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Young Children's Use of Contrast in Word Learning: The Case of Proper Names

D. Geoffrey Hall and Mijke Rhemtulla

University of British Columbia, Canada

Recent research has established that contrast can exert a powerful effect on early word learning. This study examined the role of contrast in young children's ability to learn proper names. Preschoolers heard a novel word for an unfamiliar stuffed animal in the presence of a second stuffed animal of either the same or a different kind. Children received contrastive information indicating that the word did not apply to the second animal. Children were more likely to interpret the word as a proper name if the second animal belonged to the same kind as the target than if it belonged to a different kind. Children did not appear to make a proper name interpretation in a control condition in which the second animal was not present, providing no contrastive information. The results reveal the strength of within-kind contrastive information to foster children's acquisition of proper names, highlighting the potency of comparison processes in early word learning.

There is now widespread evidence that comparison processing has a potent effect on learning (e.g., Christie & Gentner, 2010; Hammer, Bar-Hillel, Hertz, Weinshall, & Hochstein, 2008). This influence is especially powerful in the realm of language and categorization (e.g., Gentner & Namy, 2004, 2006). In particular, when children learn a new word, the opportunity to compare one referent to either another referent or a nonreferent has the potential to affect their interpretation dramatically. This impact has been demonstrated in children's learning of words from a range of lexical categories, including nouns (e.g., Gentner, Anggoro, & Klibanoff, 2011; Gentner & Namy, 1999; Graham, Namy, Gentner, & Meagher, 2010; Namy & Gentner, 2002), adjectives (e.g., Booth & Waxman, 2009; Waxman & Klibanoff, 2000), and verbs (e.g., Childers, 2011; Childers & Paik, 2009; Haryu, Imai, & Okada, 2011; Piccin & Waxman, 2007; Waxman, Lidz, Braun, & Lavin, 2009). In the current research, we investigated whether and how young children can use certain types of comparisons to learn proper names.

Children's ability to learn proper names has been the focus of extensive prior research (for reviews, see Bloom, 2000; Hall, 1999, 2009; Markman & Jaswal, 2004). A major finding from this work is that children exposed to English first use morphological/syntactic information to identify proper names in speech before the age of 2 years (e.g., Bélanger & Hall, 2006; Gelman & Taylor, 1984; Hall & Bélanger, 2012; Hall, Lee, & Bélanger, 2001; Jaswal & Markman, 2001; Katz, Baker, & Macnamara, 1974; Sorrentino, 2001). This result reveals that English-learning

Correspondence should be sent to D. Geoffrey Hall, Department of Psychology, University of British Columbia, 2136 West Mall, Vancouver, BC V6T 1Z4, Canada. E-mail: geoff@psych.ubc.ca

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children gain a powerful tool for acquiring proper names very early in development. The finding does not, however, offer insight into how children discover proper names in speech before they master any grammatical cues that their language provides (e.g., Macnamara, 1982), or how children learn proper names in languages that do not offer explicit grammatical marking of these expressions (e.g., Japanese; see Imai & Haryu, 2001).

A number of prior studies have addressed the preceding questions by examining children's ability to identify proper names through the use of nonlinguistic cues, such as the animacy and familiarity of the object a speaker labels with a novel word. This research has documented that young children are more likely to interpret a novel object word as a proper name if it is used to label an animate rather than an inanimate object (e.g., Gelman & Taylor, 1984; Hall, 1994; Hall, Veltkamp, & Turkel, 2004; Jaswal & Markman, 2001; Leung & Hall, 2012; Liittschwager & Markman, 1993; Macnamara, 1982), and if it is used to label a familiar object (i.e., an object for which they know a count noun for the kind) rather than an unfamiliar object (Hall, 1991; Imai & Haryu, 2001). Moreover, caregivers show sensitivity to animacy and familiarity cues when they label objects for children using proper names (Hall, Burns, & Pawluski, 2003).

The current research concerns another type of nonlinguistic cue that could affect children's tendency to interpret a novel object-directed word as a proper name: information about other objects that are either referents of the word (*multiple exemplars*) or not referents of the word (*contrastive exemplars*). When children receive information about *multiple exemplars*, they learn that a label for one object also applies to other objects (e.g., Akhtar & Montague, 1999; Gentner & Namy, 1999; Waxman & Braun, 2005; Waxman & Klibanoff, 2000; Waxman & Markow, 1998; see also Smith & Yu, 2008). Discovering that a novel word has multiple referents could give children evidence to help *rule out* a proper name interpretation because proper names label objects as individuals, and extension to more than one object provides evidence that a word is not a label for an individual object. A word given to multiple objects could, of course, be an accidentally shared proper name (e.g., two dogs both happen by chance to be named ''Rover''), but there is both anecdotal and experimental evidence that preschoolers *avoid* making a proper name interpretation of a novel word that has multiple referents, even if the referents are both animate and familiar (Hall, 1996; Hall & Bélanger, 2005).

In this study, we focused on children's use of information about *contrastive exemplars*: indications that a label for one object does *not* apply to another object (e.g., Booth & Waxman, 2009; Clark, 1987, 1988; Waxman & Klibanoff, 2000; Waxman et al., 2009; see also Au & Laframboise, 1990). The role of this type of information in lexical and conceptual development is less well understood (Namy & Clepper, 2010), but its potential relevance for learning proper names is especially clear. Discovering that a novel word for an unfamiliar animate object does *not* apply to other possible referents could help guide children *toward* a proper name interpretation because proper names label objects as individuals, and the nongeneralizability of an object word to other potential referents is *prima facie* evidence that it labels the object as an individual. In particular, we hypothesized that the discovery that a novel label for a novel target creature does not apply to another object *of the same kind* would foster children's tendency to interpret the word as a proper name.

