Social sampling:

Children track social choices to reason about status hierarchies

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Abstract

We tested whether preschool-aged children ($N = 280$) track an agent's choices of individuals from novel social groups (i.e., social choices) to infer an agent's social preferences and the social status of the groups. Across experiments, children saw a box containing two groups (red and blue toy cats). In Experiment 1, children were randomly assigned to Social Selection in which items were described as "friends" or to Object Selection in which items were described as "toys."

Within each selection type, the agent selected five items from either a numerically common group (82% of box; selections appearing random) or a numerically rare group (18% of box; selections violating random sampling). After watching these selections, children were asked who the agent would play with among three individuals: one from the selected group, one from the unselected group, or one from a novel group. Only participants who viewed Social Selection of a numerically rare group predicted that the agent would select an individual from that group in the future. These participants also said an individual from the selected group was the "leader."

Subsequent experiments further probed the Social Selection findings. Children's reasoning depended on the agent actively selecting the "friends" (Experiment 2) and children thought a member of the rare selected group was the "leader" but not the "helper" (Experiment 3). These results illustrate that children track an agent's positive social choices to reason about that agent's social preferences and to infer the status (likelihood of being a "leader") of novel social groups.

Keywords: Social group attitudes, social status, social biases, statistical learning, nonverbal learning

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Group-based attitudes appear in early childhood. Young children categorize and evaluate people based on factors including gender (e.g., Dunham, Baron, & Banaji, 2015; Liben & Bigler, 2002; Shutts, Roben, & Spelke, 2013), race (e.g., Baron & Banaji, 2006; Roberts, Williams, & Gelman, 2017), accent (e.g., Kinzler, Shutts, DeJesus, & Spelke, 2009), social class (e.g., Ramsey, 1991), and also the intersections of different social categories (e.g., Jaxon, Lei, Shachnai, Chestnut, & Cimpian, 2019; Lei, Leshin, & Rhodes, 2020; Perszyk, Lei, Bodenhausen, Richeson, & Waxman, 2019). Moreover, young children recognize power and status differences between individuals (Brey & Shutts, 2015; Charafeddine et al., 2015; Gülgöz & Gelman, 2017; Mascaro & Csibra, 2012; Thomsen, Frankenhuys, Ingold-Smith, & Carey, 2011) and between social groups (e.g., Baron & Banaji, 2006; Bigler, Averhart, & Liben, 2003; Bigler, Brown, & Markell, 2001; Charafeddine et al., 2020; Mandalaywala, Rhodes, & Tai, 2020; Olson, Shutts, Kinzler, & Weisman, 2012; Pun, Birch, & Baron, 2016).

Important questions concern the inputs that shape learning about social groups. Most simply, someone may tell a child which groups are preferred and highest in status. But even when parents and others make concerted efforts not to convey social group attitudes or prejudices, children likely learn them from broader societal input. In this paper, we raise a question about a particular pattern of nonverbal behavior that may communicate social group attitudes and status: the patterns of people's positive social choices. We define social choices in this context as whom people select for different roles, positions or opportunities that specifically connote a positive valence. This importantly differs from social choices that connote a negative valence, such as selection for the purposes of exclusion or punishment. If children track people's social choices over time, they may come to infer the status of social groups from these patterns.

Prior work suggests children are highly attuned to the subtleties of others' behaviors. Even when people's verbal statements are not explicitly biased, children attend to subtler elements of verbal input. For instance, children attend to labels and generic category language (Foster-Hanson, Leslie, & Rhodes, 2016; Gelman & Roberts, 2017; LaTourrette & Waxman, 2019; Rhodes, Leslie, Bianchi, & Chalik, 2017; Rhodes, Leslie, Saunders, Dunham, & Cimpian, 2018), which can direct their attention to which groups are present and important.

Children also notice nonverbal aspects of people's interactions, which can provide evidence of social-group status. Research demonstrates that children track nonverbal information about status in at least two domains: people's relative resources, and people's interpersonal behaviors and interactions. Regarding resources, preschool-aged children think agents with more resources are dominant (Charafeddine et al., 2015), and children associate greater wealth with higher competence and popularity (Shutts, Brey, Dornbusch, Slywotzky, & Olson, 2016). Even infants seem to expect resource distributions to mirror patterns of social dominance; they expect more dominant individuals to receive more resources (Enright, Gweon, & Sommerville, 2017). Observations of relative resources can thus guide children's thinking about individuals' social status, and similar information about resources can convey information about social groups' relative status. For example, as early as age 3, children in South Africa associate greater wealth with individuals from certain racial groups (Olson et al., 2012).

Second, children notice others' interpersonal behaviors during social interactions. Specifically, young children use physical posture and facial structure to infer power differentials between individuals (Brey & Shutts, 2015; Terrizzi, Brey, Shutts, & Beier, 2019). Similarly, children will use an agent's body language (e.g., leaning toward vs. away) and expressions (e.g., smiling vs. scowling) during social interactions to reason about how much that agent likes the

individual with whom they are interacting (Castelli, De Dea, & Nesdale, 2008; Skinner, Meltzoff, & Olson, 2017; Skinner, Olson, & Meltzoff, 2019) and to form their *own* social preferences (Brey & Pauker, 2019; Brey & Shutts, 2018; Castelli et al., 2008; Skinner et al., 2017, 2019). Nonverbal behaviors during social interactions can also inform children's judgments of entire groups. For instance, children predict that an agent who leans away from and scowls toward an individual dislikes that individual *as well as* other people in that individual's social group (Skinner et al., 2017, 2019). Collectively, this research demonstrates children's sensitivity to the subtleties of others' nonverbal behaviors, which may in turn relay information about different social groups' relative status.

Here, we investigate social choices as another pattern of interpersonal and intergroup behavior that may communicate people's attitudes about social groups as well as social groups' relative status. The preferential social choices people make are abundant, spanning from whom they stand near or invite to their houses for dinner to whom they choose for various roles, positions or opportunities. Notably, social choices can include one's own actions—for instance, in the case of a child, whom they choose to play with or seek information from—as well as other people's actions, which children may observe. Over time, repeated social choices may form meaningful patterns, and children may track both who (or which group) is chosen most, and perhaps also who (or which group) is not chosen. In this way, repeated social choices may reflect people's group-based attitudes and in turn shape children's reasoning about groups' social status.

To encapsulate this real-world relation between people's repeated positive social choices and observers' group-based inferences in a lab setting, we drew inspiration from the cognitive development literature. Prior research demonstrates preschool-aged children track others' object selections to infer their object preferences (e.g., Diesendruck, Salzer, Kushnir, & Xu, 2015;

Garvin & Woodward, 2015; Kushnir, Xu, & Wellman, 2010), so long as these object selections appear statistically non-random, and thus purposeful. Imagine that an agent repeatedly selects the same kind of object from a box containing only that kind of object. Here, it is unclear whether the agent likes the selected objects, or if the agent selects this kind of object because it is the only kind available. In contrast, if an agent repeatedly selects the same kind of object from a box containing primarily a different kind of object, the agent's selection may seem more like a choice—deliberate, and perhaps indicative of a preference for that kind of object. When shown these two scenarios, children reason in the following way: When numerically rare objects are selected, children think the agent likes those objects, but when numerically common items are selected, children do not infer the agent's preference. In sum, object selection communicates a preference for the selected object only when the pattern of selection appears non-random.

