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When You've Seen One, Have You Seen Them All? Children's Memory for General and Specific Learning Episodes

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In any learning situation, children must decide the level of generality with which to encode information. Cues to generality may affect children's memory for different components of a learning episode. In this research, we investigated whether 1 cue to generality, generic language, affects children's memory for information about social categories and specific individuals. In Study 1, preschool-aged children (n = 40), but not school-aged children (n = 40), remembered generic properties more often than analogous, nongeneric properties but remembered the individual category exemplars associated with nongeneric properties more often than those associated with generic properties. In Study 2, school-aged children (n = 26) did not show differential memory for generic and nongeneric learning episodes, even when task demands were increased. Additionally, both younger and older children generalized generic properties significantly more than nongeneric properties. These findings reflect an early understanding of the category relevance of generics and suggest that the effect of generic language on memory declines over development. However, generic language has a consistent and powerful influence on children's within-category generalization.

Keywords: memory, generic language, generalization, categorization

When learning about the world, people are faced with the challenge of determining what information should be remembered and what information should be discarded. Particularly for young children, remembering all aspects of a learning episode is often unfeasible (Drummey & Newcombe, 2002) and usually unnecessary. For example, when learning a conventional word label, it is important that children retain knowledge of the label but less important that they remember the details of the particular speaker who provided the label (Sabbagh & Shafman, 2009). Children's tendency to get the level of encoding "right" may be affected by cues about how generally information applies. This research investigates one cue that may affect children's encoding of new information: whether that information is presented categorically or specifically.

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A large body of research has shown that young children display sensitivity to cues about the specificity or generality of a learning episode (Gelman, 1988; Waxman & Booth, 2003). For example, children are especially attentive to category labels, which signal that discrete individuals are related on an essential dimension (Markman, 1991; Putnam, 1970). One particularly powerful type of label that influences children's interpretations of the generality of learning episodes is generic language. Generic predicates (e.g., Americans celebrate the fourth of July) imply that properties pertain to a category as a whole rather than to the specific instances observed (Gelman, 2004; Lyons, 1977). Conversely, nongenerics (i.e., personal pronouns, proper names) imply context-specificity: What is being learned is particular to one member of a larger category (Cimpian & Markman, 2008). Children are more likely to generalize properties presented generically than nongenerically (Hollander, Gelman, & Raman, 2009), suggesting that generics are salient cues to the generality of a particular learning episode.

Category labels and generics may guide children's attention and encoding during learning episodes. For instance, the value placed on information may affect the strength of encoding, such that more "valuable" information elicits deeper semantic processing (Castel et al., 2011; Craik & Tulving, 1975). Remembering properties relevant to a category could be more valuable than remembering properties about a restricted set of individuals, particularly if one's goal is to gain broad conceptual knowledge. Cimpian and Erickson (2012) predicted that children would show superior memory for properties presented generically because they recognize the inductive potential of generics and privilege learning category-relevant information. As expected, they found that children were more likely to remember properties presented generically ("*Boys* like a vegetable called fep") than those presented nongenerically ("*He* likes a vegetable called fep"). Children may be especially likely to

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remember properties presented generically because of their relevance to a category as a whole, rather than to a specific instance.

If children exhibit superior memory for generic properties because of their category relevance, they might also tend to forget other aspects of generic learning episodes. For example, when learning a generic fact about boys, remembering the specific boy displaying the property is unnecessary because the fact generalizes across his social category. Indeed, forgetting the details of the specific boy may actually help the child abstract general features of category membership and generalize appropriately in other contexts (Vlach, Ankowski, & Sandhofer, 2012). In contrast, when learning a fact about a specific boy, it is important to remember individual level details of the boy in order to correctly associate the fact with him in the future. Sabbagh and Shafman (2009) tested for a similar pattern in preschool-aged children's memory for labeling events. When children heard conventional word labels, they strongly retained the label, but discarded details about the specific speaker providing the label. However, when children received idiosyncratic labels, they formed weak representations of the label, but relatively strong representations of the speaker (also see Koenig & Woodward, 2010; Sobel, Sedivy, Buchanan, & Hennessy, 2012). In the former case, the label applies beyond the learning context such that the specific speaker is irrelevant, but in the latter case, remembering the speaker is important because the label is idiosyncratic to her. Thus, if children's strong memory for generics is due to their category relevance, children should remember relatively less about specific category members in generic compared to nongeneric learning episodes.

