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Two-year-olds use the generic/non-generic distinction to guide their inferences about novel kinds

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Abstract

These studies investigated 24- and 30-month-olds' sensitivity to generic versus nongeneric language when acquiring knowledge about novel kinds. Toddlers were administered an inductive inference task, during which they heard a generic noun-phrase (e.g., "*Blicks drink milk*") or a non-generic noun-phrase (e.g., "*This blick drinks milk*") paired with an action (e.g., drinking) modeled on an object. They were then provided with the model and a non-model exemplar and asked to imitate the action. After hearing non-generic phrases, 30-month-olds, but not 24-month-olds, imitated more often with the model than with the non-model exemplar. In contrast, after hearing generic phrases, 30-month-olds imitated equally often with both exemplars. These results suggest that 30-month-olds use the generic/non-generic distinction to guide their inferences about novel kinds.

Learning about the properties of kinds is an essential part of conceptual development. One powerful means by which children can acquire knowledge about properties associated with particular kinds is through language, that is, by hearing a speaker attribute properties to kinds (e.g., "The shark has sharp teeth"). Children, however, must distinguish between situations in which a speaker intends to refer to one particular object (e.g., a shark they are watching in an aquarium) as opposed to situations in which a speaker is referring to a property of the kind as a whole (e.g., sharks more generally). One way in which children might accomplish this task is by attending to a speaker's kind-referring expressions, also known as generic language (Gelman, 2004). Generic noun-phrases (NPs), are understood to describe information that is relevant to kinds as opposed to individuals, and thereby can license inductive inferences about the shared properties of kinds. That is, a generic utterance such as "Sharks have sharp teeth" informs an individual about a property of the category sharks that can be generalized to other members of the shark kind. In contrast, non-generic NPs refer to a particular event or an idiosyncratic property of a category member that should not be generalized to the kind (e.g., "This shark has yellow teeth"). In the present studies, we investigated whether 24- and 30-month-old children are sensitive to the distinction between generic and non-generic NPs when learning about the properties of novel kinds.

Distinguishing generic from non-generic utterances is far from a straightforward task, even for an adult listener. That is, the generic/non-generic distinction is not unambiguously

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signaled by linguistic factors. For example, the morphosyntactic cues of definite singulars (e.g., generic: "The cat cleans its own fur"; non-generic: "The cat scratched up my couch") and bare plurals (e.g., generic: "Dogs wag their tails"; non-generic: "Dogs are ruining my grass") can express both generic and non-generic utterances (Gelman, 2004; Krifka et al., 1995). As such, identifying whether a generic interpretation is appropriate often draws upon nonlinguistic considerations, such as knowledge about whether a described property is likely to be an essential or defining characteristic rather than an incidental attribute (see Krifka et al., 1995). That is, an adult would likely read a statement such as "The lion has a mane" as generic yet "The lion has fleas" as non-generic using knowledge of the kinds of attributes that are characteristic of lions.

Despite the complexity inherent in identifying generic utterances, a growing body of research has demonstrated that preschool-age children use a range of cues to distinguish between generic and non-generic interpretations (e.g., Cimpian & Markman, 2008; Gelman, Star, & Flukes, 2002; Gelman & Tardif, 1998; Pappas & Gelman, 1998; Hollander, Gelman, & Star, 2002). First, studies have demonstrated that preschoolers are sensitive to the linguistic cues that signal generic or non-generic interpretations. For example, Gelman and Raman (2003) demonstrated that by 2 years of age, children recognize the difference between generic and non-generic definite noun phrases marked by the article *the* and use these distinctions to guide their responses. Second, by three years of age, children are sensitive to pragmatic cues that can differentiate generic from non-generic interpretations. In one study, they presented children with situations that either involved or did not involve a mismatch between the immediate context and the form of the linguistic information provided. For example, in a mismatch situation, children were presented with a picture of a small elephant paired with a plural NP (e.g., "Here's an elephant. Are they big or small?"). If children were sensitive to the pragmatic mismatch, they would provide a generic response (e.g., *big*). In a match situation, children were presented with a picture of two small elephants paired with a plural NP (e.g., "Here are elephants. Are they big or small?"). In this situation, children should be more likely to provide a non-generic response. Results indicated that three- and four-year-olds, but not two-year-olds, effectively interpreted pragmatic cues for distinguishing generic from non-generic utterances.

Finally, children can recruit their previous knowledge and information about the social context of an utterance to distinguish generic from non-generic meanings. For example, Cimpian and Markman (2008) demonstrated that three- and four-year-old children produced more generic utterances when provided with a generalizable property (e.g., bears - smell things far away) compared to a non-generalizable property (e.g., bears - are sick). In this same set of studies, Cimpian and Markman demonstrated that 4-year-olds, but not 3-year-olds, were sensitive to subtle cues about the social context of an utterance and the speaker's knowledge when interpreting utterances as generic or non-generic. For example, when target sentences that described the properties of animals (birds - have rocks in their tummy) were spoken by a teacher in the context of a library visit, 4-year-olds were more likely to interpret them as generic than when they were spoken by a veterinarian in the context of her office.

The research described above provides clear and compelling evidence that during the preschool years, children distinguish between the generic and non-generic use of sentences. This sensitivity suggests that generic statements provide an extremely effective means for children to acquire knowledge about object kinds. In support of this notion, research using inductive inference tasks has shown that preschoolers consider generics to be a robust source of information about the characteristic properties of familiar and novel kinds. For example Gelman et al. (2002) found that linguistic quantifiers (the universal quantifier *all* and the indefinite plural *some*) as well as generic statements influenced adults' and four-year-old children's inferences about novel properties of a familiar kind. "*All*" statements (e.g., "all bears eat ants") elicited the most inferences, "*some*" statements (e.g., "some bears eat ants") elicited the fewest inferences, and generic statements (e.g., "bears eat ants") elicited an intermediate number of inferences. These results indicate that four-year-olds are sensitive to both generics and quantifiers and that they will use that information to guide their inferences about novel properties of familiar kinds.

Children can also apply generic language to learn about the properties of unfamiliar kinds (Chambers, Graham, & Turner, 2008; Gelman & Bloom, 2007; Hollander, Gelman, & Raman, 2009; Stock, Graham, & Chambers, 2009). For example, Chambers et al. demonstrated that four-year-olds were sensitive to generic and non-generic utterances when learning about novel creatures (e.g., "*These pagons* are friendly" vs. "*Pagons* are friendly"). Most strikingly, even when an exception case was explicitly provided (e.g., "..Except this *pagon*. This *pagon* isn't friendly"), children continued to generalize properties described in generic utterances (e.g., "*Pagons* are friendly") to subsequent exemplars. Similarly, Hollander et al. (2009) found that four- and five-year-olds used the generic/non-generic distinction to guide their extensions of novel labels to new category instances. For example, children who heard "*Bants* have stripes" were more likely to select another striped animal as being a *bant*, compared to children who heard "This *bant* has stripes". Thus, generic wording seems to imply a more kind-relevant connection between a novel category and a property.