Our hypothesis draws on a proposal first made by Markman and Jaswal (2004). The starting point for the hypothesis is a well-documented phenomenon in the word-learning literature: Young children typically generalize a novel word for a novel object to other objects from the same kind (e.g., Golinkoff, Mervis, & Hirsh-Pasek, 1994; Markman, 1989; Waxman & Lidz, 2006; Woodward & Markman, 1998). The existence of this phenomenon accounts for children's early facility at learning count nouns, but it fails to explain children's initial acquisition of proper names. Suppose a child hears a novel label for an animate but unfamiliar target object (e.g., a novel kind of stuffed animal). Previous research suggests that the child interprets such a word not as a proper name but instead as a count noun extendible to all creatures of that kind (e.g., Bélanger, 2007; Hall, 1991; Imai & Haryu, 2001). Suppose, however, that the child additionally learns that the novel word does *not* apply to a second object. If this second object belongs to the *same* kind as the target, then the child could rule out a kind interpretation of the word because the contrastive information would conflict with that interpretation. As a result, the child could entertain other interpretations of the word, such as a proper name—an alternative that would be salient if the target object were animate (e.g., Hall, 1994). Notice that this prediction of enhanced proper name learning is specific to the case in which the second object comes from the same kind as the target. If the second object belongs to a *different* kind, then the child would have no reason to rule out a kind interpretation of the label because the contrastive information would not conflict with that interpretation (i.e., the child would have no expectation that a novel label should extend to objects from different kinds).

Results from the literature on comparison also favor the prediction that learners will show an enhanced tendency to interpret a novel object word as a proper name if a labeled object is encountered along with a nonreferent object from the same kind. Extensive evidence reveals that the act of comparing two objects can highlight both similarities and differences between the objects (e.g., Gentner & Markman, 1997; Gentner & Medina, 1998). The comparison process is, however, affected by the similarity—perceptual and conceptual—between the objects being compared. The process is straightforward when the objects are similar. For example, the task of comparing two objects from the same kind (e.g., a brown dog and a grey dog) is easy, and the comparison process highlights both the similarities between them (e.g., both are dogs, both have the same shape) as well as the contrastive (or alignable) differences between them (e.g., one is brown and one is grey). Comparisons involving dissimilar objects are more difficult, because these objects do not provide a common foundation for detecting either similarities or differences. For example, comparing two objects from different kinds (e.g., a brown dog and a grey cat) is more challenging and would be less likely to lead to the highlighting of either similarities or contrastive differences between the objects (Gentner & Markman, 1997; Gentner & Medina, 1998).

Recent research indicates that within-kind contrastive information can enhance children's ability to learn words from other lexical categories. For example, this information appears to highlight property and part differences between objects, facilitating the learning of adjectives for object properties (Waxman & Klibanoff, 2000; see also Klibanoff & Waxman, 2000; Waxman & Markow, 1998) and count nouns for object parts (Gentner, Lowenstein, & Hung, 2007). We predicted that comparisons between pairs of unfamiliar animate surrogates of the same kind would also highlight differences between the objects in terms of their contrasting individual identities. If they do, then learners who receive contrastive information about these objects—indicating that a novel word applies to one but not the other—should show a heightened tendency to interpret the word as a proper name for the labeled object.

We gave preschoolers a novel word (e.g., ''DAX'') for an unfamiliar target object (a stuffed animal of a novel kind) in the presence of a second stuffed animal (the comparison object). We provided contrastive information to signal that the novel label did *not* apply to the second animal. We then assessed whether children interpreted the word as a proper name for the target object. We did so by introducing a third object that looked identical to the target (the generalization object) and then asking children to choose a referent of the word. If children restricted the word to the target object, we interpreted this behavior as indicating that they thought the word was a proper name, because otherwise we would have expected to observe extension to another same-looking animal of the same kind, having all the same properties and parts. In contrast, if children were willing to extend the word to either the target object or the generalization object, we interpreted this behavior as inconsistent with a proper name interpretation and instead consistent with a different interpretation, possibly a count noun referring to the target animal's kind or even an adjective referring to one of its properties (cf. Hall et al., 2001; see also Bélanger & Hall, 2006; Liittschwager & Markman, 1993; Sorrentino, 2001).

Our primary prediction was that children would be more likely to make a proper name interpretation of the novel label when the comparison object was from the same kind as the target object than when it was from a different kind. We thus systematically varied the similarity between the target and comparison objects. In the *high-similarity* and *moderate-similarity* conditions, the two objects had the same body shape, coloring, and texture, reflecting a degree of similarity typically observed among members of the same kind. In the high-similarity condition, the two objects looked exactly the same, but in the moderate-similarity condition, the objects differed in terms of two body parts or properties (e.g., eye shape and ear shape). Our intent in the moderate-similarity condition was to present a greater degree of perceptual variation (between target and comparison objects) within the kind than we provided in the high-similarity condition, though we did not aim to simulate the full extent of variation typically observed among members of different subordinate-level kinds within a given basic-level kind (Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976). In the *low-similarity* condition, the two objects differed in body shape, coloring, and texture, representing the low degree of similarity typically observed between members of different kinds.

Our rationale for including both high-similarity and moderate-similarity conditions was to examine whether the degree of within-kind similarity affected children's ability to learn proper names. If an enhanced tendency to make a proper name interpretation of the novel label was independent of the degree of within-kind similarity, we expected that both conditions would provide equally strong evidence of a proper name interpretation. If, however, the effect depended more precisely on the degree of within-kind similarity, we expected that the high-similarity condition would furnish stronger evidence of a proper name interpretation than would the moderate-similarity condition. This prediction follows from the fact that comparisons between two objects from the same kind should highlight contrastive differences between the objects (e.g., in their properties, their parts, and their individual identities). There were fewer perceptible contrastive differences between the target and comparison objects in the high-similarity condition than there were in the moderate-similarity condition because the objects in the high-similarity condition looked the same. As a result, the contrast between the objects' individual identities might have been more salient in the high-similarity condition than they were in the moderate-similarity condition. This difference in the salience of the distinctive individual identities might, in turn, have led to a greater tendency to interpret the novel word as a proper name in the high-similarity condition.

