Published in final edited form as:
Cogn Dev. 2015 ; 33: 84–98. doi:10.1016/j.cogdev.2014.05.002.

Children's Recall of Generic and Specific Labels Regarding Animals and People

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Abstract

Although children tend to categorize objects at the basic level, we hypothesized that generic sentences would direct children's attention to different levels of categorization. We tested children's and adults' short-term recall (Study 1) and longer-term recall (Study 2) for labels presented in generic sentences (e.g., *Kids* like to play jimjam) versus specific sentences (e.g., *This kid* likes to play jimjam). Label content was either basic level (e.g., cat, boy) or superordinate (e.g., animal, kid). As predicted, participants showed better memory for label content in generic than specific sentences (short-term recall for children; both short and longer-term recall for adults). Errors typically involved recalling specific noun phrases as generic, and recalling superordinate labels as basic. These results demonstrate that language influences children's representations of new factual information, but that cognitive biases also lead to distortions in recall.

Keywords

generic noun phrases; conceptual development; memory; inference; categorization; language development

1. Introduction

Young children, despite their limited experiences, rapidly acquire a vast amount of world knowledge. For example, although children never interact with dinosaurs, they may become dinosaur experts (Chi & Koeske, 1983). Language is thus an important mechanism for transmitting knowledge (Gelman, 2009; Harris & Koenig, 2006). However, in order to understand how language input contributes to children's knowledge representations, one

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Portions of this research were presented at the Budapest Central European University Conference on Cognitive Development in 2011, the Biennial Meeting for the Society for Research in Child Development in 2011, the Biennial Meeting of the Cognitive Development Society in 2011, and the Biennial Meeting for the Society for Research in Child Development in 2013.

must ask how children recall the information conveyed by language and whether they do so with equal accuracy under different conditions. We examine this question, with a focus on children's representations of two forms of language: generic noun phrases (e.g., "Birds lay eggs"), which refer to categories as a whole, and specific noun phrases (e.g., "These birds lay eggs"), which refer to particular individuals.

A growing literature indicates that young children understand the differences in meanings conveyed by generic and specific noun phrases (NPs), and that information learned through generic language is especially robust. By 2½ years of age, children differentiate generic and specific NPs and use this distinction to guide their inferences, extending facts learned via generic NPs more broadly than facts learned via specific NPs (Graham, Nayer, & Gelman, 2011). By 4 years of age, children distinguish generics from indefinites ("*Some* birds lay eggs") or universal quantifiers ("*All* birds lay eggs"; Cimpian & Markman, 2008; Gelman & Raman, 2003; Hollander, Gelman & Star, 2002). Generic NPs also lead to stronger conceptual ties between a property and the corresponding category, implying that members of a category share important, stable features (Cimpian & Markman, 2009, 2011; Gelman, 2003; Gelman & Raman, 2003; Gelman, Ware, & Kleinberg, 2010; Rhodes, Leslie, & Tworek, 2012). When children hear a novel property in generic form, they are more likely to extend it to a larger category than when they hear it in specific form (Gelman, Star & Flukes, 2002). When children hear generic properties about a novel kind, they are more likely to use this property to explain the behavior of a new member of the kind, compared to when they hear specific properties (Gelman et al., 2010; Rhodes et al., 2012). Finally, generic information is better remembered than specific information. Three-year-olds show better recall for labels used in generic sentences ("Hippos like to swim") than in specific sentences ("This hippo likes to swim"; Gelman & Raman, 2007). When 4- to 7-year-old children hear novel properties, they show better recall on generic trials ("Boys like a fruit called mod") than specific trials ("He likes a fruit called mod") for several aspects of the sentences provided, including whether sentences are generic or specific, the gender or animal referred to, verb content (e.g., "like"), verb valence (positive vs. negative), object noun (e.g., "fruit"), and novel word (e.g., "mod"; Cimpian & Erickson, 2012).

Despite the wealth of research regarding children's representations of generics, one key unexplored question is how generic NPs affect recall of category labels. Although researchers have examined children's recall of the referent of an NP (e.g., dog vs. cat), they have not examined children's recall of which label a speaker chooses to use to refer to a given referent (e.g., dog vs. animal). One recurring challenge children face is that any object can be classified in multiple ways and correspondingly have multiple labels (e.g., dog/animal; boy/child). For adults, labels function differently depending on whether they are presented in a generic or specific context. In specific sentences, the label serves primarily to identify the relevant instance, and the particular label used doesn't affect the interpretation (e.g., when the referent is a boy, "This **boy** is thirsty" is roughly equivalent to "This **child** is thirsty"). In contrast, for generic sentences, the conceptual information in the label is crucial in conveying the predicate being expressed (e.g., "Boys have hemoglobin in their blood" is not equivalent to "Children have hemoglobin in their blood"). Yet it is not known whether young children are sensitive to these differing implications of generic vs. specific language.

For example, when children hear a generic sentence, do they keep track of the label provided by the adult speaker when storing this information in memory? And when children hear a specific sentence, do they keep track of the information as tagged to a particular individual, or do they store it as generic? Answers to these questions have implications for how children construct and represent knowledge systems, based on the language they hear from parents and others.

Children may be biased to recall labels at the basic level. For hierarchically organized categories, children focus on basic-level categories (e.g., dog) to the exclusion of other category levels (e.g., Dalmatian, animal; Golinkoff, Shuff-Bailey, Olguin, & Ruan, 1995; Markman, 1989; Mervis & Crisafi, 1982). Basic-level labels are learned earliest and most easily (Rosch et al., 1976). Even when hearing new information involving a non-basic label, children tend to generalize primarily to other basic-level instances (Gelman & O'Reilly, 1988). Similarly, when adults are asked to remember subordinate- or superordinate-level labels, they tend to remember the basic level instead (Pansky & Koriat, 2004). Despite children's basic-level bias, language can direct children's attention to other categories. For example, children more readily learn a new superordinate label when it is linked to a basic-level label (e.g., "A car is a kind of vehicle"; Callanan, 1989). Also, children produce non-basic labels when prompted with contrastive linguistic cues (e.g., hearing "Is this an animal?" when shown a plant; Waxman & Hatch, 1992).