In the present studies, we pursued the question of the development of young children's appreciation of the generic/nongeneric distinction. In particular, we investigated two-year-olds' sensitivity to generic versus nongeneric language when making inductive inferences about the properties of novel kinds. We focused on two-year-olds for two reasons: First, given two-year-old children's exposure to, and production of, generic language, as well as their rudimentary understanding of generics, it seems plausible that younger children could also use the generic/nongeneric distinction to guide their inductive inferences. Yet, no research to date has investigated this question. Second, the distinction between generic and nongeneric language can provide a rapid and efficient means to learn about unfamiliar kinds. Hearing a generic utterance about an unknown category (e.g., "emus don't fly") or an unknown property of a category (e.g., "cows have four stomachs") can provide young children with the opportunity to gain knowledge about a kind as a whole with having limited exposure to that kind. Similarly, hearing a nongeneric utterance (e.g., "This *blick* has spots") can lead children to infer that the utterance refers to a property that should not be generalized beyond the individual.

In three experiments, two-year-olds (24- and 30-months) were administered variations of an imitation-based inductive inference paradigm (Mandler & McDonough, 1996). In each experiment, children were randomly assigned to one of two conditions: (a) a generic condition, and (b) a non-generic condition. During the demonstration phase, the child was introduced to a novel model exemplar (e.g., a blue *blick*) with either a generic NP (e.g., "*Blicks* drink milk") or a non-generic NP (e.g., "This *blick* drinks milk") while a target action was modeled (a drinking motion with a cup held up to the exemplar). During the generalization phase, the child was then prompted to imitate the target action and was presented with the model exemplar (e.g., the blue *blick*) and a novel non-model exemplar (e.g., the orange *blick*). The number of target actions performed on the model and non-model exemplars was measured. We predicted that children would be more likely to generalize the novel property to the model versus the non-model exemplar in the nongeneric NP condition. In contrast, we expected that children would generalize to both the model and non-model exemplars in the generic NP condition. In Experiment 1, we investigated 30-month-olds' use of the generic/nongeneric distinction when making inductive inferences about the properties of novel kinds. In Experiment 2, we investigated 24-month-olds' sensitivity to generics and nongenerics in a supportive linguistic context. Finally, Experiment 3 was a control for plurality in the generic and non-generic NPs.

EXPERIMENT 1

The goal of Experiment One was to investigate 30-month-olds' sensitivity to the distinction between generic NPs and nongeneric NPs when making inductive inferences about novel kinds within two linguistic contexts: one in which children received a sentence prompt and one in which children received a sound effect prompt. Within the sentence prompt group, children received four repetitions of the generic or non-generic NP, one of which occurred just prior to children's imitation of the target actions as a prompt (e.g., "Show me: *Blicks* drink milk"). It is conceivable that without such a prompt, children may be unable to recall the information initially provided to them, and hence be unable to use the generic or non-generic information to guide their inductive inferences during imitation. Indeed, the cognitive demands of this task are substantially high for young children. In addition to remembering the generic or non-generic information, children must: learn about two novel exemplars, learn and remember the novel exemplars' label (e.g., *blick*), and track which exemplar is the model and which is the non-model. In order to reduce the demands of the task, children were provided with a repetition of the generic or non-generic NP just prior to imitation.

Within the sound effect prompt group, we investigated children's sensitivity to the nature of the NP by eliminating the generic or non-generic NP prompt at test. It is possible that young children's imitative behavior could be shaped exclusively by the sentence prompt provided. That is, children may not be using the information initially provided to them to shape their inductive inferences. Rather, children may be influenced solely by the last utterance that occurs just prior to imitation (e.g., "Can you show me: *Blicks* drink milk") and thus, may not have learned about the property during the demonstration phase. To rule out this possibility, we replaced the generic or non-generic NP prompt with a general elicitation of imitative behavior (e.g., "Show me sip…sip").

Our predictions were as follows: First, we expected that 30-month-olds in the non-generic wording condition would imitate the target actions (e.g., drinking milk) significantly more often with the model exemplar than with the non-model exemplar, as the non-generic NP only applies to the model exemplar. Second, we expected that 30-month-olds in the generic wording condition would imitate equally often with the model and non-model exemplars, as the generic utterance implies that the property is generalizable to the kind as a whole. Finally, children's sensitivity to generics may or may not interact with the type of context provided. That is, if children require a supportive linguistic context for making inductive inferences about novel kinds or if children are simply illustrating the meaning of the sentence prompt, we expected that children would perform differently in the sentence prompt group than in the sound effect prompt group. More specifically, children in the sentence prompt group/non-generic condition would imitate significantly more often with the model exemplar than with the non-model exemplar. In addition, children in the sentence prompt group/generic condition would imitate equally often with the model and non-model exemplars. In contrast, children in the sound effect group would perform similarly in both wording conditions as the prompt provided is identical (i.e., either imitate equally often with the model and non-model exemplars or imitate more with the model than the non-model).

Method

Participants—The final sample consisted of 96 30-month-old children (*M* = 30.07 months, *Range:* 29.30 to 30.79 months) who were randomly assigned to one of two groups: a sentence prompt group and a sound effect prompt group. Within each group, children were randomly assigned to one of two wording conditions: a generic condition and a non-generic condition. See Table 1 for the demographics for each group and condition. Children were from predominantly middle-class, English-speaking households and were recruited through advertisements within the community. Twenty-two additional children were tested but excluded from the final sample for the following reasons: failure to complete two or more practice trials (*n* = 6); not completing the experiment due to fussiness or refusal (*n* = 12), experimenter error (*n* = 3), and parent interference (*n* = 1).

Materials—Six objects were used in the warm-up trials including: a plastic cup and a block; a plastic cylinder ring holder and a ring; and two plastic stackable blocks. For the test trials, the props used to illustrate the properties consisted of: a toy cookie to depict *eats cookies*, a yellow plastic toy cup to depict *drinks milk*, a toy wooden bed to depict *sleeps*, and a purple plastic toy cell phone to depict *talks*. Two novel animate-like exemplars were paired with each prop. The exemplars were stand-alone figurines created out of polymer hardening modeling clay. The items in each pair were identical in shape and size but differed in color. All exemplars were intended to be animate representations. Please refer to Figure 1 for pictures of the exemplar pairs and props.

Design—Each child was presented with four experimental trials (drinking, eating, sleeping, and talking) with order of trials counterbalanced across participants. The model exemplar was counterbalanced across participants. That is, half of the participants received one exemplar as the model and the other half of the participants received the other exemplar as the model. The side on which the model exemplar was placed (left of the prop versus right of the prop) alternated for each trial. The prop associated with each exemplar pair and the pairing of the novel words and actions with the different exemplar and prop sets remained constant across participants.