Recent research provides evidence that children similarly attend to the population from which people's friendship choices are made (Eason, Kaiser, & Sommerville, 2019). Eason et al. (2019) showed 7–10-year-old children cases in which students chose playmates from a majority Black classroom (10 Black students, 2 White students) or a majority White classroom (10 White students, 2 Black students). Mirroring the literature described above, children inferred agents' race-based attitudes from their friend choices, but only when these choices violated random sampling (White playmates selected from a majority Black classroom; Black playmates selected from a majority White classroom).

Our first aim in the present study was to test whether children track an agent's positive selection of novel *social agents* (i.e., positive social choices) to infer this agent's novel *social-group* preferences. We tested this question using novel social groups and a stripped-down paradigm to test a general mechanism through which children reason about social choices.

Importantly, the inferences children make from people's social choices in the real world will be informed by myriad factors including children's own identities, the demographic composition of children's local environments, and the choices that are possible to make in these environments.

We discuss these points in detail in the General Discussion.

Our second aim was to further probe the inferences—beyond those involving an individual agent's preferences—that children make from an individual agent's positive social choices. We were specifically interested in whether children would use an agent's social choices to reason about the relative likelihood of individuals from the selected rare and unselected common groups being leaders. The leadership question was of additional interest because the groups depicted differed in numerical size (i.e., one numerically larger group and one numerically smaller group). One possibility is that individuals who are part of a numerically larger group are viewed as more powerful or dominant, and thus likely to be the leader. As early as infancy, children associate members of numerically larger groups with social dominance in situations of conflict and competition (Lourenco, Bonny, & Schwartz, 2016; Pun et al., 2016; see also Thomsen et al., 2011).

Nevertheless, in the real world, there also exist social hierarchies in which numerically smaller groups of people are ascribed greater social rank. Take, for instance, the case of wealth distribution in the United States where the top 20% of households made more than half of the country's total wealth in 2018 (Samega, Kolar, Creamer, & Mohanty, 2019), or the case of many organizational or occupational hierarchies, in which a small number of people hold the highest rank. Given that the current studies did not involve competition, and that we provided children with a third-party's preferential social choices, we predicted children may ascribe status to the rare yet preferentially selected group, and think of those individuals as most likely to be leaders.

In sum, the present studies investigated whether children track an agent's positive social selections to reason about social preferences and status hierarchies. In Experiment 1, we showed children an agent's positive social or object selections from a numerically rare or common group. Here, we were particularly interested in whether children would use the combination of social and statistical information to infer the agent's social preferences and the groups' relative social status. In Experiments 2 and 3, we tested two boundaries of children's thinking about social selections. Namely, in Experiment 2, we tested whether the specific action of selecting numerically rare individuals is necessary to elicit reasoning about an agent's social preferences. In Experiment 3, we compared children's reasoning about who is likely to be the "leader" and who is likely to be the "helper."

Experiment 1

Children viewed a paradigm in which an agent repeatedly selected items from one of two groups (blue versus red toy cats). We introduced items as "friends" (social selections) or "toys" (object selections). For half of children in each item framing ("friends" or "toys"), the selected group comprised a minority of items in the box (18% of toy cats present), and thus selections violated random sampling; for the other half of children, the selected group comprised the majority of items in the box (82% of toy cats present), and thus selections did not violate random sampling. After watching the agent select five of the same kind of item, we asked children which friend or toy the agent would play with when it later returned: one from the selected group, one from the unselected group, or one from a novel group about which they received no information.

We presented these selections with no further information about the agent's emotions or preferences. Past research suggests additional emotion framing is necessary for children to reason about object preferences from selections of numerically rare objects. In one study,

children heard that some toys “make the agent happy” or that the agent “always gets” some toys. When children heard about the agent’s emotions and viewed the agent select numerically rare objects, they thought the agent liked the selected object. However, when children heard that the agent “always gets” some toys, they did not infer the agent’s object preference, even when the agent repeatedly selected rare objects (Garvin & Woodward, 2015). We tested whether positive social selections would lead children to reason about the agent’s social preferences even in the absence of framing about the agent’s emotions, since selections in the social domain may inherently communicate social attitudes. Thus, in the present study, we predicted that although children may not infer an agent’s object preference (since accompanying framing about emotions was missing), an agent’s selection of numerically rare individuals would alone (without framing about emotions) provide sufficient information to elicit inferences about the agent’s social attitudes.

Next, we explored the scope of children’s reasoning about inferred social preferences by asking children who viewed social selections (items presented as “friends”) about group members’ shared food preferences and likelihood of being the “leader.” We predicted children would track an agent’s pattern of non-random preferential social selection to reason about the relative social status of individuals from these groups.

Method

Participants

Participants were 160 preschool-aged children (89 girls, $M_{age} = 54.09$ months, $SD = 10.52$; range = 36–83) from Central New York. Children were randomly assigned to view Social Selection (items presented as “friends”; $N = 80$, 47 girls, $M_{age} = 54.93$ months, $SD = 10.05$; range = 37–72) or Object Selection (items presented as “toys”; $N = 80$, 42 girls, $M_{age} = 53.25$ months,

$SD = 11.02$; range = 36–83). Within each, items were selected from a numerical minority (Rare Item Selected) or from a numerical majority (Common Item Selected). Thus, 40 children viewed each of the following: *Social Rare Item Selected* ($M_{age} = 55.22$; $SD = 10.01$; range = 37–71); *Social Common Item Selected* ($M_{age} = 54.64$ months; $SD = 10.12$; range = 39–72); *Object Rare Item Selected* ($M_{age} = 52.40$; $SD = 9.50$; range = 36–71); and *Object Common Item Selected* ($M_{age} = 54.10$; $SD = 12.41$; range = 38–83). Six additional children were tested but not included due to experimenter error (two), failure to complete the study (two), clinical diagnosis (one), and sibling interference (one). Children participated in a quiet room in the lab, a children's museum, or a school. Demographic information was provided by parents of 68% of children. Of those, 82% identified as White, 5% as Asian, 2% as Black, 1% as Hispanic or Latinx, and 10% as Other.

Materials

Materials included a raccoon hand puppet (30.5 cm tall); three kinds of Calico Critter® cat figurines (5.7 cm tall) with shirts varying in color (red, green, or blue) (see Figure 1); and a clear box (33 cm by 18 cm by 23 cm). Two of the kinds of cats (brown fur with red shirts; grey fur with blue shirts) comprised the box's contents, such that one was numerically common (82% of the box's contents; 31 of 38 figures) and one was numerically rare (18% of the box's contents; 7 of 38 figures) (Figure 2). We used these percentages to match those used in studies testing children's inferences about object selections (Garvin & Woodward, 2015; Kushnir et al., 2010). The colors of the common and rare groups were counterbalanced across participants and conditions. A third kind of cat (white fur with green shirts) was introduced during familiarization and again at test. Testing thus included 32 items from the common group, eight items from the rare group, and one novel item.

