as the novel distracters, with the sets used as target and distracter being counterbalanced within each condition. For second label conditions, the two target objects used for the test trials were highly familiar items: a stuffed dog and a blue ball. One of the two sets of novel objects described above was used as distracters in the test trials, with each set being used for half of the participants in each condition.

Procedure

Children interacted with a single experimenter throughout the duration of the study. Before the experiment began, children were given a familiarization period with the objects that were to be used in the testing phase of the experiment. This was done to decrease the likelihood that object preferences or novelty preferences would affect performance during test trials. In the first label conditions, children were allowed to play with the four novel objects. For the second label conditions, they were given an opportunity to play with the dog and ball, and the two novel objects serving as distracters in that session. The familiarization period lasted 2 min or until the child had played with each object. If the child did not attend to a particular object, the experimenter selected each object once and said, ''Look at that one,'' so that each object had been attended to during the familiarization period. No labels were used during this time. Following familiarization, objects were placed in a red covered box that contained all of the objects selected for use in the study. The box was placed on the floor and hid all of the objects from view during the labeling procedure.

After the familiarization period, children either sat on their parent's lap or stood in front of their parent, across from a seated experimenter. The parent was directed not to engage with the participant during the study and wore headphones playing classical music to discourage interaction. The experimenter picked the first object out of the red box, held it in front of her- or himself and looked at the child to initiate eye contact, then looked at the object and began the labeling procedure. During the accurate condition, the experimenter correctly labeled the object: ''That's a (object).'' During the inaccurate condition, the experimenter labeled the object with the name of a different familiar object also being used in the experiment (e.g., the experimenter held a cup and said, ''That's an apple''). During the uninformative condition, the speaker referred to the familiar object being presented with the phrases: ''Look at that. See that. Look at that. See that. Look at that.'' In each condition, the experimenter repeated the labeling phrase approximately every 2 s for a total of five times, resulting in a trial time of approximately 10 s.

In both the knowledgeable and ignorant conditions, phrasing was designed to avoid the presentation of labeling information, thereby allowing children to form judgments of the speaker based on mental state information and not accuracy. In the knowledgeable condition, the experimenter referred to the familiar object being presented with the phrase: ''I know what that is. What's that? I know what that is. What's that? I know what that is.'' Each object was referred to five times in this manner in order to maintain consistency with previous conditions. The knowledgeable speaker appeared confident when referring to the object. In the Ignorant condition, the experimenter displayed a clear lack of knowledge about both the familiar object and its name through the following phrasing: ''I don't know what that is. What's that? I don't know what that is. What's that? I don't know what that is.'' The ignorant speaker maintained a demeanor of confusion and unfamiliarity with the object being

presented. Consequently, children could form their judgments of the credibility of the speaker using nonverbal social-affective cues in addition to the phrases provided by the speaker: The knowledgeable speaker was confident and neutral when referring to objects whereas the ignorant speaker reflected a lack of knowledge in tone of voice, body posture, and facial expression. These cues were salient indicators of the speaker's trust in his or her own knowledge.

In all conditions, the experimenter placed the object within the child's hands after beginning the labeling or nonlabeling phrases. This was done to increase the child's interest in the object being labeled. If the child did not indicate any interest in holding the object that was being labeled, the experimenter placed the object centered on the table between the child and the experimenter. Each object was labeled or referred to five times, after which the experimenter removed the object and placed it back in the red box to prevent it from distracting the participant during the next trial. The experimenter then repeated the above process with the next object until all six objects selected from the checklist had been presented.

After the first six trials, in which the experimenter had established labeling behavior dependent on the condition, children experienced two novel label learning trials. During the novel label learning trials, children heard a novel label applied to either a familiar (second label conditions) or a novel (first label conditions) object. Presentation of the two novel label trials, as well as the two test trials, was identical across all five conditions; for these trials, the knowledgeable and ignorant speakers did not differ—in demeanor, facial cues, or tone of voice—from each other or from speakers in the other three conditions. In the novel label learning trials for all conditions, objects were labeled following the format of the accurate and inaccurate conditions (i.e., ''That's a . . .''). Each object was taken from the red box and labeled five times while the child was attending to it. For the second label conditions, the two novel label trials made use of a dog and a ball. For the first label conditions, the two novel label trials each made use of a novel toy; because these toys were unfamiliar, children should not already have a label for them. Across conditions, the experimenter labeled these seventh and eighth objects using the nonsense words *danu* and *gep*, words that should not have any association to a referent. See Figure 1 for a schematic of the procedure.

