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When Choices Are Not Personal: The Effect of Statistical and Social Cues on Children's Inferences About the Scope of Preferences

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Individual choices are commonly taken to manifest personal preferences. The present study investigated whether social and statistical cues influence young children's inferences about the generalizability of preferences. Preschoolers were exposed to either 1 or 2 demonstrators' selections of objects. The selected objects constituted 18%, 50%, or 100% of all available objects. We found that children took a single demonstrator's choices as indicative only of his or her personal preference. However, when 2 demonstrators made the same selection, then children inferred that it generalized to other agents of the same kind as the original demonstrator's, but not to agents of a different kind. Lastly, only when both demonstrators blatantly violated random selection (i.e., in the 18% condition) did children generalize the preference even to an agent of a different kind. Thus, from a young age, social and statistical cues inform children's naïve sociology.

One of the hallmarks of modern Western cultures is *choice*. People are thought to be free to choose how they act, what they believe, and what they value (Bandura, 2008; Baumeister, Mele, & Vohs, 2010; Leotti, Iyengar, & Ochsner, 2010; Ross & Nisbett, 1991; Sarkissian et al., 2010; Savani, Markus, Naidu, Kumar, & Berlia, 2010). An implication of this focus on autonomous choice is that people's acts are taken to manifest people's internal states. In particular, choices are indicative of preferences, often *personal* preferences.

Importantly, however, not all preferences are idiosyncratic. Imagine observing Joe sitting at a restaurant and choosing a Greek salad from a menu of mostly meat options. One could infer that Joe really likes Greek salads, more than anything else (an individual-focused inference). One could also infer that the Greek salad is really the best dish of the house (an object-focused inference). Finally, one could infer that because Joe is a vegetarian, Greek salad is the best available option for his ''type'' (a group-focused inference).

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Developmental studies reveal that children are capable of making these various types of inferences. For instance, studies have shown that infants and young toddlers do not expect different people to share a demonstrated preference (Buresh & Woodward, 2007; Graham, Stock, & Henderson, 2006; Henderson & Woodward, 2012; Repacholi & Gopnik, 1997). In turn, other studies suggest that when given information about social group membership, infants and children uphold an expectation that preferences will be shared by group members (Birnbaum, Deeb, Segall, Ben-Eliyahu, & Diesendruck, 2010; Heyman & Gelman, 2000; Shutts, Banaji, & Spelke, 2010; Shutts, Kinzler, McKee, & Spelke, 2009; cf. Shutts, Pemberton Robben, & Spelke, 2013). Given this evidence of flexibility in the scope of young children's generalization of preferences, we investigated what might govern such flexibility. In other words, how do children decide whether a preference is idiosyncratic, shared by a certain group of people, or shared by all? The present study focused on two types of cues that might help children make these decisions.

One cue is frequency information. Research following from attribution theory reveals that children are sensitive to the absolute frequency of actions for inferring whether the causes of actions are personal or situational (e.g., Aloise, 1993; Boseovski & Lee, 2006; Heller & Berndt, 1981; Seiver, Gopnik, & Goodman, 2012). Here we evaluate whether *relative* frequency information affects children's inferences about the *social scope* of preferences. Putting it differently, whereas attribution theory addresses the ''locus'' of inferences (person or situation), the present work addresses the ''scope'' of inferences (individual, group, or universal).

