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PAPER

Minimal-group membership influences children's responses to novel experience with group members

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Abstract

Children, like adults, tend to prefer ingroup over outgroup individuals, but how this group bias affects children's processing of information about social groups is not well understood. In this study, 5- and 6-year-old children were assigned to artificial groups. They observed instances of ingroup and outgroup members behaving in either a positive (egalitarian) or a negative (stingy) manner. Observations of positive ingroup and negative outgroup behaviors reliably reduced children's liking of novel outgroup members, while observations of negative ingroup and positive outgroup behaviors had little effect on liking ratings. In addition, children successfully identified the more generous group only when the ingroup was egalitarian and the outgroup stingy. These data provide compelling evidence that children treat knowledge of and experiences with ingroups and outgroups differently, and thereby differently interpret identical observations of ingroup versus outgroup members.

Introduction

Children, like adults, have a positive bias towards experienced ingroups – known social groups in which the child is a member – as compared with outgroups. While this bias might be the result of real positive and negative experiences with members of each group, there is growing evidence that individuals might also have differing perceptions of ingroups and outgroups in general, responding differently to novel interactions with members of specific ingroups and outgroups as a result (Dunham, Baron & Carey, 2011; Hirschfeld, 1998; Vaughn, Tajfel & Williams, 1981). In the current work, we explore what happens when children encounter specific ingroup and outgroup categories for the first time. To what extent do children bring to bear existing generalized knowledge about ingroups and outgroups (either innate or formed via prior experiences with other social categories)? Are expectations about new groups the result of attitudes toward ingroups and outgroups as general, abstract categories? Or, are expectations the result of piecemeal, specific learning acquired *de novo* for each new social group to which the child is exposed?

Studies on the developmental origin of group bias, which mostly focus on social groups with whom children have natural experience, have shown that pro-ingroup preferences for experienced groups emerge early (e.g. Aboud, 1988; Cameron, Alvarez, Ruble & Fuligni, 2001;

Kinzler, Dupoux & Spelke, 2007). Children demonstrate this group bias in widely varying contexts (e.g. Baron & Banaji, 2006; Rutland, Cameron, Milne & McGeorge, 2005), and their tendencies to implicitly associate positive qualities with experienced ingroups are largely consistent across time and cultures (Dunham, Baron & Banaji, 2006, 2008). Moreover, group membership influences the processing of new direct and indirect experiences with specific social groups (Hayes, Foster & Gadd, 2003; Liben & Signorella, 1980). For example, children are better able to recall stories in which characters exhibit behaviors consistent with racial stereotypes (Bigler & Liben, 1993); European American children from a racially homogenous environment more readily attribute negative qualities to actions committed by individuals from a racial outgroup than from a racial ingroup (McGlothlin & Killen, 2006); and children perceive greater similarities and an increased likelihood for friendship between two individuals from the same racial group (McGlothlin, Killen & Edmonds, 2005). These studies demonstrate that children perceive group membership as relevant when shaping their opinions and expectations of others, and highlight the importance of exploring the underlying cognitive mechanisms driving this perception.

Given how easily and how early bias is evoked in childhood for experienced social groups, and how it emerges in response to diverse social categories, it is

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possible that children rely on a generalized mechanism for conceptualizing groups (Hirschfeld, 1998). In other words, children's attitudes or beliefs about their ingroup may be different from their attitudes or beliefs about an outgroup, and this generalized distinction between ingroups and outgroups might be brought to bear in interpreting experiences with groups. In fact, some argue that differential processing of group-based information reflects a fundamental representational system in human psychology (Hirschfeld, 2001; Spelke & Kinzler, 2007). Because the studies described to this point have focused on real-world social groups, they do not disentangle the influence of prior experience with real-world groups from the possible influence of abstract ingroup and outgroup concepts on the development of bias. Furthermore, real-world social groups are complex: children's ingroups and outgroups do not map straightforwardly onto same race versus other race, majority versus minority, high-status versus low-status, and other dimensions, raising questions about how children consider the ingroup versus the outgroup in the absence of exposure to related socially constructed concepts.