After both label learning trials were completed, the experimenter conducted two test trials during which four objects were placed on the table in front of the child: an object from a novel label learning trial, two randomly chosen objects from the six presented during the experimental trials, and one unfamiliar object that had not previously been labeled. The experimenter then asked the child, ''Where's a (nonsense word)? Can you point to the (nonsense word)?'' If the child did not respond, the experimenter prompted again: ''Can you point to a (nonsense word)?'' The child was praised regardless of which objects were chosen. Specific labels used during novel label learning trials and the locations of objects during test trials were fully counterbalanced within conditions. The study session was videotaped using a camcorder.

At the end of the experiment, the experimenter brought out all of the objects used during the initial labeling period and labeled each object with the correct label.

Results

For each trial, a correct choice, meaning the child chose the object that was labeled with the novel word, was given a score of 1. If the child chose incorrectly, meaning the child chose either one of the two familiar distracter objects or the novel distracter object that was not given a label, the child was given a score of zero. A ''no response'' was coded as a zero as well. Responses were combined across the two test trials to yield a coding score of either zero correct, one correct, or two correct. As shown in Table 1, participants in the first label conditions were equally willing to apply a novel label to a novel object, regardless of the speaker's reliability. In contrast, participants in the second label conditions attended to the reliability of the speaker when determining whether to apply a second label to a familiar object.

A 5 (condition: accurate, inaccurate, knowledgeable, ignorant, uninformative) × 2 (type of label: first vs. second) analysis of variance (ANOVA) revealed a significant main effect of condition, $F(4, 159) = 4.36$, $p < .01$, as well as a significant effect of first compared to second label learning, $F(1, 159) = 4.04$, $p < .05$. The interaction was nonsignificant, $F(4, 159) = 1.98$, *ns*. To gain a clearer understanding of the pattern of results within conditions, a series of simple effects ANOVAs were conducted. A simple effects test of condition was nonsignificant for first labels, $F(4, 75) = .53$, *ns*, but significant for second labels, $F(4, 75) = 7.08$, $p < .001$. Simple effects tests of first versus second labels within each