In particular, we ask whether children take into account the extent to which a person's choice is statistically expected. Going back to our restaurant example, if 90% of the menu consists of meat dishes and Joe goes for the Greek salad, he is in stark violation of random choice. In other words, the more a person violates random selection, the more likely the selection derives from a deliberate preference. And indeed, preschoolers obey this reasoning. Kushnir, Xu, and Wellman (2010) introduced 3- and 4-year-olds to an agent who in different conditions selected 5 objects of the same type from a population of 38 objects. The conditions differed in terms of the frequency of the chosen object type in the population. Namely, they either constituted 18%, 50%, or 100% of the objects available. Children were then asked to give the agent an object. Kushnir et al. found that children were more likely to give the agent the type of object he had originally chosen in the 18% condition than in the other conditions. In other words, when the agent's choice clearly violated random sampling, children inferred that the agent had a strong preference for the selected object. The present study extends Kushnir et al.'s findings by asking whether such violations of random sampling lead children not only to infer the *individual actor's* preference, but also to generalize the preference to *other* agents. That is, do children infer that an agent's blatant violation of random sampling in choosing a particular object may be indicative of the attractiveness of the object *in general*, rather than to that particular individual?

The second cue regards how many people manifest the preference. Referring back to the restaurant scenario, if Joe *and his partner* choose the Greek salad over the meat options, one might be more inclined to infer that Joe's selection is not necessarily idiosyncratic: Greek salad might be the best dish of the house or something that Joe, his partner, and perhaps other like-minded people prefer. To our knowledge, no developmental studies have investigated whether children make this inference in a social realm. It has been found that kindergarteners are influenced by the diversity of an animal sample when making generalizations about the kind (Rhodes, Gelman, & Brickman, 2008) and that they are influenced by how many people use an object in a certain way when inferring the function of the object (Siegel & Callanan, 2007). The present study asked whether seeing a preference manifested by more than one agent affects the generalizability of that preference. Moreover, in combination with the statistical sampling cue described earlier, the study assessed the scope of the generalization: Do children infer that everybody shares the preference, or only those of the same kind as the agents originally demonstrating the preference?

To address these questions, the present study used a methodology similar to the one employed by Kushnir et al. (2010). As in Kushnir et al., here too children were exposed to samplings of 5 target objects from a population of 38 objects, such that target objects represented 18%, 50%, or 100% of the population. The manner in which the sampling took place and the assessment of children's inferences about the generalizability of the preference, however, differed from Kushnir et al.'s study. Regarding the sampling demonstration, children here were either exposed to a single agent (e.g., a frog hand puppet) sampling target objects from a population, or to two agents (two frogs) independently sampling the same target objects from the same population. To assess the generalizability of their inferences, children were asked three questions. The first question asked children to infer which object the first demonstrating agent would like to play with. The second question asked children what type of object a new agent, of the *same* kind as the original demonstrator(s) (e.g., another frog), would like to play with. The third question asked children what type of object a new agent, of a *different* kind from the original demonstrator(s) (e.g., a bird), would like to play with. Children's pattern of responses to these three questions allowed us to detect the scope of their generalization. Namely, do children infer that a demonstrated preference manifests only the individual demonstrator's preference, the demonstrator's group preference, or a universal preference?

METHOD

Participants

One hundred and seven preschoolers ($M_{age} = 3;6$; $SD = 4.8$ months; range = 3;0–4;4; 49 boys and 58 girls) participated in this study. Participants were recruited from local preschools in Israel after receiving signed parental permission.

Design

The study included two between-subjects factors: object population and number of demonstrators. Object population varied in terms of the percentage of target items present in the demonstration containers. There were three conditions: 18%, 50%, and 100%. The number of demonstrators varied as to whether only one (*single-demonstrator* condition) or two (*multiple-demonstrators* condition) agents demonstrated a certain preference during demonstration. Children were randomly assigned to each of the six conditions resulting from the crossing of these two factors ($n = 14$–22 per condition). There were no significant differences in the age or gender distribution of children across conditions.

Materials

Two sets of objects were used as the experimental materials. There were three types of objects in each set: ''target,'' the type of object chosen by the agents during the demonstration phase;

''alternative,'' the type of object placed in the demonstration box in the 50% and 18% conditions; and ''novel,'' the type of object absent in the demonstration box but that provided a novelty control on test trials. Set 1 consisted of simple shapes: blue oblongs and green discs, which alternated as the target, and purple beads, which were always used as novel objects. Set 2 consisted of small white balls and brown rafters, which alternated as the target, and red cubes, which served as the novel objects.