Our secondary interest was in whether the type of contrastive information provided about the comparison object would affect children's tendency to make a proper name interpretation of the label. As noted by Markman and Jaswal (2004), there is more than one way in which a speaker could provide contrastive information. We examined three types of contrast. In one condition, *the speaker directly denied that the novel word given to the target object applied to the comparison object* (e.g., the speaker said, ''Not DAX''). This direct contrastive evidence provided an unambiguous signal that the comparison object was not a referent of the word. Several researchers have given young word learners this type of contrastive information in experimental tasks in successful efforts to enhance children's ability to acquire new meanings (e.g., Booth & Waxman, 2009; Klibanoff & Waxman, 2000; Waxman et al., 2009). At the same time, it remains unclear whether children typically receive such direct information in the course of language learning (e.g., Pinker, 1984).

In two other conditions, we provided indirect contrastive information. This type of information may be more widely available than direct contrastive information in the daily experience of young word learners, but it requires that learners draw a pragmatic inference to conclude that a novel label given to the target object does not apply to a comparison object. Because of the additional pragmatic inference required, we expected that indirect contrastive information might be less effective than direct contrastive information in promoting a proper name interpretation of the novel word in our task.

In one of the indirect contrastive information conditions, *the speaker provided a different novel label for the comparison object* (e.g., the speaker labeled it with ''FEP''; e.g., Manders & Hall, 2002). Rather than stating that the previously used object label did not apply to the comparison object, the speaker simply gave it its own label. In this situation, the speaker did not deny that the comparison object was a referent of the word. The learner might infer, however, that if the speaker believed the novel word applied to the comparison object, he or she would have used it. Because the speaker used a different word, the learner might infer that the speaker believed that the novel word did not apply to it (for discussion, see Clark, 1987; Diesendruck & Markson, 2001).

In the other indirect contrastive information condition, *the speaker referred to the comparison object but failed to label it* (e.g., the speaker pointed to it and said, ''Look''). Rather than noting that the earlier-employed word did not extend to the comparison object, the speaker simply refrained from labeling it. In this case, the speaker again did not deny that the comparison object was a referent of the word. The learner might again infer, however, that if the speaker believed the novel word applied to the comparison object, he or she would have used it. Because the speaker did not use the word, the learner might infer that the word did not apply to it. The preceding pragmatic inference is predicted by the ''exhaustive reference principle'' proposed by Merriman, Marazita, Jarvis, Evey-Burkey, and Biggins (1995; see also Merriman & Evey, 2005). This principle states that children assume a speaker who labels a novel object with a novel word will label all objects in the situation that he or she believes to be referents of the word. A speaker's failure to do so leads children to infer that the word does not apply to the passed-over objects, a phenomenon that Merriman and colleagues dubbed the ''nominal pass-over effect.'' These authors have provided evidence that preschool children can use this principle to refine their interpretation of a novel count noun for an object (e.g., from a basic-level kind term to a subordinate-level kind term). It remains unknown whether children can use this sort of indirect negative evidence to learn proper names (see Markman & Jaswal, 2004).

METHOD

Participants

Eighty 3-year-olds ($M_{\text{age}} = 3;6$; 43 boys, 37 girls) and eighty 4-year-olds ($M_{\text{age}} = 4;6$; 35 boys, 45 girls) took part. Sixteen were assigned to a *no-comparison* control condition; the remaining 144 were assigned in groups of 16 to 9 *comparison* conditions, defined by crossing the similarity of the comparison object to the target object (high, moderate, or low) with the type of contrastive information provided about the comparison object: direct negative information (''X''/ ''not X''), indirect information in the form of a different novel label (''X''/''Y''), or indirect information in the form of reference to the object with no label (''X''/''look''). Each of the 10 conditions included an equal number of 3-year-olds and 4-year-olds, and the mean age of the 3-year-olds and the 4-year-olds in each condition was roughly equivalent (within 3 months of the overall mean for the age group). Each condition also included roughly equal numbers of boys and girls. An additional 13 children (twelve 3-year-olds, one 4-year-old; 8 girls, 5 boys; between zero and three per condition) were tested but not included in the final sample, because of inattention/failure to cooperate ($n = 8$), experimenter error ($n = 4$), or interference from a sibling ($n = 1$).

All children were fluent speakers of English, most were Caucasian, and most were from middle-class and upper middle-class families. They were recruited either through community-based preschools or through a database maintained by a university psychology department. Children recruited through preschools were tested in their classrooms and received stickers for participating. Children recruited through the database were tested in a quiet room at the university. Parents were reimbursed for parking or travel expenses, and children received a small gift and a certificate.

Stimuli

There were eight sets of stimuli, each containing five stuffed toys. Each set contained a *target object*, which was a novel creature of a particular kind, defined by a distinctive body shape and features, including coloring and texture. Each target was thus meant to represent a member of a different unfamiliar kind. Each set also contained three *comparison objects*. The high- and moderate-similarity comparison objects were intended to represent members of the same kind as the target: The high-similarity object looked the same as the target object; the moderate similarity object differed from the target in terms of two features (properties or parts). For the eight stimulus sets, the features were: number of head stripes and number of body stripes; eyebrow shape and tongue protrusion direction; eye shape and nose-point direction; number of freckles and eye-gaze direction; eye shape and ear shape; tail length and number of teeth; nose shape and horn placement; and hair thickness and eye shape. The low-similarity comparison object was intended to represent a member of a different kind from the target: It differed in terms of body shape and features, including coloring and texture. Finally, each set contained a *generalization object* that looked the same as the target. See Figure 1 for a depiction of the objects from a sample stimulus set as they were used in each comparison-object similarity condition.

