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Generics license 30-month-olds' inferences about the atypical properties of novel kinds

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Abstract

We examined whether the distinction between generic and nongeneric language provides toddlers with a rapid and efficient means to learn about kinds. In Experiment 1, we examined 30-month-olds' willingness to extend atypical properties to members of an unfamiliar category when the properties were introduced in one of three ways: a) using a generic noun phrase ("Blicks drink ketchup"); b) using a nongeneric noun phrase ("These blicks drink ketchup"); and c) using an attentional phrase ("Look at this"). Hearing a generic noun phrase boosted toddlers' extension of properties to both the model exemplars and to novel members of the same category, relative to when a property had been introduced with a nongeneric noun phrase or an attentional phrase. In Experiment 2, properties were introduced with a generic noun phrase and toddlers extended novel properties to members of the same-category, but not to an out-of-category object. Taken together, these findings demonstrate that generics highlight the stability of a feature and foster generalization of the property to novel within-category exemplars.

Keywords

generic language; inductive reasoning; categorization; conceptual development

Categories license inferences about the shared properties of their members. The challenge of identifying and linking relevant properties with categories, however, can be formidable. Although some properties may be detectable through direct experience (e.g., Lemons are *sour*), other properties may not (e.g., Lemons have *Vitamin C*). In the latter case, this information is typically obtained through interactions with more knowledgeable individuals. Once identified, those properties that are specific to an individual (e.g., a *sour* candy) must be distinguished from those properties that are characteristic of a kind (e.g., a *sour* lemon). One means through which individuals might make this distinction is by attending to the form of a speaker's kind-referring utterances. That is, natural languages convey whether a property is specific to an individual through noun phrases (NPs) that are nongeneric (e.g., "*These candies* are sour") or more broadly associated with the kind through NPs that are

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generic ("*Lemons* are sour"). In two experiments, we investigated whether 30-month-olds' inferences about the properties of unfamiliar kinds were guided by generic and nongeneric statements.

Numerous studies have demonstrated preschoolers' remarkable sensitivity to the distinction between generic and nongeneric NPs (e.g., Brandone, Gelman, & Hedglen, 2015; Cimpian & Markman, 2008; Cimpian & Scott, 2012; Gelman & Raman, 2003; Hollander, Gelman, & Star, 2002). For example, preschoolers interpret generic NPs as referring to the kind in general, versus individuals in the immediate context, independent of how many members possess the property (e.g., Brandone, Cimpian, Leslie, & Gelman, 2012; Chambers, Graham, & Turner, 2008; Cimpian & Markman, 2008; Gelman & Bloom, 2007; Gelman & Raman, 2003). Furthermore, preschoolers treat properties conveyed in generic NPs as more conceptually central to categories than properties conveyed in nongeneric NPs (e.g., Cimpian & Markman, 2009; Gelman, Ware, & Kleinberg, 2010; Hollander, Gelman, & Raman, 2009). Finally, preschoolers are more apt to remember generic information versus specific information (e.g., Cimpian & Erickson, 2012; Gelman & Raman, 2007; Gülgöz & Gelman, 2015).

Given that young children readily distinguish between generic and nongeneric phrases, this linguistic distinction may be an efficient and reliable means for children to learn about the properties of novel kinds. Indeed, a growing body of evidence indicates that preschool-aged children make use of generic language to learn about the properties of unfamiliar kinds (e.g., Chambers, Graham, & Turner, 2008; Gelman & Bloom, 2007; Gelman, Ware, & Kleinberg, 2010; Hollander, Gelman, & Raman, 2009; Stock, Graham, & Chambers, 2009). For example, Chambers et al. (2008) demonstrated that 4-year-olds used the generic/nongeneric distinction in statements about novel objects (e.g., *<u>Pagons</u> are friendly* vs. *<u>These pagons</u> are friendly*) to guide inferences about whether a novel same-category exemplar also possessed the property (e.g., *Is this pagon friendly?*). Furthermore, this sensitivity to generic language in property induction tasks emerges during the toddler years. Using a generalized imitation paradigm, Graham, Nayer, and Gelman (2011) presented 24- and 30-month-olds with novel animate kinds paired with properties that were readily generalizable to animate kinds (i.e., drinks milk, sleeps). When properties were introduced with a generic NP (e.g., *Blicks* drink milk), 30-month-olds generalized properties to new members of the same category more frequently than when properties were introduced with a non-generic NP (e.g., *These blicks* drink milk). In contrast, 24-month-olds' generalizations did not differ as a function of noun phrase.

Although this research has established that toddlers as young as 30-months are sensitive to the generic/nongeneric distinction, it is unclear *how* the generic/nongeneric distinction shifts toddlers' attribution of properties to unfamiliar kinds. That is, because the properties used in previous studies were familiar and high-frequency (e.g., sleeps, drinks milk), toddlers may have already assumed them to be true of the novel animals. Furthermore, no baseline condition measuring toddlers' generalization tendencies in the absence of kind-referring utterances was included. Thus, condition differences in prior research may have reflected a tendency for non-generics to restrict the generalization of properties, rather than generics increasing the generalization of properties.

In the present studies, we pose a novel research question, asking whether generics signal that a property should be generalized to others of the same kind (as opposed to nongenerics signalling that a property should be restricted). Although there is evidence from a categorization task that generics (but not nongenerics) shift preschoolers' responses from baseline (Hollander et al., 2009), research has not yet documented whether generics boost generalization or nongenerics restrict generalization in inductive inference tasks, nor has this issue been studied in younger children. To address these questions, we examined 30-month-olds’ use of generics when reasoning about the atypical properties of unfamiliar kinds. Specifically, we presented toddlers with properties that are arguably less typical from their perspective (e.g., drinks ketchup) in order to test whether the generic frame shifts toddlers' expectations regarding the scope of a property, from extending to a set of individuals to extending to the kind in general. Further, we contrasted 30-month-olds’ generalization of properties to unfamiliar kinds under three test conditions: when these properties are introduced with a generic frame, a nongeneric frame, or an attentional phrase (e.g., Look at this.). The inclusion of a condition where the properties were introduced with an attentional phrase provided a critical baseline measure of toddlers’ spontaneous tendency to generalize the properties in the absence of kind-referring utterances. Importantly, this condition allowed us to benchmark generic-nongeneric differences (if obtained) to determine if they are due to generics increasing performance above baseline, nongenerics restricting performance below baseline, or both. In these studies, we focus on 30-month-olds, as there is consistent, converging evidence from both production and comprehension tasks that generics are acquired around this age (Gelman, Goetz, Sarnecka, & Flukes, 2008; Gelman & Raman, 2003; Graham et al., 2011).