Alternatively, children may show superior memory for properties presented in generic learning episodes for reasons other than their category relevance. Parents routinely utilize generic language when teaching children important information (Gelman & Tardif, 1998; Pappas & Gelman, 1998). Even if parents intend for generics to convey information about a kind, it is possible that children interpret generics as broad ostensive cues to simply pay attention and remember as much about learning episodes as possible. A similar explanation has been proposed for children's proficiency in generalizing novel words to new instances: Children may utilize low-level attentional mechanisms that lead them to associate words with perceptual properties that usually generalize (e.g., shape; Colunga & Smith, 2004; Smith, Jones, & Landau, 1996). This type of mechanism could also account for children's strong memory for generic episodes: If a child learns that she should pay attention when a parent uses a generic, the child should remember more overall from generic than nongeneric learning episodes, including category-irrelevant information, such as the details of the specific exemplars present in the episode (see Gelman, 2009). In fact, some research has found that preschool-aged children strongly remember individual category members after completing a task that draws their attention to category-level information (Sloutsky & Fisher, 2004). Thus, if children's strong memory for generic properties is due to a bias to pay attention to generic learning episodes, they should exhibit stronger memory overall for generic than nongeneric episodes.

Present Research

In the present study, we investigate two possible patterns in young children's memory for general and specific learning episodes. According to the "category-relevance" account, children privilege learning generic properties because of their link to general classes or categories. On this account, learners should display better memory for properties predicated using category labels and generics than for properties predicated using proper names and nongenerics (see Cimpian & Erickson, 2012). However, they should also exhibit weaker memory for specific targets in generic than nongeneric episodes. This pattern would suggest that children do not exhibit an overarching bias to attend to generic language but, rather, that they remember distinct types of information about categories and individuals. According to the "pay attention" account, children encode generic learning episodes more deeply because they perceive generics as a signal that they are receiving important information. On this account, learners should show superior memory for *both* the properties and targets associated with the episodes. This result would suggest that children preferentially attend to generic over nongeneric learning episodes. By testing what children remember about the targets of generic and nongeneric learning episodes, we can effectively test the exact nature of the generic property advantage.

We test these hypotheses using social stimuli because the effect of generic and nongeneric language on encoding may hold special relevance in the social domain. It is common to learn both about individual people and about kinds of people: Individual and category-level interpretations of learning events are both plausible and familiar. In contrast, animals and objects are usually relevant as instances of kinds. Thus there may a "categorical assumption" when learning about nonhumans. We are not suggesting that the proposed memory patterns are limited to the social domain (see Scott & Monesson, 2009) but only that individual people, as opposed to animals or artifacts, may have more obvious and relevant variation such that learning about a specific person is often necessary. Of course, there could be cases where an animal or artifact (e.g., a pet or valued toy) is individually memorable, in which case we might expect a similar memory pattern (see Cimpian & Erickson, 2012).

We investigate this issue in the early school years because several important changes in children's memory occur during this period. Memory for episodic information improves greatly (Perner & Ruffman, 1995; Shing et al., 2010), as does the ability to track the sources of information (Drummey & Newcombe, 2002; Gopnik & Graf, 1988). Additionally, improvements in visual working memory have been found around age six, when children are learning to read (Alloway, Gathercole, Willis, & Adams, 2004; Gathercole, Pickering, Ambridge, & Wearing, 2004). In light of these changes, we investigated whether the effect of generic language on memory also changes in the early school years. In Study 1, we compare the performance of preschool-aged children and young school-aged children on remembering targets and properties. In Study 2, we narrow in on older children and investigate their performance in a more challenging version of the task.

Study 1

Participants

Participants (N = 80) were preschool-aged children (n = 40, 23 male; M age = 4,0; range: 3,0-4,11) and young school-aged children (n = 40, 21 male; M age = 6,11; range: 6,0-7,11).

Children were recruited from preschools and after-school programs in a midsized Midwestern city. Participants were tested individually in a quiet laboratory space or in a corner of their classroom or daycare facility.

