Consistent but not diagnostic: Preschoolers' intuitions about shared preferences within social groups

Natalia Vélez (nvelez@stanford.edu) **Yuerui Wu (juliayueruiwu@berkeley.edu)**

Hyowon Gweon (hyo@stanford.edu)
Department of Psychology, Stanford University, Stanford, CA 94063

Abstract

Social groups highlight latent structure in the social world and support inductive inferences about individuals. In the present work, we examined children and adults' intuitions about shared preferences within social groups. In Exp.1, 3- to 5-year-old children treated preferences as a *consistent* property of social groups; that is, children expected members of a social group to like the same toys that other members have liked. However, they did not treat preferences as *diagnostic* of social groups; they did not expect individuals to belong to a group that shares their preferences. By contrast, in Exp.2, adults readily treated preferences as both a consistent and diagnostic property of social groups. These results suggest that children's inferences about social groups are asymmetric: Children readily infer preferences based on group membership, but not group membership based on preferences.

Keywords: social cognitive development; social categories

Introduction

Categories organize jumbled, noisy experiences into structured, generalizable knowledge. Members of a category tend to be similar to one another; for instance, the categories "dogs", "cars", and "children" each contain members that are outwardly similar to one another and share some internal, non-obvious properties (e.g., cars, but not children, run on fuel; Gelman & Markman, 1986). Beyond picking out similarities between objects, categories also highlight which similarities are relevant and embed these similarities within a causal, conceptual framework (Keil, 1992). Young children flexibly use categories to make rich inductive inferences from sparse data (Carey, 2009). For example, if a child learns that an object called a "blicket" rattles when she shakes it, she'd expect that another object called a blicket would also rattle when shaken (Gopnik & Sobel, 2000).

Children have to learn not only about the objects around them, but also about new people they encounter: What do other people like? Who is friends with whom? Whom should I approach, befriend, or trust? If children had to learn about each new person in isolation, these questions would be difficult to answer. However, the social world is crowded yet structured; just as categories allow children to learn efficiently about new objects, children also use social groups to learn about new individuals (Rhodes & Gelman, 2009).

Members of a social group tend to be similar to one another (Billig & Tajfel, 1973). Some social groups are associated with perceptually identifiable properties, such as gender, race, and language. Prior research suggests that even young children readily use these cues as a marker for identifying in-group and out-group members (Finkelstein & Haskins, 1983; Maccoby & Jacklin, 1987). However, social groups can also be defined by latent, unobservable properties that are only revealed through behavior. For example, children tend to befriend children who play the same games as them (Rubin, Lynch, Coplan, Rose-Krasnor, & Booth, 1994) or who have similar personalities to them (Erwin, 1985). Recent work finds that even infants expect agents in the same group to act alike (Powell & Spelke, 2013).

One particularly important latent property of social groups is their *preferences*—what people like and dislike. While preferences are not directly observable, adults frequently broadcast their preferences and befriend people who share them (Werner & Parmelee, 1979): Groups such as "Trekkies," "Red Sox fans," and "metalheads" are all bound together by a shared preference. Adults also use preferences to infer deeper, hidden traits, such as personality (Rentfrow & Gosling, 2006).

Prior work suggests that young children are also sensitive to the social importance of shared preferences. Starting as early as infancy, children tend to choose the same things as people who are similar to them: They choose foods that are endorsed by people of their same gender, language, and race, rather than those endorsed by people who are different from them (Kinzler, Shutts, DeJesus, & Spelke, 2009; Shutts, Banaji, & Spelke, 2010; Shutts, Kinzler, McKee, & Spelke, 2009). This work suggests that children expect preferences to be *consistent* across members of the same social group. For example, if a child from a local preschool says that she likes Coco, her class's pet chicken, then we might expect other children in her class to also like Coco. Preschool-aged children will even enforce preferences within a social group by negatively evaluating individuals whose preferences differ from the rest of the group (Roberts, Gelman, & Ho, 2017).

In addition to being consistent within social groups, preferences are also often *diagnostic* of group membership; knowing that two people share the same preferences might support the inference that they are socially connected. Returning to the example above, if we meet a different child who says that she likes Coco, we might infer that she attends the same preschool, and perhaps even the same class. However, less is known about whether children treat preferences as diagnostic of social groups, and—if they do—how strong such expectations are compared to their expectations of consistency.