Figure 1

Note. The three kinds of items. For Social Selection (left), the three items were described as “friends” and presented standing up to appear more agentic. For Object Selection (right), the three items were described as “toys” and presented lying flat to appear less agentic.

Procedure

Familiarization. The research procedure received approval from our university’s Institutional Review Board (“Development of Social Cognition”). An experimenter introduced children to “Raccoon,” a raccoon hand-puppet (the agent). Children saw three kinds of “friends” (*Social Selection*) or “toys” (*Object Selection*) in Raccoon’s town (see Figure 1). The three items were presented in all six possible color orders, counterbalanced across participants and conditions (the selected item appeared left, right and center an equal number of times). For Social Selection, the experimenter presented items sitting upright and told children “different kinds of friends live in Raccoon’s town.” Children heard that each group has a different color fur and wears a different color shirt (e.g., “Some of the kinds of friends have brown fur and wear red shirts, like this”). For Object Selection, the experimenter presented items lying down and told children “different kinds of toys are in Raccoon’s town.” Children heard that each kind of toy is two colors (e.g., “Some of the kinds of toys are brown and red, like this”).

Selection. After removing the friends/toys from the table, the experimenter presented a clear box filled with two kinds of friends/toys, as described above (see Figure 2). The third kind

of friend/toy did not appear in the box; thus, children received no information about this group (defined as the *Novel group*). The experimenter asked children to look through the box to familiarize them with its contents. Then, Raccoon reappeared, and the experimenter asked if Raccoon was ready to select some friends/toys from the box. Raccoon sequentially selected five of the same kind of item from the box, such that the selected item (defined as the *Selected group*) came from the numerical majority (Common Item Selected) or minority (Rare Item Selected). The other kind of item in the box was never selected (defined as the *Unselected group*). After Raccoon selected items (five total), the experimenter noted that Raccoon now had some friends/toys to play with and Raccoon briefly held the items.

Figure 2

Note. The transparent box shown to children during Selection. Two kinds of items comprised the box's contents. One kind was numerically common (here, red) and one kind was numerically rare (here, blue). The colors of the numerically common/rare groups were counterbalanced across participants.

Questions Asked of All Participants. *Play Questions (Agent's Preference).* One item from each group (the rare group, the common group, and the novel group) was placed on the table. Order of placement was yoked to that used during familiarization. Raccoon appeared from

beneath the table and children were told: “Look! Raccoon is back, and Raccoon wants to play!” and were asked “Who (*Social Selection*)/Which (*Object Selection*) will Raccoon play with?”

(Play Question 1). After, Raccoon disappeared beneath the table and returned once more.

Children were asked “Who/Which will Raccoon play with this time?” (Play Question 2).

Home Question. All children were asked which friend/toy they would want to take home.

Follow-up Questions Asked of Participants Who Viewed Social Selection. We furthered our exploration of social selection to probe some social-specific questions about the three kinds of friends and the agent’s relationship with them. The following questions were asked of children who viewed Social Selection.

Preference Matching Questions. We examined whether children thought Raccoon shared food preferences with members of the groups. We told children about food preferences because prior research demonstrates that even infants expect food preferences to align with social group affiliation (Lieberman, Woodward, Sullivan, & Kinzler, 2016). We told children that each group of friends likes one kind of fruit (pineapples, plums, or apricots). We yoked the order of introduction to the order used during familiarization and kept the order of the fruits fixed; thus, across children and selection types, each group of friends was paired with each fruit an equal number of times. For each pairing, we asked children if they thought Raccoon also liked that kind of fruit. We then asked children two forced-choice questions: (1) whether Raccoon prefers the selected group’s favorite fruit or the unselected group’s favorite fruit; and (2) whether Raccoon prefers the unselected group’s favorite fruit or the novel group’s favorite fruit.

Identity Question. We asked children which friend they thought Raccoon is like: “Is Raccoon this kind of friend (rare), this kind of friend (common), or this kind of friend (novel)?”

Leader Question. Last, we examined whether inferences about an individual agent's social preference would guide children's thinking about the relative status of individuals from the social groups. We asked children which friend (one from the rare group, one from the common group, or one from the novel group) is the "leader."

Full text of all questions is displayed in Table 1.

Table 1

Experiment 1	
Questions asked of all participants	
Play Questions (Agent's Preference)	Who/which will Raccoon play with? Who/which will Raccoon play with this time?
Home Question	Which friend/toy would you want to take home?
Follow-up Questions Asked of Participants Who Viewed Social Selection	
Preference Matching Questions	Do you think Raccoon likes this fruit? (asked about each of three fruits preferred by the three kinds of friends) Which fruit do you think Raccoon likes more? (fruit liked by selected friend vs. unselected friend; fruit liked by unselected friend vs. novel friend).
Identity Question	Which kind of friend do you think Raccoon is?
Leader Question	Which friend do you think is the leader?
Experiment 2	
Play Question (Agent's Preference)	Who will Raccoon play with?
Home Question	Which friend would you want to take home?
Leader Question	Which friend do you think is the leader?
Experiment 3	
Leader and Helper Questions (introduced in counterbalanced order)	Which friend do you think is the leader? Which friend do you think is the helper?

Note. Questions asked of participants across Experiment 1–3.

Results

Below, we present results in the order questions were asked. Multinomial and binomial logistic regression analyses revealed no significant effects of participant gender, participant age, the color of the selected group, nor the order of item presentation on responses. Thus, we did not consider these factors in the following analyses.

Questions Asked of All Participants

Play Question (Agent's Preference). We first compared children's responses within each of the four selection types (for full results see Figure 3) to chance distributions (33% of children choosing each of the three possible items) using chi-square goodness-of-fit tests. Children's pattern of response differed from chance only in Social Rare Item Selected, $\chi^2(2, N=40) = 9.80, p = .007, w = .49$; a result driven by these children responding with the selected friend above chance (55%, Binomial Exact Test $p = .006$, 95% CI [.38, .71]) and the unselected friend below chance (15%, Binomial Exact Test $p = .012$, 95% CI [.06, .30]). Children's pattern of response did not differ from chance in any of the other selection types, p 's $> .202$.

To further examine the distribution of responses within and across selection types, we constructed a multinomial logistic regression using R's "nnet" package (Venables & Ripley, 2002) with children's response to the Play Question (selected, unselected, novel) as the outcome and selection type as the predictor. Comparisons between responses were estimated using R's "emmeans" package (Lenth, 2020) and the tukey method for comparing families of estimates. This allowed us to examine contrasting rates of responding to the Play Question between items (e.g., selected versus unselected item). The overall effect of selection type was not significant, likelihood ratio test: $\chi^2(6, N=160) = 8.43, p = .208, w = .23$. Of primary interest to us was whether children treated the selected item differently than the unselected item depending on selection type. Only when friends were selected from the numerically rare group (Social Rare

Item Selected) were children more likely to say the agent would play with the selected item *over* the unselected item, $t(8) = 3.44$, $SE = 0.12$, corrected $p = .021$ (Figure 3). No other item contrasts were significant, all corrected p 's $> .236$ (see Supplemental Materials Table S1 for all contrasts).