There is already some evidence that bias is readily evoked even for artificial groups created in the laboratory – groups that by definition have no prior association with negative stereotypes – in situations in which group distinctions have been emphasized. For instance, Bigler and colleagues (Bigler, Jones & Lobliner, 1997) found that, over the course of a summer school session, children who had been assigned to different groups (marked by colored T-shirts) showed high levels of ingroup preference when group membership was highlighted as being socially relevant (e.g. teachers asked students from the 'yellow' group to line up together). Similar findings have emerged in contexts evoking competition between groups (e.g. Sherif, 1958) and in which groups varied in status (e.g. Bigler, Brown & Markell, 2001; Nesdale & Flessler, 2001). These studies provide strong demonstrations of bias with novel groups, but do not speak to the question of how children respond to ingroup and outgroup individuals in contexts that place less emphasis on group relevance, intergroup competition, or group status. These studies thus leave open the question of how group assignment *per se* affects intergroup attitudes.

A more recent series of studies highlights the potential of the minimal-groups paradigm, which makes use of arbitrary groups introduced in a neutral context, for assessing children's group-based thinking. Dunham and colleagues (2011) established that children exhibit a range of biased behaviors after being assigned to arbitrarily designated groups. In some baseline measures they found that children expressed moderately greater liking of ingroup individuals. Children also demonstrated an implicit tendency to make more positive associations with the ingroup and, in one study, they displayed a marginal tendency to share more with the ingroup. In addition to illustrating initial positive bias towards novel

ingroups, these studies showed that children's responses to information about ingroup and outgroup individuals were influenced by their own group membership. After hearing stories in which ingroup or outgroup individuals performed both positive and negative actions, children were more likely to recollect positive actions performed by their ingroup, indicating a tendency to maintain a more positive concept of one's own group.

Dunham and colleagues' studies provide initial evidence that children have a generalized concept of ingroup and outgroup, and that this concept shapes attitudes about individual members of new groups. These studies raise a host of questions. How strong are the initial ingroup biases? How resilient are they in the face of contradictory data? How do they modulate attitudes and inferences in light of specific experiences with ingroup and outgroup members? The goal of the present work is to address the question of whether the general orientation towards ingroups and outgroups influences children's learning from experiences with specific groups. If children's naive psychology includes distinct concepts of and attitudes toward generic ingroups and outgroups, then children may not process novel information about ingroups and outgroups in the same way. In light of growing evidence that children's expectations affect how they process new information (e.g. Schulz, Bonawitz & Griffiths, 2007; Xu, 2008), there is good reason to consider that positive and negative information about ingroup and outgroup members might differentially influence children's social judgments.

The present study assesses children's group bias prior to any experience with an artificial ingroup and outgroup, and their responses following positive and negative experiences with each group. Using a minimal-groups paradigm, we assigned 5- and 6-year-olds to artificial groups and showed them 12 brief video clips of ingroup and outgroup individuals (puppets) sharing resources in either an 'egalitarian' or a 'stingy' manner. We chose to manipulate sharing behavior because observations of prosocial behaviors affect children's judgments of others (Hamlin, Wynn & Bloom, 2007; McCrink, Bloom & Santos, 2010), and because children sometimes change their own sharing behaviors based on the group affiliation of the recipient (Fehr, Bernhard & Rockenbach, 2008; Vaughn *et al.*, 1981). Resource allocation is a particularly compelling context in which to explore group bias because some evolutionary theories suggest that the tendency to exhibit pro-ingroup bias may arise from a need to reduce risk in exchange interactions, such as sharing (e.g. Gil-White, 2001; Salter, 2002).

In this study, all individual puppets shared in every video clip, but they varied in how much they shared. Thus, our label of 'egalitarian' or 'stingy' applies to the ingroup or outgroup only in relation to the other group's behavior. In one condition, the ingroup behaved in a more generous manner than the outgroup; in the other condition, the outgroup was more generous. We also used a moderately noisy design in that each group was

associated with five instances of condition-typical behavior and one of condition-atypical behavior; for example, even when the ingroup was mostly generous, the ingroup was stingy on one occasion. Such a presentation is arguably ecologically valid because it is unlikely that real-world groups will exhibit only positive or negative behaviors. Moreover, in contrast to Dunham *et al.* (2011), we did not show ingroup and outgroup members engaging in interactions with each other, but rather sharing with a neutral group member. The advantage of this design was to focus the child's attention on a single group member's sharing behavior in each clip, rather than having the child evaluate a more complex relationship between giver and recipient. We asked children questions to establish how the observed sharing behavior influenced their feelings and expectations about ingroup versus outgroup members. We assessed children's liking ratings for ingroup versus outgroup members before versus after video viewing, and their willingness to share with members of each group.