In Experiment 1, 30-month-olds were administered an imitation-based inductive inference paradigm in one of three wording conditions: (a) a generic condition, (b) a nongeneric condition, and (c) a baseline condition. During the demonstration phase, the child was introduced to two model objects (e.g., a blue and an orange *blick*) and an associated property using one of three phrases: a generic noun-phrase (e.g., “*Blicks* drink ketchup”), a nongeneric noun-phrase (e.g., “These *blicks* drink ketchup”), or an attentional phrase (e.g., “Look at this”) while a target action was modeled. During the generalization phase, the child was provided with the two model exemplars and a novel same-category object (e.g., a green *blick*) and prompted to imitate the action. We have two sets of (non-competing) predictions. Based on previous research (Graham et al., 2011; Hollander et al., 2009), our primary predictions involve the same-category object (i.e., the one that was not involved in the modeling). If generics boost generalization of properties, toddlers in the generic wording condition should generalize to the same-category object more often than those in the nongeneric and baseline conditions. If nongenerics restrict generalization of properties, toddlers in the nongeneric wording condition should generalize to the same-category object less often than those in the generic and baseline conditions. Finally, if both effects are operating (generics boosting generalization and nongenerics restricting generalization), then performance in all three conditions should be significantly different from one another. We also had a secondary prediction involving the modeled objects. Generics have been hypothesized to indicate that a feature is stable and non-accidental (Gelman et al., 2010). Whereas some features may be true at one moment but not the next (e.g., "This blicket is bored"), a stable, kind-relevant feature (e.g., "Blickets are four-legged") should typically hold true over time. We thus predicted that generics may lead to higher levels of imitation for the modeled objects as well.

Experiment 1

Method

Participants—The participants were 72 30-month-olds (*Mean age* = 30.10 months, *SD* = .53, *Range* = 28.82 to 31.05 months) randomly assigned to one of three wording conditions: a generic condition (*n* = 22), a nongeneric condition (*n* = 24), and a baseline condition (*n* = 26). Please refer to Table 1 for the demographics. Twenty-one additional children were tested but excluded from the final sample for the following reasons: not completing the experiment due to fussiness or refusal (*n* = 9), experimenter error (*n* = 5), statistical outliers as indexed by z-scores +/− 3 SD on the frequency of target action generalization variables (*n* = 1), and exposed to a language other than English more than 20% of the time (*n* = 6). Children were primarily Caucasian and the majority of parents (over 80%) had completed some type of post-secondary education.

Materials—Objects used in the warm-up trials included a plastic cylindrical ring holder and a ring, two plastic stackable cups, and a plastic cup and a block. The props used to illustrate the properties on the test trials included: a cluster of flowers to depict *eats flowers*, a plastic ketchup bottle to depict *drinks ketchup*, a tree on a holder to depict *sleeps in trees*, and a foam ball to depict *bounces a ball on their heads*. Each object set consisted of three novel exemplars intended to be animate representations. Within each set, the exemplars were identical in shape and size but differed in color (see Figure 1).

Design—The inductive inference task consisted of three practice trials and four test trials (eating flowers, drinking ketchup, sleeping in trees, bouncing a ball on their heads), with the order of the trials counterbalanced across participants. The two exemplars from each set that were used as models were counterbalanced across children. Which model was used for the first demonstration of the target action also was counterbalanced across children. The location of the same-category exemplar alternated for each trial (left, middle, right).

Procedure—Toddlers sat in a booster chair across the table from the experimenter with their parent seated on a chair beside them.

Practice Trials: Three practice trials were presented to familiarize toddlers with the imitation task. On each trial, the experimenter performed an action three times: once to the right, once in the center of the table, and once to the left, relative to where the child was seated. After the three demonstrations, the child was given the objects and encouraged to imitate the action. The actions performed were: stacking two blocks, putting a ring on a ring holder, and using a cup to cover a block. Children were praised for each successfully imitated action. Children in the generic wording condition (*M* = 98% *SD* = 12.5), the nongeneric wording condition (*M* = 99%, *SD* = 6.8), and the baseline wording condition (*M* = 92%, *SD* = 14.3) imitated on the majority of trials, with no significant difference across groups, *p* = .10.

Test trials: Each test trial consisted of three phases: *exposure, demonstration*, and *generalization*. The exposure phase provided a measure of the child's spontaneous tendency to demonstrate target actions with the exemplars without demonstration or instruction. During this phase, the child was presented with the three exemplars from a given set and a prop (e.g., a yellow, blue, and orange *fep* and the cluster of flowers). The prop was set on the middle of a black holder (a flat, rectangular section of reinforced cardboard) with two of the exemplars to one side of the prop and the third exemplar to the other side. The black holder with the exemplars and the prop in position was placed in front of the child and the child was given 30 seconds to explore the exemplars and the prop. If the child did not examine the exemplars after the first 10 seconds, the experimenter used a general prompt to direct the child's attention to the exemplars (e.g., "Look at these"). An additional prompt was provided after 20 seconds if no examination had occurred. After 30 seconds, the experimenter removed the three exemplars and the prop.

During the *demonstration* phase, the experimenter returned the two model exemplars that had been positioned together on the black holder along with the prop to the table. After the experimenter provided the same introductory statement ("Here are my *feps* from home") for all conditions, the instructions diverged according to wording condition. In the generic wording condition, the experimenter used a generic statement to introduce the exemplars (e.g., "Now I'm going to tell you something about *feps*"). In the nongeneric wording condition, she used a nongeneric statement (e.g., "Now I'm going to tell you something about these *feps*"), and in the baseline wording condition, she used an attentional statement (e.g., "Now I'm going to show you something"). The experimenter then demonstrated the target action three times with each of the two model exemplars (e.g., modeling an eating motion with the cluster of flowers using the blue *fep* and the orange *fep*). The target action modeled on the two model exemplars was accompanied by instructions that varied according to wording condition: a) a generic noun phrase (e.g., "*Feps* eat flowers") for the generic condition; b) a nongeneric noun phrase (e.g., "These *feps* eat flowers") for the nongeneric condition; or c) an attentional phrase (e.g., "Look at this") for the baseline condition. In total, the target action was modeled six times and the critical phrase was repeated three times. The third exemplar (the same-category exemplar; e.g., the yellow *fep*) was not visible during the demonstration phase. The model objects and props were then removed from the table.