Some insight comes from prior work on children's inferences about gender categories. Preschool-aged children infer biological properties from group membership more readily than they infer group membership from biological properties. For example, after learning that girls have a substance named "estro" in their bodies, children expect that other girls also have estro, but not that children who have estro are girls (Gelman, Collman, & Maccoby, 1986). Thus one possibility is that children's reasoning about shared preferences within social groups might show a similar asymmetry. Young children's preferences are largely shaped by adults' choices, rather than their own. Thus even though children readily expect members of the same group to have shared preferences, they might not treat preferences as a distinctive feature of group membership until later in life, particularly in adolescence. If this is the case, while children might consider preferences as consistent but not diagnostic of group membership, adults might consider them as both consistent and diagnostic.

However, an alternative possibility is that such asymmetry is specific to biological properties and groups that are associated with such properties, such as gender. Prior work suggests that biological properties have a privileged status in early development of categories and concepts. Even young children hold strong beliefs that members of the same biological category have the same deep, internal structure (or "essence"), such that changing their outward appearance does not change their category membership (Gelman, 2004). However, such essentialist beliefs about biological categories might not extend to the domain of preferences. Furthermore, biological traits are genetically determined, shaped through evolution, and largely out of an individual's control, while preferences are fluid and arbitrary. Therefore, children's reasoning about the relationship between preferences and social groups may differ from their understanding of biological properties and category membership.

In the present work, we explored children and adults' intuitions about shared preferences within social groups. In Experiment 1, we examined preschool-aged children's intuitions about the relationship between agents' preferences and their group membership. Across two conditions, we asked whether children treat preferences as consistent (Infer Preference) and diagnostic (Infer Groups) properties of social groups. If children treat preferences as consistent, they might expect individuals to like the same things as people in their social group. If children treat preferences as diagnostic, they might expect individuals to belong to the group that shares their preference. Based on prior work Gelman et al. (1986), we predicted an asymmetry in children's judgments; specifically, children might treat preferences as consistent, but not diagnostic. In Experiment 2, we gauged adults' intuitions on the same task. Materials for this project can be found at `osf.io/7fmk9`.

Experiment 1

Methods

Participants 98 3-, 4-, and 5-year-old children (M(SD) = 4.38 (.88) years, 61% female) were recruited from a nursery school and children's museum in Palo Alto, CA. Children were assigned to two between-subjects conditions: Infer Preference (N = 48) and Infer Group (N = 50). In each condition, we recruited 15-17 children from each age group. An additional 12 children were excluded from analysis because they did not speak English fluently (N = 1), were too young or too old for our planned age range (N = 4), or received interference from parents (N = 1) or peers (N = 6).

Procedure Children saw a short Keynote presentation about aliens named "gazorps". The experimenter explained that gazorps played on different teams: some gazorps were on the red team, while some gazorps were on the blue team. Each gazorp had unique facial features and wore a colorful t-shirt to mark which team it belonged to.

In the *Observe Preferences* phase, children learned about the preferences of one member of each team (Figure 1a). Children saw a screen with two baskets. Each basket contained a different toy, marked by an icon on the basket: one basket had a car, while the other had a robot. Children then watched a gazorp from the blue team pick its favorite toy. In a brief animation, the gazorp announced: "Look at all these toys!" and hovered to each basket to check its contents. The gazorp always checked both baskets and picked the toy in the second basket that it visited. When it arrived at the second basket, the gazorp bounced and announced: "This one! I really like the toy in this basket." As a comprehension check, children were asked to point to the toy that the gazorp liked. The gazorp then left the screen, and children watched a similar animation where a gazorp from the red team chose the opposite toy. As a memory check, children were then asked to recall which toy each gazorp chose. On each trial, children saw one gazorp from the Observe Preferences phase standing between the two baskets and were asked to point to the toy that the gazorp liked.

Finally, children were shown a new *target gazorp* (Figure 1b–c). The experimenter emphasized that the gazorp was completely new and asked children to confirm that they had never seen this gazorp before. Children were assigned to two between-subjects conditions, which differed in the inference that children were asked to make about the target gazorp.

In the Infer Preference condition, children were shown which group the target gazorp belonged to and were asked to infer its preference. The target gazorp appeared, wearing a t-shirt, between the two baskets. The experimenter announced: "Look! This is a whole new gazorp. This gazorp is on the red team." The experimenter then asked the child to guess which toy the gazorp likes.