We were interested in three specific questions. First, would children demonstrate a preference for the ingroup solely on the basis of having been assigned to the group, without additional primes for group identity or competition? Currently, the literature on minimal groups is mixed about how easily group bias can be evoked (see Dunham *et al.*, 2011, for a detailed review). Second, would children's attitudes towards ingroups and outgroups be influenced by experience in the same way? If ingroups and outgroups are conceptualized similarly, attitudes towards them should be affected by experience in the same manner. If instead these groups are conceptualized differently, attitudes towards them might *not* be affected identically by experience. Third, if in- and outgroups are conceptualized differently, how do different types of experience with groups cause changes in attitudes or concepts about the groups? Given children's tendency to develop negative perceptions of outgroups (McGlothlin & Killen, 2006), and their broad sensitivity to negative information (Kinzler & Shutts, 2008; Vaish, Grossmann & Woodward, 2008), we hypothesized that attitudes towards outgroups would be more influenced by negative than by positive outgroup experiences. Further, given children's preference for ingroup over outgroup individuals in many contexts (Dunham *et al.*, 2008, 2011; Hirschfeld, 2001; Spelke & Kinzler, 2007), we hypothesized that attitudes towards ingroups would be more influenced by positive than by negative ingroup experiences.

Methods

Participants

Five- and 6-year-olds were tested in preschools, kindergartens, a children's museum, and a university laboratory, with 80 children included in the final sample. Three additional children were excluded for failure to correctly

identify their own group membership upon completion of the test. Children were assigned to one of two conditions: Ingroup Egalitarian/Outgroup Stingy ($n = 41$, 21 females, mean age 70 months, range 61–84 months) or Outgroup Egalitarian/Ingroup Stingy ($n = 39$, 21 females, mean age 73 months, range 60–83 months). For counterbalancing purposes, half of the children in each condition were assigned to the Kite Group and the other half were assigned to the Balloon Group.

Materials

Puppets

A set of distinct human-like puppets was divided into two groups (Kite Group and Balloon Group). Six puppets from each group were used in video clips, each paired with a distinct animal puppet (with equal numbers of females in each group). Another two puppets from each group (all males) were used in live interactions with the children before and after watching the clips. The human-like puppets wore kite or balloon badges, with similar colors and patterns, indicating group membership (see Figure 1). Children also wore a kite or a balloon badge.

Liking scale

A 3-point scale determined children's attitudes about the puppets.¹ The scale represented three different attitudes: a face with a large frown, a face with a straight line for a mouth, and a face with a large smile. Liking ratings from the face scale were coded as frown = 1, straight mouth = 2, and smile = 3.

Videos

Two videos were created – a Kite Egalitarian/Balloon Stingy Video and a Balloon Egalitarian/Kite Stingy Video – each composed of 12 video clips. Each clip



Figure 1 Still frames from egalitarian (left) and stingy (right) video clips. In the egalitarian clip, the group puppet shared half of his or her candy with the animal puppet. In the stingy clip, he or she shared only two pieces of candy.

¹ Pilot testing indicated that a 5-point scale was too complex for some children at this age.

followed the same general format, with two key differences: the clips differed in which group was portrayed as the more generous, and new puppets were used in each clip. First, a still-frame image of a group puppet (Kite or Balloon) and a neutral animal puppet were presented for 1 second. The group puppet had a large pile of about 20 candies in front of it and the animal puppet had none. After 1 second, the animal puppet asked, 'Will you please share your candy with me?' The group puppet answered, 'Sure.' The group puppet then either behaved in an *egalitarian* manner by pushing half of its candies to the animal puppet, or in a *stingy* manner by pushing only two of its candies. The animal puppet replied, 'Thank you.' For 1 second after the candy was given, the children observed a still-frame of the scene (see Figure 1 and Supplementary Materials, Video S1), giving them an opportunity to note how much candy had been given, before the next clip began.