Procedure—Children sat either in a booster chair or on their parents' lap across the table from the experimenter. Parents were instructed not to encourage or reward their child during the task, nor to label, touch, pick up, or point to any of the items. An inductive inference task similar to that of Mandler and McDonough (1996) was used.

Practice Trials: Each child received three practice trials intended to familiarize him or her with the imitation task. On each trial, the child observed the experimenter perform an action three times: once to the left, once to the right, and once in the center of the table, relative to where the child was seated. Each action was paired with a vocal sound. On the first warm-up trial, the experimenter demonstrated stacking two blocks while saying, "boom". On the second trial, the experimenter demonstrated putting a ring through a ring holder while saying, "whoop". On the third trial, the experimenter demonstrated a cup covering a block while saying "oh oh". Following the demonstration of each action three times, the child was given the objects and encouraged to imitate the action (e.g., "Can you show me whoop?"). The experimenter praised the child for each successful imitated action. Children imitated on the vast majority of the practice trials (*M* = 94.45%, *SD* = 12.48), demonstrating that they were familiar with the imitation task prior to the experimental trials.

Test Trials: The test trials consisted of three phases: baseline, demonstration, and generalization. The baseline phase provided the child with the opportunity to explore the novel objects and also provided a baseline measure of the child's spontaneous ability to demonstrate target actions with the exemplars prior to the target actions being modeled. During the baseline phase, the child was presented with two novel exemplars and an accompanying prop (e.g., a blue and orange *blick* and the cup). The prop was positioned in the middle of the two exemplars and in front of the child. The child was then given the opportunity to explore and play with the exemplars and prop for 30 s. No instructions or demonstrations were provided. If the child failed to examine the exemplars after the first 10 s, the experimenter highlighted the objects using a general attentional prompt (e.g., “Look at these”). An additional attentional prompt was provided after 20 s if the child still had not examined the exemplars. Children rarely required such prompts and typically explored the exemplars spontaneously. Once 30 s had elapsed, the experimenter removed the two exemplars and the prop from the table.

During the demonstration phase, the experimenter demonstrated a target action three times with one of the exemplars (the model exemplar; e.g., modeling a drinking motion with the cup and the blue *blick*); once to the left, once to the right, and once in the center relative to where the child was seated. In the sentence prompt group, the target action modeled on the model exemplar was accompanied by either (a) a generic NP (e.g., “*Blicks* drink milk”) or (b) a non-generic NP (e.g., “This *blick* drinks milk”). In the sound effect prompt group, the target action modeled on the model exemplar was accompanied by either (a) a generic NP and a verbal sound effect (e.g., “*Blicks* drink milk…sip…sip”) or (b) a non-generic NP and a verbal sound effect (e.g., “This *blick* drinks milk…sip…sip”). In total, the target action was modeled three times and the generic or non-generic NP was repeated three times in the demonstration phase for both reminder and no reminder groups. The other exemplar (the non-model exemplar; e.g., the orange *blick*) was placed out of sight during the demonstration phase.

Following completion of the demonstration phase, the model exemplar (e.g., the blue *blick*) and the prop were removed from the table and promptly re-introduced with the non-model exemplar (e.g., the orange *blick*). The two exemplars and the prop were then placed in front of the child. In the sentence prompt group, the experimenter encouraged the child to imitate the target action by saying either (a) a generic NP (e.g., “Can you show me: <u>*Blicks* drink milk</u>”) or (b) a non-generic NP (e.g., “Can you show me: <u>This *blick* drinks milk</u>”). In the sound effect prompt group, the experimenter encouraged the child to imitate the target action without the NP (e.g., “Can you show me: sip…sip?”). The child was then given 30 s to imitate the target action. The experimenter repeated the encouragement sentence a second time once 10 s had elapsed and a third time once 20 s had elapsed, if the child had failed to perform at least one target action. No further encouragement was given if the child successfully imitated the target action at least once. If the child attempted to push away the objects prior to the 30 s time limit, the experimenter repositioned the objects in their initial locations, with the verbal cue “It’s still your turn”. The child was not given any verbal or non-verbal feedback during test trials.

Three cautionary measures were taken to ensure that one exemplar was not inadvertently highlighted over another exemplar by the experimenter. First, each pair of exemplars was placed on, and removed from the table together. Second, if an exemplar fell on the floor, the other exemplar that remained on the table was immediately removed from the table, and subsequently both exemplars were placed back in their initial locations at the same time. Third, if an exemplar was pushed out of reach from the child, the experimenter picked up both exemplars simultaneously and placed them back in their initial locations.

Following completion of the task, parents were asked to complete the MacArthur-Bates Communicative Development Inventory: Words and Sentences (CDI Advisory Board; 1992) to obtain a measure of language development and ensure that the groups and conditions were equated on language proficiency. The parent was given the CDI form to complete at home and return by mail within one week of their visit. The majority of CDI forms were returned within two weeks, however, six forms were not returned and two were incomplete. Please refer to Table 1 for the total vocabulary scores. A series of 2 × 2 ANOVAs with

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prompt group and condition performed on total vocabulary produced and subscale mean percentiles (words produced percentile, irregular words percentile, longest sentences percentile, and sentence complexity percentile) revealed no significant main effects or interactions, all *p*s > .10.

Coding—Videotapes were coded without sound to ensure that coders were unaware of group assignment and condition. Both performance of target actions on the practice trials and the four experimental trials were coded. A successful completion of a target action required clear and intentional (eye-hand coordination) behavior. For the *eating* trial, the target action consisted of touching the mouth region of the exemplar with the cookie. The cookie touching any other area of the exemplar was not coded as a target action (e.g., placing the cookie on top of the exemplar). For the *drinking* trial, the target action consisted of touching the mouth region of the exemplar with the cup and/or tilting the cup as to imitate a drinking motion. The cup being held up to the exemplar, and the exemplar being held up to the cup were also considered target actions. The cup touching any other area of the exemplar was not coded as a target action (e.g., putting the cup upside down on top of the exemplar). For the *sleeping* trial, the target action consisted of placing the exemplar lying down, either with the head or feet first, lengthwise on the bed. Placing the exemplar standing up on the bed or on the bedpost were not considered target actions. For the *talking* trial, the target action consisted of placing the phone to the head of the exemplar. The phone touching any other area of the exemplar was not coded as a target action.

A second coder coded 20% of the data for reliability purposes. The inter-rater reliability for the sentence prompt group (as calculated by an intraclass correlation coefficient) was .92 ($p < .001$) and the inter-rater reliability for the sound effect prompt group (intraclass correlation coefficient) was .92 ($p < .001$).

Results

Figure 2 illustrates the mean summed frequency of target actions by phase, exemplar, and condition. Analyses of infants' performance of target actions during the baseline phase revealed no significant differences as a function of group (sentence prompt, sound effect prompt), wording condition (generic, non-generic), or exemplar (model, non-model). Importantly, however, children performed significantly more target actions at generalization ($M = 4.72$, $SD = 1.93$) than at baseline ($M = 2.21$, $SD = 1.81$), $t(95) = 10.43$, $d = 1.33$, $p < .001$, indicating that children's imitative actions were influenced by the information provided to them during the demonstration phase.