The present studies examine the effect of generic versus specific language on children's recall of labels, including both scope and content, to assess how children construct representations on the basis of these different language forms. We ask two questions: (1) How well do children retain the label that the speaker uses (e.g., "dog" vs. "animal")? We predicted greater accuracy when hearing the label in a generic vs. a specific context. (2) When and how often do children inappropriately generalize information presented in specific form (e.g., recalling "This dog…" as "Dogs…")? We predicted this generalization error to be most common for basic-level categories.

Children and adults viewed a series of pictures of either animals or people, each accompanied by a sentence expressing a novel property. Participants heard the sentences either in generic or specific form, and were then asked to remember the label that the property pertained to, after either a brief delay (Study 1) or a longer delay (Study 2). We manipulated both category level and category scope, yielding four kinds of sentences: generic sentences with a basic-level label (e.g., "Dogs like to play jimjam"; "Girls are afraid of yippets"), generic sentences with a superordinate-level label (e.g., "Bugs have tiddles in their eyes"; "Kids are good at kertling"), specific sentences with a basic-level label (e.g., "This cat is afraid of yippets"; "This boy has grumpets in his bones"), and specific sentences with a superordinate-level label (e.g., "This animal likes to smell zats"; "This kid likes to smell zats"). In contrast to prior studies (Cimpian & Erickson, 2012; Gelman & Raman, 2007), we did not ask participants to remember the type of entity that each sentence pertained to (e.g., dog or cat), but rather the level of the category that had been expressed (e.g., dog or animal). Because each picture could be categorized in multiple ways, participants could not simply infer the labels based on the pictures, but had to remember the

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particular label used by the experimenter. We predicted children would show better recall after hearing generic NPs than specific NPs.

The items included both animals, where every individual belongs to a nested set of hierarchical categories (e.g., beagle, dog, animal; Murphy, 2004), and people, where every individual belongs to a host of cross-cutting categories (e.g., female, teacher, grown-up; Medin, Lynch, & Solomon, 2000). In hierarchies, a novel fact about a higher-level category (e.g., "Dogs are warm-blooded") can extend to lower level categories (e.g., "Beagles are warm-blooded"). We predicted that when learning about animal categories, children would show a strong bias in favor of basic-level labels, regardless of the form in which they heard the sentences. It is unclear whether children would hold a basic-like bias toward a particular level for people. However, because gender is an early-emerging, salient category that is the basis of children's inferences (Gelman, Collman, & Maccoby, 1986; Martin, Eisenbud, & Rose, 1995), we predicted children would be more likely to categorize people based on gender than on age.

To test our predictions that children would better recall category level in generic sentences than in specific sentences, we recruited 3–5-year-olds. By this age, children can easily distinguish generic and specific sentences in long-term recall (Gelman & Raman, 2007) and can flexibly categorize objects at different levels (Waxman & Hatch, 1992).

2. Study 1: Short-Term Recall

2.1. Method

2.1.1. Participants—Participants were 36 children (*M* age 5.05, range 3.66–6.17, 16 females, 20 males) and 47 adults (*M* age 18.85, range 18–21, 32 females, 15 males). Children were recruited through local preschools and the database of a university's cognitive development lab. One additional participant produced relevant responses for less than half the items and so was excluded. Adults were recruited through an introductory psychology class and participated for partial course credit. An additional 18 children participated in pretesting of the materials.

2.1.2. Materials—16 photographs of animals (8 insects, 8 mammals) and 16 photographs of people (4 girls, 4 boys, 4 women, 4 men) were used. Each photograph was presented with a corresponding sentence, varying in label content. For animals, the label was either basic-level (ant, bear, bee, bunny rabbit, butterfly, cat, caterpillar, cow, dog, elephant, firefly, grasshopper, horse, ladybug, pig, spider) or superordinate (animal, bug). For people, the label denoted either gender and age (girl, boy, mommy, daddy; henceforth "basic-level") or age (kids, grown-ups; henceforth "superordinate"). The labels "mommy" and "daddy" were selected due to the potential difficulty of distinguishing the singular and plural forms of "man/men" and "woman/women", which is necessary for coding. Sentences also varied in scope (generic vs. specific). Each sentence included a novel word to ensure that the properties were not familiar to participants (e.g., "Dogs like to play jimjam," "Horses have trudders in their stomach"). The novel predicates were comparable across the two domains, except that some predicates were adjusted slightly to be domain-appropriate (e.g., "This grasshopper has zevies on its legs" was changed to "This mommy has zevies inside her heart”). The photographs were selected from a larger pool of 53 photographs, based on pretesting. Two additional items were used in practice trials: Elmo from the Sesame Street television program, and a satellite image of Michigan (where the sessions took place).

2.1.3. Design—Participants were assigned to either the animal condition (*n* = 19 children, 24 adults) or the people condition (*n* = 17 children, 23 adults). Each participant received both generic and specific sentences, in counterbalanced blocks. Within each block, half of the labels were basic level and half were superordinate. The order of trials within a block was randomized with the constraint that no more than two items of the same superordinate kind appeared in a row. The pairing between label content (basic vs. superordinate level) and NP scope (generic vs. specific) was counterbalanced across participants for each item.

2.1.4. Procedure—The experimenter (E) met with each participant individually. Participants were told that they would be shown some pictures and hear a sentence about each. Participants were also introduced to a puppet and told that the puppet would sometimes be under the table, where he could not see the pictures or hear the sentences, but that he would also sometimes be on the table, where he could see the pictures and hear what the participants say (see Cimpian & Markman, 2008, for a similar procedure). Then the puppet was placed under the table, and the task began with two practice trials (“Elmo has red fur”; “Michigan is fun”). For each trial, E placed the picture on the table and said the corresponding sentence, while pointing at the picture. Then, E removed the picture, to avoid children merely labeling it, placed the puppet on the table and asked the recall question (e.g., “Can you tell Mr. Frog who has red fur?”). At the end of each trial, the puppet was placed underneath the table. Adults were 100% accurate on the practice trials; children were correct on 96%. If a child did not answer correctly, he/she was explicitly instructed to recall the information. All children were accurate following this correction.