In the Kite Egalitarian/Balloon Stingy Video, members of the Kite Group were egalitarian most of the time (egalitarian in five clips and stingy in one clip), and members of the Balloon Group were stingy most of the time (stingy in five clips and egalitarian in one clip). The clip order was: (1) Kite-egalitarian, (2) Balloon-stingy, (3) Kite-egalitarian, (4) Balloon-stingy, (5) Kite-stingy, (6) Balloon-egalitarian, (7) Kite-egalitarian, (8) Balloon-stingy (9) Kite-egalitarian, (10) Balloon-stingy, (11) Kite-egalitarian, and (12) Balloon-stingy. In the Balloon Egalitarian/Kite Stingy Video, the groups were reversed such that the Balloon Group was usually egalitarian and the Kite Group usually stingy (i.e. Clip 1 was Balloon-egalitarian, Clip 2 was Kite-stingy, etc.). Otherwise, the videos were identical. In both videos, clips alternated between Kite and Balloon groups, the first clip was always egalitarian, and the fifth and sixth clips illustrated the condition-atypical behaviors.

Pilot testing

Four- and 5-year-olds participated in pilot testing in which they were not assigned to either group. Children rated their liking of Kite Group and Balloon Group puppets using the 3-point smiley-face scale ($n = 16$). Mean liking scores for puppets from each group were identical, indicating that children liked each group equally (Balloon Group $M = 2.19$, $SE = .780$, Kite Group $M = 2.19$, $SE = .780$). A second group of 4- and 5-year-olds ($n = 17$) viewed one of the two videos and were asked which group shared the most in the video. Children were highly accurate in reporting which group was more generous (15/17 accurate, binomial $p = .01$) when not assigned to either group.

Experimental conditions

There were two between-subjects conditions. In the Ingroup Egalitarian/Outgroup Stingy Condition, children viewed a video in which their ingroup was

usually egalitarian and their outgroup was stingy. Which video this was depended on whether the child was in the Kite Group or the Balloon Group. For children in the Kite Group, this was the Kite Egalitarian/Balloon Stingy video; for those in the Balloon Group, it was the Balloon Egalitarian/Kite Stingy video. In contrast, in the Outgroup Egalitarian/Ingroup Stingy Condition, children viewed a video in which their outgroup was egalitarian and their ingroup was stingy. For the Balloon Group, this was the Kite Egalitarian/Balloon Stingy video; for the Kite Group, it was the Balloon Egalitarian/Kite Stingy video. In other words, it was not the video alone that determined condition but, rather, the relationship between the video and the child's group assignment.

Procedure

One female experimenter (E1) interacted with the child while another experimenter (E2) recorded responses. E1 explained that the child would meet puppets belonging to two groups, and that the child would also be assigned to a group ('The puppets you're meeting today are special because they belong to two groups: the Kite Group and the Balloon Group. You get to belong to a group too. You get to belong to the Kite/Balloon Group.'). The child was assigned to one of these groups and asked to wear a badge with the group's symbol (kite or balloon). A kite badge and a balloon badge were placed in front of the child (where they remained for the study). The child was asked to identify which badge belonged to each group and was asked to identify his or her own group membership. The child then saw four pictures of puppets wearing badges and identified each puppet's group membership ('Does he belong to the Kite Group or the Balloon Group?'). Finally, the face scale was introduced as a way for the child to show how much he or she liked the puppet, and E1 asked questions to confirm that the child understood how the scale worked (e.g. 'Which face are you going to point to if you really like a puppet a lot?'). In the rare instances where a child did not understand any points, E1 repeated explanations until they were clear.

Pre-test measures

E1 then presented the child with two puppets, one from the Kite Group and one from the Balloon Group, and asked questions to establish baseline feelings about each group: (1) *Liking*: How much do you like him? (Child responds using face scale, once for each puppet.) (2) *Child's intended sharing*: Who do you want to share with? (3) *Predicted puppet sharing*: Who do you think will share with you?

Video intervention

The child then watched the series of 12 video clips. To ensure that children attended to group membership and

sharing behavior, for the first four clips, E1 paused the video before and after the puppets shared candy to ask the child to identify the puppet's group ('Does he belong to the Kite Group or the Balloon Group?' or 'What group does he belong to?') and how much the puppet shared ('Did he share a lot or a little?').