Our primary analyses thus focus on the frequency of target actions performed with the model and non-model exemplars summed across the experimental trials during the generalization phase. Recall we predicted that 30-month-olds in the non-generic condition would perform significantly more target actions with the model exemplar than with the non-model exemplar at generalization. In contrast, we predicted that 30-month-olds in the generic condition would perform an equivalent number of target actions with the model and non-model exemplars at generalization. In addition, we predicted that the pattern of results in the sentence prompt and the sound effect prompt groups would significantly differ if children required a linguistically rich context to effectively use the generic/nongeneric distinction to guide their inductive inferences.

A 2 × 2 × 2 mixed factors analysis of variance (ANOVA) was performed with group (sentence prompt, sound effect prompt) and wording condition (generic, non-generic) as the between-subject variables and exemplar (model, non-model) as the within-subject variable. This analysis yielded only a significant interaction between condition and exemplar, $F(1, 92) = 10.15$, $\eta^2 = .10$, $p < .01$. As predicted, follow-up comparisons with a Bonferroni

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correction (p = .025) indicated that children in the generic condition imitated equally often with the model exemplar (M = 4.44; SD = 2.46) and the non-model exemplar (M = 5.08; SD = 2.50) at generalization, p > .18. Children in the non-generic condition, however, imitated significantly more often with the model exemplar (M = 5.50; SD = 3.03) than with the non-model exemplar (M = 3.85; SD = 2.47) at generalization, t (47) = 3.00, d = 0.59, p < .01.

In the final set of analyses, we used planned comparisons to examine whether the influence of wording condition held up within each prompt type group. Within the sentence prompt group, children in the generic condition performed similar numbers of target actions with the model exemplar (M = 4.79) and the non-model exemplar (M = 4.67) at generalization, p > .87. In contrast, children in non-generic condition performed significantly more target actions with the model exemplar (M = 5.88) than with the non-model exemplar (M = 3.71), t (23) = 2.28, d = 0.73, p < .05. Within the sound effect prompt group, children in the generic condition performed significantly more target actions with the non-model exemplar (M = 5.50) than with the model exemplar (M = 4.08), t (23) = 2.60, d = 0.69, p < .05. Finally, children in non-generic condition performed more target actions with the model exemplar (M = 5.12) than with the non-model exemplar (M = 4.00), t (23) = 2.05, d = 0.43, p = .052. Thus, consistent with the results of the overall ANOVA, children in the non-generic wording condition in both prompt groups were more likely to imitate with the model exemplar than the non-model exemplar.

Discussion

Children in the non-generic condition performed significantly more target actions with the model exemplar than with the non-model exemplar at generalization. In contrast, children in the generic condition performed an equivalent number of target actions with the model and non-model exemplars at generalization. These results provide evidence that 30-month-old children use the generic/nongeneric distinction to guide their inductive inferences about novel kinds. That is, children generalized properties to a new exemplar (the non-model exemplar; e.g., the orange *blick*) and to the original modeled exemplar of a novel category (the model exemplar; e.g., the blue *blick*) when they heard a generic NP (e.g., "*Blicks* drink milk"). In contrast, when 30-month-olds heard a non-generic NP (e.g., "This *blick* drinks milk"), they were more likely to imitate with the model exemplar rather than with a new exemplar from the same novel category.

There was no main effect of prompt type or any interaction effects with prompt type group that even approached significance. Furthermore, planned comparisons indicated that children in both non-generic conditions were more likely to imitate with the model than the non-model exemplar. Interestingly, in the generic condition in the sound effect prompt group, children imitated more with the non-model exemplar than the model exemplar. Together, these findings demonstrate that children used the generic and non-generic information provided during the demonstration phase to shape their inductive inferences at generalization. These findings also demonstrate that children did not simply interpret the prompt in the generic condition in the sentence prompt group as a request to provide a plural demonstration of the actions. If that were the case, then children's performance should have varied across prompt groups (i.e., one would have expected a main effect or interaction with prompt type). Nor were children simply illustrating the meaning of the prompt, rather than attending to the information provided during the demonstration phase. If that had been the case, children's generalizations in the sound effect group would have been similar across wording conditions, given that they heard the exact same prompt (e.g., "Can you show me: sip…sip?") at generalization.

Given that 30-month-olds use generics to guide their inductive inferences, we sought to examine the developmental progression of this ability. The goal of Experiment Two was to investigate whether 24-month-old children are sensitive to the generic/nongeneric distinction when making inductive inferences. We elected to use the sentence prompt reminder procedure in Experiment 2, as we reasoned that providing children with an additional repetition of the generic and nongeneric NPs may solidify younger children's attention to the generic/nongeneric distinction and optimize their performance. If 24-month-olds effectively use the generic and nongeneric information to guide their inductive inferences, then children in the generic condition should imitate with the model and non-model exemplars equally often. In contrast, children in the non-generic condition should imitate with the model exemplar significantly more often than with the non-model exemplar.

EXPERIMENT 2

Method

Participants—Forty-eight 24-month-old infants (*M* = 24.09 months, *Range:* 23.26 to 24.62 months) were randomly assigned to two conditions: a generic wording condition (*n* = 24) and a non-generic wording condition (*n* = 24). See Table 1 for demographics. Six additional participants were tested but excluded due to: failure to complete two or more practice trials (*n* = 2); fussiness/refusal (*n* = 3); and parent interference (*n* = 1). All other participant information is identical to Experiment One.

Materials and Design—Identical to Experiment 1.

Procedure and Coding—The procedure was identical to that used in Experiment 1 in the sentence prompt group. As in Experiment 1, children imitated on the vast majority of the practice trials (*M* = 93.06%, *SD* = 15.31). All but two of the CDI forms were returned. See Table 1 for the total vocabulary scores. The difference in total vocabulary scores across the conditions was marginally significant, $p = .054$, and the percentile of total number of words produced differed significantly across conditions, t (44) 2.23, $d = .66$, $p = .03$. The percentile of words produced was used as a covariate variable in subsequent analyses to equate the two conditions on expressive language proficiency. The coding procedure was identical to that used in Experiment One. The inter-rater reliability (intraclass correlation coefficient) for 20% of the data was .98 ($p < .01$).

Results

Figure 3 illustrates the mean summed frequency of target actions by phase, exemplar, and condition. As described above, the CDI percentile of words produced was used as the covariate variable in all analyses. For ease of interpretation, the unadjusted means are reported. Analyses of infants' performance of target actions during the baseline phase revealed no significant differences as a function of exemplar but did indicate a significant main effect of wording condition, F (1,45) = 4.21, $\eta^2 = .09$, $p < .05$. Children in the non-generic condition (*M* = 1.94; *SD* = 1.57) produced significantly more target actions at baseline than children in the generic condition (*M* = 1.10; *SD* = 1.51). Importantly, however, children in both wording conditions performed significantly more target actions at generalization (generic condition: *M* = 4.91, *SD* = 2.39; non-generic condition: *M* = 4.39, *SD* = 1.54) than at baseline (generic condition: *M* = 1.10, *SD* = 1.51; non-generic condition: *M* = 1.93, *SD* = 1.57), t (23) = 6.30, $d = 1.91$, $p < .001$ and t (23) = 7.97, $d = 1.58$, $p <$ 001, respectively.