The practice trials were followed by the test trials, using the same procedure. For example, E showed a dog, provided a sentence (e.g., “This dog likes to play jimjam”), put the picture away, brought out Mr. Frog, and asked, “What likes to play jimjam?” This procedure was repeated for a block of eight different pictures. At the end of the first block, participants used rubber stamps on paper as a 1-minute break between blocks. The procedure of the second block was the same, except that if the first block was presented in specific form, the second block was presented in generic form, and vice versa. Throughout, no corrective feedback was provided.

2.1.5. Coding and Tallies—All responses were coded for NP scope (generic, specific, other) and label content (basic, superordinate, other). Coding did not require verbatim recall. For example, responses such as “dogs”, “a dog”, “animals”, and “they” were all coded as generic, whereas “this dog”, “the dog”, “it/he”, and “that animal” were all coded as specific. Similarly, “dogs”, “this dog”, “puppies”, or “this puppy” were all coded as basic level, whereas “animals,” “creature,” or “this mammal” were coded as superordinate. When participants provided either no response or one that did not fall under any of the above-mentioned coding categories, the response was coded as ‘other.’ For example, “that one” would be coded as ‘specific’ for NP scope, but ‘other’ for label content; “grass” would be coded as ‘other’ for both coding categories. When a participant provided a response before hearing the prompt, only the response that followed the prompt was coded, in order to avoid coding simple label responses rather than recall. One coder coded all responses, and a second coder independently coded a randomly selected 20% of responses to achieve inter-rater reliability. Coding of NP scope yielded agreement of 98%, $\kappa > .95$; coding of label content yielded agreement of 99%; $\kappa > .98$.

We computed three scores, separately for label content and NP scope: accurate responses, "opposite" errors (defined below), and other errors. Accurate content responses were those for which the label content matched the input, regardless of scope (e.g., upon hearing "dogs", accurate content would be "dog" or "dogs"). Accurate scope responses were those for which the scope matched the input, regardless of content (e.g., upon hearing "dogs", accurate scope would be "dogs" or "animals"). Opposite content errors were those for which participants provided the opposite label content, i.e., basic recalled as superordinate (e.g., "dog" misremembered as "animal") or superordinate recalled as basic (e.g., "animal" misremembered as "dog"); opposite scope errors were those for which participants provided the opposite NP scope, i.e., specific recalled as generic (e.g., "this dog" misremembered as "dogs" or "animals") or generic recalled as specific (e.g., "dogs" misremembered as "this dog" or "this animal"). Other errors included all responses that were neither correct nor opposite errors.

In each domain (animals vs. people), accuracy scores, opposite scores, and other scores were calculated separately for label content and NP scope on all four types of trials: (a) generic scope/basic label, (b) generic scope/superordinate label, (c) specific scope/basic label, and (d) specific scope/superordinate label. Each score could range from 0 to 4, and for each participant, the three types of responses (correct, opposite error, other error) summed to 4.

2.2. Results

We examined accurate and opposite recall separately for NP scope and label content, yielding four separate analyses. For each, we conducted a repeated-measures analysis of variance (ANOVA) with age (children vs. adults; between-subjects), domain (animals vs. people; between-subjects), scope (generic vs. specific; within-subjects), and label content (basic vs. superordinate; within-subjects) as factors. Figures 1 and 2 present the results; "other" responses are reported in the figures but not analyzed further. All results not reported here were non-significant (*p*s > .05).

Accurate recall of NP scope: The dependent variable was the number of trials (0–4) on which participants recalled the NP scope correctly. Adults showed better recall of NP scope than children (*M*s= 3.82, 2.31), $F(1,79) = 148.10$, $p < .001$, $\eta_p^2 = .65$. As expected, participants showed better scope recall of generic than of specific sentences (*M*s= 3.59, 2.55), $F(1,79) = 44.67$, $p < .001$, $\eta_p^2 = .36$. However, this effect was driven entirely by the children (age group x NP scope, $F(1,79) = 27.18$, $p < .001$, $\eta_p^2 = .26$).

The remaining significant effects involve domain: a main effect of domain, $F(1,79) = 14.61$, $p < .001$, $\eta_p^2 = .16$, a domain x scope interaction, $F(1,79) = 20.98$, $p < .001$, $\eta_p^2 = .21$, and a domain x scope x age group interaction, $F(1,79) = 8.82$, $p = .004$, $\eta_p^2 = .10$. Participants more accurately recalled NP scope for people than animals, but only for specific sentences (*M*s = 3.14, 1.95, $p < .001$). Most important, children showed a generic advantage (greater NP scope accuracy for generics than specifics) for both animals ($p < .001$) and people ($p = .05$).

Opposite errors in recall of NP scope: The dependent variable was the number of trials (0–4) on which participants remembered the NP scope opposite to what had been presented (recalling specific sentences as generic, or generic sentences as specific). Adults made fewer opposite errors in recall than children (*M*s = 0.08, 1.28), $F(1,79) = 132.93$, $p < .001$, $\eta_p^2 = .63$. Participants were more likely to recall specific sentences as generic than to recall generic sentences as specific (*M*s= 1.12, 0.24), $F(1,79) = 28.42$, $p < .001$, $\eta_p^2 = .27$. However, this effect was driven entirely by children (NP scope x age group, $F(1,79) = 19.28$, $p < .001$, $\eta_p^2 = .20$).

The remaining significant effects involve domain: a main effect of domain, $F(1, 79) = 6.06$, $p = .02$, $\eta_p^2 = .07$, a domain x scope interaction, $F(1,79) = 10.85$, $p = .001$, $\eta_p^2 = .12$, and a domain x scope x age group interaction, $F(1,79) = 5.54$, $p = .021$, $\eta_p^2 = .07$. Overall, participants made more opposite errors regarding NP scope for animals than people, but only for specific sentences (*M*s = 1.52, 0.72). Moreover, children's tendency to produce more opposite errors for specific than generic sentences was more robust for animals ($p < .001$) than for people ($p = .07$).