Post-test measures

After the child watched the clips, E1 presented two novel puppets, one from each group. She then asked the same three baseline questions (liking, intended sharing and predicted sharing).

Child sharing

After answering the questions, the child was given two stickers and was asked to share one sticker: 'My friend [E2's name] is going to give you two stickers. One sticker is for you to take home and the other is for you to share with one of the puppets. Will you please share one of the stickers with one of the puppets?' The child then gave a sticker to one puppet.

Predicted puppet sharing

The child was told that each puppet would receive two stickers and that one of them would share with him or her. The child was then asked to predict which puppet would share: 'In a minute E2 is going to give each of the puppets two stickers. One of them is going to share with you and one of them isn't. Who do you think is going to share with you?' The child pointed to one puppet. Finally, both puppets were given two stickers, which they both shared with the child.

Memory check and additional questions

Finally, the experimenter asked three more questions: (1) 'When we watched the video, which group shared the most?' (2) 'Which group is the nicest?' (3) 'Which group do you belong to?'

Results

Initial tests revealed no effects of sex or age, so these data were collapsed. Children's mean liking scores before and after viewing the video were assessed. A three-way repeated-measures ANOVA was conducted with liking score as the dependent measure, Time (pre-test, post-test) and Puppet Group (ingroup, outgroup) as within-subjects factors, and Sharing Condition (Ingroup Egalitarian/Outgroup Stingy, Outgroup Egalitarian/Ingroup Stingy) as a between-subjects factor. This analysis revealed a significant three-way Time \times Puppet Group \times Sharing Condition interaction, $F(1, 78) = 3.95$, $p = .050$, $\eta^2 = .05$, a main effect of Puppet Group,

$F(1, 78) = 6.23$, $p = .015$, $\eta^2 = .07$, and a main effect of Sharing Condition, $F(1, 78) = 9.18$, $p = .003$, $\eta^2 = .11$. Means (see Figure 2) show that children's liking scores for ingroup and outgroup members were initially similar and did not change following video viewing except in one case: When children observed the outgroup being stingy and the ingroup being egalitarian, their liking of the outgroup decreased following the video.

Follow-up ANOVAs were conducted separately for each sharing condition, with liking score as the dependent variable and Time and Puppet Group as within-subjects factors. These ANOVAs tested for the effect of each video on children's liking of ingroup versus outgroup members. In the Outgroup Egalitarian/Ingroup Stingy Condition, there were no significant effects (all $p > .100$); in other words, group attitudes did not change as a result of seeing largely positive outgroup and negative ingroup behaviors. In contrast, in the Ingroup Egalitarian/Outgroup Stingy Condition, there was a significant main effect of Puppet Group, $F(1, 40) = 4.75$, $p = .035$, $\eta^2 = .05$, and a Puppet Group \times Time interaction, $F(1, 40) = 4.70$, $p = .036$, $\eta^2 = .01$, indicating that group attitudes changed as a result of seeing largely positive ingroup and negative outgroup behavior.

T-tests provided three additional pieces of information. First, there were no significant differences in ingroup versus outgroup pre-test liking scores in either the Ingroup Egalitarian/Outgroup Stingy Condition (ingroup $M = 2.37$, $SE = .12$ vs. outgroup $M = 2.34$, $SE = .12$; $t(40) = .183$, $p = .855$), or the Outgroup Egalitarian/Ingroup Stingy Condition (ingroup $M = 2.49$, $SE = .11$ vs. outgroup $M = 2.72$, $SE = .09$; $t(38) = 1.55$, $p = .130$). Second, in the Ingroup Egalitarian/Outgroup Stingy Condition, the only liking scores that changed significantly over time were towards the outgroup. Liking of the outgroup decreased from the pretest ($M = 2.34$, $SE = .12$) to the post-test ($M = 2.00$,