Following the demonstration phase, the model exemplars (e.g., the blue *fep* and the orange *fep*), the same-category exemplar (e.g., the yellow *fep*), and the prop were placed on the black holder arranged in the same order as in the exposure phase. The experimenter then pointed to the two model exemplars, providing the child with a reminder statement appropriate for the wording condition (e.g., "Here are my *feps*. Remember *feps* eat flowers/ Remember *these feps* eat flowers/Remember them"). The experimenter then pointed towards the same-category exemplar, and labeled it (e.g., "Here's another *fep*"). The three exemplars and the prop were then placed in front of the child and the experimenter encouraged the child to imitate (e.g., "Show me who eats flowers" for the generic and nongeneric condition; "Show me" for the baseline condition). The child was then given 30 seconds to imitate the target action. If the child failed to perform at least one target action, the experimenter repeated the encouragement sentence a second time once 10 seconds had elapsed and a third time once 20 seconds had elapsed. If the child attempted to push away the objects prior to the 30-second time limit, the experimenter motioned towards the objects, pushing them back towards the child saying, "It's still your turn." No verbal or non-verbal feedback was provided during test trials.

Parents completed the MacArthur-Bates Communicative Development Inventory-III (CDI; Fenson et al., 2007) to ensure that the groups were equated on language proficiency. Please refer to Table 1 for mean CDI percentile scores. A series of one-way ANOVAs for group performance on vocabulary word production percentile, sentence complexity percentile, using language percentile, and mean sentence length revealed no significant differences, all *p*s > .35.

Coding—The coders were unaware of the hypotheses of the experiment and coded the videotapes without sound, ensuring they were unaware of wording condition assignment. Coders recorded both whether or not the child performed the target action on a particular exemplar and the number of target actions performed for the practice trials and the four experimental trials. A conservative coding scheme was applied-successful completion of a target action was only coded if there was evidence that it was intentionally produced. For the *eating flowers* trial, the target action consisted of touching the front of the face region of the exemplar with the cluster of flowers. The flowers touching any other area of the exemplar was not coded as a target action (e.g., placing the flowers on top of the exemplar). For the *drinking ketchup* trial, the target action consisted of touching the top end of the ketchup bottle to the front of the exemplar's head and/or tilting the plastic ketchup bottle so as to imitate a drinking motion. The bottle touching any other area of the exemplar was not coded as a target action (e.g., putting the bottle on top of the exemplar). For the *sleeping in trees* trial, the target action consisted of placing the exemplar lying down lengthwise across the top of the tree. Placing the exemplar standing up on the tree or lying down lengthwise underneath the tree was not considered target actions. For the *bouncing a ball on their heads* trial, the target action consisted of touching the blue foam ball to the top of the head of the exemplar and quickly removing it so as to create a bouncing motion. The blue foam ball touching any other area of the exemplar or holding the ball stationary on the top of the head of the exemplar was not coded as a target action.

A second coder coded 23% (n =17) of the data to assess inter-rater reliability. The inter-rater reliability (as calculated by an intraclass correlation coefficient) was .95 ($p < .0001$).

Results

We examined toddlers' imitative actions in two sets of analyses: First, we examined the likelihood of generalization by calculating whether or not infants performed the depicted target actions on a given object in each set. We then summed this Yes/No score for each object across the four object sets. Next, we examined the strength of generalization by calculating the mean summed frequency of target actions across objects. Because preliminary analyses indicated that actions on the two model exemplars did not differ across groups and because these objects have equivalent status from a conceptual standpoint, we computed an average model score for inclusion in both sets of analyses.[1]

Likelihood of generalization—Figure 2 presents the mean target action score as a function of wording condition, phase, and exemplar. A 3 (Wording Condition: Generic, Nongeneric, Baseline) × 2 (Phase: Exposure vs. Generalization) × 2 (Exemplar: Model Average, Same-Category Exemplar) mixed factor ANOVA yielded significant main effects of wording condition ($p = .001$) and phase ($p < .0001$). The phase main effect indicates that toddlers were significantly more likely to imitate with exemplars at generalization (M = 2.54, SD = 1.12) than at exposure (M = 0.35, SD = 0.53). This result demonstrates that children's imitative actions during the generalization phase can be attributed to the information provided during the demonstration phase.

The above analysis also yielded an interaction of wording condition and exemplar ($p = .003$) and a phase by wording condition interaction ($p = .04$). These effects were qualified by a significant three-way interaction among wording condition, exemplar, and phase, $F(2, 69) = 5.14$, $\eta_p^2 = .13$, $p = .008$. We followed up on this interaction by examining toddlers' target actions in the exposure and generalization phases separately. Results of a 3 (Wording Condition) × 2 (Exemplar: Model Average, Same-Category Exemplar) ANOVA performed on actions in the exposure phase revealed only a significant main effect of wording condition, $F(2,69) = 3.38$, $\eta_p^2 = .09$, $p = .04$. Follow-up comparisons indicated that toddlers in the generic condition (M = .56, SD = .70) were more likely to perform imitative actions during the exposure phase than toddlers in the baseline condition (M = .17, SD = .33; $p = .011$). There were no other significant differences (ps >.14). Although there were significant group differences during this phase, the overall level of performance was very low and differences are likely not a reflection of meaningful variation between the wording conditions (recall that the objects were introduced in the same way during this phase).

Recall that the primary question of interest was whether the type of noun phrase used to introduce the novel property influenced 30-month-olds' generalization of the property, both to the model exemplars and (most centrally) beyond the model exemplars. A 3 (Wording condition) × 2 (Exemplar) mixed factor ANOVA yielded a main effect of wording condition, $F(2, 69) = 6.95$, $\eta^2 = .17$, $p = .002$. Toddlers in the generic wording condition were more likely to imitate the target actions, collapsed across exemplar, than toddlers in the nongeneric and baseline conditions ($ps < .004$), who did not differ from one another ($p = .63$). This analysis also yielded a significant interaction between wording and exemplar, $F(2, 69) = 6.13$, $\eta^2 = .15$, $p = .004$.