Figure 3

Note. The observed percentage of children that said Raccoon would play with the rare item (red/stripped), common item (blue/dashed), and novel item (white/solid) in Social Rare Item Selected, Social Common Item Selected, Object Rare Item Selected, and Object Common Item Selected. Dotted line depicts chance levels (33%). * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

We again used chi-square goodness-of-fit tests to compare children's responses to the second Play Question to chance distributions. When asked who Raccoon would play with this second time, children's responses did not differ from chance in any selection type, all p 's $> .161$. Notably, the first and second Play Questions were strongly negatively related, $\chi^2(4, N=160) = 53.73$, $p < .001$, Cramer's $V = .41$. Only 10 of the 160 children tested said Raccoon would play with the same item on both Play Questions (Supplemental Materials Table S2). In other words, children did not make reliable predictions for this question, which may relate to demand characteristics of being asked two highly similar questions twice in a row.

Home Question. We asked children which item they would want to take home. We compared children's responses within selection types to chance distributions using chi-square goodness-of-fit tests. In Social Rare Item Selected, 40% of children wanted to take home the selected rare item, 20% wanted to take home the unselected common item, and 40% wanted to take home the novel item, $\chi^2(2, N=40) = 3.20, p = .202, w = .28$. In Social Common Item Selected, 30% wanted to take home the unselected rare item, 20% wanted to take home the selected common item, and 50% wanted to take home the novel item, $\chi^2(2, N=40) = 5.60, p = .061, w = .37$. In Object Rare Item Selected, 29% wanted to take home the selected rare item, 34% wanted to take home the unselected common item, and 37% wanted to take home the novel item, $\chi^2(2, N=38) = 0.37, p = .832, w = .01$. In Object Common Item Selected, 45% wanted to take home the unselected rare item, 30% wanted to take home the selected common item, and 25% wanted to take home the novel item, $\chi^2(2, N=40) = 2.60, p = .273, w = .25$. To examine the distribution of responses to the Home Question across selection types, we constructed a multinomial logistic regression with children's response to the Play Question (selected, unselected, novel) as the outcome variable and selection type as the predictor. Selection type did not predict which item children wanted to take home, likelihood ratio test: $\chi^2(6, N=158) = 2.83, p = .243, w = .16$.

Children's responses to the Home Question and the first Play Question related positively, $\chi^2(2, N=158) = 37.13, p < .001$, Cramer's $V = .33$ (Supplemental Materials Table S3). Regardless of which item children said Raccoon would play with, children tended to want to take home this same friend/toy.

Follow-up Questions Asked of Participants Who Viewed Social Selection

Preference Matching Questions. We asked children whether Raccoon would share a food preference with each of the three kinds of friends. Overall, children were more likely than not to predict Raccoon would like the fruits, regardless of which kind of friend was the target of the question (overall, 68% responded “yes”). We compared children’s response on each question to chance (50%) using two-tailed binomial tests. Full results are depicted in the first three columns of Table 2. Notably, children were least likely to say Raccoon would like the target fruit when asked about the unselected friend in Social Rare Item Selected (60%, not different from chance, Binomial Exact $p = .268$, 95% CI [.43, .75]). This pattern contrasts from that in Social Common Item Selected, in which children responded that the puppet *would* share the unselected friend’s food preference (71%, above chance, Binomial Exact Test $p = .014$, 95% CI [.54, .85]). We then asked children whether the puppet would be *more* likely to prefer the fruit liked by (1) the selected friend or the unselected friend and (2) the unselected friend or the novel friend. Children in Social Rare Item Selected were more likely to say Raccoon liked the selected friend’s fruit than the unselected friend’s fruit, $\chi^2(1, N=40) = 6.40$, $p = .011$, $w = .40$. Full results are provided in the fourth and fifth columns of Table 2.

Table 2

Preference matching questions (chance = 50%)					
	Selected	Unselected	Novel	Selected vs. Unselected	Unselected vs. Novel
Social Rare	78% (yes)	60% (yes)	68% (yes)	70% (selected)	60% (novel)
Social Common	67% (yes)	71% (yes)	63% (yes)	57% (selected)	54% (novel)

Note. Children’s responses to the Preference Matching Questions asked of children in Social Selection. Responses are broken down by selected group size (Social Rare and Social Common).

Identity Question. In Social Rare Item Selected, 48% of children said Raccoon was most like the selected rare friend, 40% picked the unselected common friend, and 12% picked the

novel friend. This distribution differed from chance, $\chi^2(2, N=40) = 8.15, p = .017, w = .45$; a pattern that was driven by children responding with the selected rare friend above chance (Binomial Exact $p = .065$, 95% CI [.32, .64]) and the novel friend below chance (Binomial Exact $p = .004$, 95% CI [.04, .27]). In Social Common Item Selected, 33% of children responded with the unselected rare friend, 49% responded with the selected common friend, and 18% responded with the novel friend. This distribution differed marginally from chance, $\chi^2(2, N=39) = 5.54, p = .063, w = .38$, a pattern driven by children choosing the selected common friend above chance (Binomial Exact $p = .060$, 95% CI [.32, .65]) and the novel friend below chance (Binomial Exact $p = .042$, 95% CI [.08, .33]).

To examine contrasting rates of responding between items on the Identity Question, we constructed a multinomial logistic regression with children's response to the Identity question (selected, unselected, novel) as the outcome and selection type as the predictor. The numerical size of the selected group (Social Common vs. Social Rare) did not predict responses, likelihood ratio test: $\chi^2(2, N=79) = 0.63, p = .729, w = .09$. Children's responses to the Identity Question did not relate to their responses to the first Play Question, Fisher's Exact Test $p = .305$, Cramer's $V = .18$ (Supplemental Materials Table S8).

Leader Question. We compared children's responses within each social selection type (for full results, see Figure 4) to chance distributions using chi-square goodness-of-fit tests. Children's pattern of response differed from chance in Social Rare Item Selected, $\chi^2(2, N=40) = 7.40, p = .025, w = .43$; a result driven by children responding with the selected rare item above chance (50%, Binomial Exact Test $p = .029$, 95% CI [.34, .66]) and with the unselected common item below chance (15%, Binomial Exact Test $p = .012$, 95% CI [.06, .30]). Children's pattern of response did not differ significantly from chance in Social Common Item Selected, $\chi^2(2, N=40)$

= 5.15, $p = .076$, $w = .36$; however, children responded with the novel item above chance levels (50%, Binomial Exact Test $p = .029$, 95% CI [.34, .66]).