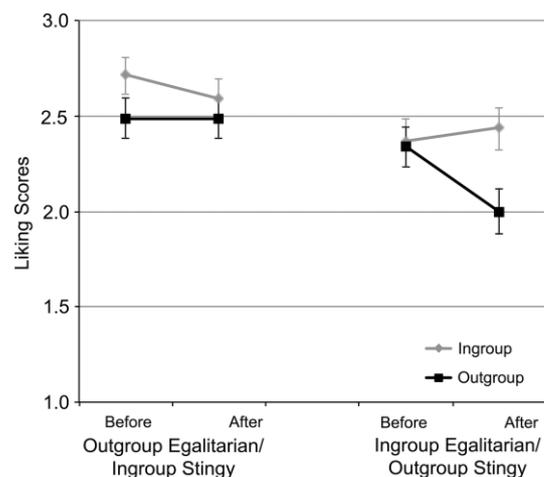


Figure 2 Liking-score means (frown = 1, straight mouth = 2, and smile = 3) and standard errors for the Outgroup Egalitarian/Ingroup Stingy (left) and Ingroup Egalitarian/Outgroup Stingy (right) Conditions before and after viewing the video of sharing behavior.

$SE = .12$; $t(40) = 2.15$, $p = .036$, $d = .33$), and children liked the post-test outgroup less than the ingroup ($M = 2.44$, $SE = 1.05$; $t(40) = 2.88$, $p = .006$, $d = .45$). Third, there were no statistically significant changes, in either condition, in how much children liked the ingroup, or in how much they liked the outgroup in the Outgroup Egalitarian/Ingroup Stingy Condition (all $p > .100$). No other statistically significant differences were found.

Because the liking scale offered only three response options, we also conducted non-parametric tests. We created a 'Change Score' to reflect whether each child's reported liking increased, remained the same, or decreased over time, and used this score as a categorical dependent measure (see Table 1). Two ordinal regression analyses assessed the Ingroup Liking Change Score and Outgroup Liking Change Score separately, each as a function of condition. Consistent with our other analyses, condition was a reliable predictor of changes in outgroup scores ($b = -1.905$, $Wald = 5.66$, $SE = .460$, $p = .017$) but not ingroup scores ($b = .597$, $Wald = 1.66$, $SE = .46$, $p = .197$). As shown in Table 1, Outgroup Liking Change Scores were more likely to be in the 'decrease' category in the Ingroup Egalitarian/Outgroup Stingy Condition relative to the other condition. Ingroup Liking Change Scores were more likely to be in the 'increase' category, but not reliably.

Finally, we analyzed children's post-test choices about whether the ingroup or outgroup puppet was *nicer*, which one *shared the most in the video*, and which one was *most likely to share with the child* (for complete frequency data, see Supplemental Materials, Table S1). A chi-square analysis of an association between condition and choice for each question did not reach significance (all $p > .150$). However, binomial tests provided evidence of children's selective sensitivity to the condition in which they observed negative information about the outgroup. For the Outgroup Egalitarian/Ingroup Stingy Condition, the percentage selecting the outgroup puppet did not differ from chance (50%) for any question (all $p > .100$). In contrast, for the Ingroup Egalitarian/Outgroup Stingy Condition, children reported the ingroup to be nicer (75%; $p = .002$) and to share the most in the video (68%; $p = .023$) at rates significantly greater than chance. Surprisingly, they also reported that the outgroup would be most likely to share with the child (66%; $p = .042$) in the Ingroup Egalitarian/Outgroup Stingy Condition. In general, these results support the claim that children

Table 1 Number of children whose liking scores increased, decreased or remained the same, before and after watching the video of sharing behavior

| Change in liking | Outgroup Egalitarian/ Ingroup Stingy | | Ingroup Egalitarian/ Outgroup Stingy | |
|------------------|---|----------|---|----------|
| | Ingroup | Outgroup | Ingroup | Outgroup |
| Decrease | 7 (18%) | 5 (13%) | 8 (20%) | 19 (46%) |
| No Change | 29 (74%) | 29 (74%) | 22 (54%) | 16 (39%) |
| Increase | 3 (8%) | 5 (13%) | 11 (27%) | 6 (15%) |

were more sensitive to novel information in the Ingroup Egalitarian/Outgroup Stingy Condition, though the non-significant chi-square analyses temper the interpretation of these trends.

Discussion

This study examined children's initial group-based beliefs in a minimal-group task and their subsequent interpretations of observed ingroup and outgroup sharing behaviors. The minimal-groups paradigm ensured that children had no prior experience with either group, allowing us to observe how children applied group biases in the face of novel information. Pilot testing, in which children were not assigned to groups, indicated that children could readily track the behaviors presented in the videos. Therefore, the current task allows us to test the effects of minimal group affiliation on children's sensitivity to the information in the clips.