To follow up on this interaction, we conducted a series of one-way ANOVAs for each exemplar, with wording condition as the between-subjects factor. For both the Model Average and the Same-Category exemplars, there were significant effects of wording condition, Fs > 6.08, ps < .004. Toddlers in the generic wording condition were significantly more likely to imitate with the model exemplars and the same-category exemplar compared to children in the nongeneric and baseline wording conditions, ps < .038. Children's

[1]When Model1 and Model2 are included in the analyses separately, the same pattern of findings emerges in both Experiments 1 and 2.

imitation of the target actions on the model exemplars and the same-category exemplar did not differ significantly between the nongeneric and baseline wording conditions, *ps* > .09. These findings suggest that hearing the generic noun phrase boosted the likelihood of generalization across all exemplars and led toddlers to infer that the property applied broadly to the category.

Frequency of generalization—Next, we examined the frequency of target actions performed on each exemplar. This measure, in addition to the likelihood measure, provides an assessment of the strength of toddlers' generalizations. We calculated a score for each exemplar that reflected the number of target actions performed during the exposure phase and the generalization phase. See Figure 3 for frequency of target action scores as a function of wording condition, phase, and exemplar. Preliminary analyses indicated no significant group or exemplar differences in frequency of target actions performed on the model exemplars and the same-category exemplars during exposure phase (*ps* > .07). Our primary analyses thus focus on target actions performed during the generalization phase.

To examine wording condition differences, we conducted a 3 (Wording condition) × 2 (Exemplar) mixed factors ANOVA. This analysis yielded only a significant main effect of wording condition, $F(2, 69) = 4.27$, $\eta^2 = .11$, $p = .018$. The effect of exemplar ($p = .94$) and interaction of wording condition and exemplar ($p = .068$) did not reach significance. Consistent with the likelihood analyses, the main effect of the wording condition indicated that children in the generic wording condition ($M = 7.63$, $SD = 3.22$) imitated significantly more often with the model and same-category exemplars than children in the nongeneric condition ($M = 5.12$, $SD = 4.08$) and children in the baseline condition ($M = 4.73$, $SD = 3.54$), *ps* < .03. Children's frequency of the target actions on the same-category exemplars did not differ significantly between the nongeneric and baseline conditions, $p > .70$.

Discussion

Hearing a generic noun phrase boosted the likelihood of generalization and frequency of target actions to both the model exemplars and same-category exemplars, relative to when properties were introduced using a nongeneric noun phrase or an attentional noun phrase. These findings suggest that embedding properties in generic NPs highlighted the conceptual significance and kind-relevance of the property, an issue we return to in the General Discussion.

The finding that children in the Generic wording condition were more likely to attribute the property to both the model exemplars and the same-category exemplars, relative to children in the Nongeneric and Baseline groups, raises questions about toddlers' interpretations of the generic noun phrase. That is, it is possible that hearing a generic noun phrase leads toddlers to generalize atypical properties to a greater degree across all exemplars, even to items belonging to a different category. In Experiment 2, we address this possibility.

Experiment 2

In this experiment, we presented 30-month-olds with the same object sets used in Experiment 1 but added an out-of-category exemplar differing in shape and color from the other exemplars. We tested children in two conditions: a No Contrasting Label condition and a Contrasting Label condition. For toddlers in both conditions, the properties of the model exemplars were introduced using generic noun phrases, as in Experiment 1. The manner in which the out-of category exemplar was introduced, however, differed across conditions. For toddlers in the No Contrasting Label condition, the same-category objects were labeled with the same count noun as the model exemplars (e.g., “This is another blick”) but the out-of-category object was introduced with an attentional phrase (e.g., “Look at this.”). Because the out-of-category status was only marked by the object’s appearance (i.e., it differed in shape and color from the other exemplars), inclusion of this condition provided a stringent assessment of whether toddlers would restrict their generalization of the novel property to exclude the out-of-category exemplar. For the Contrasting Label condition, the same-category objects were again labeled with the same count noun as the model exemplars (e.g., “This is another blick”) but here the out-of-category object was introduced with a contrasting count noun (e.g., “This is a dax. This is not a blick”). Inclusion of this condition allowed us to examine the scope of children’s property generalizations when the contrast between the membership of the same-category exemplars and the out-of-category exemplars was clearly marked by different count noun labels.

Our predictions were as follows: If 30-month-olds appreciate that generic NPs refer to kinds, generalization to the same-category exemplars should be significantly greater than generalization to the out-of-category exemplar. It is possible, however, that children’s performance may interact with the type of context provided. That is, if children require a clear contrast between the same-category exemplars and the out-of category exemplar, we expected that children would perform differently in the No Contrasting Label condition than in the Contrasting Label condition. More specifically, children in the Contrasting Label condition, but not in the No Contrasting Label condition, would imitate significantly more often with the model exemplars and the same-category exemplars than with the out-of-category exemplar.

Participants

Participants were 48 30-month-olds. Please refer to Table 1 for the demographics. Children were from predominantly English-speaking households and were recruited as in Experiment 1. Twenty-two additional children were tested but excluded from the final sample for the following reasons: experimenter error ($n = 8$), statistical outliers ($n = 4$), exposed to a language other than English in their home more than 20% of the time ($n = 9$). Children were primarily Caucasian and the majority of parents (over 80%) had completed some type of post-secondary education.

Materials

The materials were identical to those used in Experiment 1 with one exception: For each set, a fourth out-of-category exemplar was added. See Figure 4. Like the same-category exemplar, this object was presented during the exposure phase but not during the demonstration phase.

Design and Procedure

The inductive inference task was identical to that used in Experiment 1 with two exceptions: First, children were presented with four objects in each set (Model1, Model2, Same-Category Exemplar, and Out-of-Category Exemplar). When presented to the child, the positions of the model objects and the same-category and out-of-category objects relative to the child were counterbalanced across trials (i.e., for half of the trials, the two model exemplars were on the child's right and for the other half of the trials, they were on the left). Second, all children were tested in the generic noun phrase group. How the out-of-category exemplar was labeled, however, varied across conditions. In the No Contrasting Label condition, the experimenter labeled the same-category exemplar with the same category label as the model exemplars (e.g., "Here's another *fep*") but referred to the out-of-category exemplar with an attentional phrase (i.e., "Look at this"). In the Contrasting Label condition, the experimenter labeled the model exemplars and same-category exemplar with the same count noun, but the out-of-category exemplar was labeled with a new count noun (i.e., "This is a dax. This is not a fep."). The No Constrasting Label condition was run first, followed by the Contrasting Label condition. As in Experiment 1, toddlers in the No Contrasting Label condition (M =98% SD = 6.9) and the Contrasting Label condition (M =92% SD = 14.5) imitated on the majority of the practice trials, with no condition differences ($p > .06$).

