Changing Children's Intergroup Biases Through Statistical Counterevidence

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Abstract

Biases about social groups emerge from a young age. This study examines whether statistically representative counterevidence – a randomly drawn sample from the social group – can change children's attitudes and beliefs about minimally defined social groups. We found that 5- to 6-year-olds learned from the sample to change their attitudes and beliefs about minimal groups. However, they showed a negativity bias and an ingroup bias when they learned from the evidence. It was unclear whether 9- to 10-year-olds' attitudes and beliefs can also be changed by this type of evidence. Future directions and implications of this study are discussed.

Keywords: intergroup bias; stereotype; statistical learning

Introduction

We live in a world of increasing diversity, with populations composed of people from various racial, ethnic, religious, economic, and cultural backgrounds. Tensions and conflicts between groups become inevitable as these groups become more entangled. Disturbingly, many biases and stereotypes regarding social groups emerge early in children's development (e.g., Augoustinos & Rosewarne, 2001; Dunham et al., 2006; Halim & Ruble, 2010; Yee & Brown, 1994). In this paper, we focus on whether biases and stereotypes can be changed during early childhood.

From a young age, children develop positive associations, attitudes, and stereotypes about their own social groups (their "ingroup"), and negative associations, attitudes, and stereotypes about other social groups (their "outgroup"). For example, children show explicit and implicit preferences for their own gender by 3-5 years of age (Dunham et al., 2016; Yee & Brown, 1994), and North American White children show an explicit preference for their own race, as well as an implicit pro-White/anti-Black bias as young as 3 years of age (Dunham et al., 2006).

How do these biases develop in childhood? The Rational Constructivist framework (Xu, 2019) proposes that learning and belief formation depend on both prior knowledge or biases and statistical information from environmental input. Consistent with this framework, the Developmental Intergroup Theory (DIT, Bigler & Liben, 2006) proposes that both internally driven processes (ingroup bias and essentialist beliefs) and externally driven processes (environmental input) contribute to biases and stereotypes. The basic forms of ingroup bias emerge in infancy – infants prefer those similar to them over those who are different (Mahajan & Wynn, 2012). The statistical information from children's social environment often reinforces these intergroup attitudes. For instance, children's biases are correlated with their parents' and teachers' attitudes and behaviors toward different social groups (Sinclair et al., 2005; Vezzali et al., 2012).

Thus, children's initial bias and early environmental input work in tandem, allowing children to develop strong intergroup attitudes that are hard to revise. However, an important aspect of the Rational Constructivist framework is that relearning and belief revision is always possible given the right kind of counterevidence, even when we have strong prior beliefs and biases. A large body of research has shown that children learn from counterevidence and rationally update their beliefs in various domains. For instance, in the domain of physical reasoning, children can update their understanding of balance when they observe evidence that violates their initial theories about balance (Bonawitz et al., 2012). In the domain of psychological reasoning, toddlers can update their beliefs about theory of mind given counterevidence (Amsterlaw & Wellman, 2006). A recent study has shown that even our earliest-emerging and most fundamental beliefs about objects (e.g., objects exist and move continuously in time and space) and agents (e.g., agents' actions are directed to goals) can be revised in young children, given a small amount of counterevidence (Liu & Xu, 2021). Furthermore, children's belief revision appears to be rational, consistent with principles of Bayesian inference (e.g., Kushnir & Gopnik, 2007; Lucas et al., 2014).

Can children also learn from counterevidence about social groups and change their attitudes and beliefs about the groups? A prevalent method to change children's biases is exposure to exemplars that are inconsistent with their prior biases. However, past studies have shown that this method is effective for older children, but not younger children. For instance, providing White children with positive Black exemplars reduced older children's (9- to 12-year-olds) implicit pro-White bias, but was less effective for younger children (5- to 8-year-olds) (Gonzalez et al., 2021). Observing prosocial outgroup members and antisocial ingroup members increased 8-year-olds' liking for the outgroup, but had no effect on 5-year-olds (Wilks & Nielsen, 2018).

One reason that disconfirming exemplars might fail to reduce bias is that children's processing of new information is still filtered by their preexisting biases (Bigler & Liben, 2006). For instance, children prefer to hear positive information about ingroups and negative information about outgroups than vice-versa (Over et al., 2018). As another example, showing children mean outgroup members decreased their liking of the outgroup, but showing them nice outgroup members did not increase their liking of the outgroup (Schug

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et al., 2013). Another reason that disconfirming exemplars might be ineffective is because of a process called subtyping (Richards & Hewstone, 2001; Hayes et al., 2003). Disconfirming exemplars can be mentally clustered into a subtype, allowing the exemplars to be seen as exceptions and therefore not representative of the entire group.