In the Infer Group condition, children were shown the target gazorp's preference and were asked to infer its group. The target gazorp appeared, without a shirt, between the two toy baskets. The experimenter explained: "Look! This is a whole new gazorp. This gazorp lost its shirt." Children then saw a brief animation where the target gazorp chose one of the two baskets. Finally, a red and blue shirt appeared on the screen equidistant from the gazorp, and children were asked to guess which team the gazorp belonged to. Children in both conditions were also prompted to explain their choice. Two independent raters coded children's explanations (Co-

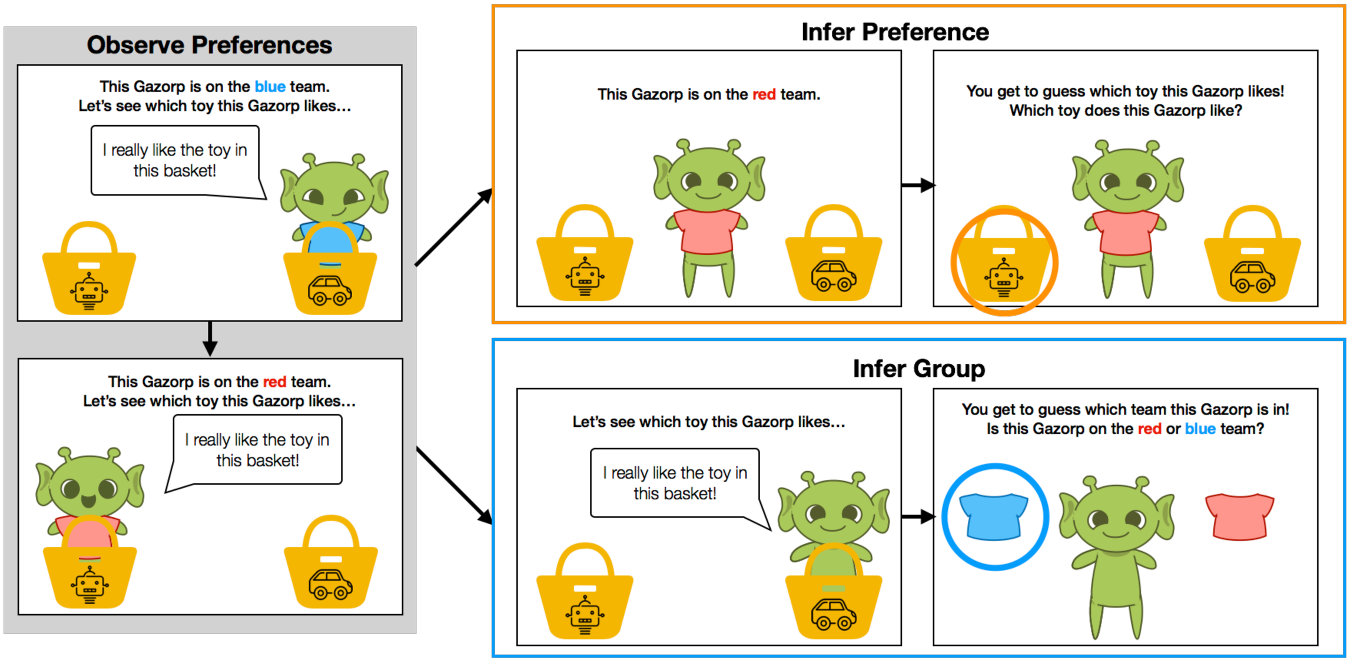

Figure 1: Task structure and stimuli. *Left*: In both conditions, participants saw one gazorp from each team choose a toy from a basket. *Right, top*: Infer Preference condition. Participants were shown which team the target gazorp belongs to and were asked to guess which toy it likes. *Right, bottom*: Infer Group condition. Participants were shown which toy the target gazorp likes and were asked which team it belongs to. Circled options indicate responses that were coded as "matching".

hen's $\kappa = 0.903$) and conferred to resolve disagreements.

We counterbalanced all superficial aspects of the task between participants, including: the order in which the teams were presented in the Observe Preferences phase, which toy was associated with each team, the team membership of the test gazorp (Infer Preference), the preferences of the test gazorp (Infer Group), and the placement of the shirts in the critical test question (Infer Group).