A series of independent t-tests for group performance on vocabulary word production percentile, sentence complexity percentile, using language percentile, and mean sentence length revealed no significant differences between the two conditions, all *p*s > .26. Toddlers' scores were significantly lower than those tested in the generic wording condition in Experiment 1 on the sentence complexity percentile ($p = .031$) but were similar on the other language measures (*p*s > .07).

Coding

The coding scheme was identical to that of Experiment 1. Inter-rater reliability on frequency of target actions (as calculated by an intraclass correlation coefficient) for 10 children (22% of the data) was .95, $p < .0001$.

Results

As in Experiment 1, we examined both the likelihood of generalization (calculating a Yes/No for each exemplar and summing across the four sets) and frequency of generalization (using the mean summed frequency of target actions).

Likelihood of generalization—Figure 5 presents the mean target action score as a function of phase and exemplar. A 2 (Labeling Condition: No Contrasting Label vs. Contrasting Label) × 2 (Phase: Exposure vs. Generalization) × 3 (Exemplar: Model Average, Same-Category Exemplar, Out-of-Category Exemplar) repeated measures ANOVA yielded no main effect of labelling condition ($p = .78$) or any interactions with labelling condition (*p*s > .18). Thus, toddlers' performance did not vary as a function of how the out-of-category exemplar was introduced. This analysis did indicate a significant main effect of phase, $F(1, 92) = 148.86$, $\eta_p^2 = .76$, $p < .0001$. Toddlers were significantly more likely to imitate with exemplars at generalization (M = 2.05, SD = 1.09) than during the exposure phase (M =

0.20, *SD* = 0.39). Thus, toddlers' imitative actions during the generalization phase can be attributed to the information provided during the demonstration phase. This main effect was qualified by a phase by exemplar interaction, $F(2, 92) = 5.03$, $\eta_p^2 = .10$, $p = .008$.

We followed up the phase by exemplar interaction by performing a repeated measures ANOVA for each phase separately. There were no significant differences in performance of target actions on the three exemplars during the exposure phase, $p = .46$. There was a main effect of exemplar, however, for the generalization phase, $F(2, 94) = 3.77$, $\eta_p^2 = .08$, $p = .027$. As predicted, toddlers were more likely to imitate with the model exemplars and the same-category exemplar than with the out-of-category exemplar (*p*s < .035). Furthermore, toddlers' performance of target actions on the same-category exemplar did not differ from that on model exemplars ($p = .74$). This finding indicates that toddlers were equally likely to perform target actions on the model exemplars and the same-category exemplars but less likely on the out-of-category exemplar.

Frequency of generalization—As in Experiment 1, we calculated a score reflecting summed frequency of target actions. See Figure 6. Preliminary analyses revealed no differences in target actions performed in the exposure phase as a function of exemplar or labelling condition (*p*s > .23). Our primary analyses thus focus on target actions performed during the generalization phase. Results of a 2 (Labeling condition: No Contrasting Label vs. Contrasting Label) × 3 (Exemplar: Model Average, Same-Category Exemplar, Out-of-Category Exemplar) mixed factor ANOVA yielded only a significant main effect of exemplar, $F(2, 92) = 8.10$, $\eta^2 = .15$, $p = .001$. The main effect of labelling condition ($p = .71$) and labelling condition by exemplar interaction ($p = .64$) were not significant. Consistent with the likelihood analyses, toddlers performed significantly more target actions on the model exemplars ($M = 3.98$, $SD = 3.49$) and the same-category exemplar ($M = 3.78$, $SD = 2.87$) than the out-of-category exemplar ($M = 2.44$, $SD = 1.93$), *p*s < .001. Children's performance of target actions on the model exemplars and the same-category exemplar did not differ significantly, $p = .65$.

Toddlers' performance did not differ as a function of labelling condition, indicating that whether or not the out-of-category member was introduced with a contrasting count noun label did not influence inductive reasoning. The results of the likelihood and frequency analyses demonstrate that hearing a generic NP did not lead toddlers to generalize properties to an out-of-category object. Toddlers performed more target actions on the model exemplars and same-category exemplars than on the out-of-category exemplar. Thus, both sets of analyses clearly indicate that hearing a generic noun phrase did not lead toddlers to generalize to objects beyond category boundaries.

General Discussion

Our results demonstrate that 30-month-old children are keenly attuned to the generic/nongeneric distinction when making inferences about properties ascribed to novel kinds and highlight two key findings: first, generic noun phrases highlight the conceptual relevance of atypical properties for novel kinds; and second, generic noun phrases lead toddlers to extend properties within, but not beyond, categories. We discuss each of these findings below.

In Experiment 1, when the properties were introduced with generic noun phrases, 30-month-olds extended the properties to both model exemplars and to new, same-category exemplars more frequently than when the properties were introduced with nongeneric noun phrases or attentional phrases. Thus, generic noun phrases highlighted the kind-relevance of the atypical properties used in our experiments, leading toddlers to treat these properties as more conceptually relevant to all the exemplars presented. Notably, generics accomplished this in two ways: they highlighted the stability of a feature for the model exemplars, and they fostered generalizing the property to novel within-category exemplars. These findings are in keeping with studies with preschoolers demonstrating that generic noun phrases reinforce the connections between properties and categories and communicate that a feature is relatively stable and non-accidental (e.g., Cimpian & Markman, 2009; Gelman et al., 2010; Hollander et al., 2009).

Although generic noun phrases increased property extensions across all exemplars in Experiment 1, the results of Experiment 2 indicate that this effect is specific to members of the same category. That is, generic noun phrases did not lead toddlers to overgeneralize the properties to out-of-category objects. Together, these findings provide further evidence that 30-month-olds, who are just beginning to produce generic noun phrases in their own speech, use generic noun phrases to license their inferences about the properties of novel kinds. Thus, children are sensitive to the semantic implications of generics from their earliest uses.

Importantly, for atypical properties tested in these experiments, the generic NPs increased toddlers' generalization of properties to both model exemplars and to members of the same category, relative to baseline performance. This is the first demonstration that generics serve to boost children's inductive inferences. In contrast, the nongeneric NPs did not lead toddlers to restrict their generalizations relative to the baseline wording condition. That is, whether properties were introduced with nongeneric noun phrases or attentional phrases, toddlers were less likely to generalize the properties to the model exemplars and to the same-category exemplar as compared to when hearing generics. The finding that generic NPs elevated the atypical properties to become representative of the kind, but nongeneric NPs did not lead to restriction of the properties, demonstrates one respect in which the understanding of generics developmentally precedes at least one form of nongenerics. This finding is in keeping with the proposal advanced by Hollander et al. (2009) that developmental change may be more pronounced in acquiring nongenerics than in acquiring generics.