As in Experiment 1, our primary analyses focused on the frequency of target actions during the generalization phase. A 2 (wording Condition) × 2 (exemplar) mixed factors ANCOVA with CDI percentile of words produced used as the covariate variable yielded no significant effects or interactions. In contrast to Experiment 1, children in both wording conditions imitated equally often with the model exemplar and the non-model exemplar.

Discussion

Results indicated that 24-month-olds in the generic and non-generic conditions imitated equally often with the model and non-model exemplars during the generalization phase. These findings suggest that 24-month-olds are not sensitive to generic and non-generic NPs when making inductive inferences about the properties of novel kinds. There are a number of possible explanations for this result. For example, it is possible that the task was too difficult for children of this age. That is, they may not have understood the language input, they may have forgotten the identity of the model, or they may have been too overwhelmed by task demands to attend to the input. These factors could have led them to focus on the perceptual similarity between the model and non-model and thus, imitate the target action on both. These findings may also suggest that when the cognitive demands of a task are high, children use a generic interpretation as a default, consistent with the results of other recent studies (Gelman, Goetz, Sarnecka, & Flukes, 2008; Hollander et al., 2002).

EXPERIMENT 3

An alternative explanation for the results found in Experiment 1 may be that 30-month-old children rely only on sentence plurality (in the generic NP) or singularity (in the non-generic NP), rather than on genericity or non-genericity, to guide their inductive inferences about novel kinds. In that experiment, a distinguishing characteristic between the conditions was the plurality of the subject in the generic NP or the singularity of the subject in the non-generic NP ("*Blicks* drink milk" vs. "This *blick* drinks milk"). Thus, the plurality of the subject may influence children's propensity to imitate the target action with more than one exemplar in the generic condition. Analogously, the singularity of the subject may influence children to imitate with only one exemplar in the non-generic condition.

In Experiment 3, we addressed this issue by keeping the plurality of the subject constant across the generic and non-generic NPs. Children in both the generic (e.g., "*Blicks* drink milk") and non-generic (e.g., "*These blicks* drink milk") conditions heard plural NPs, and the target actions were demonstrated with two, rather than one, model exemplars. Children were then presented with the two model exemplars and one non-model exemplar and asked to imitate the target action. Because of the increased complexity of this task, we tested children in two procedures: one in which all three exemplars were presented together in a straight line during the test phase (the stringent procedure group) and one in which the model exemplars were physically separated from the non-model exemplar (the supportive procedure group). The procedure used in the stringent group required the child to remember the identity of the two model exemplars with little support but is most analogous to that used in Experiment 1. The procedure used in the supportive group gave children a clear demarcation between the model exemplars and the non-model exemplars, which may assist them in tracking the various exemplars over time. We predicted that if 30-month-old children are sensitive to the generic/non-generic nature of the NP when sentence plurality remains constant, then children in the non-generic condition would imitate significantly more often with the model exemplars than with the non-model exemplar. In contrast, children in the generic condition would imitate equally often with the model and non-model exemplars.

Method

Participants—The final sample consisted of 100 30-month-olds (*Mean age* = 30.00 months, *Range:* 28.46 to 30.95 months) who were randomly assigned to two groups: a stringent procedure group (*n* = 46) and a supportive procedure group (*n* = 54). Within each group, children were randomly assigned to two wording conditions: a generic condition and a non-generic condition. Please refer to Table 1 for the demographics. All other participant information is identical to the previous experiments. Eighteen additional participants were tested but excluded due to: failure to complete two or more practice trials (*n* = 2); fussiness or refusal (*n* = 11), statistical outliers (infants with frequency of target action standard scores greater than 3 standard deviations above or below the mean; *n* = 2), parental interference (*n* = 1), and experimenter error (*n* = 2).

Materials—The materials were identical to those used in the previous experiments. However, four exemplars that differed in color from the other exemplars were added to the object sets.

Design—The two exemplars used as models were counterbalanced across children for each trial. That is, a third of the participants received one set of model exemplars, another third received a different set, and the final third received a third set. The first demonstration of the target action with one of the model exemplars was counterbalanced across children as well. That is, half of the participants saw one model exemplar used as the model first, and the other half saw the other model exemplar being used as the model first. The location of the non-model exemplar alternated for each trial (left, middle, right) with the non-model appearing on the left side a third of the time, in the middle a third of the time, and on the right side a third of the time, across the participants. All other counterbalancing was identical to the previous studies.

Procedure and Coding—The inductive inference task was similar to that used in previous experiments. In the stringent procedure group, the procedure was identical to that used in previous experiments with the following adaptations: During the baseline phase, the child was given three novel exemplars and an accompanying prop (e.g., a blue, orange, and green *blick*, and the cup). Second, during the demonstration phase, the experimenter demonstrated the target action with two of the three exemplars (two model exemplars: e.g. the blue and orange *blick* drinking with the cup). The third exemplar was placed out of sight (non-model exemplar: e.g., the green *blick*). The experimenter demonstrated the target action twice, once with each model exemplar for every generic or non-generic NP. The target actions were accompanied by either (a) a generic NP (e.g., "*Blicks* drink milk") or (b) a non-generic NP (e.g., "These *blicks* drink milk"). The generic or non-generic NPs were repeated three times during the demonstration phase as in previous experiments. During the generalization phase, the experimenter re-introduced the child to the three exemplars (the two model exemplars and the one non-model exemplar) and the prop. The three exemplars were positioned together in a line diagonally across from the prop in the stringent group. The experimenter then encouraged the child to imitate the target action by uttering either (a) a generic NP (e.g., "Can you show me: *blicks* drink milk") or (b) a non-generic NP (e.g., "Can you show me: *these blicks* drink milk"). Note that we elected to use the sentence prompt to make the procedure comparable to that of both Experiments 1 and 2.

For children in the supportive procedure group, a number of changes were made to the stringent procedure methodology to reduce the cognitive demands of the task. First, the child was initially introduced to the novel referent and the novel word prior to the inductive inference paradigm (e.g. "Here are my *blicks* from home. Now I'm going to tell you something about *blicks*"). This introduction provided the child with more exposure to the novel word and referents. Second, the child was provided with a "remember" statement just prior to the generalization phase (e.g., "Remember, *blicks* drink milk. Show me who drinks milk"). Third, the model and non-model exemplars were separated from each other during the generalization phase. That is, the two model exemplars and the non-model exemplar were separated by the prop in the middle, providing children with a visual reminder of which exemplars were the models and which exemplar was the non-model. As the three exemplars and the prop were placed in front of the child, the experimenter reminded the child by tapping the two model exemplars and uttering the phrase appropriate for the condition (e.g., "Remember, these blicks drink milk" or "Remember, blicks drink milk"). She then moved the exemplars and the prop towards the child and prompted the child with a nonspecific prompt (e.g., "Show me who drinks milk").