Accurate recall of label content: The dependent variable was the number of trials (0–4) on which participants recalled the label content correctly. Adults showed better recall for label content than children (*M*s = 3.67, 2.82), $F(1,79) = 66.23$, $p < .001$, $\eta_p^2 = .46$. Participants showed better recall of basic-level than superordinate-level labels (*M*s= 3.77, 2.73), $F(1,79) = 57.28$, $p < .001$, $\eta_p^2 = .42$. This effect was particularly pronounced for children (label content x age group, $F(1,79) = 15.13$, $p < .001$, $\eta_p^2 = .16$). Importantly, participants better recalled label content of generic sentences than of specific sentences (*M*s= 3.53, 2.96), $F(1,79) = 47.75$, $p < .001$, $\eta_p^2 = .38$. This effect, however, was greater when participants heard superordinate than basic-level labels (NP scope x label content, $F(1,79) = 17.06$, $p < .001$, $\eta_p^2 = .18$).

The remaining significant effects involve domain: a main effect of domain, $F(1,79) = 14.46$, $p < .001$, $\eta_p^2 = .16$, a domain x label content interaction, $F(1,79) = 13.44$, $p < .001$, $\eta_p^2 = .15$, and a domain x label content x scope interaction, $F(1,79) = 10.59$, $p = .002$, $\eta_p^2 = .12$. Overall participants were more accurate in recall of label content for people than for animals (*M*s = 3.45, 3.05). The effects of NP scope was maintained in both domains for superordinates, *p*s < .02, but only in the people domain for the basic level, $p < .001$.

Opposite errors in recall of label content: The dependent variable was the number of trials (0–4) on which participants remembered the label content opposite to what was presented (recalling superordinate labels as basic, or basic labels as superordinate). Children made more opposite errors regarding label content than adults (*M*s = 1.11, 0.31), $F(1,79) = 61.66$, $p < .001$, $\eta_p^2 = .44$. Participants also were more likely to recall superordinate labels as basic than to recall basic labels as superordinate (*M*s= 1.23, 0.19), $F(1,79) = 59.00$, $p < .001$, η_p^2

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= .43. However, this effect was larger for children (age group x label content, $F(1,79) = 17.48$, $p < .001$, $\eta_p^2 = .18$). Participants made more opposite errors in label content recall for specific versus generic sentences (*M*s = 0.97, 0.46), $F(1,79) = 40.73$, $p < .001$, $\eta_p^2 = .34$. This effect was greater for superordinate than basic labels (NP scope x label content, $F(1,79) = 19.97$, $p < .001$, $\eta_p^2 = .20$).

The remaining significant effects involve domain: a main effect of domain, $F(1,79) = 14.96$, $p < .001$, $\eta_p^2 = .16$, a domain x content interaction, $F(1,79) = 13.38$, $p < .001$, $\eta_p^2 = .14$, and a domain x content x scope interaction, $F(1,79) = 12.20$, $p = .001$, $\eta_p^2 = .13$. Participants made more opposite errors in label content recall for animals than for people (*M*s = 0.91, 0.51). However, the generic advantage (i.e., fewer opposite errors) was maintained for superordinate labels in both domains (*p*s < .05) and for basic labels in the people domain ($p < .01$) but not the animal domain ($p > .8$).

2.3. Discussion

We predicted that participants would show better recall for the content of basic-level labels (e.g., dog, girl) than of superordinate labels (e.g., animal, kid), and that they would show better recall for the scope of generic sentences (e.g., “Dogs like to play jimjam”) than of specific sentences (e.g., “This dog likes to play jimjam”). Our results support both predictions.

The bias to recall labels at the basic level was indicated in two ways: a) greater accuracy for basic-level content, and b) more opposite errors for superordinate-level content. This bias was apparent in both age groups, but particularly strong for children. These findings are consistent with studies demonstrating a bias to categorize at the basic level and reveal that the bias extends to a verbal memory task. Even when participants were explicitly provided with the superordinate label and instructed to recall the information only after a brief delay, they still tended to have relative difficulty recalling the superordinate label. Importantly, the basic-level advantage obtained for both generic and specific sentences. It is striking that participants’ difficulty maintaining in memory the superordinate label was found even in the case of generics, where the label provides critical information regarding the scope of a novel property.[1]

The bias to recall sentences as generic was also indicated in two ways: a) greater accuracy for the scope of generic than specific sentences, and b) more opposite errors for the scope of specific than generic sentences. These findings support previous suggestions that generic information holds a privileged status in knowledge acquisition (Cimpian & Erickson, 2012; Gelman & Raman, 2007). Furthermore, these findings demonstrate that children as well as adults tend to spontaneously generalize information (see Sutherland, Cimpian, Leslie, & Gelman, under review, for evidence with adults). This tendency is most clearly evidenced in

[1]One question that arises is whether the basic-level bias could result from the different number of basic-level vs. superordinate-level labels within each block of trials. To address this issue, we examined responses to the very first trial that each participant experienced. If differences in performance were due just to the structure of the items as a set (i.e., the amount that certain labels repeated), then such differences would not appear on the very first trial. This analysis revealed that participants were more accurate on basic-level than superordinate-level trials, for both domains, *p*s < .05. We thus conclude that the greater accuracy at the basic level could not be attributed to greater variation of basic-level labels in the experimental task.

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the findings that children misremembered specific sentences as generic more often than they did the reverse and adults never misremembered generic sentences as specific.

Our central prediction was that, given the important category scope information conveyed by generic labels, participants would show better recall for the label content of subject nouns in generic sentences (e.g., “Dogs…”, “Grown-ups…”) than in specific sentences (e.g., “This dog…”, “This grown-up…”). Supporting this prediction, both children and adults showed better recall for label content in generic sentences than in specific sentences. However, because both children’s and adults’ recall for basic-level labels was at ceiling for both generic and specific sentences, the effect of generics on label content recall was manifest only for the superordinate level.

This study thus demonstrates that young children are sensitive to the informational value of labels in generic sentences. Additionally, the results suggest two biases in the recall of novel information: a basic-level bias and a bias to recall information as generic. However, given the very brief delay presented in this task – about twenty seconds – the question arises as to whether children maintain these biases (for the basic level and generic scope) over longer delays. This question is important, given that longer delays reflect more stable knowledge representations. In Study 2, we examined whether children’s initial sensitivity to the differing informational value of generic and specific labels persists across a longer-term delay.