The finding that toddlers did not generalize the properties beyond baseline in the absence of kind-referring information validates that these properties were atypical and not automatically assumed to be true of any animal instance. This point is particularly compelling when one considers that the same-category exemplar was identical to the two model exemplars in all aspects except color, and all three exemplars were named with the same count noun label, even in the baseline and nongeneric wording conditions. The finding that toddlers did not assume that objects sharing the same count noun label shared atypical properties, in the absence of a generic noun phrase, is consistent with research demonstrating that young children are sensitive to the nature of the property when making inductive inferences (Gelman, 1988; Graham, Cameron, & Welder, 2005; Graham, Welder, & McCrimmon, 2003; Waxman, Lynch, Casey & Baer, 1997).

Although our results suggest that by 30-months of age, children are sensitive to the semantic implications of generics, a number of questions regarding the nature of their knowledge remain. In particular, it is unclear whether toddlers' understanding of generics reflects the same sophisticated understanding of the generic/nongeneric distinction seen in preschoolers. For example, do 30-month-olds, like preschoolers, appreciate that generics are robust to counterexamples (e.g., Chambers et al., 2008)? Do they expect that facts presented in generic NPs will be widely shared (e.g., Cimpian & Scott, 2012)? Will toddlers be more likely to remember generic than nongeneric facts (e.g., Gelman, Tapia, & Leslie, 2015)? Investigating these and other issues will lead to a more fulsome account of the emergence of generic concepts during early childhood.

In summary, when learning about more atypical properties, 30-month-olds use the information contained in generic statements to move from a position of restriction to an understanding that the property is typical of the kind and stable over time. This finding is in keeping with research demonstrating that generics lead preschoolers to consider properties as more conceptually relevant to kinds, relative to when properties are conveyed with nongeneric noun phrases (e.g., Cimpian & Markman, 2009; Gelman, Ware, & Kleinberg, 2010; Hollander et al., 2009). These findings also highlight the intricate interaction between toddlers' sensitivity to the linguistic distinction between generics/nongenerics and their knowledge about the property to be generalized.

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Figure 1.
Objects sets and props used in Experiment 1

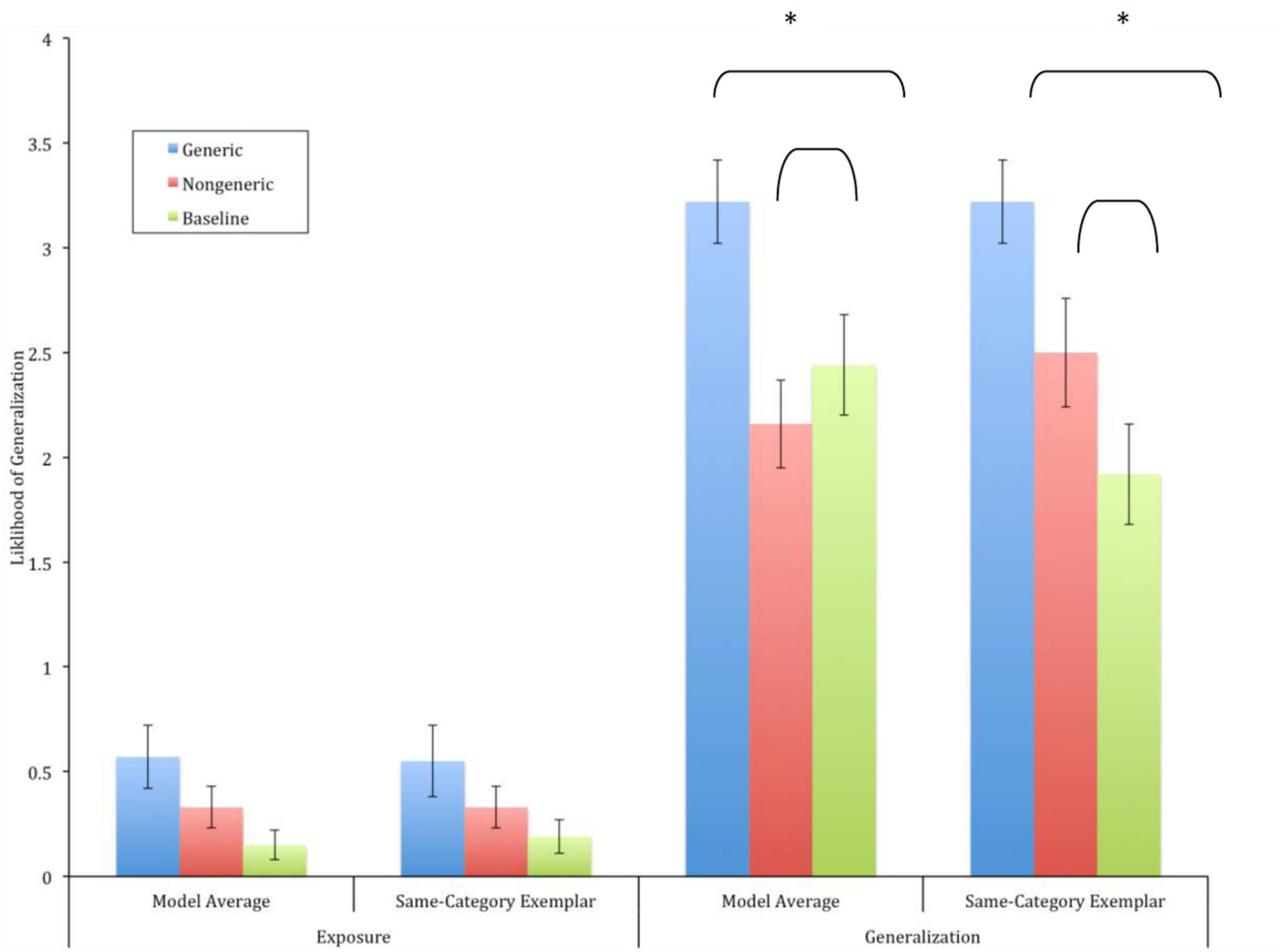

Figure 2.