We predicted that affiliation with a minimal group would affect how children would respond to observations of egalitarian and stingy behaviors by group members, and that children would not interpret identical information about ingroups and outgroups in the same manner. Our data provide clear evidence that minimal group assignment influences children's attitudes about groups. Specifically, when the ingroup was egalitarian and the outgroup was stingy, children's liking of the outgroup decreased and their liking of the ingroup did not change. In contrast, when the ingroup was stingy and the outgroup was egalitarian, no changes in liking towards either group were observed.

Consistent with one of our predictions and with past research, these findings provide evidence that children are more sensitive to negative information (Kinzler & Shutts, 2008; Vaish *et al.*, 2008), and are particularly likely to make negative associations with an outgroup (McGlothlin & Killen, 2006).

We also hypothesized that children would be more sensitive to positive information about ingroups. Consistent with this prediction, children reliably identified which group shared more both when their ingroup did so, and in the pilot study when children were not assigned to groups. However, they responded at chance when the outgroup was more generous. This pattern further indicates that children were sensitive to group membership in their encoding of the events. One possible interpretation is that group membership directly affected information processing and memory; an alternative possibility is that children's responses about who shared more reflect their relative positivity toward each group – in the case where they like the ingroup more than the outgroup at post-test, they report more ingroup sharing; in the case where they like both groups equally at post-test, they are split in their responses about who shared more.

Liking scores for the ingroup did not significantly increase in the Ingroup Egalitarian condition. A ceiling

effect for ingroup pretest ratings might have obscured increases in liking scores (means were about 2.5 out of 3), or children's attitudes simply might not have changed. Nevertheless, taken together, these findings suggest that children may more readily process experiences consistent with their generalized expectations about ingroups and outgroups.

Because identical ingroup and outgroup information across conditions elicited different post-test responses, our findings provide evidence that relatively general concepts of ingroups and outgroups may underlie children's group-based reasoning. Biases observed in children's information processing about real-world social groups (Hirschfeld, 2001; Spelke & Kinzler, 2007; Nesdale & Flessler, 2001) may thus arise from a general ingroup/outgroup schema, not from piecemeal learning about those specific groups. The observed behavior could be described in terms of a confirmation bias (Darley & Gross, 1983; Kuhn, 1989) in which data are sought that are consistent with existing hypotheses, and inconsistent data are less easily encoded. Dunham *et al.* (2011) demonstrated that children show a general preference for ingroup individuals in the absence of any group-based experience and better memory for positive ingroup behaviors. Like Dunham *et al.* (2011), the current data suggest that a strong ingroup bias is not always immediately apparent following group assignment, but that information processing is nevertheless affected by children's group membership.

Our findings leave open the question of whether children's ingroup and outgroup concepts are driven by cognitive processes, affective processes, or both. One curious result from this study was that although children's attitudes were affected by the video intervention, children's explicit predictions about which group would share, and their choices of the group with whom to share, showed little change in response to the videos. In fact, counterintuitively, children predicted that the outgroup would share more with them in the Ingroup Egalitarian/Outgroup Stingy Condition. These findings may reflect a limitation of the current methodology for assessing children's expectations about sharing. While the attitudinal measures allowed children to demonstrate liking for both puppets, the categorical questions forced children to choose one puppet over the other, at which point some children expressed hesitation. Any reluctance to choose a favorite may have been especially strong in our paradigm because children interacted with 'live' puppets, rather than with the pictures or videos often used in similar studies (e.g. Baron & Banaji, 2006; Kinzler *et al.*, 2007). Alternatively, our results may indicate actual differences between children's attitudes and inferences. Specifically, attitudinal measures might better reflect children's implicit beliefs or their affective responses toward group members, while the categorical questions required children to make explicit predictions about group members. The lack of significant effects on the prediction and sharing trials could arise if the

experience with the video clips elicited more of an affective change in children's regard for groups rather than a cognitive change in children's beliefs about group behavior. In a study similarly focused on resource allocation, Dunham and colleagues (2011) also found that the minimal-group paradigm failed to evoke strong ingroup preferences with this age group, suggesting that the current results may reflect a more general pattern. Differing the dimensions of social interactions, such as having group members directly compete with one another, might yield different patterns of data.