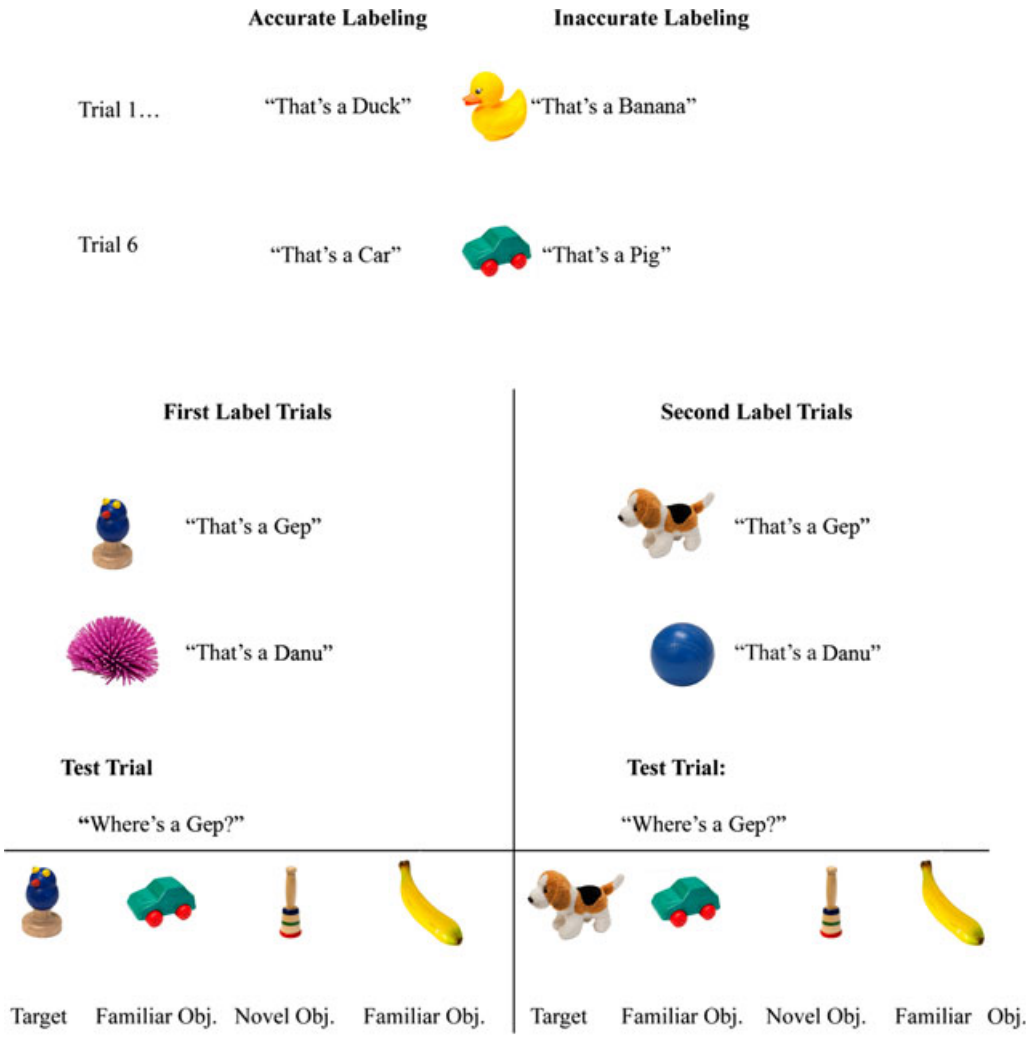

Figure 1. An example sequencing of objects and labels in accurate and inaccurate conditions with possible first test trial for the first label and the second label conditions.

Table 1
Mean Number of Target Object Responses With Standard Deviations Across Two Test Trials for Both First and Second Label Conditions

	First label		Second label	
Condition	*M*	*SD*	*M*	*SD*
Accurate	1.50	0.52	1.56	0.51
Inaccurate	1.38	0.72	0.81	0.75
Uninformative	1.31	0.79	1.43	0.63
Knowledgeable	1.19	0.66	1.06	0.57
Ignorant	1.19	0.91	0.63	0.50

condition suggest that the main effect of label was due to lower performance for second versus first labels in the inaccurate and ignorant conditions: Analyses were significant for the inaccurate, $F(1, 30) = 70.9$, $p < .001$, and ignorant, $F(1, 30) = 48.7$, $p < .001$, conditions, but were nonsignificant for the accurate, $F(1, 30) = 0.118$, *ns*; the knowledgeable, $F(1, 30) = 0.33$, *ns*; and the uninformative, $F(1, 30) = 0.244$, *ns*, conditions.

These data were also analyzed using Fisher's exact probability tests in which the number of children scoring 0, 1, and 2 correct for first and second labels, within each condition, was compared with a chance distribution. Consistent with the ANOVA results, the patterns of responding across first and second label trials differed significantly for the inaccurate ($p < .05$) and ignorant ($p < .001$) conditions but did not differ for the accurate, knowledgeable, and uninformative conditions.

Additionally, children's performance in each condition was compared with chance using second-order binomial probabilities. On each test trial, there were four objects: one target object, two familiar distracters, and one novel distracter. Because the chance probability of a child selecting the target object on a single trial is .25 (given the four options available to be chosen), the chance probability of a child selecting the target object on both trials, meaning a score of 2 of 2, is $(.25) \times (.25) = .0625$. The chance probability of scoring 1 of 2 is $(.25) \times (.75) \times 2 = .3750$, and the chance probability of scoring 0 of 2 is $(.75) \times (.75) = .5625$. The probability that the observed number of children would achieve scores of 1 or 2 was tested for first and second labels within each condition. The observed frequencies differed from chance in all conditions except the second label inaccurate and the second label ignorant conditions (both ps $> .10$), with values for the other conditions being as follows: first label accurate, first label inaccurate, and second label accurate (ps $< .001$); first and second label knowledgeable (ps $< .001$); first label ignorant ($p < .05$); first label uninformative ($p < .001$); and second label uninformative ($p < .01$).