3. Study 2: Longer-Term Recall

3.1. Method

3.1.1. Participants—Participants were 32 children (*M* age 4.6; range 3.55–5.42; 11 female) and 33 adults (*M* age 19.28, range 18–23; 20 female). Children were recruited through local preschools and the database of a university’s cognitive development lab. Adults were recruited through an introductory psychology class and received partial course credit. Data from an additional three children were excluded due to failure to complete the task (n = 2) and experimenter error (n = 1).

3.1.2. Materials—The items were the same as those used in Study 1.

3.1.3. Design—The design of this study was the same as in Study 1.

3.1.4. Procedure—Participants were assigned to either the animal domain (n = 16 children, 17 adults) or the social domain (n = 16 children, 16 adults). The experimenter (E) met with each participant individually. Participants were first told that they were going to be looking at some pictures and that they should listen very carefully to the sentences they heard about each picture. For each trial, the experimenter placed the picture on the table and stated the property sentence twice, while pointing at the picture. After presenting the first block of eight pictures, E asked the participant to complete a 4-minute distracter task (for children, playing with Legos; for adults, solving multi-digit multiplication problems). This was followed by a recall task, in which E brought out Mr. Frog and asked participants to tell Mr. Frog what they had heard about each picture. For each item, E showed the picture for two seconds, turned the card over, and prompted recall with the relevant predicate (e.g., "Can you tell Mr. Frog what likes to play jimjam?"). Each picture was shown in the original presentation order. The participant's answer was recorded with an audio-recording device, and E wrote down the response. For children whose parents did not consent to audio recording, E recorded answers in writing. The entire procedure was then repeated for the second block of eight items, using K'Nex as the distracter task for children and word puzzles as the distracter task for adults. No corrective feedback was provided.

3.1.5. Coding—All responses were coded for scope and label content, as in Study 1. One coder coded all responses, and a second coder independently coded a randomly selected 20% of responses to achieve inter-rater reliability. For NP scope, inter-coder agreement was 93%, $\kappa > .94$. For label content, inter-coder agreement was 96%, $\kappa > .87$.

3.2. Results

As in Study 1, we examined accurate and opposite recall separately for NP scope and label content, yielding four separate analyses. For each, we conducted a repeated-measured ANOVA with age (children vs. adults; between-subjects), domain (animals vs. people; between-subjects), scope (generic vs. specific; within-subjects), and label content (basic vs. superordinate; within-subjects) as factors. Figures 3 and 4 present the results; "other" responses are reported in figures but not analyzed further. All results not reported here were non-significant (*p*s > .05).

Accurate recall of NP scope: Adults more accurately recalled NP scope than children (*M*s = 3.08, 1.55), $F(1,61) = 49.31$, $p < .001$, $\eta_p^2 = .45$, especially for the animal items (age group x domain, $F(1,61) = 10.03$, $p = .002$, $\eta_p^2 = .14$). Participants more accurately recalled NP scope of generic than specific sentences (*M*s = 2.86, 1.77), $F(1,61) = 15.65$, $p < .001$, $\eta_p^2 = .20$.

Opposite errors in recall of NP scope: Children produced more opposite scope errors than adults (*M*s = 1.28 vs. 0.52), $F(1,61) = 19.13$, $p < .001$, $\eta_p^2 = .24$. Participants made more opposite scope errors when they heard specific than generic NPs (*M*s = 1.38, 0.42), $F(1,61) = 14.96$, $p < .001$, $\eta_p^2 = .20$, but this effect was exclusive to children (age group x NP scope, $F(1,61) = 4.73$, $p = .033$, $\eta_p^2 = .07$), and to the animal domain (domain x NP scope, $F(1,61) = 4.43$, $p = .04$, $\eta_p^2 = .07$). Finally, the generic effect in children was larger for superordinate than basic level labels (NP scope x age group x content, $F(1,61) = 6.44$, $p = .014$, $\eta_p^2 = .10$).

Accurate recall of label content: Adults showed better recall for label content than did children (*M*s = 2.78, 1.70), $F(1,61) = 47.40$, $p < .001$, $\eta_p^2 = .44$. Label content recall was higher for basic than superordinate labels (*M*s = 3.25, 1.22), $F(1,61) = 184.96$, $p < .001$, $\eta_p^2 = .75$, particularly for children (label content x age group, $F(1,61) = 4.73$, $p = .033$, $\eta_p^2 = .07$).

Opposite errors in recall of label content: Children made more opposite errors regarding label content than did adults (*M*s = 1.59, 1.13), $F(1,61) = 12.02$, $p = .001$, $\eta_p^2 = .17$. Participants made more opposite content errors when they heard superordinate versus basic-level labels (*M*s = 2.36, 0.36), $F(1,61) = 167.84$, $p < .001$, $\eta_p^2 = .73$, but the effect was larger for children (label content x age group, $F(1,61) = 6.26$, $p = .015$, $\eta_p^2 = .09$). Importantly, participants made more opposite content errors when they heard specific than generic NPs, but only in the animal domain (not the person domain; scope x domain, $F(1,61) = 6.96$, $p = .011$, $\eta_p^2 = .10$).

3.3. Discussion

In this study, participants were presented novel information, with either generic or specific labels regarding basic- or superordinate-level categories, and asked to recall the facts after a delay of several minutes. In contrast to shorter-term recall, children and adults showed no differences in correct recall of label content as a function of the scope of the sentences originally presented. However, both children and adults made more opposite errors regarding label content when they heard specific sentences than when they heard generic sentences. This difference provides an indirect indication that attention to the label is heightened in generic linguistic contexts.

As in Study 1, we again found a powerful basic-level bias, in both age groups. This result is consistent with research indicating a basic-level bias in categorization and labeling. Yet it provides important new evidence that a basic-level bias also appears in how both children and adults recall new facts after a longer delay. Despite language indicating that the scope of a predicate is at a superordinate level (e.g., "*Animals* like to play jimjam"), children and adults tend to misremember the information as pertaining to a relevant basic-level category (e.g., "*Dogs* like to play jimjam").