Experiment 1: Likelihood of generalization as a function of group, exemplar, and phase

* Generic > Nongeneric; Generic > Baseline, *ps*< .05

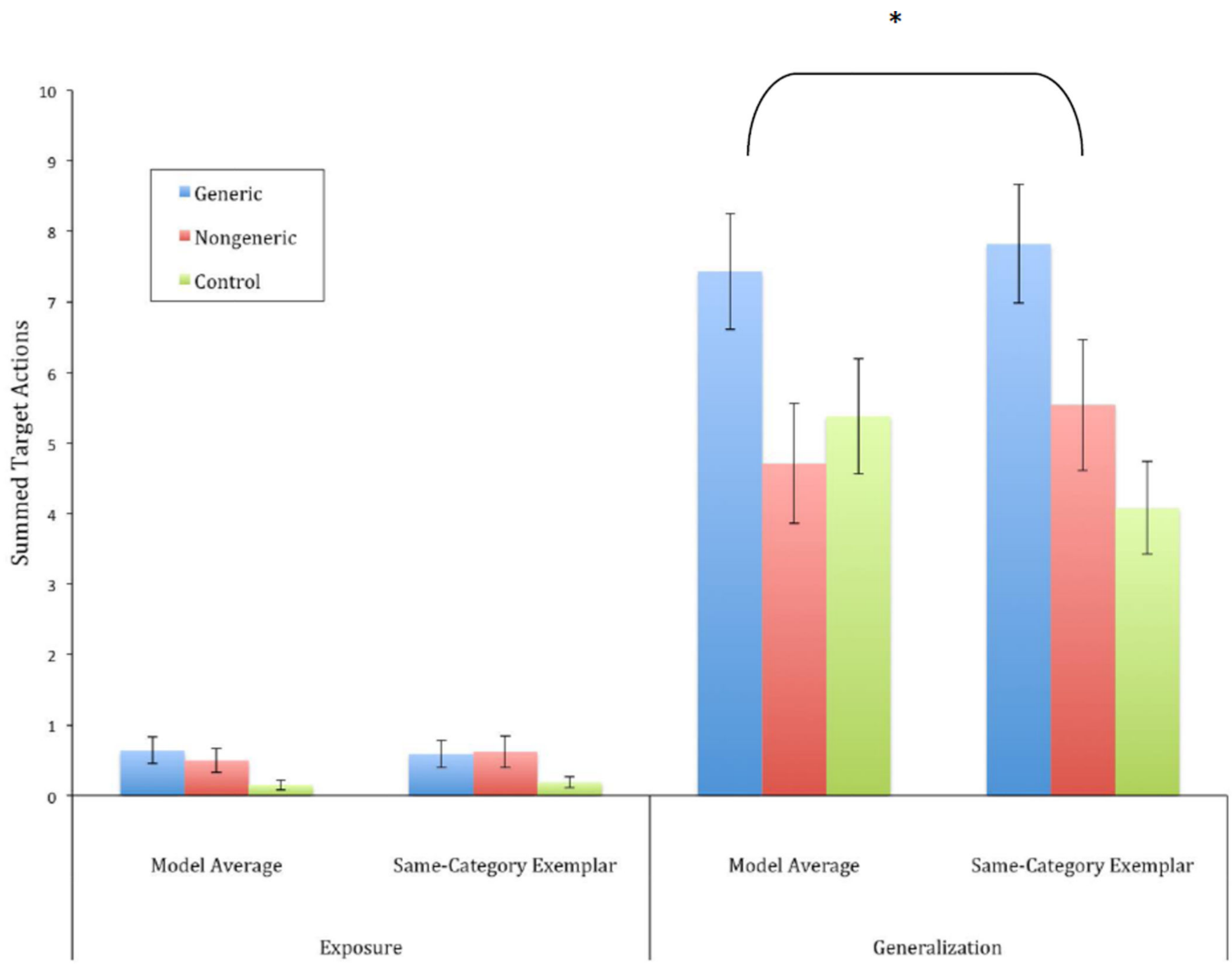

Figure 3.

Experiment 1: Frequency of generalization as a function of group, exemplar, and phase

*Main effect of wording condition: Generic > Nongeneric; Generic > Baseline, *ps*< .05

Figure 4.
Object sets used in Experiment 2, arrayed horizontally, with Out-of-Category Exemplar on the far right of each row.