In both procedure groups, to ensure that the three exemplars were placed on, and removed from the table at the same time, a black place-holder was used. All three exemplars in the stringent group, and all three exemplars and the prop in the supportive group were placed on the place-holder before and after each trial for easy and consistent positioning of the objects.

As in the previous two experiments, children imitated on the majority of the practice trials (*M* = 96.33%, *SD* = 10.48). All but seven CDI forms were returned within two weeks of the test date. See Table 1 for scores. No significant differences were found for any of the vocabulary measures, *p*s > .16

The same coding procedure from previous experiments was used. A second coder coded 10% of the data for reliability purposes. The intraclass correlation coefficient was .97 ($p < .01$).

Results

Figure 3 illustrates the mean summed frequency of target actions by phase, exemplar, and condition. Analyses of infants' performance of target actions during the baseline phase revealed no significant differences as a function of procedure (stringent, supportive), wording condition (generic, non-generic), or exemplar (model1, model2, non-model). Children performed significantly more target actions at generalization (*M* = 3.73; *SD* = 1.69) than at baseline (*M* = 1.33; *SD* = 1.35), *t* (99) = 12.98, *d* = 1.57, $p < 001$.

As in previous experiments, our primary analyses focus on the frequency of target actions during the generalization phase. A 2 (procedure) × 2 (wording Condition) × 3 (exemplar) mixed factors ANOVA yielded a significant main effect of exemplar, $F(2, 192) = 3.41$, $\eta^2 = .04$, $p < .05$. Of greatest relevance to the hypotheses was the significant two-way interaction among wording condition and exemplar, $F(2, 192) = 3.18$, $\eta^2 = .04$, $p < .05$. No other significant interactions or main effects were found. Notably, the main effect of procedure was not significant nor did procedure interact with any other variables.

To understand the source of the two-way interaction, we conducted separate repeated measures ANOVAs within the generic and non-generic conditions. The results of a repeated measures ANOVA within the generic condition revealed no significant main effect of exemplar, indicating that children in the generic condition imitated equally often with the model exemplars as with the non-model exemplar at generalization, $p > .78$. In contrast, analysis of performance in the non-generic condition revealed a significant main effect of exemplar, $F(2, 98) = 6.47$, $\eta^2 = .12$, $p < .01$. Follow-up comparisons with a Bonferroni correction ($p = .017$) indicated that children in the non-generic condition imitated significantly more often with the first model exemplar (*M* = 3.90; *SD* = 1.89) than with the non-model exemplar (*M* = 2.98; *SD* = 1.52) at generalization, *t* (48) = 3.03, *d* = 0.53, $p < .004$ and with the second model exemplar (*M* = 3.76; *SD* = 1.60) than with the non-model exemplar, *t* (48) = 2.96, *d* = 0.50, $p < .005$. In contrast, children imitated equally often with the two model exemplars, $p > .58$.

In the final set of analyses, we used planned comparisons to examine whether the influence of wording condition held up within each procedure type group. Within the stringent procedure group, children in the generic condition performed similar numbers of target actions with the model exemplars (M_{model1} = 4.14; M_{model2} = 4.23) and the non-model exemplar (*M* = 3.86) at generalization, *p*s > .38. In the non-generic condition, children performed similar numbers of actions with the two model exemplars (M_{model1} = 4.00; M_{model2} = 3.83), $p > .65$, and significantly more with the two models than on the non-model exemplar (*M* = 2.92), t (23) = 2.23, d = 0.64, $p < .04$ and t (23) = 1.98, d = 0.59, p = .059, respectively. This same pattern held within the supportive procedure group, with children in the generic condition performing similar numbers of target actions with the model exemplars (M_{model1} = 3.66; M_{model2} = 3.93) and the non-model exemplar (*M* = 4.03) at generalization, *ps* > .40. Again, in the non-generic condition, children performed similar numbers of actions with the two model exemplars (M_{model1} = 3.80; M_{model2} = 3.68), $p > .75$, and more with the two models than with the non-model exemplar (*M* = 3.04), t (24) = 2.02, d = 0.42, p = .054 and t (24) = 2.43, d = .39, $p < .03$. Altogether then, the patterns of findings were consistent with the results of the overall ANOVA in that children in both non-generic groups were more likely to imitate with the model exemplars versus the non-model exemplar.

Discussion

Results indicate that children in the non-generic condition performed significantly more target actions with the model exemplar than with the non-model exemplar at generalization. In contrast, children in the generic condition performed an equivalent number of target actions with the model and non-model exemplars at generalization. These results provide evidence that 30-month-old children use the generic/nongeneric distinction to guide their inductive inferences about novel kinds when sentence plurality remained constant.

There were no main effects or interactions with procedure type, indicating that children in the stringent procedure group and the supportive procedure group performed similarly on the inductive inference task. Moreover, further analyses indicated that children in both procedures showed similar patterns of performance. Thus, children were sensitive to generic and nongeneric information, regardless of the amount of support provided.

GENERAL DISCUSSION

These studies were designed to examine the developmental emergence of young children's sensitivity to the generic/non-generic distinction. Experiment 1 was an initial investigation of 30-month-olds' sensitivity to generic and nongeneric NPs when generalizing properties of novel kinds. Experiment 2 investigated 24-month-olds' use of generic and nongeneric information within a supportive linguistic context. Finally, Experiment 3 investigated 30-month-olds' attention to generic versus nongeneric information when plurality of the generic and non-generic NP was controlled.

As predicted, in Experiment 1, after hearing a non-generic description of a property, 30-month-olds performed significantly more target actions with the model exemplar than with the non-model exemplar at generalization. In contrast, after hearing a generic description of the property, 30-month-olds performed an equivalent number of target actions with the model and non-model exemplars at generalization. Similar results were found in Experiment 3 when the plurality of the NPs was equated across generic and non-generic wording conditions. These results provide clear evidence that 30-month-olds use the generic/nongeneric distinction to guide their inductive inferences about novel kinds. That is, when hearing a generic NP, children will attribute properties to the exemplar model(s) as well as generalize properties to new exemplars of the same category. In contrast, when children hear a non-generic NP, they are more likely to restrict the attribution of properties to the model exemplar(s) and are less likely to generalize properties to other members of the same category.