In addition, the results provide further evidence of a bias to recall novel facts as generic, kind-relevant facts. Just as with shorter-term recall (Study 1), not only did participants show better recall of sentence scope for generic sentences than specific sentences, they were also likely to misremember specific sentences as generic more often than they misremembered generic information as pertaining to an individual (e.g., "This dog/animal likes to play jimjam" was often recalled as "Dogs/animals like to play jimjam").

4. General Discussion

Children obtain much information about the world via linguistic input (Harris & Koenig, 2006). Given that individuals can be classified into multiple categories (Rover is a dog and an animal), children's representations are influenced by how they remember--or misremember--the labels provided when novel information is given. In the two studies presented here, we explored children's and adults' accuracy and errors when provided information pertaining to generic categories and specific individuals. Study 1 examined participants' short-term recall; Study 2 examined longer-term recall.

If children are sensitive to the informational value of label content in generic sentences, we predicted they should show better recall for label content presented in generic sentences than in specific sentences. Second, we predicted a generic bias, with children and adults more likely to recall that sentences were presented as generic than specific. Third, we predicted that participants would show a bias for basic-level labels.

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4.1. Prediction 1: Participants will show better recall for label content in generic sentences than in specific sentences

The findings provide support for the first prediction. In short-term recall (Study 1), both children and adults showed better recall for label content in generic than specific sentences, and more opposite errors in label content recall when they heard specific sentences than when they heard generic sentences. Together, these findings indicate that even young children are sensitive to the scope information conveyed in generic sentences and more accurately recall labels that convey categorical scope than labels that refer to particular instances. This effect is general across domains and for both animals and people.

Longer-term recall yielded more mixed results. In the animal domain, children and adults were more likely to show opposite errors for label content on specific versus generic trials, but they did not show differences in recall accuracy for label content on generic versus specific trials. In the people domain, neither children nor adults showed differences in recall of label content for generic versus specific sentences. In contrast, Cimpian and Erickson (2012) found superior recall for novel facts about kinds rather than individuals. An important difference between Cimpian and Erickson's design and the present studies is that in the present studies, participants were asked to recall labels at different levels or content. Thus, it was not sufficient for a participant to produce a basic-level label for the animal items (e.g., giraffe), or remember the gender of the social items (e.g., girl); instead, the participants had to report the label provided by the experimenter (e.g., giraffe OR animal; girl OR kid). The tasks used in these studies are actually simplified versions of the situations children are faced with in everyday life, in which multiple labels are possible.

Thus, although children show initial sensitivity to the importance of generic labels, when longer-term recall is required and cognitive demands increase, they may resort to existing cognitive biases in recalling information. This possibility is consistent with results among adults, who, when asked to recall subordinate- or superordinate-level labels, tend to misremember the labels and default to a relevant basic-level label (Pansky & Koriat, 2004). Our results provide the first demonstration of this phenomenon with young children, and especially with generic labels, for which label content is particularly central.

The finding that children (and to some extent adults) revert to default categories in longer-term recall suggests that, even when children hear novel generic information--where keeping track of the correct category is crucial, they resort to existing biases about the category level that is the most informative (the basic level). This result has implications for children's acquisition of categorical knowledge, given the centrality of generic information in conceptual representations (Cimpian, Brandone, & Gelman, 2010; Cimpian & Markman, 2009). Generic input conveys the scope of a generalization, so children's systematic distortion of this input demonstrates that conceptual preferences lead to biased representations. We speculate that this result may point to a mechanism by which stereotypes are reinforced even in the absence of direct parental input (e.g., "Kids are good at kertling" may be recalled as a gender stereotype: "Boys are good at kertling").

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4.2. Prediction 2: Participants will show biases in recall toward certain types of label content

Supporting our second prediction, in both studies and across both domains, participants showed a clear preference toward basic-level label content in short and longer-term recall. Not only was content recall higher for basic-level than superordinate-level labels; participants also tended to misremember superordinate-level labels as basic level more often than the reverse. Thus, these findings extend previous research indicating a strong bias for the basic level in both adults and children (Pansky & Koriat, 2004), by demonstrating that this bias is in place even when participants are asked about items that vary in category scope.

4.3. Prediction 3: Participants will show recall biases for generic NPs over specific NPs

Supporting our third prediction, a bias for generic information over specific information was found, although primarily among children. Children showed better recall for generic than specific sentences and misremembered specific sentences as generic more often than the opposite. Both effects were found in both immediate and longer-term recall. Adults showed better recall for generic than specific sentences, but only in longer-term recall. These findings suggest that children tend to remember specific information about animals as kind-referring. Thus, our study supports the argument by Sutherland et al. (under review), that the bias to recall information as generic is due to the implicit inferences one makes when faced with specific information.

4.4. Domain differences

Participants showed a number of similar patterns of recall in the animal and people domain, although we focus here on the differences that emerged. In short-term recall, both NP scope and label content were recalled more accurately for people than animals, and opposite errors of both scope and label content were greater for animals than people. More accurate recall of specific statements about people suggests that they more readily keep track of individuating information when it is about people than when it is about animals. A reason might be that the animal domain yields a greater focus on kinds (e.g., an individual dog may readily stand in for dogs in general), compared to the social domain (e.g., an individual boy does not necessarily stand in for boys in general). People may be more used to individuating people than animals due to greater experience with people. Additionally, individual animals of a kind (e.g., different dogs) may be viewed as sharing a larger number of characteristics, whereas people may be perceived as more varied and idiosyncratic. These perceptions may lead to differential rates of generalizing learned information (Nisbett, 1993).

In longer-term recall, the effects of generic language (fewer opposite scope errors than specific language and fewer opposite label content errors than specific language) were found only for animals and not people. This domain difference might reflect the different organizational structure of animal and people categories, as previously mentioned. Animal kinds are hierarchically organized, with relatively direct paths of inferences between category levels. For example, a fact that pertains to a superordinate-level category such as mammals will also be true of the included basic-level categories such as dogs, and a fact that pertains to a basic-level category will also be true of the included subordinate-level categories such as beagles, by deductive reasoning (but see Jönsson & Hampton, 2012). Due to this inclusive relationship between different category levels, a generic advantage within the animal domain would allow for multiple inferences. In contrast, social categories are often cross-cutting and overlapping, without clear paths of categorical inferences (e.g., something true of teachers is not necessarily true of mothers). Thus, because generic information about a category within the social domain has more limited implications for other social kinds, the privileged status of generic knowledge about social categories may not persist over the long term.