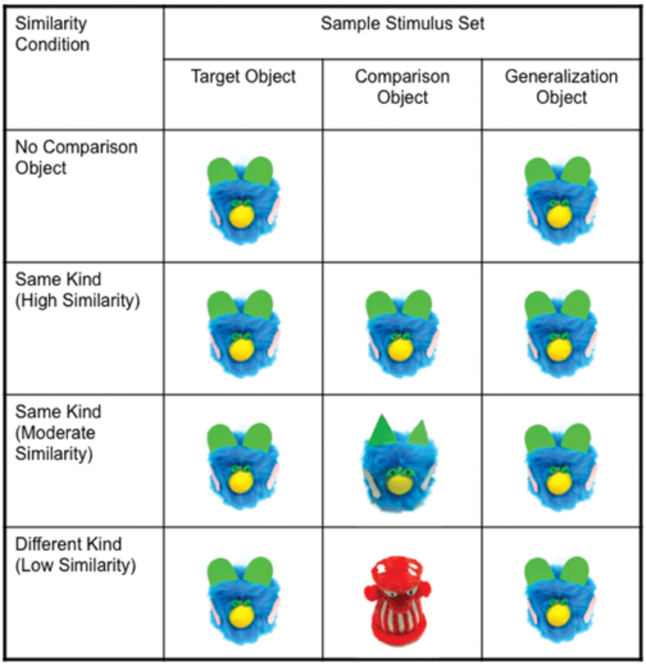

FIGURE 1 Example of stimuli used in different comparison-object similarity conditions. Note that the high-similarity comparison object matched the target object in all features, whereas the moderate-similarity comparison object differed from the target object in two features (i.e., eye shape and ear shape).

Each participant saw four stimulus sets. This aspect of the design enabled us to use the different kind (low-similarity) objects from the first four stimulus sets as the target objects in the last four sets. In other words, Sets 1 to 4 included a target object, high- and moderate-similarity comparison objects, and a generalization object from one of the first four object kinds, along with a low-similarity comparison object from one of the four remaining object kinds. Sets 5 to 8 included a target object, high- and moderate-similarity comparison objects, and a generalization object from one of the last four object kinds, along with a low-similarity comparison object from one of the first four object kinds. Participants never saw an object of a given kind in more than one set.

We chose labels for the target objects (and labels for the comparison objects in the ''X''/''Y'' conditions) from the following list: ZAV, YIX, SEB, MUV, NOL, PRAZ, FLEG, and MOOP.

Finally, we used a plastic mat roughly 3 ft long by 1 ft wide, subdivided into three roughly 1-ft squares. This mat served to standardize the placement of the objects during the task.

To assess the similarity of the targets to the comparison objects, we enlisted eight undergraduate and graduate student volunteers from a university psychology department. They rated the similarity of each target object to the corresponding three comparison objects (high, moderate, and low similarity) on a scale from 1 (labeled ''highly similar'') to 7 (labeled ''highly dissimilar''). The eight stimulus sets were presented in two blocks (Sets 1 to 4; Sets 5 to 8), with set order random within each block. The order of presentation of the high-, moderate-, and low-similarity comparison objects was approximately counterbalanced across sets. As expected, participants rated the high-similarity objects to be highly similar to the targets ($M = 1.28$, $SD = 0.55$); they rated the moderate-similarity objects to be somewhat less similar to the targets ($M = 2.73$, $SD = 0.78$); and they rated the low-similarity objects to be highly dissimilar to the targets ($M = 6.78$, $SD = 0.35$). An 8 (stimulus set) × 3 (comparison-object similarity) repeated-measures analysis of variance (ANOVA) of the mean similarity ratings yielded only one significant effect, comparison-object similarity, $F(2, 14) = 330.99$, $p < .0001$, $\eta_p^2 = .98$. Pairwise comparisons (using a Bonferroni adjustment) revealed that the high-similarity objects were rated significantly more similar to the targets than were the moderate-similarity objects; and both were rated significantly more similar to the targets than were the low-similarity objects ($p < .05$).

To assess the novelty of the eight stimulus kinds, we recruited eight preschoolers (four 3-year-olds and four 4-year-olds), none of whom took part in the experiment proper. Children first received training, in which we asked them, ‘‘What is that?’’ for 4 objects (2 familiar, 2 novel). We praised them for labeling the familiar objects (a toy airplane, a storybook) and for saying ‘‘I don’t know’’ to the unfamiliar objects (2 oddly shaped pieces of plastic). We then showed children the 8 target creatures, along with 8 stuffed animals of familiar kinds (e.g., dog, cat). We presented these 16 objects one at a time, in one of two random orders, asking, ‘‘What is that?’’ for each object. Children gave a count-noun label for the familiar animals on virtually all trials (96.9%); each familiar animal received a count-noun label from at least seven of the eight children; and children provided the correct count noun for familiar animals on 95.3% of all trials. In contrast, children gave a count noun for the target creatures on only 25.0% of trials; no target creature received a count-noun label from more than three out of eight children; and there was no complete agreement (among those who answered) about the label for any target creature. These findings provide strong evidence that the target creatures were unfamiliar, at least in the sense that children knew no count noun for the kinds.

Procedure

The child sat at a table across from the experimenter. The experimenter placed the mat with three squares width-wise across the table and invited the child to play a game, which usually lasted less than 10 min. The game had four trials, each involving a different stimulus set. Each trial unfolded in the same way. We will describe the procedure for a sample trial.