Design and Procedure

Participants were randomly assigned to the Person condition (n = 40), in which they learned specific facts about individual members from novel social categories, or to the Kind condition (n = 40), in which they learned generic facts about novel social categories. The study was administered on a computer and took 7 to 10 min to complete. The study consisted of a Learning phase, Distraction phase, Memory task, and a Generalization task.

The Learning phase in the Person condition was prefaced with "I'm going to tell you about eight people from around the world" and in the Kind condition was prefaced with "I'm going to tell you about eight different groups of people from around the world." In the Learning phase, participants were shown eight consecutive trials, each of which consisted of one target and one property illustration. The target stimuli were illustrations of individuals from distinct ethnic groups (e.g., Indian, Russian), representative of groups children might observe in the real world. The property stimuli were illustrations of one of four types of properties: trade, dwelling, food source, and location. Target and property pairs were randomized across participants. The language used to describe the target and property varied by condition, between subjects. In the Person condition, the target was first introduced with a proper name (e.g., "This is Binisha"). Then, a novel property was ascribed to the individual (e.g., "She lives in the mountains"; see Figure 1). Targets in the Kind condition were introduced using a category label (e.g., "This is a Binisha") and properties were predicated in a generic frame (e.g., "Binishas live in the mountains"). The target illustration then moved toward the property illustration, reinforcing their connection and drawing children's attention to the screen.

The Distraction phase immediately followed the learning phase and consisted of a short game (2–3 min) in which participants were asked to click on pictures of animals shown intermittently among pictures of the targets presented in the Learning phase and dis-



Figure 1. Screenshot of a sample trial in the learning phase.

tracters from the Memory task. Younger children saw pictures in 2-s intervals and older children saw pictures in 1-s intervals. The purpose of this game was to provide a delay between the learning phase and the memory task so that subsequent recognition would be a function of long-term memory processes (see Cimpian & Erickson, 2012; Gelman & Raman, 2007). Performance on this task was not measured.

After the Distraction phase, participants completed a Memory task, which was prefaced with "Now that you've learned about all of those people, I'm going to see how well you remember them." Participants then received eight memory trials, with each trial containing a target recognition question and a property recognition question. First, participants were shown a screen with the correct target and two distractors and asked to indicate the illustration they had seen in the Learning phase (see Figure 2). For each target stimulus, there were two distractor targets, which shared observable category-relevant features such as dress and skin color, but differed in specific clothing, posture, and hairstyle. In the Person condition, participants were asked which individual they had learned about in the Learning phase (e.g., "Which one is Binisha?") and in the Kind condition, they were asked which member of the social group they had seen in the learning phase (e.g., "Which Binisha did you see before?"). On the next screen, participants saw the individual they had selected and were asked to choose, from a set of three property illustrations, what they had learned about the person or social group. Distractor properties used in the testing phase were of the same type as the correct property (e.g., "lives in the mountains" appeared with "lives in the jungle" and "lives in the desert"). In the Person condition, children were asked, "Did you learn that Binisha lives in the mountains, the desert or the jungle?" and in the Kind condition children were asked, "Did you learn that Binishas live in the mountains, the desert or the jungle?" The position in which the correct response appeared was counterbalanced across trials. Participants completed eight trials, in the same order as the learning phase, without feedback. Target memory was evaluated based on whether participants selected the target individual presented in the learning phase from among two distractors. Property memory was evaluated based on whether participants selected the property associated with the target from among two distractors.

Finally, participants completed a Generalization task to examine whether they perceived properties in the Person condition as relatively less generalizable to other category members and properties in the Kind condition as relatively more generalizable. The exact language used in the task differed across conditions in order to remain consistent with the Learning phase. Children were first shown the target and property pair they had seen in the Learning phase and were reminded of the pairing (e.g., "I told you that Binisha/s live/s in the mountains.") They were then shown a second target illustration from the same social category as the original target and asked whether that person would share the original property. Participants in the Person condition were told "Here's another person. Does she live in the mountains too?" and participants in the Kind condition were told "Here's another Binisha. Does she live in the mountains too?" Generalization was evaluated based on whether participants ascribed the same property to another individual from the same social category as the target.