Discussion

The findings from this study suggest that both prior knowledge and speaker reliability play a role in children's willingness to accept a novel label. Results from the first label condition show that children will learn a novel label for an unfamiliar object regardless of the labeler's previous reliability. The children in the first label condition did not already have a label that could be assigned to the object. These children might have accepted a novel name, even from a previously unreliable source, because they had no other options. Results from the second label condition indicate that children presented with a reliable labeler, as in the accurate and the knowledgeable conditions, are willing to apply a second label to an object for which they already have a name, overriding mutual exclusivity. However, children who interacted with a labeler who provided cues suggesting lower levels of reliability, as in the inaccurate and ignorant conditions, did not select the target object during the test trial. Because children in the second label conditions had a name that could be used for the object, they could be more selective in who they accepted information from. If the novel label was provided by a previously reliable source, they may have been inclined to believe that the novel word was an alternate name for the object, particularly given that the labeler's gaze and other social cues explicitly and consistently indicated that she or he was referring to the object in all conditions. This result coincides with previous findings that 2-year-old children can override mutual exclusivity when provided with clear cues to the referent in simple word learning tasks (Jaswal, 2010; Liittschwager & Markman, 1994; Mervis et al., 1994).

Our results contrast, to some degree, with those of Koenig and Woodward (2010), in that we found consistent evidence that children learned first labels more successfully than second labels from inaccurate labelers. It may be that our study highlighted variations in speaker reliability to a greater degree because we used more labeling trials, though other differences in procedures also might have contributed to the discrepancy in results. Overall, our findings suggest that children are capable of comparing their knowledge with the information being presented by an adult speaker and of making decisions, based on the apparent credibility of the speaker, as to whether to rely on their own knowledge or accept the information being provided.

Our findings also provide evidence that children are attentive to ignorance at an age for which this ability has not previously been studied. It is important to note that children were not given any information about the accuracy of the speaker's knowledge during the knowledgeable and ignorant conditions. Children were presented with cues about the speaker's mental state knowledge in the form of verbal phrasing, tone of voice, and facial expression but were not provided with a history of labeling behavior on which to base their judgments. Both the knowledgeable and the ignorant speakers appeared confident when providing the novel labels during the novel label learning trials. However, in the second label condition, children were more likely to apply a second label to a familiar object when interacting with a knowledgeable speaker than an ignorant one. The change in confidence for the ignorant speaker between the reliability establishing trials and the learning trials was not a sufficiently strong indicator of current knowledge to allow children to disregard the speaker's previous lack of knowledge about familiar objects.

These results extend Koenig and Harris's (2005) finding that children as young as 3 years distrust ignorant labelers. As mentioned earlier, a possible confound in Koenig and Harris's study is that children were given a decision as to whether to rely on a speaker who had provided accurate

information (e.g., a speaker looked at a cup and said, ''That's a cup'') and a speaker who was ignorant about the names of objects (e.g., a speaker looked at a cup and said, ''I don't know what that is''). In that paradigm, children could respond solely on the basis of whether or not the speaker had provided a label. In the study presented here, neither speaker provided labels for objects. The phrasing for both conditions was closely matched in length and in word choice. Children could make their judgments about the speaker's reliability based upon the phrases and the social cues provided, but were given no explicit information about the speaker's accuracy with regard to labels for objects.

Our findings also speak to the question of whether children have initial biases, absent a history of reliability, as to the credibility of adult labelers. Children in the uninformative condition showed the same pattern of responding as children in the accurate and knowledgeable conditions—above chance responding both for first and second label learning with no significant differences between the two—a pattern that differed from children in the inaccurate and ignorant conditions. The similarities observed between the uninformative and the two ''credible adult'' conditions suggests that children do not require a previous history of accurate labels to judge a speaker as a reliable source of information. This finding is consistent with Koenig and Harris's (2005) suggestion that children have the assumption, a ''default trust,'' that adults are accurate sources of information. Moreover, it is compatible with observations that children as young as 16 months expect adults to provide accurate labels, looking longer at adults who violate this expectation and seeking to correct their behavior (Koenig & Echols, 2003). Children may, from very early in language development, expect speakers' intentions to include the desire to provide accurate information. Although our results do not address the origin of any such bias, it is conceivable that it could be learned: Most young children will have massive exposure to adults who generally are accurate labelers. Regardless of its origin, such a bias would allow children early in language development to focus less on determining the reliability of individuals and attend more to the information being provided, unless there is clear evidence that the source should not be trusted (e.g., Jaswal et al., 2010).