Large transparent boxes were used as the containers for the objects during the demonstration trials. In the 18% condition, boxes contained a 7:31 ratio of target-to-alternative objects. In the 50% condition, boxes contained a 19:19 ratio of target-to-alternative objects. The boxes used in the 100% condition contained 38 target objects. An additional set of 5 objects of each type were kept in three separate small baskets to be used in the test phase.

Finally, four hand puppets were used as agents. Three were green frogs that looked exactly the same, except that they were labeled differently and each had a distinctive ''sticker'' affixed to its body: a flower, a star, or a ball. These puppets were labeled in typical Hebrew morphology according to their distinctive marks as ''Flowery,'' ''Starry,'' and ''Bally.'' The fourth puppet was a black bird.

Procedure

Each child was tested individually by a female experimenter in a quiet area of their preschools. In all conditions, the procedure included a demonstration phase—in which the agent(s)' choice was demonstrated—and a test phase—in which children's inferences about preferences were assessed.

Demonstration phase. The experimenter introduced the agent (e.g., ''Flowery'') and the agent's friend (e.g., ''Starry'') to the child, while handling the puppets and speaking for them in a different tone of voice. After a brief introduction, the experimenter removed the agent's friend and told children that Flowery likes some toys but not others. The experimenter then familiarized children with one object of each kind for the first set and labeled them as well.

The experimenter brought out a box for Set 1, containing objects according to the child's condition. The experimenter asked Flowery whether he wanted to take some toys to play with. Flowery picked out a sample of five target objects one at a time and placed them on the table in a small basket. After Flowery picked out the fifth target object, the experimenter removed the box from the table, Flowery played with the objects for 10 s, and then he went away.

In the single-demonstrator condition, the experimenter then brought out the box with Set 1 again—surreptitiously replenished so that it contained the same set of objects as in its first appearance—and then Flowery reappeared and was invited to play with the toys. Flowery went on to pick out the same five target objects. In turn, in the multiple-demonstrators condition, rather than Flowery coming back for a second turn at choosing toys from Set 1, Starry was brought out and was invited to choose toys from another box containing the same objects, in the same ratio, as in the box Flowery had seen. The experimenter asked Starry whether he wanted to take some toys to play with. Starry picked up a sample of five target toys, identical to those selected previously by Flowery, and played with them for 10 s. Starry was then removed from the table, and the test phase ensued. Notice that the single-demonstrator condition here was different from the one in Kushnir et al. (2010), in which an agent's preference was demonstrated only once. This change was implemented so as to equate the number of times—twice—children saw an agent demonstrating a preference across the single-demonstrator and multiple-demonstrators conditions.

Test phase. The test phase consisted of three questions, asked in a fixed order. In both the single-demonstrator and multiple-demonstrators conditions, the first question asked children about Flowery's preference (inference-about-individual question). Flowery was brought out again, and the experimenter set out on the table the three small baskets containing five objects of each kind: target, alternative, and novel. Flowery then turned to the child and said, ''I want some toys again. Can you give me the ones that I like?'' The child's first choice was recorded, and Flowery was taken away.

The second question was the ''inference-about-similar'' question. For this question, the third frog puppet, ''Bally,'' was brought out, and the experimenter greeted him marking his identity: ''Look! There is another frog here! It's Bally. See, he has a ball on his tummy!'' Turning to the child, Bally said, while looking at the three baskets, ''I want some toys to play with. Can you give me the ones that I like?'' The child's first choice was recorded. Notice that for this question, given that children had not observed Bally's preference, they had to guess it. Again, Bally left the table after playing for a few seconds with the objects in the basket that the child had handed him.