Figure 2. Screenshot of a sample trial in the memory task.

Results and Discussion

Correctly recalled items received one point each. There were eight items and, thus, eight possible points for target and property recall and for generalization.

According to the "pay attention" account, memory for both targets and properties should be superior in the Kind condition. In contrast, the "category relevance" account predicts better memory for targets in the Person condition but better memory for properties in the Kind condition. To test these hypotheses, we used a 2 (Age: Younger, Older) \times 2 (Condition: Kind or Person) \times 2 (Memory measure: Target or Property) repeated-measures analysis of variance (ANOVA), with Age and Condition as between-subjects variables and Memory measure as a within-subject variable. Consistent with the category-relevance account, there was a significant interaction between Memory measure and Condition, F(1, 78) =



Figure 3. Mean number of correctly recalled target and property items for younger children. Performance for property in the Kind condition and for both target and property in the Person condition was significantly better than would be expected due to chance (dashed line), p < .05. Error bars represent standard errors of the mean.



Figure 4. Mean number of correctly recalled target and property items for older children. Performance for property and target in both the Kind and Person conditions was significantly better than would be expected due to chance (dashed line), p < .05. Error bars represent standard errors of the mean.

7.10, p = .009, $\eta_p^2 = .05$. There was also a significant main effect of Age, F(1, 78) = 58.41, p < .0001, $\eta_p^2 = .28$, and a marginally significant three-way interaction, F(1, 78) = 3.74, p = .055, $\eta_p^2 = .024$.

We examined the simple interactions within each age group and found a significant Memory measure by Condition interaction in younger children, F(1, 38) = 9.48, p = .003, $\eta_p^2 = .11$, but not in older children, F(1, 38) = 0.32, p = .58, $\eta_p^2 = .004$ (see Figures 3 and 4). Given this support for the category-relevance account in younger children, we would expect this simple interaction to be composed of two simple effects: memory for targets would be better in the Person condition than the Kind condition, and memory for properties would be better in the Kind condition than the Person condition. Indeed, younger children showed significantly better memory for targets in the Person condition, ¹ F(1, 38) =4.32, p = .04, $\eta_p^2 = .10$, and significantly better memory for properties in the Kind condition, F(1, 38) = 4.53, p = .04, $\eta_p^2 =$.11.

We also examined whether these patterns held at the individual level. Because there were three response options, chance performance on any target or property memory trial is .33. We classified children who remembered six or more targets or properties as displaying a "remembering" pattern, given that p(6 or more of 8) = .02. For targets, we expected more children in the Person

¹ To insure that the target effect was not due to the specific wording differences used in the Memory task, we conducted a control study with younger children (N = 20), in which the Memory task for both conditions was worded as "Which person did you see before?" As in the main study, children showed significantly better memory for targets in the Person condition, F(1, 18) = 5.41, p = .03, $\eta_p^2 = .23$.

condition than in the Kind condition to display this pattern. Among younger children, 15% in the Person condition and 10% in the Kind condition displayed the pattern. Among older children, the corresponding values were 35% and 25%. For properties, we expected more children in the Kind condition than in the Person condition to display the "remembering" pattern. Among younger children, 50% in the Kind condition and 30% in the Person condition displayed the pattern. Among older children, 90% in both conditions did so. Thus, younger children's memory for targets and properties and older children's memory for targets followed the predicted pattern.

We next considered children's performance on the generalization task to verify that children viewed properties predicated of categories as more generalizable than properties predicated of individuals (see Figure 5). A 2 (Age) × 2 (Condition) ANOVA yielded a significant main effect of condition. Participants generalized properties to new targets more often in the Kind condition than in the Person condition (M = .69, SD = .33 vs. M = .30, SD = .26 for younger children; M = .50, SD = .43 vs. M = .21, SD = .29 for older children); F(1, 78) = 19.49, p = .0001, $\eta_p^2 =$.20. In addition, younger children generalized properties to new targets more often than older children, F(1, 78) = 7.02, p = .01, $\eta_p^2 = .09$.