Comparison conditions. The experimenter first presented the target object in either the left-most or the right-most square. In the center square, the experimenter placed the comparison object (either high similarity, moderate similarity, or low similarity, depending on the comparison-object similarity condition). The experimenter then labeled the target object with a novel target word modeled in a *bare* sentence frame, in an effort to preserve ambiguity surrounding the word’s lexical category (i.e., to discourage reliance on morphosyntactic cues to guide interpretation). Pointing to the target object, the experimenter said, ‘‘Look! ZAV! ZAV! Can you say ‘ZAV’?’’ Regardless of whether children responded, the experimenter repeated the word twice more, saying, ‘‘Right! ZAV! ZAV!’’ We were aware that modeling a novel word in a bare sentence frame might be more felicitous for some lexical categories (e.g., a proper name, such as ‘‘Fido!’’) than it would be for others (e.g., a count noun, such as ‘‘Dog!’’). If true, however, we anticipated that this fact would have influenced children's interpretation (e.g., their tendency to make a proper name interpretation) similarly in *all* conditions. We were also aware of the potential pragmatic awkwardness of presenting the novel word in a bare frame, given that children typically hear novel words embedded in richer sentential contexts. Again, however, we expected that any awkwardness would have affected children's interpretation similarly in *all* conditions.

The experimenter then provided contrastive information about the comparison object, just as she had provided the label for the target object. In the ''X''/''not X'' conditions, the experimenter pointed to the comparison object and said, ''And look! Not ZAV! Not ZAV! Can you say, 'Not ZAV'?'' Regardless of whether children responded, the experimenter then said, ''Right! Not ZAV! Not ZAV!'' In the ''X''/''Y'' conditions, the experimenter pointed to the comparison object and said, ''And look! YIX! YIX! Can you say, 'YIX'?'' Regardless of whether children responded, the experimenter then said, ''Right! YIX! YIX!'' In the ''X''/''look'' conditions, the experimenter pointed to the comparison object and said, ''And look! Look! Look! Do you see here?'' Regardless of whether children responded, the experimenter then said, ''Right! Look! Look!''

The experimenter repeated the word for the target twice more, saying, ''So remember! ZAV! ZAV!'' Children thus heard the target labeled seven times in total. The experimenter then repeated the contrastive information for the comparison object twice more. In the ''X''/''not X'' conditions, the experimenter said, ''And not ZAV! Not ZAV!'' In the ''X''/''Y'' conditions, the experimenter said, ''And YIX! YIX!'' In the ''X''/''look'' conditions, the experimenter said, ''And look! Look!'' Children thus also heard the contrast information (either ''Not ZAV!''; ''YIX!''; or ''Look!'') seven times in total.

The experimenter then placed the generalization object in the square on the opposite side of the mat from the target object. The experimenter asked children to choose a referent of the novel target word, again presented without any sentence context: ''Now I want you to show me one. ZAV! Can you show me the one I want? ZAV!'' There was a brief pause before the target word was mentioned in each request. The experimenter asked for only one object on each trial to facilitate our ability to analyze children's performance across trials with respect to chance. We reasoned that children who made a proper name interpretation would tend to select the target object systematically across trials, whereas children who made an alternative (e.g., count noun) interpretation would tend to select randomly between the target object and generalization object across trials. The experimenter recorded children's choices. If children tried to point to/grasp two objects, the experimenter asked them to identify only one. Any child who failed to cooperate with this request was excluded from the analyses for not following instructions (see the ''Participants'' section). After children made a choice, the experimenter thanked them and removed all the objects from the table. The same procedure was repeated on each of the four trials, with a different stimulus set and a different novel word (or words).

No-comparison condition. The procedure was the same as in the comparison conditions, except that no comparison object was presented (i.e., the center square on the mat remained empty), and thus, no contrast information was provided.

We counterbalanced across trials the side on which the target object appeared, following either a left-right-right-left or right-left-left-right ordering. We also counterbalanced the order in which the four stimulus sets were presented. Half the participants in each condition saw

Stimulus Sets 1 to 4; the other half saw Sets 5 to 8. Pairs of novel words were yoked to pairs of stimulus sets (one from the first four stimulus sets, one from the second four).

RESULTS

We first present the results from the no-comparison condition, which served to verify that children did *not* tend to interpret the novel words as proper names in the absence of any comparison object. We then present the results from the comparison conditions, which provided a test of our primary hypothesis. Initial analyses revealed no effects of sex in either the no-comparison or comparison conditions, so we collapsed the data across this factor.

No-Comparison Condition

Given no comparison object, children did not tend to interpret the novel labels as proper names. We calculated the mean proportions of choices of the target and generalization objects (across the four trials). Children selected the target object roughly as often as they selected the generalization object ($M = 0.52$, $SD = 0.46$; and $M = 0.48$, $SD = 0.46$, respectively). An independent-groups t test revealed no significant difference between 3-year-olds and 4-year-olds in the mean proportion of target-object choices, $t(14) = 0.13$, $p > .05$, $d = 0.07$. Furthermore, children chose the target object only at chance levels (based on a single-sample t test, where chance was .50, given two choices), $t(15) = 0.14$, $p > .05$, $d = 0.03$. Additionally, we determined that only 8 of the 16 children were *target-object choosers*, based on their tendency to select the target object consistently (on three or four of the four trials). By confirming that children did not tend to make proper name interpretations in the absence of a comparison object, these findings provide an important foundation for interpreting the results from the comparison conditions. If children in the no-comparison condition had strongly tended to interpret the novel words as proper names, we would have been unable to document an enhancement of children's tendency to make a proper name interpretation in the comparison conditions.

Comparison Conditions

As predicted, preschoolers were more likely to interpret the novel words as proper names when given contrastive information along with a comparison object from the same kind (either high similarity or moderate similarity) than when given the same information along with a comparison object from a different kind (low similarity).