To explore contrasting rates of responding between items on the Leader Question, we constructed a multinomial logistic regression with children's response to the Leader Question (selected, unselected, novel) as the outcome and selection type as the predictor. The numerical size of the selected group (Common vs. Rare) predicted children's response, likelihood ratio test: $\chi^2(2, N=80) = 6.84$, $p = .033$, $w = .29$. We further contrasted children's rates of picking items within and between selection types using R's "emmeans" package and the tukey method for comparing families of estimates. Children in Social Rare Item Selected were more likely to respond with the selected group than were children in Social Common Item Selected, $t(4) = 2.67$, $SE = 0.10$, corrected $p = .056$. Moreover, children who saw friends selected from a rare group (Social Rare Item Selected) were marginally more likely to say an individual from the rare selected group was the leader than they were to say an individual from the common unselected group was the leader, $t(4) = 3.05$, $SE = 0.11$, corrected $p = .080$. No other item contrasts were significant (Supplemental Materials, Table S9-S10). Children's responses to the Leader Question related positively to their responses to the first Play Question, Fisher's Exact Test $p = .017$, Cramer's $V = .28$ (Supplemental Materials Table S11). Regardless of which friend children said Raccoon would play with, children tended to predict this friend was also the leader.

Figure 4

Note. The observed percentage of children who said a member of the rare group (depicted in red/striped), common group (depicted in blue/dashed) and novel group (depicted in white/solid) was the “leader” in Social Rare Item Selected (left) and Social Common Item Selected (right). Dotted line depicts chance levels (33%). * = $p \leq .05$, ** = $p \leq .01$, *** = $p \leq .001$.

Discussion

After viewing an agent repeatedly select the same kind of item, children reasoned that the agent preferred this kind of item, but only if items were framed as “friends” and selected from a numerically rare group; selections thereby violating random sampling and appearing purposeful. Thus, children tracked an agent’s positive social selections of numerically rare individuals to infer that agent’s social preference for those individuals.

The present findings provide some evidence that children’s inferences about social selections may differ from their inferences about object selections. When the agent selected toys from a rare group, children did *not* infer the agent’s toy preference. This finding accords with past literature suggesting children do not use neutral selection of numerically rare objects to reason about object preferences without supporting language that connects object selection to the

agent's emotions (e.g., expressing that some items make the puppet happy; Garvin & Woodward, 2015). In contrast, an agent's non-random social selections were sufficient to evoke inferences about social preferences. Thus, positive social selections (selecting friends) seem to indicate social attitudes whether or not the connection between selection and an agent's attitudes is made explicit.

Children made additional social inferences from the agent's preferential selections of numerically rare individuals. Children's choice of which agent to take home correlated with which item children thought the agent liked. Moreover, children predicted an agent would be more likely to share food preferences with members of the rare selected social group over members of a common unselected group. Children also viewed an individual from this preferentially selected group as the leader. Importantly, children used an agent's choices not only to reason about the selected group, but also about the group that the agent did not select. For both the Play Question and the Leader Question, children responded with the common unselected friend below chance.

In both scenarios involving social selection, children ascribed status to members of numerically rare social groups (to the selected rare group in Social Rare Item Selected and to the novel group in Social Common Item Selected). This finding contrasts from past research demonstrating infants and young children associate greater social power with numerically larger groups (Lourenco et al., 2016; Pun et al., 2016). However, this past research primarily examines children's inferences about social dominance in situations involving competition. Here, the groups were not in competition. Additionally, whereas past research asked children who would "win" (Lourenco et al., 2016), we asked who was the "leader." Finally, we presented children with the cue of a third-party agent's preferential choice, which may have framed the situation as

one in which prestige or popularity were especially important. For these reasons, the present context may have invoked thinking about a different notion of hierarchy, in which a subset of individuals are highest in status. The results underscore the idea that young children will use an agent's positive social choices to guide their reasoning about social status.

In sum, Experiment 1 builds on past work by demonstrating that children attend to an agent's non-random behavioral choices in the social domain. Moreover, positive social choice of numerically rare groups appears to facilitate thinking about an individual's social preferences, and also about the status (i.e., likelihood of being a leader) of groups of individuals who are preferentially chosen, as well as those who are not. We interpreted the results from Experiment 1 to imply that children inferred the agent's social preferences because the agent's selections violated random sampling. An alternative interpretation is that numerically rare social groups, independent of whether or not they are selected by an agent, are seen as preferred because they appear rare or valuable. A goal in Experiment 2 was to distinguish between these possibilities.

Experiment 2

In Experiment 2, we aimed to replicate our central finding from Experiment 1 in a new sample, and to further probe our interpretation that the act of selection by a third-party agent mattered. An alternative explanation for our findings is that children may simply notice that the numerically smaller social group is rarer, and thus infer that it is more valuable than the numerically common one. To distinguish between these alternatives, we randomly assigned children to the Social Rare Item Selected condition in which an agent repeatedly selects friends from a numerically rare group (identical to the same condition in Experiment 1) or to a No Selection condition in which an agent repeatedly engages with identical stimuli without ever selecting friends from the box. We predicted that children in the Social Rare Item Selected

condition would reason that the numerically smaller selected group is preferred and higher in status. In contrast, we expected children's reasoning in the No Selection condition to differ from this pattern. We did not predict that children would see the numerically rarer group as most-preferred or most likely to be the leader without viewing the agent's preferential social choices. If anything, children in the No Selection condition may think the common group is most-preferred since it is the most-represented group. Or, children may think the agent will play with a friend from the novel group because this group did not appear in the box; thus, the agent could not previously play with this friend. We pre-registered all study materials, conditions, analyses, and these predictions (AsPredicted #24989; see <https://osf.io/3gd8m/>)

Methods

Participants

Participants included 80 preschool-aged children (45 girls, $M_{age} = 56.74$ months, $SD = 8.86$; range = 37–71) from Central New York. Children were randomly assigned to view Social Rare Item Selected ($N = 40$, $M_{age} = 56.48$ months, $SD = 8.69$; range = 40–71) or No Selection ($N = 40$, $M_{age} = 57.00$ months, $SD = 9.14$; range = 37–71). Five additional children were tested but not included due to experimenter error. Children participated in a quiet room in a lab, a children's museum, or a school. We recruited families from a wide range of socioeconomic backgrounds (family income between < \$20,000 to > \$150,000). Demographic information was provided by parents of 38% of children. Of those, 67% identified as White, 23% as Bi- or Multiracial, 7% as Asian, and 3% as Black.

Materials

Materials were identical to those used in Experiment 1.

Procedure

Interaction. The experimenter presented children with a transparent box filled with two kinds of friends; the third kind of friend did not appear in the box such that children received no information about this group (defined as the Novel group/friend). In Social Rare Item Selected, Raccoon sequentially selected five friends from the numerically rare group. In No Selection, children instead heard that Raccoon would “see some friends” and Raccoon entered the box five times, but without selecting friends. The amount of time Raccoon spent in the box and the amount of time children spent viewing the materials were equated across conditions.

Questions. In a fixed order, we asked children the Play, Home and Leader Questions from Experiment 1. Question text is provided in Table 1.