After Bally left, a frog puppet without any identity markers arrived at the table, and the experimenter said, ''Oh! Someone came back! I can't recognize him because there is no sign on his tummy! Let's see with what toy he will choose to play!'' The experimenter then set out the three small baskets with objects, and the puppet chose to play with the target object for 10 s. Again, the puppet left the table after playing with the objects. The main purpose of this scene was to separate between the inference-about-similar and inference-about-different question, while at the same time reinforcing the similarity across the frogs.

The last question in the test phase was the ''inference-about-different'' question. This question was identical to the inference-about-similar question, but the identity of the recipient was different. Namely, here the bird puppet arrived, and the experimenter acknowledged his identity. The experimenter set out the three small baskets with the objects, and the bird turned to the child and said, ''I want to play too! Can you give me the ones that I like?'' The child's first choice was recorded. Just as in the inference-about-similar question, the child had no previous indication of the bird's preference and thus had to guess it.

The entire procedure was repeated with the other set of objects. The set of objects presented first and the specific objects used as targets in each set were counterbalanced across participants. The left-center-right placement of the small baskets in the test phase was counterbalanced within participants.

RESULTS

Recall that in the inference-about-individual question, the requesting puppet was the original demonstrator; in the inference-about-similar question, the requesting puppet was a puppet similar in kind to the original demonstrator; and in the inference-about-different question, the requesting puppet was a puppet different in kind from the original demonstrator. The main dependent measure for all three test questions was the number of times (zero to two) in which children gave the target object to the requesting puppet. Our main analyses were analyses of variance (ANOVAs) in which these measures were treated as continuous variables. This allowed us to assess interactions among the different independent factors.

In the main ANOVA, object population (18%, 50%, and 100%) and number of demonstrators (single, multiple) were entered as between-subjects factors, and requester identity (demonstrating agent, same kind, different kind) was entered as a within-subjects factor. The analysis revealed a significant effect of requester identity, $F(2, 100) = 29.77, p < .001, \eta^2 = .37$, and significant interactions

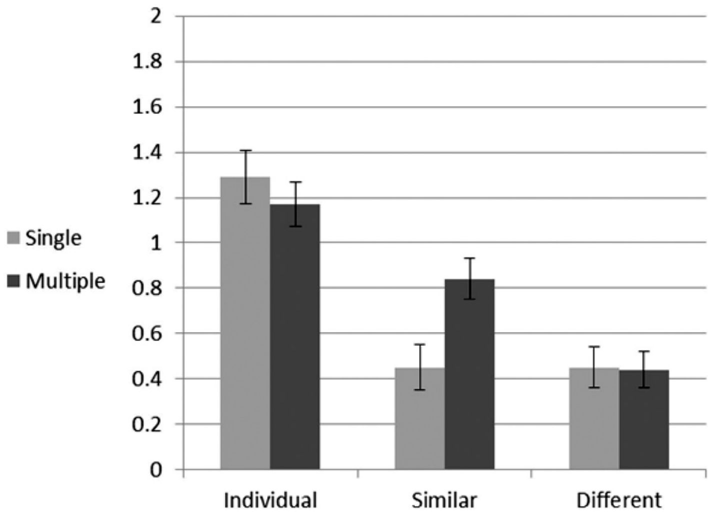

FIGURE 1 Mean number of times (*SE*s) that children offered the target object, by number of demonstrators and requester identity.

between number of demonstrators and requester identity, $F(2, 100) = 3.93$, $p < .05$, $\eta^2 = .073$, and between number of demonstrators and object population, $F(2, 101) = 3.21$, $p < .05$, $\eta^2 = .060$. Figures 1 and 2 depict the respective interactions. No other effects were significant.