Between-condition analyses. To examine differences in performance across conditions, we conducted a $3 \times 3 \times 2$ between-subjects ANOVA, with comparison-object similarity (high, moderate, or low similarity), comparison-object treatment (''X''/''not X,'' ''X''/''Y,'' or ''X''/''look''), and age (3-year-olds or 4-year-olds) as factors. The dependent variable was the mean proportions (for four trials) of choices of the *target object*. The only significant effect was that of comparison-object similarity, $F(2,\ 126) = 16.81$, $p < .001$, $\eta_p^2 = .21$. Follow-up Tukey tests revealed that the proportion was significantly *higher* in the high- and moderate-similarity conditions than it was in the low-similarity condition (both ps $< .001$) and that the first two conditions did not differ significantly from each other. As predicted, there was more restriction of the novel label to the target object (consistent with a proper name interpretation) when the target and comparison objects were of the same kind (high- and moderate-similarity conditions) than when they were of different kinds (low-similarity condition).

An analysis of the proportions of *generalization object* choices revealed complementary results to those based on the proportions of target-object choices. Moreover, an analysis of the proportions of *comparison-object* choices revealed no significant effect of comparison-object similarity; we expected this result, given that children received contrastive information about the comparison object, and we anticipated that they would interpret the contrastive information as indicating that the novel word did not apply to it. Figure 2 shows the mean proportions of children's choices of the target, comparison, and generalization objects, broken down by comparison-object similarity (high, moderate, or low similarity) and comparison-object treatment (''X''/''not X,'' ''X''/''Y,'' or ''X''/''look'').

Within-condition analyses. To examine whether children showed a *systematic* tendency to make a proper name interpretation in any condition, we conducted two-tailed one-sample t tests, comparing the proportion of target-object choices in each condition to chance (.33, given three alternatives). Because we conducted a total of nine t tests, we used the Bonferroni-Holm method to maintain our family-wise error rate at an alpha level of .05. We also conducted a parallel set of t tests using .50 as our index of chance responding, adopting the view that there were only two *reasonable* alternatives on any trial, because children received contrastive information about the comparison object. The pattern of significance across conditions was the same using both measures of chance. We report here the results based on chance assessed at .33.

In all three comparison-object treatment conditions, the proportion of choices of the target object was significantly greater than chance in both the high- and moderate-similarity conditions. In the ''X''/''not X'' conditions, $t(15) = 5.59$, $p < .05$, $d = 1.40$, and $t(15) = 6.93$, $p < .05$, $d = 1.73$; in the ''X''/''Y'' conditions, $t(15) = 16.74$, $p < .05$, $d = 4.19$, and $t(15) = 11.36$, $p < .05$, $d = 2.84$; and in the ''X''/''look'' conditions, $t(15) = 9.07$, $p < .05$, $d = 2.27$, and $t(15) = 5.85$, $p < .05$, $d = 1.46$. On the other hand, in the low-similarity conditions, the proportions were merely at chance. In the ''X''/''not X'' condition, $t(15) = 1.83$, $p > .05$, $d = 0.46$; in the ''X''/''Y'' condition, $t(15) = 1.34$, $p > .05$, $d = 0.33$; and in the ''X''/''look'' condition, $t(15) = 1.65$, $p > .05$, $d = 0.41$. These results provide evidence that children were more likely to make a systematic proper name interpretation of the novel labels when the target and comparison objects were of the same kind (high- and moderate-similarity conditions) than when they were of different kinds (low-similarity condition).

Individual patterns analyses. We then examined children's patterns of object choices across the four trials, focusing on whether the number of *target-object choosers* differed across conditions. Recall that a *target-object chooser* was a child who selected the target object on at least three out of four trials, suggesting a consistent within-participant tendency to make a proper name interpretation. See Figure 3.

The proportion of target-object choosers was higher in the *combined* high-similarity and moderate-similarity conditions than in the low-similarity condition. The difference was significant in the ''X''/''not X'' conditions, $\chi^2(1, N = 48) = 9.19$, $p = .002$, $\phi = .44$, and in the ''X''/''Y'' conditions, $\chi^2(1, N = 48) = 9.97$, $p = .002$, $\phi = .46$. The difference approached significance in the ''X''/''look'' conditions, $\chi^2(1, N = 48) = 3.60$, $p = .058$, $\phi = .27$.