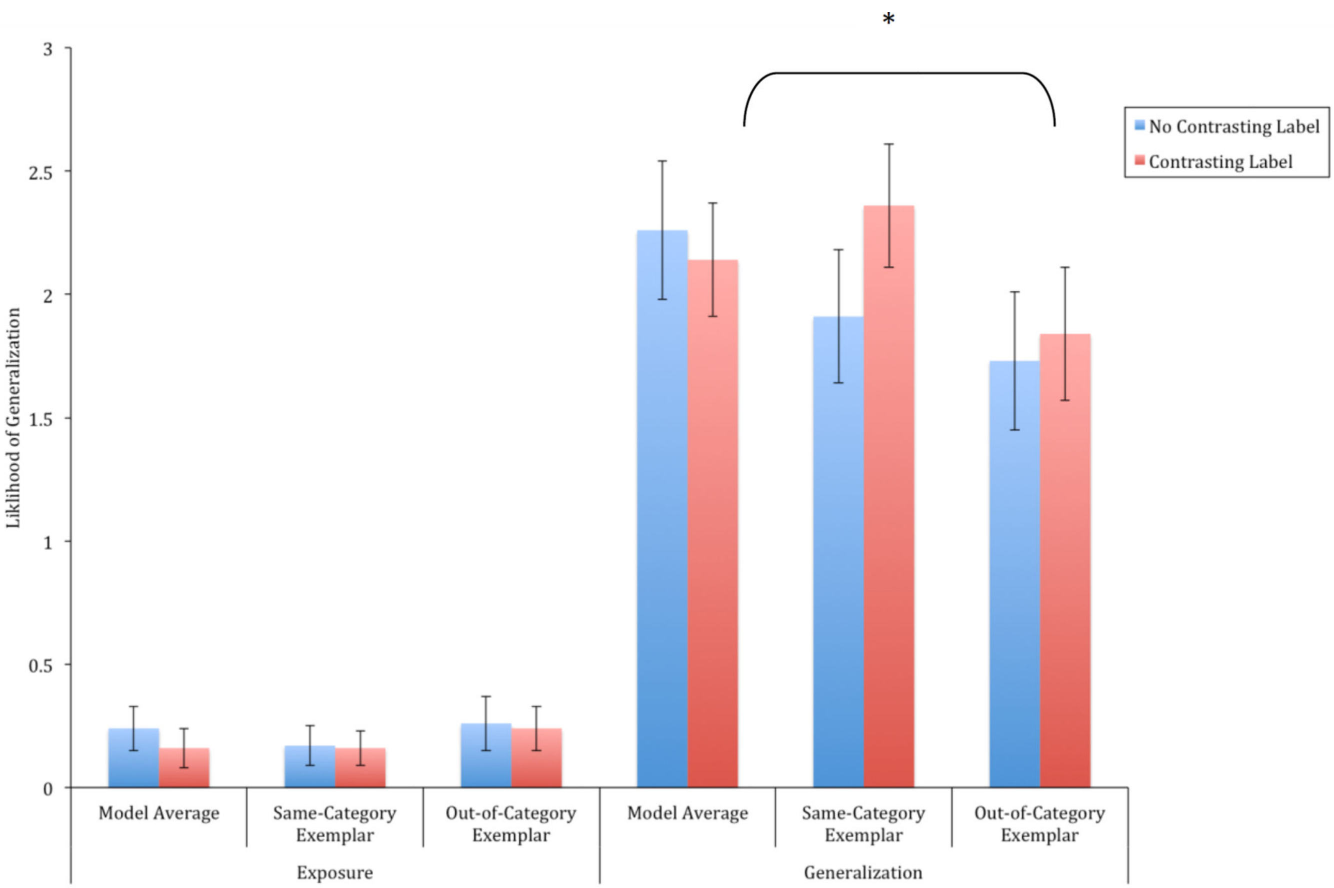

Figure 5.

Experiment 2: Likelihood of generalization as a function of condition, phase and exemplar

* Main effect of Exemplar: Model Average, Same-Category Exemplar > Out-of-Category, *ps*< .05

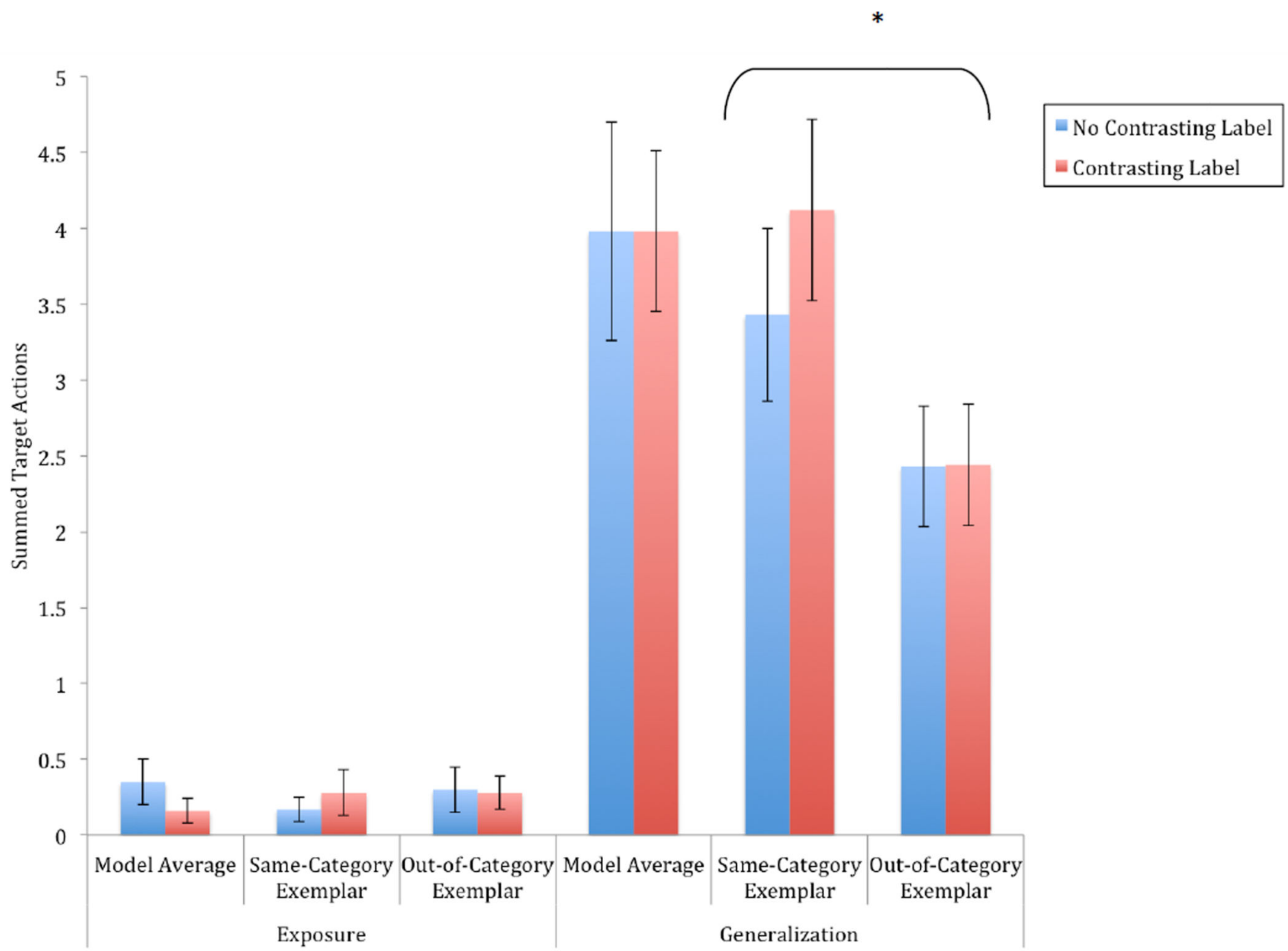

Figure 6.

Experiment 2: Frequency of generalization as a function of condition, phase and exemplar

* Main effect of exemplar: Model Average, Same-Category Exemplar > Out-of-Category, *ps*< .05

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Table 1

Demographics for Experiments 1 and 2

Condition	*n*	Mean Age (SD)	Gender	Mean CDI Word Production Percentile (SD)
EXPERIMENT 1				
Generic	22	30.16 (.48)	12 Boys	55.18 (32.96)
Non-generic	24	30.13 (.61)	13 Boys	54.79 (29.74)
Baseline	26	30.03 (.52)	10 Boys	57.50 (28.07)
EXPERIMENT 2				
No Contrasting Label	23	29.93 (.63)	13 Boys	35.05 (20.74)
Contrasting Label	25	30.06 (.39)	12 Boys	43.68 (30.10)