We pursued the interaction between number of demonstrators and requester identity by conducting two separate repeated-measures ANOVAs for each number-of-demonstrators condition separately. Requester identity was the within-subjects variable in these analyses. The ANOVA on the single-demonstrator condition revealed a significant effect of requester identity, $F(2, 43) = 15.04$,

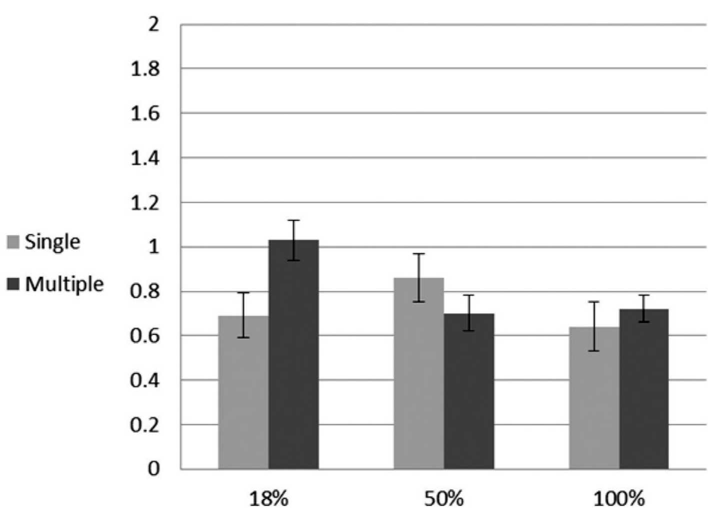

FIGURE 2 Mean number of times (*SE*s) that children offered the target object, by number of demonstrators and object population, across inference types.

$p < .001$, $\eta^2 = .41$. Post-hoc Bonferroni tests revealed that this effect resulted from the fact that children were more likely to offer the target object to the original demonstrator ($M = 1.29$, $SD = 0.84$) than to either someone of the same ($M = 0.44$, $SD = 0.62$) or a different kind ($M = 0.44$, $SD = 0.69$) as the demonstrator ($ps < .001$). The difference between the latter two was not significant. One-sample t test analyses against chance (chance $= 1/3$ selections of the target objects across the two trials, i.e., 0.67) revealed that whereas children tended to offer the target object to the original demonstrator *more* often than would be expected by chance, $t(44) = 4.93$, $p < .001$, they did so to an agent similar in kind, $t(44) = -2.43$, $p < .05$, or to an agent different in kind, $t(44) = -2.18$, $p < .05$, *less* often than would be expected by chance. In other words, when exposed to a single demonstrator, children drew an inference about his personal preference but were as unlikely to generalize the preference to a similar agent as they were to a different agent.

The ANOVA on the multiple-demonstrators condition also revealed a significant effect of requester identity, $F(2, 60) = 18.62$, $p < .001$, $\eta^2 = .38$. However, different from the results in the single-demonstrator condition, post-hoc Bonferroni tests revealed that this effect resulted from the fact that children were more likely to offer the target object to the original demonstrator ($M = 1.18$, $SD = 0.76$) *or* to someone of the same kind as the demonstrator ($M = 0.84$, $SD = 0.73$) than to someone of a different kind from the demonstrator ($M = 0.45$, $SD = 0.59$; $ps < .05$). In fact, a multivariate analysis of variance (MANOVA) with number of demonstrators as a between-subjects factor, including children's responses on the inference-about-individual, inference-about-similar, and inference-about-different questions, revealed that the effect of number of demonstrators was significant only with respect to inferences-about-similar questions, $F(1, 105) = 8.60$, $p < .005$, $\eta^2 = .08$. Namely, children were more likely to generalize to a similar agent when exposed to multiple demonstrators than when exposed to only one. Summing up these analyses, when exposed to multiple demonstrators, children were as likely to generalize the preference to the individual demonstrator as they were to generalize to a similar agent.