4.5. Memory versus Inference

Did participants interpret our procedure as a memory task or as an inference task? There are several reasons to be confident that the procedure indeed assessed memory. First, the procedure included pragmatic cues indicating that participants were expected to engage in recall. In both studies, Mr. Frog was hidden under the table when each fact was provided but then was brought into view during testing ("Can you tell Mr. Frog what is good at kertling?"). Thus, the participant's job was to convey to Mr. Frog the information they had heard. Second, in Study 1, participants were over 96% correct on the practice trials, confirming that they understood the task. Third, when a child did not answer a practice item correctly, an explicit memory prompt was then provided ("I want you to tell [Mr. Frog] what I just told you, okay?"). An explicit memory prompt was also included for the recall portions of Study 2. Fourth, participants' responses on test trials further suggest that they correctly understood the task as assessing memory rather than inference: They never mentioned individuals from outside the experimental context (e.g., "my mom"), and rarely (5% of trials) mentioned categories other than those depicted (e.g., "cow" on a dog trial). Finally, accuracy was greater with shorter than longer delays, consistent with what one would predict on a memory task. Nonetheless, memory and inference are closely linked processes, and recall errors may reflect some influence of inference. Future studies are necessary to understand the role of memory and inference as mechanisms underlying these processes.

4.6. Conclusion

The present findings have implications for children's acquisition of novel information regarding different levels of categories and the role of others' testimony. When children learn novel information about an individual or a non-basic category, they may distort this information and misremember it as pertaining to a relevant basic-level category. For example, children who hear "This dog is warm-blooded" or "Mammals are warm-blooded" may misremember this information as "Dogs are warm-blooded." Children's tendency to distort generic information also has implications for children's endorsement of the testimony of others. Given that the experiences available to young children are limited, much of what they know comes from adult input, and under many circumstances young children have a tendency to believe what adults tell them (Gelman, 2009; Harris & Koenig, 2006). Thus, the tasks studied here, in which children hear novel facts from an experienced adult, provide a particularly important and representative example of the sort of context in which children add to their knowledge representations.

Acknowledgments

This research was supported by NICHD grant HD-36043 to the second author. We are grateful to the children and parents who participated in the research, and we thank Alex Was, Christina Koch, Erika Manczak, Michelle Bergy, Natalie Davidson, and Sarah Stilwell for their assistance. We also thank parents and administrators at Annie's Children Center, Morning Star Child Care, The Discovery Center, Generations Together, and Play and Learn Children's Place.

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Highlights

- We examined children's and adults' memory for new facts about animals and people.
- Participants were biased to recall information at the basic level.
- Facts learned about specific individuals were often misremembered as generic.
- These biases in recall may provide a mechanism by which stereotypes are reinforced.

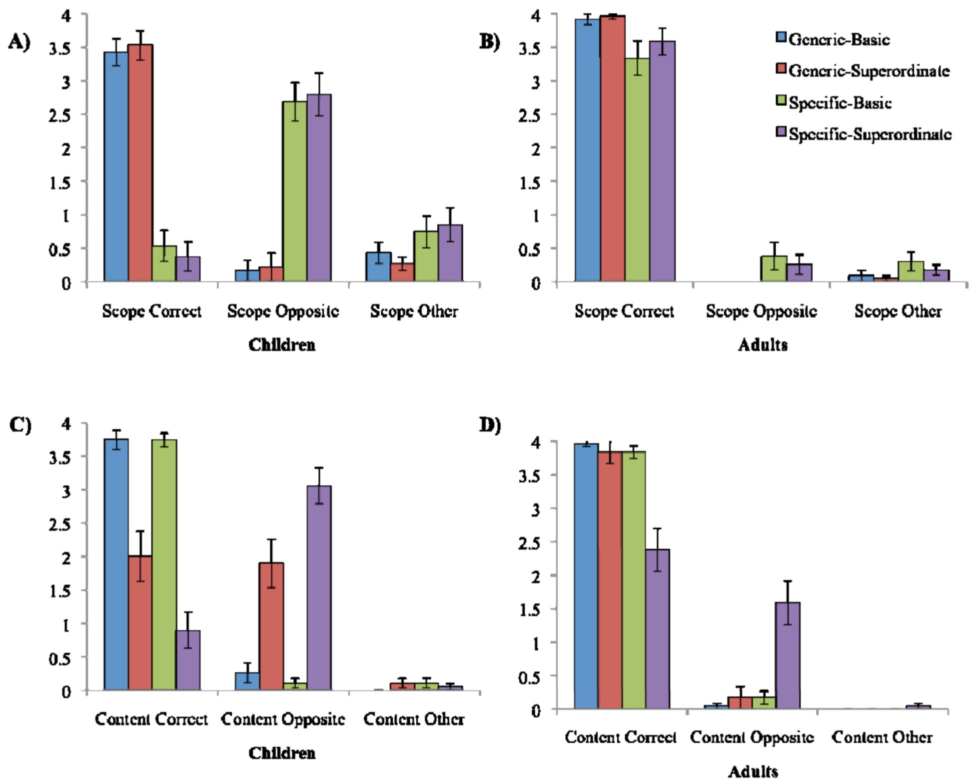

Figure 1.

Results of Study 1 (short-term recall): ***Animal domain***. (A) and (B) show children's and adults' accurate, opposite, and other responses of noun phrase scope by condition. (C) and (D) show children's and adults' accurate, opposite, and other responses of label content by condition.