Results

Preliminary analyses revealed no significant effect of age, gender, order of item presentation, or the color of the numerically rare group on children’s responses to the dependent variables, so we did not consider these factors further. There are three possible responses for each dependent variable, so chance is 33% across questions.

Play Question (Agent’s Preference)

After watching the agent engage in a series of interactions that either did or did not involve the agent selecting friends from the box, we asked children who that agent would play with upon its return. We compared children’s pattern of response within each condition (see Figure 5 for full results) to a chance distribution using chi-square goodness-of-fit tests.

Children’s pattern of response differed from chance only in Social Rare Item Selected, $\chi^2(2, N=40) = 15.05, p < .001, w = .61$; a result driven by these children responding with the selected item above chance (53%, Binomial Exact Test $p = .017$, 95% CI [.36, .69]) and the unselected item below chance (4%, Binomial Exact Test $p < .001$, 95% CI [.01, .17]). In contrast, children’s

pattern of response did not differ from chance in No Selection, $\chi^2(2, N=40) = 3.80, p = .150, w = .31$, and children responded with no items above or below chance, all p 's $> .092$.

To further examine the influence of selection on children's responses, we constructed a multinomial logistic regression using R's "nnet" package (Venables & Ripley, 2002) with children's response to the Play Question as the outcome variable and condition (Social Rare Item Selected versus No Selection) as the predictor variable. Comparisons were estimated using R's "emmeans" package (Lenth, 2020) and the tukey method for comparing families of estimates. Condition significantly predicted children's response to the Play Question, likelihood ratio test: $\chi^2(2, N=80) = 21.05, p < .001, w = .51$. This difference results from the extent to which children in Social Rare Item Selected and No Selection said Raccoon would play with the rare and common items. Children in Social Rare Item Selected were significantly more likely than children in No Selection to say Raccoon would play with the rare (selected) item, $t(4) = 3.21, SE = 0.10$, corrected $p = .033$. In contrast, children in No Selection were significantly more likely than children in Social Rare Item Selected to say Raccoon would play with the common (unselected) item, $t(4) = -4.66, SE = 0.09$, corrected $p = .010$. Children were no more likely to say Raccoon would play with the novel friend in either condition, $t(4) = 0.69, SE = 0.11$, corrected $p = .528$.

Further, within Social Rare Item Selected, children were more likely to say Raccoon would play with the selected rare friend than the unselected common friend, $t(4) = 5.08, SE = 0.09$, corrected $p = .015$, and were also more likely to say Raccoon would play with the novel friend than the unselected common friend, $t(4) = 4.10, SE = 0.09$, corrected $p = .032$. In contrast, children in No Selection were no more likely to say Raccoon would play with any items over the others, all p 's $> .213$ (see Supplemental Materials, Table S12).

Figure 5

Note. The observed percentage of children responding that Raccoon would play with the rare item (depicted in red/striped), common item (depicted in blue/dashed), and novel item (depicted in white/solid) across Social Rare Item Selected (left) and No Selection (right). Dotted line depicts chance levels (33%). * = $p \leq .05$, ** = $p \leq .01$, *** = $p \leq .001$.

Home Question

We compared children's patterns of response within each condition to a chance distribution using chi-square goodness-of-fit tests. In Social Rare Item Selected, 27% of children wanted to take home the selected rare item, 25% wanted to take home the unselected common item, and 48% wanted to take home the novel item, $\chi^2(2, N=40) = 3.65, p = .161, w = .30$. In No Selection, 30% wanted to take home the unselected rare item, 32% wanted to take home the selected common item, and 38% wanted to take home the novel item, $\chi^2(2, N=40) = 0.35, p = .840, w = .09$. To examine the influence of selection on children's responses, we constructed a multinomial logistic regression with children's response to the Home Question as the outcome and condition as the predictor. Condition did not predict children's response to the Home

Question, likelihood ratio test: $\chi^2(2, N=80) = 0.91, p = .635, w = .11$, and children did not want to take home any friend type more than another, either within or across conditions, all p 's $> .300$.

As in Experiment 1, children's responses to the Home Question related positively to their responses to the Play Question, $\chi^2(4, N=80) = 12.92, p = .012$, Cramer's $V = .28$ (Supplemental Materials Table S13).

Leader Question

We again compared children's pattern of response within each condition to a chance distribution using chi-square goodness-of-fit tests. Children's pattern of response did not differ from chance in either condition (Social Rare Item Selected: 43% selected rare item, 35% unselected common item, 22% novel item; No Selection: 43% rare item, 35% common item, 22% novel item; $\chi^2(2, N=40) = 2.45, p = .294, w = .25$, in both conditions). Given the identical patterns of response across the two conditions, we did not further examine the difference between conditions. Children's responses to the Leader Question related to their responses to the Play Question, Fisher's Exact Test $p = .012$, Cramer's $V = .27$; a pattern that was driven by children who selected the novel item for the Play Question tending not to select this group as the leader (Supplemental Materials Table S14).

Discussion

We replicated our finding from Experiment 1 that children attended to an agent's non-random pattern of positive social selections to reason about that agent's social preferences. After viewing an agent repeatedly select individuals from a numerically rare social group, children predicted that the agent would later also play with a member of this group. Critically, children only inferred the agent's social preference if the friends were *selected*, but not if the agent interacted with the groups without selecting them. Indeed, children were significantly more

likely to think the agent preferred the rare group when the agent selected these friends versus merely engaged with them. In sum, our findings demonstrate that children's reasoning about the agent's social preferences resulted specifically from the agent's non-random pattern of social selections, rather than from the mere presence of rarity. More broadly, this finding highlights the potential impact of observing people's purposeful social choices in the social world.

In contrast to Experiment 1, children were at chance when responding to the Leader Question. This could result from differences between the designs of the two studies. In particular, because children were asked fewer questions in Experiment 2, the Leader Question directly followed two other questions with the same predicted response (i.e., choosing the selected rare friend). This may have created unintentional pressure to switch responses. We designed Experiment 3 to more specifically test children's inferences about leadership when thinking about a preferentially selected rare group.

Experiment 3

In Experiment 3, our goal was to simplify the design to focus directly on children's reasoning about leadership. In doing so, we also asked whether there is any specificity to the connection between the preferentially selected rare group and leadership, or whether children would ascribe any positive trait to this group. All children viewed the Social Rare Item Selected scenario in which an agent repeatedly selects friends from a numerically rare group (identical to the same condition in Experiments 1 and 2). After, we asked children which friend was the "leader" and contrasted children's inferences about leadership to their inferences about another positive trait: being a "helper." We chose "helper" because past work suggests preschoolers understand the word "helper" and view this trait as desirable (Bryan, Master, & Walton, 2014; Foster-Hanson, Cimpian, Leshin, & Rhodes, 2020). Although we did not have strong predictions

about how children would interpret “helper” in this context, we predicted children would think the preferentially selected rare group was the leader but not necessarily the helper.