Our finding that 2-year-old children showed lower levels of learning second labels, as compared to first labels, only from inaccurate and ignorant labelers can be interpreted in at least two ways: The first is that children are compelled to accept first labels from inaccurate and ignorant labelers, even though they are well aware that the sources are unreliable, because they are highly motivated to learn labels and have no other information upon which to rely; in short, unreliable information may be better than no information. In contrast, when children have knowledge available to them (e.g., a first label), they can be more selective in who they learn from. The second, not necessarily contradictory, way of interpreting the children's behavior is that they are continually evaluating new information against their existing knowledge. When there is a contradiction, children more critically evaluate the source of information: If the source does not appear credible, they maintain the information that they currently hold and disregard new information. However, when the source of information complies with their general assumptions about reliable speakers, children are more willing to update their current knowledge to include the novel information and, where contradictions exist, may be more motivated to resolve the contradiction (e.g., by interpreting the new word as referring to a specific subcategory). This second argument is consistent with a proposal by Bergstrom, Moehlmann, and Boyer (2006) that children are particularly attentive to contextual factors, such as speaker reliability, when information provided by others contradicts their existing knowledge.

The research described here contributes to a growing literature suggesting that young children are highly competent at interpreting cues to a speaker's referential intent and credibility. The current study extends past research by showing that children as young as 24 months of age attend to both reliability and mental state information in judging from whom to accept novel information, exhibiting low levels of learning from a speaker who previously labeled inaccurately or conveyed ignorance of a series of common objects. Furthermore, our findings address children's initial biases, in the absence of reliability or mental state information, supporting the view espoused by Koenig and Harris (2005) that children have a ''default trust'' of adults, such that they expect adults to be reliable labelers. Finally, our findings enhance understanding of how children's prior knowledge interacts with their judgments of speaker credibility, showing that these 24-month-olds reject information from less credible sources only when they have existing knowledge, in the form of a known name for an object; when they do not have such knowledge, they are equivalently willing to accept information from credible and

noncredible sources. Taken together, these findings suggest that children as young as 24 months are highly attentive to information about the credibility of labeling sources and are actively interpreting that information in relation to their existing knowledge. These skills undoubtedly contribute to young children's remarkable success in language learning. They also may speak to the broader question of how young children evaluate testimony from others across a wide range of learning tasks.

References

Au, T. K., & Glusman, M. (1990). The principle of mutual exclusivity in word learning: To honor or not to honor? *Child Development*, *61*, 1474–1490.

Baldwin, D. A. (1993). Early referential understanding: Infants' ability to recognize referential acts for what they are. *Developmental Psychology*, *29*, 832–843.

Bergstrom, B., Moehlmann, B., & Boyer, P. (2006). Extending the testimony problem: Evaluating the truth, scope, and source of cultural information. *Child Development*, *77*, 531–538.

Birch, S. A. J. (2005). When knowledge is a curse: Children's and adults' reasoning about mental states. *Current Directions in Psychological Science*, *14*, 25–29.

Birch, S. A. J., Akmal, N., & Frampton, K. L. (2010). Two-year-olds are vigilant of others non-verbal cues to credibility. *Developmental Science*, *13*, 363–369.

Birch, S. A. J., & Bloom, P. (2004). Understanding children's and adults' limitations in mental state reasoning. *Trends in Cognitive Sciences*, *8*, 255–260.

Birch, S. A., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*, 1018–1034.

Clark, E. V. (1983). Meaning and concepts. In P. H. Mussen (Series Ed.) & J. H. Flavell & E. M. Markman (Vol. Eds.), *Handbook of child psychology: Vol. 3. Cognitive development* (pp. 787–840). New York: Wiley.

Clark, E. V. (1987). The principle of contrast: A constraint on language acquisition. In B. Mac-Whinney (Ed.), *Mechanisms of language acquisition* (pp. 1–33). Hillsdale, NJ: Erlbaum.

Clément, F., Koenig, M., & Harris, P. (2004). The ontogenesis of trust. *Mind & Language*, *19*, 360–379.

Corriveau, K. H., Fusaro, M., & Harris, P. L. (2009). Going with the flow: Preschoolers prefer nondissenters as informants. *Psychological Science*, *20*, 372–377.

Corriveau, K., & Harris, P. L. (2009a). Preschoolers continue to trust a more accurate informant 1 week after exposure to accuracy information. *Developmental Science*, *12*, 188–193.