As for the interaction between number of demonstrators and object population, we followed it up by looking at the effect of object population in each number-of-demonstrators condition separately. One-way ANOVAs revealed that whereas in the single-demonstrator condition, the effect of object population was not significant ($p > .4$), in the multiple-demonstrators condition, it was significant, $F(2, 59) = 5.42$, $p < .01$, $\eta^2 = .16$.[1] Post-hoc Tukey tests revealed that children in the 18% condition were more likely to offer the target object to any agent compared with children in either the 50% or 100% condition ($ps < .05$)—these two latter conditions not differing significantly (see Figure 2).

[1]Note that the present pattern of findings regarding the effect of object population on children's inferences about the preferences of the demonstrating agent differs from the pattern reported by Kushnir et al. (2010). One possible explanation for this divergence has to do with the fact that different from Kushnir et al., here, children in the analogous single-demonstrator condition were exposed to an agent making the same choice twice in a row—rather than only once. To address this possibility, we tested another group of fifty 3- to 4-year-olds in the three object population conditions ($ns = 16$–18 per condition), in a single demonstrator–single demonstration condition. We analyzed the effect of object population only on children's responses on the inference-about-individual question. Replicating Kushnir et al.: a) A planned contrast comparing the frequency of selection of the target object in the 18% condition ($M = 1.22$, $SD = 0.73$) to those in the 50% ($M = 0.63$, $SD = 0.62$) and 100% ($M = 0.88$, $SD = 0.89$) conditions was significant, $t(47) = 2.13$, $p < .05$; and b) analyses against chance confirmed that only in the 18% condition did the frequency of children's choices of the target object significantly differ from chance, $t(17) = 3.20$, $p < .005$ (for the other two conditions, $ps > .3$). It is possible that in the present study, having the same demonstrator select 10 target objects, or repeating the same selection twice, weakened the effect of the relative frequency statistical cue.

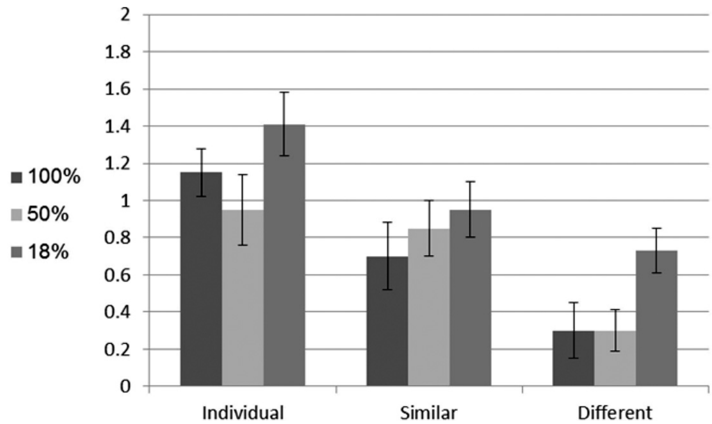

FIGURE 3 Mean number of times (*SE*s) that children in the multiple-demonstrators condition offered the target object to the individual demonstrator, a similar puppet, and a different puppet, by object population condition.

Given our theoretical hypothesis about potential differences in the scope of children's generalization, we explored whether the effect of object population in children's tendency to generalize a preference to any agent given multiple demonstrations indeed held for all types of agents. A MANOVA with object population as a between-subjects factor, including children's responses on the inference-about-individual, inference-about-similar, and inference-about-different questions, revealed that the effect of object population was significant only on children's inferences about different agents, $F(2, 59) = 4.07$, $p < .05$, $\eta^2 = .12$. In particular, children in the 18% condition were more likely to generalize to different others than were children in either the 50% or 100% conditions (*ps* $< .05$, on Tukey's post-hoc tests). Looking at this effect differently, analyses against chance (chance =.67) revealed that whereas children in the 100% and 50% conditions offered the target object to a different agent significantly less often than expected by chance—$t(19) = -2.52$, $p < .05$, and $t(19) = -3.52$, $p < .005$, respectively—children in the 18% condition offered the target object to a different agent at chance levels. In other words, whereas children in the 50% and 100% conditions tended not to generalize a demonstrator's preference to an agent different in kind, this refusal was not evident in the 18% condition (see Figure 3).