The finding that 30-month-olds use the generic/non-generic distinction to guide their inferences about the properties of novel kinds is particularly impressive when one considers the difficulty of the task used in the present experiments. That is, children were presented with two or three novel objects that were identical in all respects except color. During the demonstration phase, children were required to learn about the properties of these novel objects based on relatively subtle differences in input. Although there were several linguistic markers that distinguished generic (e.g., "*blicks* drink milk") from non-generic (e.g., "*this blick* drinks milk") NPs in Experiment 1, including: (a) the absence or presence of the demonstrative pronoun "this"; (b) singularity and plurality of the subject (*blicks* versus *blick*); and (c) singularity and plurality of the verb (drink versus drinks), there was only one linguistic difference between the generic (e.g., "*Blicks* drink milk") and non-generic (e.g., "*These blicks* drink milk") NPs in Experiment 3 (the absence or presence of the demonstrative pronoun "these"). The exemplars were completely unfamiliar to the children and thus children could not recruit any real-world knowledge to assist them in interpreting the NPs. Moreover, the properties used (i.e., eating, drinking, talking, sleeping) could be plausibly applied to most animate kinds. Thus, children were required to shift their attention away from the salient similarity between the exemplars and disregard their knowledge about the scope of the properties presented and attend to the distinction between generic and non-generic NPs.

In contrast to the 30-month-olds, 24-month-olds in both the generic and non-generic conditions imitated equally often with the model and non-model exemplars. This suggests that 24-month-olds were not sensitive to the generic/non-generic distinction in guiding their inductive inferences about novel kinds. This raises the question of what develops between 24- and 30-months of age. The present findings, in conjunction with other research, suggest that the period between 24 and 30 months may be a time of critical developments in the sensitivity to the generic/non-generic distinction. Indeed, inspection of data from the MCDIs for the 24-month-olds indicated that while all parents reported that their children were producing plurals, only a minority reported that their children were producing the articles *the* (15% of children) and *these* (11% of the children). In contrast, about half of the parents of the 30-month-olds in Experiments 1 and 3 reported that their children were producing the articles *the* (52% of children) and *these* (59% of children). This increase in production of articles between 24- and 30-months is also evident in the standardization sample for the lexical development norms for the MCDI (Dale & Fenson, 1996). Thus, there is a marked increase in the production of articles, which is a key component of expressing generic NPs in English, between 24 and 30 months of age.

It may be, then, that 24-month-old children are only beginning to learn about the components of generic language and how the distinction between generics and non-generics can guide their inductive inferences about novel kinds. In particular, recall that the 24-month-olds in the non-generic condition generalized to both the model and non-model exemplars. This suggests that children of this age do not yet appreciate the linguistic distinction between generics and non-generics – even though generic concepts are easily grasped. This claim that 24-month-olds are only beginning to interpret the generic/non-generic distinction is consistent with the results of research investigating two-year-olds' production and understanding of generic language. That is, two-year-olds' low incidence of generic production in everyday speech, which significantly increases between three and four years of age, may indicate an emerging understanding of generic language during the second year of life (Gelman et al., 2008). In addition, research indicates that 32-month-olds can interpret linguistic cues, but not pragmatic cues, for distinguishing generic from non-generic NPs, illustrating that older two-year-old children may only be beginning to understand how to identify cues to generic language (Gelman & Raman, 2003). By two-and-a-half to three years of age, children frequently use generic language in everyday speech and in play sessions (Gelman, 2004; Gelman, Chesnick, & Waxman, 2005).

Our finding that 30-month-olds reliably used the distinction between generic and non-generic NPs to guide their inductive inferences adds critical insight into our understanding of the development of category-based reasoning in young children. A large body of evidence suggests that prior to the emergence of an understanding of generic language, children engage in category-based reasoning. That is, infants readily form kind concepts and make inductive inferences about the shared properties of kinds using cues such as perceptual similarity and shared novel labels (Baldwin, Markman, & Melartin, 1993; Gelman & Coley, 1990; Graham, Kilbreath, & Welder, 2004; Keates & Graham, 2008; Welder & Graham, 2001). As children develop, they will limit the inferences they make based on factors such as previous knowledge about a particular category, property generalizability, and category homogeneity (Gelman, 1988). For example, preschoolers will not draw inferences about shared properties when two objects are labeled with a term that describes a transient state rather than with a category label (e.g., “This is *sleepy*” vs “This is *a bird*”; Gelman & Coley, 1990). Preschoolers will also attend to the nature of the property to be generalized and will not generalize those properties that are arbitrary (e.g., “fell on the floor this morning”) or that reference transient properties (e.g., “hungry”; Gelman, 1988; Graham, Cameron, & Welder, 2005; Graham, Welder, & McCrimmon, 2003; Waxman, Lynch, Casey & Baer, 1997). Our findings add to this literature by demonstrating that the emergence of the ability to identify and understand the distinction between generic and nongeneric language around 30-months of age provides young children with a rapid and efficient means to learn about whether or not a property relates to an individual versus a kind. In our experiments, we speculate that children are using their sensitivity to the information contained in the non-generic sentence to limit their generalizations. That is, given that the properties used in our experiments are readily generalizable to most animate kinds, it may be that children used the sentence information to restrict their generalizations of these properties to the individuals. If the properties described had been more idiosyncratic (e.g., “eats shoes”) or if they were not able to draw upon their preexisting knowledge about the general nature of the properties (e.g., “has leukocytes”), generics may have helped children move from a position that the property is to be restricted to an understanding that the property was typical of the kind.

Although our findings demonstrate that toddlers are sensitive to the distinction between generic and nongeneric NPs, it remains to be established how children actually construe the information they learn from generic and nongeneric sentences. For example, do toddlers, like preschoolers, appreciate that the properties conveyed in generic sentences are more conceptually central than the information conveyed in non-generic sentences (e.g., Cimpian & Markman, in press; Hollander et al., 2009)? Do toddlers appreciate that generic statements refer to an abstract concept that is not tightly linked to actual experience with individual exemplars? Investigating these and other issues will shed light on the emergence of the understanding and use of generics during the toddler and preschool years.

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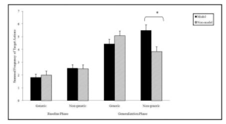
Figure 1.
Exemplar pairs and accompanying props used in Exps. 1 and 2.



*$p < .01$

Figure 2.