Methods

Participants

Participants were 40 preschool-aged children (20 girls, $M_{age} = 55.10$ months, $SD = 10.65$; range = 35–71) from Central New York. Children participated in a quiet room in a lab, at a children’s museum, or at a school. Recruited families were from a range of socioeconomic backgrounds (family income between < \$15,000 to > \$150,000). Demographic information was provided by parents of 50% of participants. Of those, 60% identified as White, 30% as Biracial, 5% as Asian or Asian-American, and 5% as Native Hawaiian.

Materials

Materials were identical to those used in the previous experiments. Additional materials included two laminated note cards (2 inches x 3 inches) depicting stick figure silhouettes, one labeled as a “leader” and the other labeled as a “helper.”

Procedure

Familiarization and Selection were identical to the Social Rare Item Selected scenarios from Experiment 1 and 2.

Question Phase. In counterbalanced order, we told children that there was a “leader” and a “helper” in the town. Children saw two laminated notecards, one with a stick figure labeled as a “leader” and the other with a stick figure labeled as a “helper.” We provided these notecards as a visual cue and to provide children with a way of responding to the questions nonverbally by placing items onto the cards. Next, in counterbalanced order, we asked children to place the

friend they thought was the leader onto the “leader” notecard and to place the friend they thought was the helper onto the “helper” notecard. Question text is provided in Table 1.

Results

Preliminary analyses revealed no significant effects of gender, age, order of item presentation, color of rare item, nor question order (leader vs. helper first) on children’s responses to either question.

Given the three possible responses, chance within each question was 33%. When asked which friend was the leader, 65% of children said the selected rare friend, (significantly above chance, Binomial Exact Test $p < .001$, 95% CI = [.48, .79]), 10% said the unselected common friend (significantly below chance, Binomial Exact Test $p = .001$, 95% CI = [.03, .24]), and 25% said the novel friend (not different from chance, Binomial Exact Test $p = .316$, 95% CI [.13, .41]). When asked who was the helper, 10% of children said the selected rare friend (significantly below chance, Binomial Exact Test $p = .001$, 95% CI [.03, .24]), 60% said the unselected common friend (significantly above chance, Binomial Exact Test $p < .001$, 95% CI [.43, .75]), and 30% said the novel friend (not different from chance, Binomial Exact Test $p = .739$, 95% CI [.17, .47]) (see Figure 6 for full results).

Given the interdependence of children’s responses to the two questions, we also analyzed responses considering children’s response to the two questions in conjunction. There are six possible response permutations in which the three items could be picked for the Leader and Helper questions. Thus, if children were selecting items at chance, each pair of responses across the two questions would occur 16.67% of the time. Children’s pattern of response differed from chance, $\chi^2(5, N = 40) = 24.80$, $p < .001$, $w = .79$. Children’s modal response was to say the selected rare friend was the leader and the unselected common friend was the helper (40% of

children, significantly greater than chance, Binomial Exact Test $p < .001$, 95% CI [.25, .57]; see Supplemental Materials Table S15 for full results).

Figure 6

Note. The observed percentage of children indicating that the Selected Rare item, Unselected Common item, and Novel item was the “leader” (left) and the “helper” (right). Dotted line depicts chance (33%). * = $p \leq .05$, ** = $p \leq .01$, *** = $p \leq .001$.

Discussion

Children most often said a friend from the selected rare group was the leader and a friend from the unselected common group was the helper. This result provides additional evidence that children will use an individual agent’s preferential social selections of rare individuals to reason about which social group is most likely to be a leader. Notably, children reasoned differently about helper compared to leader. Children were significantly more likely to pick a member of the numerically smaller selected group as a leader compared to as a helper and were significantly more likely to pick a member of the numerically larger unselected group as a helper compared to as a leader. This finding provides initial evidence that children do not ascribe all positive traits to

rare and preferentially selected groups. Rather, there seems to be some specificity to the connection between leadership and rare groups that are preferentially selected by others.

An open question concerns the range of attributes—particularly those relating to status—that children would confer to the rare selected and common unselected groups in this context. The present results provide some evidence that children specifically associated status with the numerically smaller selected group. However, these results do not address whether all aspects of status would be ascribed to this group. Future research could consider whether there are conditions under which children may also think this preferentially selected smaller group is more dominant. Likewise, open questions involve whether children prefer to learn from a member of this group, or whether children expect members of preferentially selected rare groups to have more or better resources than those from repeatedly unselected groups.

Open questions also concern how children interpreted “helper” in this context. We included “helper” as a comparison trait to “leader” because past work suggests preschoolers understand the word “helper” and view this trait as positive. Given the association between “helper” and the unselected common group, one possibility is that children interpreted “helper” in this context as a more subordinate trait (e.g., an assistant to the leader). This possibility would further support the idea that children track both who is chosen as well as who is not, learning simultaneously about the status of both the selected and unselected groups. Another complementary possibility is that “helper” and “leader” may loosely map onto “warmth” and “competence” dimensions, respectively (e.g., Cuddy, Glick, & Beninger, 2011; Fiske, Cuddy, Glick, & Xu, 2018), meaning they may be dissociable. Nevertheless, a certain agent could be construed as both warm and competent and likely a leader and a helper (e.g., a leader who acts

for the common good). Future research could examine children's reasoning about "helper" in isolation and how children's notions of leadership and helping compare in other contexts.

General Discussion

Across three experiments, children used statistical information from an agent's positive social selection (i.e., selection of "friends") to infer that agent's social preference and to reason about the preferentially selected groups' likelihood of being a leader. After watching an agent repeatedly select friends from a numerically rare group (selections thus appearing non-random and purposeful), children reasoned that the agent preferred this group over the group that was not selected. In this sense, children viewed an agent's non-random positive social selections as meaningful social *choices*—ones that indicate a social preference that will extend into the future. In contrast, when children saw the same social groups, but the agent selected individuals from the common group or the agent merely interacted with the groups without selecting friends, children did not infer the agent's social preference. Thus, children's inferences about an agent's social preferences depended on the action of intentional selection, rather than the mere presence of rarity.

Children used an agent's social choices to reason not only about who *that* agent preferred, but also which group was most likely to be the leader. Children who viewed friends selected from a rare group also predicted that members of this preferentially selected rare group were more likely to be leaders than members of the repeatedly unselected common group. In contrast, when an agent repeatedly selected friends from a numerically common group (selections appearing random), children chose neither selected nor unselected friends as leaders and instead predicted that a member of the novel group was the leader. Notably, across studies, children tended to ascribe leadership to numerically rare groups. Past research demonstrates that

numerical group size guides children's reasoning about social dominance, such that children ascribed greater dominance to members of numerically larger groups (e.g., Lourenco et al., 2016; Pun et al., 2016). Based on such findings, it was conceivable that members of the numerically larger group in the present studies would have likewise appeared more powerful or dominant, and thus likely to be a leader, regardless of which group the agent selected. Yet, even when a numerically larger social group *was* selected in Experiment 1, children did not think that an individual from this group was the leader; rather, children most often responded with an individual from the novel group, which was the *most* numerically rare.