DISCUSSION

The goal of the present study was to assess whether young children relied on object and social frequency cues when deciding on the generalizability of a demonstrated object preference. In general, and replicating findings by Buresh and Woodward (2007) and Graham et al. (2006), we found that children tend *not* to generalize an agent's preference to other agents. This was especially the case when children were exposed to a single agent demonstrating a preference. Choices manifest personal preferences.

Nonetheless, children did generalize a preference when exposed to particular combinations of object and social frequency cues. Specifically, when the preference was manifested by more than one agent of a given kind choosing the target object, children were as likely to attribute that preference to one of the original demonstrating agents as they were to attribute it to a third agent of the same kind. Interestingly, under these circumstances, children generalized the preference to a same-category member more than to a different-category member. In other words, it sufficed for children to observe two members of a given category manifesting the same preference for them to infer that the preference was associated with the category.

Finally, the only circumstance in which children seemed to make an inference that the choice was universal was when both cues pointed in that direction. Namely, when children were exposed to multiple agents whose choices violated random sampling, they were more likely to generalize the preference to a member of a different category compared with when the agents' choices did not violate random sampling. Thus, children seemingly inferred that if two agents so blatantly breach random sampling, it might be because their choices are based on something other than an idiosyncratic preference, namely an objective property (or value) of the target object.

Previous studies have shown that young children can rely on statistical (Kushnir et al., 2010) and social (Fawcett & Markson, 2010) cues for drawing inferences about personal preferences. In a sense, these studies revealed how these cues inform children's understanding of people as *psychological* beings. At the same time, children can rely on social group information for drawing inferences about preferences (Birnbaum et al., 2010; Shutts et al., 2010). By showing how object and social frequency cues inform children's inferences about the generalizability of preferences across individuals, the present study sheds light on how these social category-based inferences get formed. In other words, it reveals how children construct an understanding of people as *sociological* beings.

One valid question is whether the particular combination of cues examined here are uniquely effective for children's inferences about preferences. Although the present study did not examine this question directly, we nonetheless believe that the answer to this question is likely to be affirmative. First, we know from previous work that object frequency information of the same kind used here impacts infants' and toddlers' inferences about personal preferences only when the choices are clearly intentional (Ma & Xu, 2011; Xu & Denison, 2009). Second, previous work also has revealed that preferences are somewhat unique in that they are typically narrowly generalized. For instance, although infants do not generalize the preferences of one individual to others, they do generalize the object labels used by one individual to other individuals (Graham et al., 2006; Henderson & Woodward, 2012).

This sophistication in children's naïve sociology is critical for their adaptive functioning in society. Indeed, some seemingly arbitrary preferences for objects, foods, or habits are what constitute culture. And in fact, children from a young age do realize that various arbitrary cultural forms are conventional across a group of individuals (Diesendruck & Markson, 2011) and even enforce them as being normative (Rakoczy & Schmidt, 2013). In this respect, the present findings provide evidence for some of the mechanisms that allow children to reach this realization. Moreover, the present findings show that in some cases, these *same cues* allow children to generalize their inferences even across social categories, thus de-facto drawing generic inferences about objects. This is an important conclusion because it shows that children might not need generic language (Cimpian & Scott, 2012), or pedagogical cues (Gergely, Egyed, & Kiraly, 2007), to draw such kinds of inferences. Evidently children can use these cues, as well as others such as the conformity and reliability of the demonstrators (Corriveau, Fusaro, & Harris, 2009), or perhaps the diversity of the demonstrators, to make decisions about the generality of preferences. These possibilities notwithstanding, unique combinations of children's early emerging intuitions about statistical sampling (Xu & Garcia, 2008) and social categories (Kinzler, Dupoux, & Spelke, 2007) might suffice to allow them varying inferences about the scope of preferences.

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