Results

We tested two aspects of children's intuitions about shared preferences within social groups. First, in the Infer Preference condition, we asked whether children treat preferences as *consistent* properties within a group. If so, we expected that children would match the target gazorp with the same preferences as its teammate: for example, if children saw a gazorp from the red team choose a robot, they might expect another gazorp from the red team to like robots, too.

Consistent with our predictions, overall, 37/48 children matched the target gazorp with the same toy as its teammate (77.1%; binomial test: $p < 0.001$, 95% CI: $[62.7, 88.0]$; Figure 2). This pattern was consistent throughout the age range studied. 13/16 3-year-olds (81.3%; $p = 0.021$, 95% CI: $[54.4, 96.0]$) and 14/17 4-year-olds (82.4%; $p = 0.013$, 95% CI: $[56.6, 96.2]$) matched the target gazorp with the same toy as its teammates. While only 10/15 5-year-olds matched (66.7%; $p = 0.302$, 95% CI: $[38.4, 88.2]$), a logistic regression of children's responses as a function of age revealed no age-related differences in children's responses ($\beta = -0.33$, $z = -0.733$, $p = 0.463$).

Of the 38/48 children who provided an explanation for their choice, several spontaneously referred to the gazorp's team or the preferences of its teammates. 12 children explicitly referred to the preferences of the gazorp's team or teammate (e.g., "Because he is on the blue team and the blue team likes to play with the car") and 6 children emphasized which team the gazorp belongs to (e.g., "Because he is a blue team"). The remaining children restated the toy they had chosen (N = 11; e.g., "Because it likes the car"), described a property of the toy (N = 4; e.g., "Because [the toy] moves"), or gave an irrelevant explanation (N = 5; e.g., "I like the car").

Second, in the Infer Group condition, we asked whether children treat preferences as *diagnostic* properties of a group. If so, children might expect gazorps to belong to the team that has gazorps who share their preferences. For example, if the target gazorp chose the car, children would expect the target gazorp to belong to the red team, because other gazorps on the red team also like cars. Prior work suggests that children infer properties (here, preferences) from group membership more readily than they infer group membership from properties (e.g., Gelman et al., 1986); as a result, we expected that children would be at chance.

Indeed, children did not reliably match the target gazorp with the team that shared its preferences. Overall, only 28/50 children chose the matching team (58%; $p = 0.322$, 95% CI: $[43.2, 71.8]$; Figure 2), including 10/17 3-year-olds (58.8%;

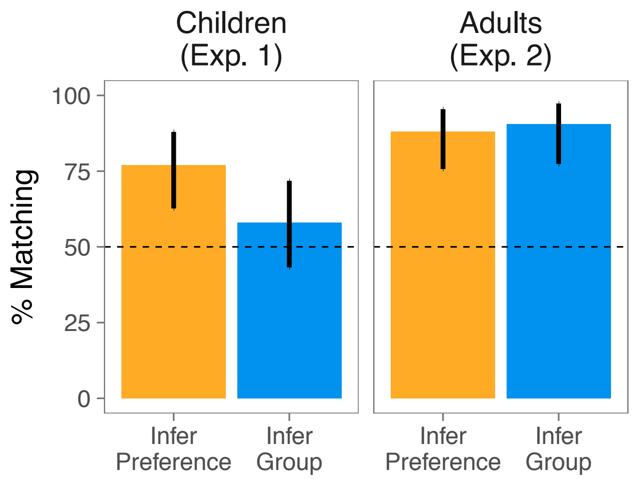

Figure 2: Experiment 1 (left) and 2 (right) results. Yellow bars show the proportion of participants in the Infer Preference condition who predicted that the target gazorp would like the same toy as its teammate. Blue bars show the proportion of participants in the Infer Group who predicted that the target gazorp belonged to the team consistent with its preference. Error bars denote 95% CI.

$p = 0.629$, 95% CI: $[32.9, 81.6]$), 8/17 4-year-olds (47.1%; $p = 1.00$, 95% CI: $[23.0, 72.2]$ and 11/16 5-year-olds (68.8%; $p = 0.210$, 95% CI: $[41.3, 89.0]$). As before, we found no age-related differences in children's responses (logistic regression: $\beta = 0.46$. $z = 1.23$, $p = 0.218$).