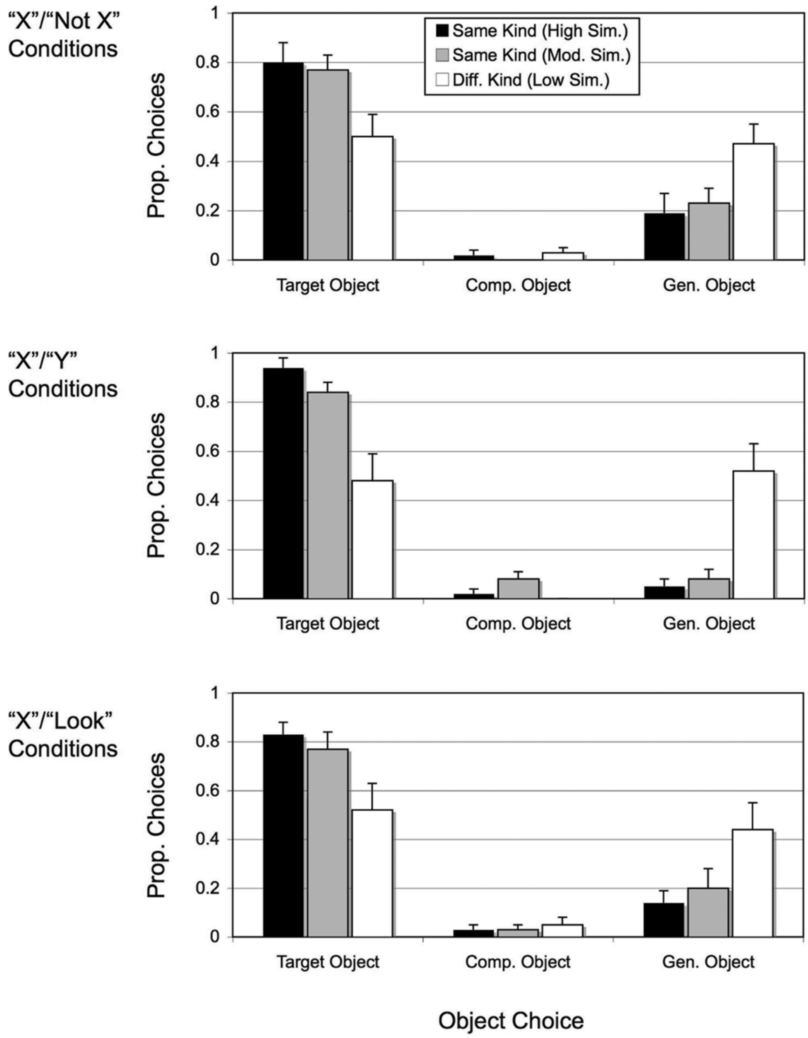

FIGURE 2 Mean proportions of object choices. Error bars represent 1 standard error.

There was also a higher proportion of target-object choosers in the high- and moderate-similarity conditions when we compared them *separately* to the proportion in the low-similarity condition. The differences were significant in the ''X''/''not X'' conditions: $\chi^2(1, N=32)=6.35$, $p=.01$, $\phi=.45$, and $\chi^2(1, N=32)=6.35$, $p=.01$, $\phi=.45$, respectively. They were also significant in the ''X''/''Y'' conditions: $\chi^2(1, N=32)=7.58$, $p=.006$, $\phi=.49$, and $\chi^2(1, N=32)=5.24$, $p=.02$, $\phi=.41$, respectively. In the ''X''/''look'' conditions, the differences were in the predicted direction but did not reach significance: $\chi^2(1, N=32)=3.24$, $p=.07$, $\phi=.32$, and $\chi^2(1, N=32)=2.03$, $p=.15$, $\phi=.25$, respectively. These findings indicate that children had a greater tendency to make a consistent proper name interpretation when

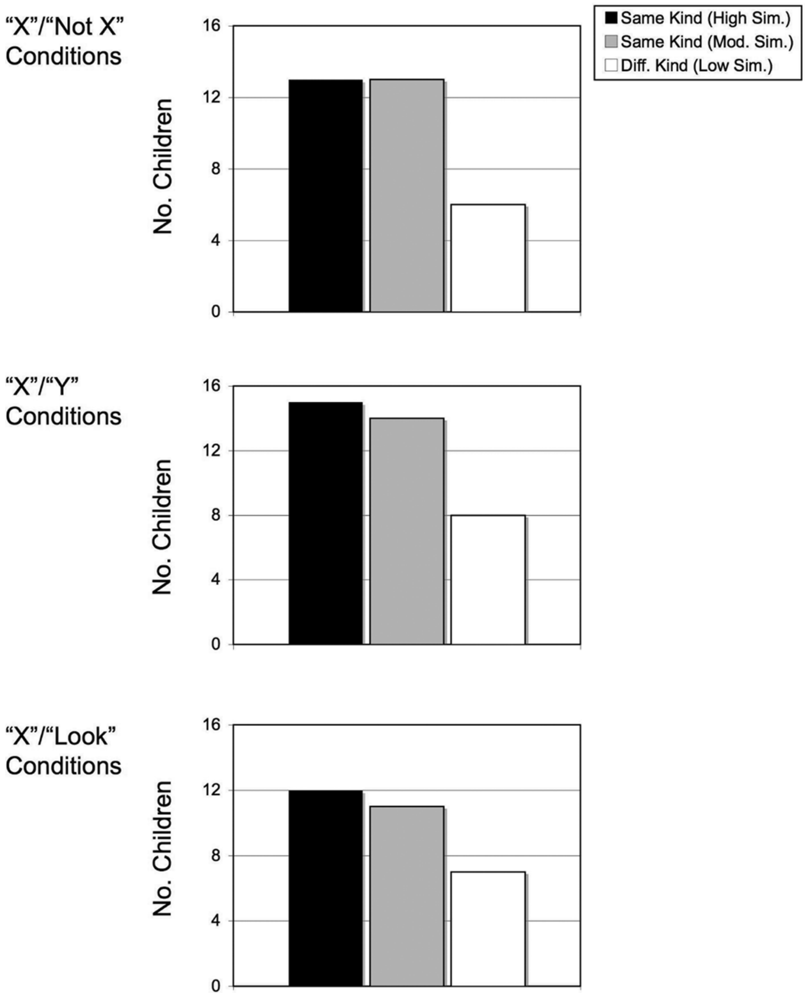

FIGURE 3 Numbers of labeled object choosers (i.e., children who chose the labeled object on three or four out of four trials). $N = 16$ per condition.

the target and comparison objects were of the same kind (high- and moderate-similarity conditions) than when they were of different kinds (low-similarity condition), although this effect was not as strong when they heard indirect contrastive information involving reference to the comparison object but no label (in the ''X''/''look'' conditions).

DISCUSSION

Preschoolers received the opportunity to compare two unfamiliar stuffed animals, along with contrastive information indicating that a novel label given to one of the objects did *not* apply to the second. Children were more likely to interpret the word as a proper name if the second object was from the same kind than if it came from a different kind. Children showed no clear tendency to interpret the word as a proper name if the second object was not present, giving no opportunity for comparison. Furthermore, we observed an enhanced tendency to make a proper name interpretation when the second object belonged to the same kind, regardless of how we provided the contrastive information: directly, by denying that the label applied to the second object (''X''/''not X'' conditions); indirectly, by providing a different label for the second object (''X''/''Y'' conditions); or indirectly, by referring to the second object without providing a label (''X''/''look'' conditions). These findings advance our understanding of lexical and conceptual development in three primary ways.