It is important to note that, although children's differential processing of video experience clearly indicates that they responded differently to ingroup versus outgroup information, we did not find differences in children's pre-test responses to questions about the groups. Our methods provided less group-based priming than those used in many minimal-group paradigms, and many studies have also used stronger cues to ingroup/outgroup status (i.e. describing groups as 'your group' or the 'other group' rather than the 'Balloon Group' and 'Kite Group'; see Vaughn *et al.*, 1981) before taking measures of children's attitudes. Our findings, however, are concordant with other developmental work on the formation of intergroup attitudes, which tend to show relatively weak baseline ingroup preferences. For example, studies by Bigler and colleagues (1997) and Spielman (2000) have suggested that minimal group affiliation in the absence of other functional differences between groups does not lead to strong ingroup preferences. Similarly, Dunham *et al.* (2011) found only weak baseline preferences for the ingroup on explicit measures (ranging from no effect to moderate effects depending on the measure).

Nonetheless, children's differential processing of information about each group suggests that a latent bias existed and influenced children's interpretations of the experiences with the videos. One explanation of this finding is that rather than having different attitudes towards the two new groups from the outset, children might instead have accessed schemas for how to encode and interpret data about each group, ultimately resulting in different attitudes. The current data provide some hints about the nature of these schemas. Attitudes toward or beliefs about the ingroup might be relatively robust and less sensitive to new information. In contrast, attitudes toward or beliefs about the outgroup might be relatively malleable, resulting in rapid changes in light of new information. Coupled with a generalized bias to weigh negative information more strongly than positive information, children may be particularly sensitive to negative information about outgroups.

These results help to illuminate the developmental origins of intergroup attitudes. As in other studies with minimal priming, children in our study did not tend to show a strong initial ingroup preference. Despite this, group affiliation reliably evokes differential responses in more subtle measures, such as sensitivity to novel

information (in this study) and implicit attitudes (Dunham *et al.*, 2011). Additional factors over and above group assignment, such as intergroup competition, differential status, or even group size (Bigler *et al.*, 2001; Brown & Bigler, 2002; Spielman, 2000), may evoke stronger ingroup biases.

This study provides a systematic framework for assessing children's generalized group-based concepts and for exploring the malleability of these concepts. It also lays a foundation for further work on the origins and development of group bias in children. For example, here, although most exemplars were condition-typical (e.g. the outgroup sharing stingily in the Ingroup Egalitarian/Outgroup Stingy Condition), participants did view one condition-atypical exemplar. Differential information processing emerged despite this moderately noisy demonstration, indicating the resilience of this effect.² Further work assessing the amount of evidence required to override biased interpretations could provide an improved understanding of how bias emerges in naturalistic contexts, where children may frequently encounter conflicting examples of a given group's behavior.

Future research should further address the quantity and quality of experience that is required to affect children's reasoning about groups, and the current methodology may be a useful tool for building a more precise understanding of the nature of children's group-based beliefs. For example, the effects of more positive behavior (e.g. giving everything away) or more negative behavior (e.g. hoarding or taking), as well as behaviors other than resource sharing, could reveal more subtle contours of children's reasoning about groups.

In addition, because our findings underscore the rapid impact of negative experience on outgroup representations, and because children are regularly exposed to negative stereotypes about socially stigmatized groups (Bigler & Liben, 2007), future work might explore how negative beliefs about outgroups could be overridden. For instance, it would be useful to know whether, once negative outgroup attitudes have been evoked through exposure to negative observations, children's outgroup attitudes might be improved by the viewing of many positive outgroup observations.

In sum, children's attitudes about ingroup and outgroup members are differentially affected by positive and negative observations of each group, even when the relevant groups are arbitrarily assigned. These findings indicate that children process the same experiences with ingroup and outgroup members differently, consistent with theories proposing that children have generalized concepts of ingroups and outgroups. By recognizing the impact of biases on attitude formation and resilience,

future developmental research may facilitate systematic assessments of the impact of biases and well-informed interventions to reduce bias in real-world social settings.

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² We note that, in order to direct children's attention to the sharing behaviors, experimenters asked children to state how much was being shared in the first four (condition-typical) video clips, possibly making those examples more salient.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Categorical Data.

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