The results of Study 1 provide strong support for the categoryrelevance account of generics for younger children. In generic learning episodes, younger children exhibited superior memory for properties, but worse memory for targets, compared to nongeneric learning episodes. Additionally, younger children generalized generic properties more than nongeneric properties, suggesting they treat generics with great inductive potential. Older children's encoding, however, was not affected by generic language, although their generalization was.

In Study 2 we sought to test whether generic language would affect older children's encoding if the task demands were increased. We expected that, in a more demanding task, we might observe greater variation across conditions. Additionally, the generalization task in Study 1 was confounded by the wording differ-



Figure 5. Mean number of generalized properties per condition for both younger and older children. Generalization in the Kind condition for both older and younger children was significantly higher than would be expected by chance, p < .05 (dashed line). Generalization for older children in the person condition was significantly lower than would be expected by chance, p < .05. Error bars represent standard errors of the mean.

ences across conditions. In Study 2, the generalization task is presented identically across the Person and Kind conditions.

Study 2

Participants

Participants were 26 young school-aged children (15 male; M age = 7,1; range = 6,1–7,10) recruited from the same population as Study 1. No child had participated in Study 1.

Design and Procedure

Children were randomly assigned to the Person condition (n =13) or the Kind condition (n = 13). The procedure was identical to Study 1 with a few exceptions. First, children in each condition learned about 12 social categories or specific individuals, rather than eight. Second, the wording of the questions in the Memory Task were the same, regardless of condition assignment. Children in both the Person and Kind conditions were first asked, "Which person did I tell you about before?" and prompted to select a target illustration from a choice of three similar looking targets. All children were then asked the property question (e.g., "Did you learn that he/she lives in the mountains, the jungle, or desert?") and prompted to select a property illustration from among three similar properties. Third, the language used in the Generalization task was also the same across conditions. Children in both the Person and Kind conditions saw a screen with the original target and property pair and were asked to recall the property (e.g., "Remember I told you that this person lives in the mountains?"). They were then shown a second target illustration and asked the generalization question (e.g., "How about this other person? Does he/she also live in the mountains, or does she live in the jungle or desert instead?").

Results and Discussion

We conducted a 2 (Condition: Kind or Person) \times 2 (Memory measure: Target or Property) repeated-measures ANOVA, with Condition as a between-subjects factor and Memory measure as a within-subject factor. As in the older group in Study 1, there was no significant interaction between Condition and Memory, F(1, 24) = 0.008, p = .928 (see Figure 6). Thus, assignment to the Kind or Person condition had no effect on older children's memory for targets or properties.

We also tested whether the generalization test would reveal differences in generalization rates across the Kind and Person conditions. A one-way ANOVA yielded a significant main effect of Condition, F(1, 24) = 5.79, p = .024 (see Figure 6). Children generalized significantly more in the Kind condition (M = .49; SD = .41) than in the Person condition (M = .16, SD = .21).

Thus, older children remembered targets and properties in the Kind and Person conditions equally well. However, children in the Kind condition were significantly more likely to generalize properties to new targets than were children in the Person condition. Although generic language did not affect older children's memory encoding, it did have a strong effect on their future inferences.

General Discussion

This research demonstrates that generic language affects young children's but not older children's memory for social categories



Figure 6. Mean number of correctly remembered targets and properties and mean number of generalized properties across conditions in Study 2. Memory for targets and properties in both the Kind and Person condition was significantly higher than what would be expected by chance (dashed line), p < .05. Generalization in the Kind condition was significantly higher than what would be expected by chance, p < .05, while generalization in the Person condition was significantly lower than what would be expected by chance, p < .05. Error bars represent standard errors of the mean.

and individuals. We found that young children remembered properties presented generically and using category labels more than equivalent properties predicated of individuals. Young children also exhibited better memory for the people displaying properties (i.e., targets) when learning about individuals, rather than categories. This memory pattern reflects an early understanding of the category relevance of generics, rather than an overall bias to attend more closely to generic learning episodes. Older children, however, did not exhibit differential memory for learning episodes containing generic or nongeneric language, even with the increased task demands in Study 2. Together, these results shed light on the development of children's interpretation of generic language. Generic language may play a somewhat different role in older and younger children's learning.