Contrastive Information to Learn Proper Names

Our findings offer new evidence of the power of contrastive information to foster early word learning, and they provide support for Markman and Jaswal's (2004) proposal about how young children learn proper names. The literature on word learning has documented that young children often interpret novel words for unfamiliar objects as labels for the kind, arguably reflecting the operation of certain default assumptions about word meaning (e.g., Markman, 1989; Waxman & Lidz, 2006; Woodward & Markman, 1998). The current results suggest that preschoolers can use contrastive information about objects from the same kind (i.e., that a novel label applies to one object but not another) to drive the inference that the word is *not* a kind term, thereby allowing them to override the proposed word-learning assumptions. As a result, this ability to use contrast frees children to entertain other possible interpretations of a novel word for an unfamiliar (animate) object, including a proper name.

An important question for future research is to determine whether comparisons involving contrastive information (either direct or indirect) promote the learning of proper names at a younger age. The children in the current research were 3- and 4-year-olds. Given that knowledge of the morphosyntactic properties of proper names appears as early as 17 months of age (Hall & Bélanger, 2012; Macnamara, 1982), it would be valuable to address this question with a task developed for use with children during the 2nd year of life. At that age, children's count-noun lexicons are still sparse (i.e., they know few labels for object kinds), and their proposed word-learning assumptions pose an especially strong impediment to learning proper names. Evidence that within-kind contrastive information can promote proper name learning in such young children would raise the possibility that this nonlinguistic cue plays a role in guiding the earliest learning of these words.

The Impact of Comparison Processes on Word Learning

Our findings enrich our understanding of the influence of comparison processes on early word learning. Prior research has revealed that within-kind contrastive information can enhance children's learning of words from other lexical categories, such as count nouns for object parts (Gentner et al., 2007) and adjectives for object properties (Klibanoff & Waxman, 2000), in situations where children encounter objects differing in terms of the presence/absence of particular parts or properties. To explain such results, Gentner and Namy (2004, 2006; see also

Gentner & Markman, 1997; Gentner & Medina, 1998; Waxman & Klibanoff, 2000) have proposed that children use a process of structural alignment, whereby juxtaposing representations of objects in terms of their shared kind creates a stable backdrop against which contrasts along certain dimensions (e.g., the presence/absence of a part or property) become salient. When the compared objects belong to different kinds, however, this alignment is more difficult, and the same contrasts are not highlighted. The current results suggest that aligning representations of objects in terms of a shared kind also provides a background against which contrasts in *individual identity* become salient. Within-kind comparison processing thus appears to have the power to highlight not only *perceptual* contrasts between objects (e.g., having Part A vs. lacking Part A; having Property A vs. lacking Property A) but also *conceptual* distinctions (e.g., being Individual A vs. not being Individual A).

The results in the high- and the moderate-similarity conditions were comparable, suggesting that the observed comparison effect did not depend on the degree of within-kind similarity. In the indirect contrastive information conditions (''X''/''Y'' and ''X''/''look'' conditions), however, children showed a slightly greater tendency to make a proper name interpretation in the high-similarity condition than they did in the moderate-similarity condition. Recall that we predicted this difference if the amount of within-kind similarity affected the ability to learn proper names, on grounds that the contrastive individual identities of the target and comparison objects would be more salient in the high-similarity condition, where other alignable differences between the objects (in parts and properties) were minimal.

Future research will be needed to determine the range of conditions under which children can exploit contrastive information about comparison objects in the service of learning proper names. In particular, it is unclear whether comparison and contrast need to be simultaneous to be effective or whether they could also be sequential. In the current research, the target object and comparison object were both present during training and testing so that children did not have to store and subsequently recall either the identity of the comparison object or the nature of the contrastive information provided by the experimenter. To be maximally efficient in fostering proper name learning, however, the sort of comparison (and contrast) processing under consideration in this work would operate over time as well (see Smith & Yu, 2008).

Direct and Indirect Contrastive Information in Word Learning

A final contribution of our results is the demonstration that children can exploit both direct and indirect contrastive cues in the service of learning novel words. This discovery suggests that contrastive information may play a pervasive role in lexical development. Although children may not systematically receive direct contrast from their caregivers about the extension of novel words (as given in our ''X''/''not X'' conditions; e.g., Pinker, 1984), there are undoubtedly many other occasions on which they receive indirect contrastive information. For example, children likely experience situations in which caregivers provide a label for one object along with different labels for other objects (as in our ''X''/''Y'' conditions; Manders & Hall, 2002; Markman & Jaswal, 2004). Children also likely encounter contexts in which caregivers label one object and merely draw attention to other objects in some fashion without labeling them (as in our ''X''/''look'' conditions; Markman & Jaswal, 2004; Merriman & Evey, 2005; Merriman et al., 1995). Children's enhanced tendency to interpret a novel word as a proper name after receiving indirect within-kind contrastive information suggests that they readily draw the pragmatic inference that a speaker is providing information about what is not in the extension of a novel word, even in situations in which the speaker does not do so overtly.

Although all three types of contrastive information examined in this research had a significant effect on children's performance, the indirect information involving reference to the comparison object without any label (''X''/''look'' conditions) seemed to be less successful than the other two types in enhancing proper name learning, as revealed by the individual patterns analyses. This finding is consistent with the prediction that the indirect contrastive information would be less effective than the direct contrastive information, because of the additional pragmatic inference required to interpret the indirect information as being contrastive. In light of this consideration, it is noteworthy that the indirect contrastive information involving a different novel label for the comparison object (''X''/''Y'' conditions) was just as effective as the direct contrastive information (''X''/''not X'') in promoting proper name learning. A challenge for future research will be to clarify the relative strength of direct and indirect contrastive cues in fostering learning in other lexical areas of lexical and conceptual development.

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