Mean summed frequency of target actions by Phase and Condition for Experiment One

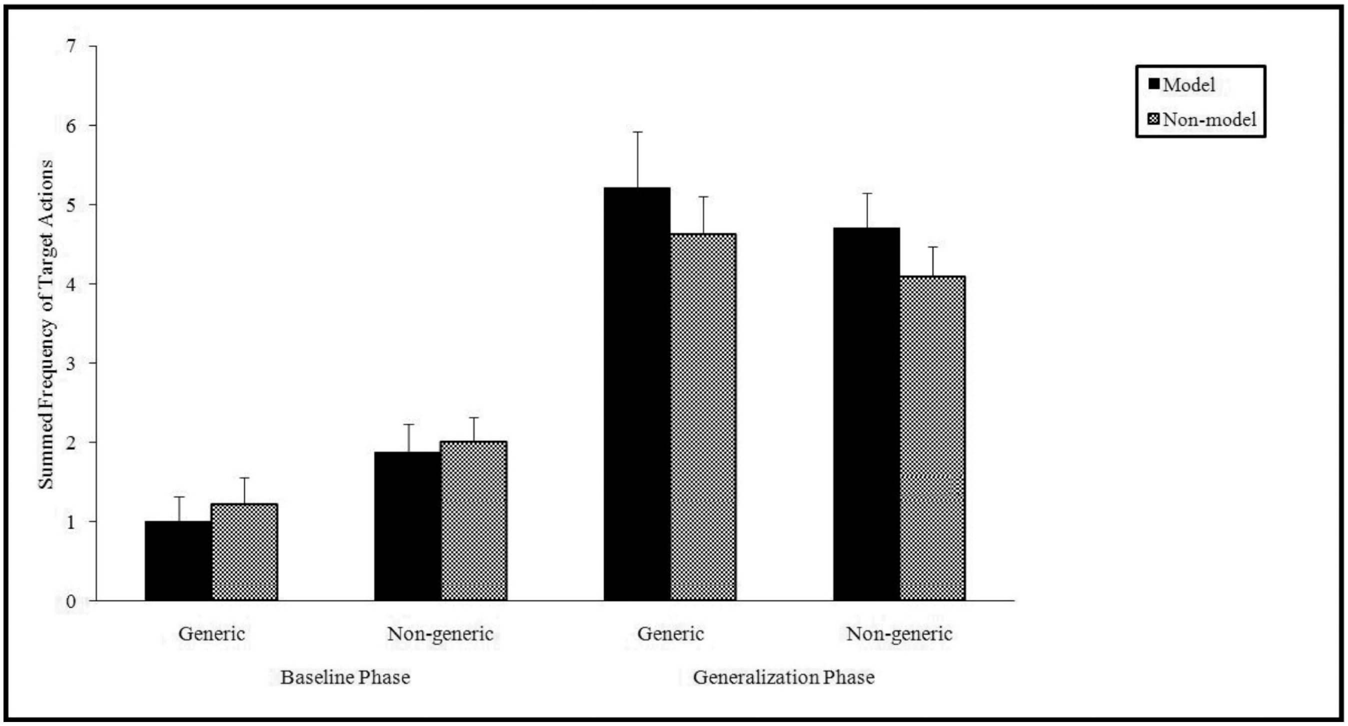
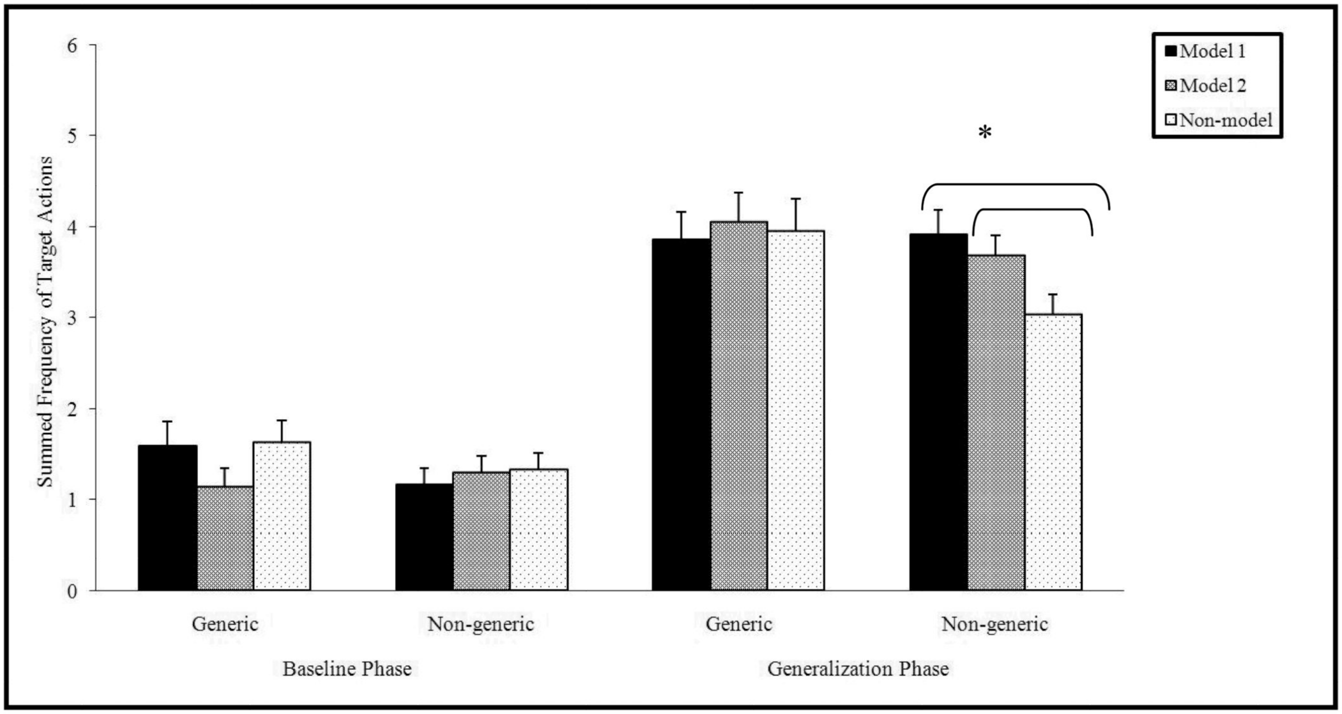


Figure 3.

Figure 2. Mean summed frequency of target actions by Phase and Condition for Experiment Two



*$p < .01$

Figure 4.

Mean summed frequency of target actions by Phase and Condition for Experiment Three

Table 1

Demographics for children in Experiments 1 to 3

	n	Mean Age (SD)	Gender	Total CDI Vocabulary
EXPERIMENT 1				
Reminder Group				
Generic Condition	24	30.18 (.30)	12 Boys	488.45 (147.90)
Non-generic Condition	24	30.19 (.28)	12 Boys	522.52 (140.40)
No Reminder Group				
Generic Condition	24	29.90 (.31)	12 Boys	491.87 (185.60)
Non-generic Condition	24	30.02 (.35)	12 Boys	492.09 (157.47)
EXPERIMENT 2				
Generic Condition	24	24.08 (.31)	12 Boys	346.00 (154.26)
Non-generic Condition	24	24.11 (.33)	12 Boys	248.46 (177.81)
EXPERIMENT 3				
Stringent Procedure Group				
Generic Condition	22	30.01 (.39)	12 Boys	521.80 (145.95)
Non-generic Condition	24	29.99 (.30)	12 Boys	443.83 (79.82)
Supportive Procedure Group				
Generic Condition	29	30.05 (.32)	14 Boys	504.41 (129.77)
Non-generic Condition	25	29.93 (.52)	13 Boys	488.09 (146.09)