Our findings indicate that young children do not display an overall bias toward attending to and remembering more in generic contexts, as would be predicted by a pay-attention account of generics. Instead, young children show selective memory for generic learning episodes, consistent with a category-relevance account. In Study 1, young children remembered the aspects of generic and nongeneric learning episodes that are most critical for future generalization. Clearly children cannot generalize what they cannot remember. Better memory for category-level (generic) than individual-level properties suggests that the former will be generalized more than the latter. At the same time, forgetting specific details of the targets of category-level properties supports generalization. By remembering only general information about targets (e.g., dress, or other markers of group membership), children will be well positioned for within-category generalization. Additionally, encoding category-level information about targets is practical when generic information is provided in the presence of multiple category members. In such cases, attention should be spread across all members, so that the learner can better recognize future exemplars to which the generic property applies. In contrast, when learning about a specific individual it is critical to retain enough detail to restrict inferences to that individual and not overgeneralize properties to other members of that person's social category.

We propose that the memory pattern we observed in younger children may arise because of their relatively limited working memories (Alloway et al., 2004; Hitch, Halliday, Schaafstal, & Schraagen, 1988). If learners can remember only some features of a learning episode, it is crucial that they remember the right ones. Older children, in contrast, often remembered both the targets and properties of generic and nongeneric learning episodes, even in the more demanding Study 2. It may be that Study 2 did not sufficiently tax older children's working memory to reveal variation across conditions. Perhaps with a significantly longer delay or with a recall rather than recognition task (see Cimpian & Erickson, 2012), older children might have differentially recalled targets and properties across conditions.

Although older children's encoding was not systematically related to the presence of generic language, they did recognize that properties presented generically supported stronger withincategory inferences than properties presented nongenerically. Additionally, the fact that older children generalized significantly more in the Kind condition in Study 2, when generic language was not presented at the same time as the inference, suggests that generics have a lasting effect on older children's generalizations. Why, then, did older children not differentially remember generic and nongeneric learning episodes in our task? One explanation is that older children's greater experience in generalizing information about social categories may have attenuated the effect of generic language on their encoding. Older children may understand that category members often display substantial variability, such that a generic predicate (e.g., "Binishas make necklaces") may not apply to every individual category member. Thus, it is often unwise to discard individuating information in categorical learning contexts.

A related possibility is that children begin to attend closely to individual-level variation in the early school-aged years (Kalish, 2012). In our study, older children remembered generic and nongeneric properties equally, which suggests that although they do attend to category-relevant information, they are equally motivated to learn about specific individuals. Cimpian and Erickson (2012) did, however, find that older children remembered generic properties more often than nongeneric properties. We propose that the difference in findings is related to our use of novel social category members, each given a proper name in the Person condition, as opposed to Cimpian and Erickson's use of specific boys and girls referred to as "this boy" or "this girl," who were not marked as being from a different social category from the participants. Additionally, Cimpian and Erickson did not show pictures of the targets but only described them verbally in reference to the nongeneric property. Thus, the use of proper names and the pictures of the individual targets could have increased older children's motivation to encode properties predicated of specific individuals.

Finally, memory may play a different role in generalization as children gain capacity and experience. In our experiments, older children tended to remember *both* information supporting future category-level inferences, and information specific to a single individual. This result aligns with research on the development of source monitoring, which suggests that at 6 years of age, children tend to remember both the generic (i.e., semantic) and nongeneric (i.e., episodic) aspects of learning episodes (Drummey & Newcombe, 2002). Older children may retain the information needed to make or refrain from generalizations but use that information selectively. Unlike for younger children, whose memory traces may help or hinder generalization, older children's memory traces

may not be specifically tailored for generalization (e.g., they may retain individual-level detail about generic episodes).

In sum, we have demonstrated that young children's memory for learning episodes is guided by generic language, which we argue serves as a cue to the generality of information. Preschoolers' encoding and discarding of specific contextual detail highlights their attentiveness to the category-relevance of learning episodes. At the same time, however, our results suggest that the effect of generic language on memory may decline once children are able to remember more overall and once they are motivated to learn about individual people as well as categories. Together, these results illustrate the critical role of generic language in supporting young children's encoding processes and the continued role of generic language in guiding children's inferences throughout development.

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