Of the 33/50 children who provided an explanation for their choice, 6 referred to what the gazorp's team or teammate liked (e.g., "Because the blue team likes the robot") and 7 cited what the target gazorp liked or what toy it chose (e.g., "Because he picked the robot"). The remaining children restated the team they had chosen (N = 5; e.g., "Because it's the blue"), gave a physical description of the gazorp (N = 9; e.g., "Because he's green"), or gave an irrelevant explanation (N = 6; e.g., "Because three").

We compared children's rate of matching across conditions; a response was coded as a "match" if the child matched the target gazorp with the same toy as its teammates (Infer Preference) or with the team that shares its preferences (Infer Group). We found a marginal difference between conditions (Fisher's exact test: $p = 0.054$), providing suggestive evidence that children matched more often in the Infer Preference condition than in the Infer Groups condition.

Children's responses were not driven by superficial, counterbalanced features of our stimuli. In the Infer Preference condition (N = 48), children did not systematically choose the toy on one side of the screen (20/48 chose the toy on the left), the toy associated with the most recent memory check question (23/48 chose the most recent toy), or the toy associated with a particular team (25/48 chose the red team's toy; binomial test: all $ps > 0.416$). In the Infer Group condition (N = 50), children did not systematically choose a shirt based on color (24/50 chose red) or based on the team that appeared most recently in the memory check (22/50 chose the most recent team), and they didn't choose the shirt on the same side of the screen that the target gazorp had moved to (27/50; binomial test: all $ps > 0.479$).

We found that children infer agents' preferences based on group membership, but not their group membership based on preferences. These results suggest that children treat preferences as a consistent, but not diagnostic property of social groups. In Experiment 2, we tested whether these intuitions persist into adulthood. Given that adults group themselves based on shared preferences and derive meaning from what people like (Rentfrow & Gosling, 2006; Werner & Parmelee, 1979, e.g.,), adults may treat preferences as both a consistent and diagnostic property of social groups.

Experiment 2

Methods

Participants Adult participants (N=92) were recruited for a brief online survey on Amazon Mechanical Turk and randomly assigned to the Infer Preference (N=50) and Infer Group (N=42) conditions. An additional 15 participants were excluded from analysis because they failed at least one check question (see Procedure). All participants had US IP addresses and provided informed consent in accordance with the requirements of the IRB at Stanford University.

Procedure Stimuli were presented online using jsPsych (De Leeuw, 2015). The procedure was similar to that of Experiment 1. Participants watched one member from each team choose their favorite toy from two baskets; as a memory check, they were asked to recall which toy each gazorp liked. Participants were then introduced to a completely new target gazorp; as an attention check, they were asked to confirm that they had never seen the gazorp before. Participants who answered either of these check questions incorrectly were excluded from analysis.

As in Experiment 1, participants were asked to make some inference about the target gazorp. In the Infer Preference condition, participants were shown which team the target gazorp belongs to and were asked to guess which toy it likes; in the Infer Group condition, participants were shown which toy the gazorp likes and were asked to guess which team it belongs to. Adults were asked two follow-up questions about their choice: first, they rated how confident they were about their choice by adjusting a slider (where the extremes were labeled "Not at all confident" at 0% and "Very confident" at 100%) and, second, they wrote in an optional explanation for their choice.

Results

In Experiment 1, we found that children treat preferences as a consistent, but not diagnostic property of social groups. In Experiment 2, we tested adults' intuitions on the same task.

Adults inferred the target gazorp's preferences based on its social group. In the Infer Preference condition, 44/50 participants guessed that the target gazorp would like the same toy as its teammates (88.0%; binomial test: $p < 0.001$, 95% CI: $[75.7, 95.5]$). Critically, they also inferred the target gazorp's social group based on its preferences. In the Infer Group condition, 38/42 participants guessed that the target gazorp belonged to the group that shared its preferences (90.5%; $p < 0.001$, 95% CI: $[77.3, 97.3]$). Across the two conditions, adults inferred the target gazorp's preferences based on its social group as often as they inferred its social group based on its preferences (Fisher's exact test: $p = 0.75$).

Interestingly, adults were more confident when guessing the target gazorp's social group based on its preference. We examined the confidence of adults who matched the target gazorp with the same preferences as its team (Infer Preference) or with the team that shared its preferences (Infer Group). Of these, adults in the Infer Group condition reported higher confidence in their choice compared to those in the Infer Preference condition (75.8% (4.37) vs. 59.02% (4.00), $W = 502.5$, $p = 0.002$, Wilcoxon rank-sum test).