Corriveau, K., & Harris, P. L. (2009b). Choosing your informant: Weighing familiarity and recent accuracy. *Developmental Science*, *12*, 426–437.

Fenson, L., Dale, P., Reznick, S., Thal, D., Bates, E., Hartung, J., et al. (1993). *MacArthur Communicative Development Inventories: User's guide and technical manual*. San Diego, CA: Singular.

Golinkoff, R. B., Mervis, C. B., & Hirsh-Pasek, K. (1994). Early object labels: The case for a developmental lexical principles framework. *Journal of Child Language*, *21*, 125–155.

Jaswal, V. K. (2004). Don't believe everything you hear: Preschoolers' sensitivity to speaker intent in category induction. *Child Development*, *75*, 1871–1885.

Jaswal, V. K. (2010). Explaining the disambiguation effect: Don't exclude mutual exclusivity. *Journal of Child Language*, *37*, 95–113.

Jaswal, V. K., Croft, A. C., Setia, A. R., & Cole, C. A. (2010). Young children have a specific, highly robust bias to trust testimony. *Psychological Science*, *21*, 1541–1547.

Jaswal, V. K., & Hansen, M. B. (2006). Learning words: Children disregard some pragmatic information that conflicts with mutual exclusivity. *Developmental Science*, *9*, 158–165.

Jaswal, V. K., & Malone, L. S. (2007). Turning believers into skeptics: 3-year-olds' sensitivity to cues to speaker credibility. *Journal of Cognition and Development*, *8*, 263–283.

Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*, *17*, 757–758.

Koenig, M., Clément, F., & Harris, P. (2004). Trust in testimony: Children's use of true and false statements. *Psychological Science*, *15*, 694–698.

Koenig, M., & Echols, C. (2003). Infants' understanding of false labeling events: The referential roles of words and the speakers who use them. *Cognition*, *87*, 179–208.

Koenig, M. A., & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development*, *76*, 1261–1277.

Koenig, M. A., & Woodward, A. L. (2010). Sensitivity of 24-month-olds to the prior inaccuracy of the source: Possible mechanisms. *Developmental Psychology*, *46*, 815–826.

Liittschwager, J. C., & Markman, E. M. (1994). Sixteen- and 24-month-olds' use of mutual exclusivity as a default assumption in second-label learning. *Developmental Psychology*, *30*, 955–968.

Markman, E. M. (1990). Constraints children place on word meanings. *Cognitive Science*, *14*, 57–77.

Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology*, *20*, 121–157.

Markman, E. M., Wasow, J. L., & Hansen, M. B. (2003). Use of the mutual exclusivity assumption by young word learners. *Cognitive Psychology*, *47*, 241–275.

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

Mervis, C. B., & Bertrand, J. (1994). Acquisition of the novel name-nameless (N3C) principle. *Child Development*, *65*, 1646–1662.

Mervis, C. B., Golinkoff, R. M., & Bertrand, J. (1994). Two-year-olds readily learn multiple labels for the same basic-level category. *Child Development*, *65*, 1163–1177.

Nurmsoo, E., & Robinson, E. J. (2009a). Children's trust in previously inaccurate informants who were well or poorly informed: When past errors can be excused. *Child Development*, *80*, 23–27.

Nurmsoo, E., & Robinson, E. J. (2009b). Identifying unreliable informants: Do children excuse past inaccuracy? *Developmental Science*, *12*, 41–47.

Pasquini, E. S., Corriveau, K. H., Koenig, M., & Harris, P. L. (2007). Preschoolers monitor the relative accuracy of informants. *Developmental Psychology*, *43*, 1216–1226.

Povinelli, D. J., & DeBlois, S. (1992). Young children's (Homo sapiens) understanding of knowledge formation in themselves and others. *Journal of Comparative Psychology*, *106*, 228–238.

Robinson, E. J., & Whitcombe, E. L. (2003). Children's suggestibility in relation to their understanding about sources of knowledge. *Child Development*, *74*, 48–62.

Sabbagh, M. A., & Baldwin, D. A. (2001). Learning words from knowledgeable versus ignorant speakers: Links between preschoolers' theory of mind and semantic development. *Child Development*, *72*, 1054–1070.

Sabbagh, M. A., Wdowiak, S. D., & Ottaway, J. M. (2003). Do word learners ignore ignorant speakers? *Journal of Child Language*, *20*, 905–924.