Thus, the present findings suggest children do not always equate larger numerical group size with higher social rank; rather, the perceived relation between numerical group size and social rank seems to depend on context. One possibility is that an association between numerically rare groups and leadership is learned from situations in the world in which only a subset of individuals occupy leadership roles (e.g., one teacher being in charge of many students). Future work should continue to explore the factors—beyond a third-party's social preference—that shift children's likelihood of reasoning about power hierarchies versus leadership hierarchies (see Cheng, Tracy, & Anderson, 2014; Henrich & Gil-White, 2001; Magee & Galinsky, 2008 for relevant discussion). Existing research demonstrates children can differentiate between dominance and prestige at the individual level (e.g., Kajanus, Afshordi, & Warneken, 2020; Margoni, Baillargeon, & Surian, 2018), but less is known about how children represent different notions of social hierarchy at the group level. Future work could also consider the relation between individuals' social status and groups' social status, as well as how children reason about the relation between the two. It remains unclear from the present findings whether

children inferred that one member of the group was the leader, or whether the entire group to which the individual belonged was seen as higher in status.

An interesting facet of social choices, which we observed in the present study, concerns the group that is never selected. In past research on object selection, children who did not think the agent liked the selected object were equally likely to say the agent liked the unselected object and the novel object. The authors took this pattern to indicate that the agent's object selections communicated its preference for the selected toy, rather than its avoidance of the unselected toy (Kushnir et al., 2010). In contrast, children in our studies who viewed social selections from a numerically rare group said the agent would play with the previously unselected friend below chance levels. Across Experiments 1 and 2, a total of only eight children (10%) responded with the unselected common group. Likewise, children were unlikely to say a member of this unselected common group was the leader (15% of children in Experiment 1 and 10% of children in Experiment 3). Together, these findings complement existing research demonstrating that even young children are highly attuned to social exclusion (e.g., Hwang, Marrus, Irvin, & Markson, 2017; Killen, Mulvey, & Hitti, 2013; Killen & Rutland, 2011). In sum, for social choice, choosing and avoiding seem to go hand-in-hand; who is *not* chosen seems to matter just as much as who is.

Together, the present studies highlight one mechanism through which children may learn about social attitudes and status hierarchies from the patterns of people's meaningful social choices. Children likely observe people making social choices every day. If children track the patterns of social selections in their own environments, they may use people's social selections to infer not only the social attitudes of those people (i.e., parents, teachers or friends), but also the social status of groups that are chosen and groups that are not. Indeed, if children track social

choices beginning early in life, this may also help illustrate why social attitudes can be difficult to revise later in life (Aboud et al., 2012; Aboud & Skerry, 1984; Dunham & Olson, 2008; Gonzalez, Dunlop, & Baron, 2016), at which point children (or adults) have been exposed to an extraordinary number of choice exemplars.

In considering the role of social choices outside of the laboratory context investigated here, there exist numerous questions open for empirical investigation. In the current study, we used the statistical likelihood of an agent's selections (i.e., whether or not selections violated random sampling) to manipulate whether the agent's social selections appeared intentional, and thus meaningful. But in the real world, there likely exist many other ways beyond random sampling that choices may seem meaningful and deliberate. For instance, the specific social attitudes inferred from a given statistical pattern of social choices will depend on factors including the valence of the choice made (e.g., positive versus negative choices), what choices are possible in a given environment, children's specific social identities, and the demographic composition of children's environments. Furthermore, in the present study, the agent's choices notably connoted a positive valence (i.e., choosing "friends"). However, there certainly exist cases in the world in which people's social choices are negative, such that individuals or groups are chosen for positions, roles or opportunities that are undesired or lower in status. In such cases, we would not predict that being chosen connotes being preferred or being a leader. Rather, inferences made from social choices are likely to mirror the valence of the choice itself (for a similar discussion regarding the valence of intergroup contact, see Paolini, Harwood, & Rubin, 2010). In sum, future research could examine the myriad ways that social choices in the real world — including positive and negative choices, in different social settings — communicate status information to children.

Likewise, a noteworthy aspect of the present study is that the agent's choices were in no way constrained; the agent was free to choose individuals from both social groups present. However, in the world, people's social choices can be constrained by factors beyond their social attitudes. The social choices people can (and cannot) make can be shaped by the demographic composition of the environments they occupy and the hierarchical structures present in them (e.g., segregation; for a discussion of racial segregation, see Roberts & Rizzo, 2020). Important questions concern whether children consider the choices people are (or are not) capable of making when reasoning from people's social choices.

Finally, critical questions concern whether and how the present results extend to and vary across different contexts. In the present study, we used novel groups to examine a general mechanism, without exploring the influence of children's knowledge of real-world social groups. However, children's inferences about social groups in the world are not devoid of their prior knowledge about these groups. Illustrating this point, participants' inferences about students' friendship choices in the Eason et al (2019) study described prior depended on the race of the student: Participants viewed White students' choices of Black playmates from a majority White classroom as indicating that the student preferred Black playmates, whereas participants did not view Black students' choices of White playmates from a majority Black classroom as indicating that the student preferred White playmates (Eason et al., 2019). As this finding illustrates, children's inferences from social choices may be shaped over time by the social choices they tend to see. Moreover, given that children in the present study were from a relatively homogenous sample from one region of the United States, it remains unknown how our results may generalize to other populations. Children's sensitivity to the mechanism explored here may be tuned by the statistical patterns present between social groups and social hierarchies in

children's local environments, by children's own identities, and by the choices to which children are exposed (e.g., children's parents' social networks; see Pahlke, Bigler, & Suizzo, 2012).

Children's inferences may differ depending on whether they themselves identify more with the selected or unselected group (e.g., see Brey & Pauker, 2019), or whether they perceive their own social group(s) as higher or lower in status (see Rizzo & Killen, 2018).

In conclusion, the present research illustrates one mechanism through which children track an individual agent's non-random social choices to reason about that agent's preferences and also about social groups' relative status. The present work underscores the idea that children view social selection as a choice of one agent *over* another. People's everyday social choices may similarly indicate information about social attitudes and status hierarchies—over time highlighting which groups are chosen, and which groups are not.

Context paragraph

Children observe people making social choices (whom people select for different roles, positions or opportunities). The repeated patterns of people's social choices may reveal people's social attitudes as well as the social hierarchies present in people's environments. In this project, we drew inspiration from methods in the cognitive development literature to examine whether children track an agent's positive social selections to reason about that agent's social preferences. We further examined whether children thought about the different social groups' relative status. After viewing an agent repeatedly select "friends" from a numerically rare group (selection violating random sampling, and thus appearing purposeful), children reasoned that the agent preferred this group and also that members of this preferentially selected rare group were the leaders. Importantly, non-random social choices simultaneously led children to reason about the group that was selected and also the group that was not selected. The present work highlights one mechanism through which everyday patterns of nonverbal behavior may over time communicate people's social attitudes and societal hierarchies. This work raises open questions about how the patterns and valence of the social choices children observe in their own environments may inform their thinking about social groups.

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