Discussion

In the present work, we tested children and adults' intuitions about shared preferences within social groups. In Experiment 1, children inferred an agent's preferences from their group membership; that is, they expected agents to like the same toy as their teammates. They did not, however, infer group membership based on preferences. Children's intuitions about preferences in our task mirror their inferences about biological properties in previous work (Gelman et al., 1986). By contrast, in Experiment 2, adults inferred both agents' group membership from their preferences, as well as their preferences from their group membership. Taken together, our work identifies an asymmetry in category-based induction based on social groups and preferences, as well as an interesting developmental difference: While adults readily treat preferences as both a consistent and diagnostic property of social groups, children consider preferences as consistent, but not necessarily diagnostic.

The asymmetry in children's judgments raises the question of whether children generally do not treat *any* preference as diagnostic of any social category. One possibility is that children consider specific domains of preferences to be particularly diagnostic of social group membership. In particular, recent developmental work suggests that young children have an early-emerging, domain-specific system for reasoning about the social nature of food preferences. Preverbal infants expect people who like the same foods to interact positively with one another, and they also expect people who interact positively with one another to like the same foods. By contrast, infants have no such expectations based on shared preferences for objects (Liberman, Kinzler, & Woodward, 2014; Liberman, Woodward, Sullivan, & Kinzler, 2016). Given that infants use food preferences to infer affiliation between individuals, it is possible that food preferences may also signify that an individual belongs to a broader social group. Even within a domain, certain preferences may be more diagnostic than others. For example, in the present work, we used two toys—cars and robots—that were quite similar to one another. It is possible that children do not treat preferences for these particular items as diagnostic because they themselves like both toys, or because they expect that children from the same category (e.g., boys) like both toys.

Additionally, children may treat preferences as diagnostic when they are associated with specific social categories, such as gender. From an early age, children gravitate towards toys and activities that are typical of their gender, such as blocks for boys and dolls for girls (Berenbaum, Martin, Hanish, Briggs, & Fabes, 2008). Thus, gender may present a special case where preferences for certain toys are strongly associated with particular social groups. For example, while children might not expect a gazorp who likes robots to belong to the blue team, they may expect a child who likes dolls to be a girl. Indeed, these possibilities are not mutually exclusive, and future work might examine the generality of the asymmetry observed in the current study.

Unlike children, adults did not show this asymmetry; they inferred agents' group membership from their preferences as well as their preferences from their group membership. Somewhat surprisingly, adults were actually *more* confident in their inferences about group membership than in their inferences about preferences. One interpretation is that, even though children do not infer social groups from individual preferences, they might start to consider preferences as diagnostic of social groups later in life. This relationship might be further strengthened by adults' own beliefs about which preferences are worth communicating. Prior work suggests that adults frequently and spontaneously talk about their preferences, perhaps because preferences provide information about one's personality traits (Rentfrow & Gosling, 2006). However, another interpretation is that the current results merely reflect adults' pragmatic reasoning about the task structure. Given simple scenarios with minimal associations between groups and preferences, adults might have readily matched a novel agent in a way that is consistent with prior data. However, note that children did not use this simple matching strategy; furthermore, this interpretation is inconsistent with our prior work, which has found that adults' use of preferences for social affiliation judgments, even within minimal tasks, is flexible and context-dependent (Vélez, Bridgers, & Gweon, 2016).

Beyond exploring whether children consider preferences as diagnostic, an important open question is *how* children come to appreciate that preferences can be diagnostic. Young children use sparse data to make rich, causal attributions of other individuals' behavior, such as what they value or why they failed to achieve a goal (Gweon & Schulz, 2011; Liu, Ullman, Tenenbaum, & Spelke, 2017). However, less is known about how children learn the structure of groups and learn to attribute properties to individuals based on their group membership. One possible avenue for future work is to examine whether children calibrate their expectations about the diagnosticity of a preference through repeated observations of members of a social group.

Social groups organize an otherwise crowded and complex social world. Here, we find that children's inferences based on social groups are asymmetric: children infer preferences based on group membership, but not group membership based on preferences. Our work invites new questions about how the social meaning of preferences is learned and constructed over the course of development.

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