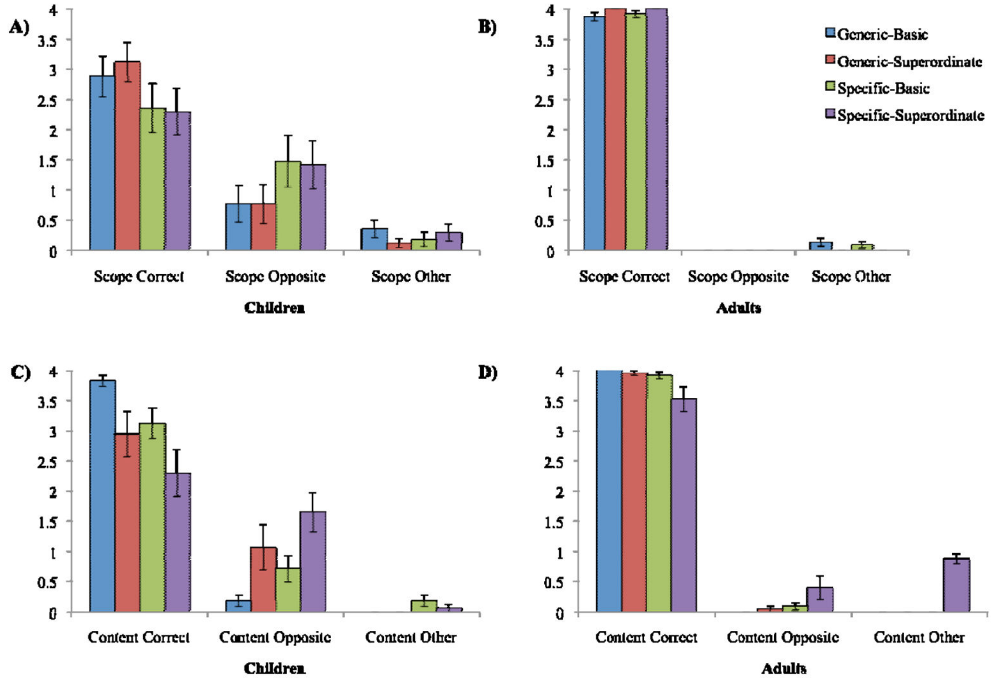

Figure 2.

Results of Study 1 (short-term recall): ***People domain***. (A) and (B) show children's and adults' accurate, opposite, and other responses of noun phrase scope by condition. (C) and (D) show children's and adults' accurate, opposite, and other responses of label content by condition.

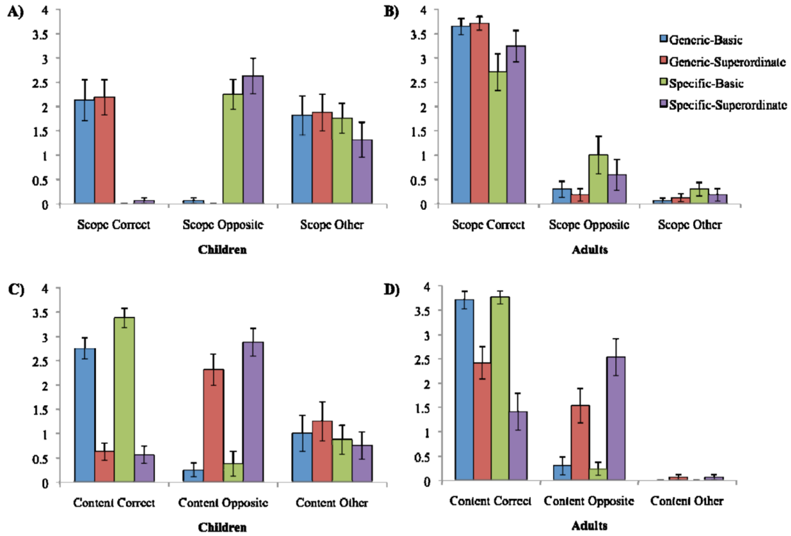

Figure 3.

Results of Study 2 (longer-term recall): ***Animal domain***. (A) and (B) show children's and adults' accurate, opposite and other responses of noun phrase scope by condition. (C) and (D) show children's and adults' accurate, opposite, and other responses of label content by condition.

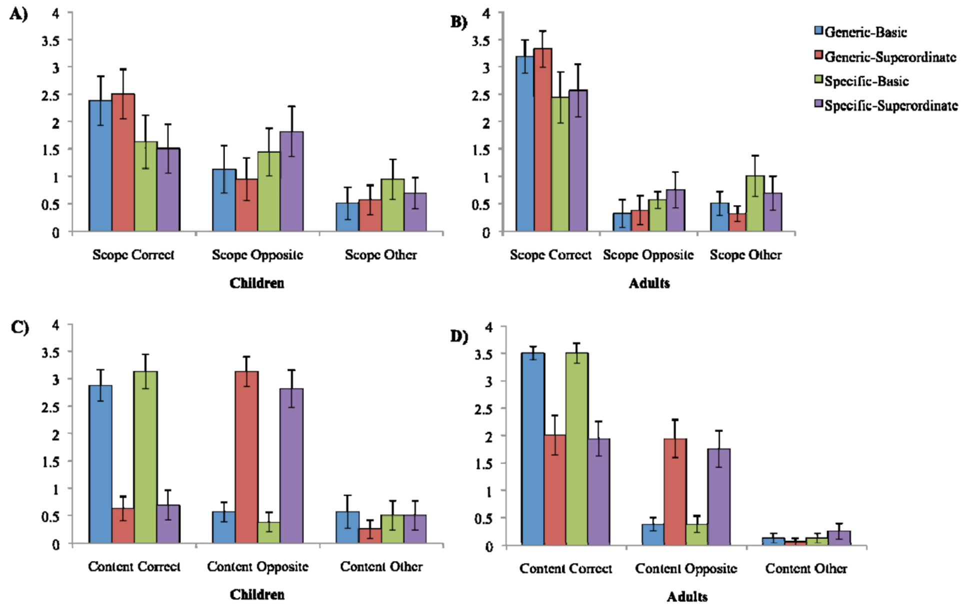

Figure 4.

Results of Study 2 (longer-term recall): ***People domain***. (A) and (B) show children's and adults' accurate, opposite and other responses of noun phrase scope by condition. (C) and (D) show children's and adults' accurate, opposite, and other responses of label content by condition.