Preventing children from processing new information in a biased way might be hard. However, one way to avoid subtyping is by showing children exemplars that are representative of the group. In the present study, we assess whether exposing children to counterevidence that is statistically representative of the entire social group, might change their attitudes and beliefs about the group. Specifically, we showed children a randomly drawn sample from the group, with information about the distribution of nice vs. mean traits in this sample, and examined whether the trait distribution in the sample can change children's attitudes and beliefs about the group as a whole. Infants and children are sensitive to statistical information, and they understand that a randomly drawn sample is representative of the group (Denison & Xu, 2019). Thus, when children observe a randomly drawn, mostly nice sample from the outgroup, it is unlikely that they will discount the sample as an exception, and more likely to take it into account in forming more positive attitudes and beliefs about the outgroup.

In order to control for any prior beliefs children might have about particular groups, we first adopted a minimal group paradigm to assess this question. Children show the same forms of ingroup biases for real social groups and for minimally defined social groups (Dunham, 2018), although their biases are weaker for minimal groups than for real groups (Mullen et al., 1992). Thus, in the present study, we first investigate whether statistically representative counterevidence can effectively change children's attitudes and beliefs about minimal groups.

As noted earlier, previous studies have shown that younger children might be less responsive to disconfirming exemplars compared to older children. However, given the strong sensitivity to statistical information even in infants, we tested both younger (5- to 6-year-olds) and older (9- to 10-year-olds) children.

We hypothesized that a priori, children would show an ingroup bias – they would show more positive attitudes and beliefs toward the ingroup than the outgroup. Crucially, their attitudes and beliefs would be changed by the trait distribution of the sample they observe. Children's attitudes and beliefs toward both the ingroup and the outgroup would become more positive after observing a mostly nice sample, and more negative after observing a mostly mean sample. We further hypothesized that children might process the information in a biased way, such that the mostly nice sample would have a larger positive effect on children's attitudes towards the ingroup than the outgroup, and the mostly mean sample would have a larger negative effect on attitudes towards the outgroup than the ingroup.

Methods

Participants

One hundred and twelve 5- to 6-year-olds (62 females; mean age = 5.96; range = 5.00 to 6.96; *SD* = 0.59) and 74 9- to 10-year-olds (42 females; mean age = 9.92; range = 9.05 to 10.98; *SD* = 0.55) participated in the experiment. Our target sample size is 30 children per condition per age group (a total of 120 children per age group). Sample sizes are determined based on the effect sizes in a similar study (Baron & Dunham, 2015), which reported large effect sizes for the effect of group membership on 6- to 8-year-olds' tendency to generalize behaviors to ingroup and outgroup members. Our target sample size provides at least 85% power (at $\alpha = .05$) to detect the effect sizes observed in Baron & Dunham (2015).

Participants were tested in a lab room or at children's museums. Parents of the participants provided written informed consent prior to the experiment session.

Design and Procedure

The study employed a 2 (Group condition: Ingroup vs. Outgroup) × 2 (Trait Distribution condition: Majority nice vs. Majority mean) between-subject design. We used a between-subject design to avoid carry-over effect and to prevent the procedure from being too long. A visual schematic of the procedure is shown in Figure 1.

Room Introduction Participants were shown two social groups – in two rooms on the computer screen – each filled with pictures of 50 children. Children in one room all wore yellow shirts, and children in the other room all wore blue shirts. Participants were told that some children in the rooms were nice, and some children were mean, and they could find out whether a child was nice or mean when they turned around the picture and saw the expression on the child's face (smiling or frowning, respectively).

Room Assignment Participants were shown 2 cups on the screen. They were told that a blue coin was hidden in one cup and a yellow coin was hidden in the other cup. The experimenter asked the participant to choose a cup, and revealed the coin in the cup. Depending on the color of the coin, the experimenter told the participant, "You belong to the blue/yellow room!" Half of the participants were assigned to the blue room, and half to the yellow room. Then, the experimenter gave the participant a blue/yellow hat and a blue/yellow sticker to reinforce their group membership.

Prior Measurements We measured participants' attitudes about the ingroup and the outgroup, as well as their expectations about the likelihood of drawing a nice child and a smart child from the groups. Participants in the Ingroup condition were asked the following questions about the room they were assigned to, and participants in the Outgroup condition were asked the following questions about the room they were not assigned to.

Attitudes. The experimenter showed participants pictures of 4 gender-matched children from the room corresponding to their group condition (Ingroup or Outgroup). For each child, the experimenter assessed whether participants were willing to interact with the child (e.g., "Would you like to play with this child?"), and to what extent they wanted or did not want to interact with the child (e.g., "Do you sort of want to or really want to?"). Each answer received a score ranging from 1 to 4, with higher scores indicating more positive attitudes (really don't want to = 1, sort of don't want to = 2, sort of want to = 3, really want to = 4). The participant's *prior attitude score* was the average of the scores for the 4 questions.

Expectation. To assess participants' expectations about the distribution of nice and mean traits in the rooms, they were shown all the children from the room, and were asked, "If we were to check one child from this room, do you think this child would be nice or mean?"

Over-hypothesis. To assess participants' expectations about the distribution of a different trait, they were asked, "If we were to check another child from this room, do you think this child would be smart or not smart?"

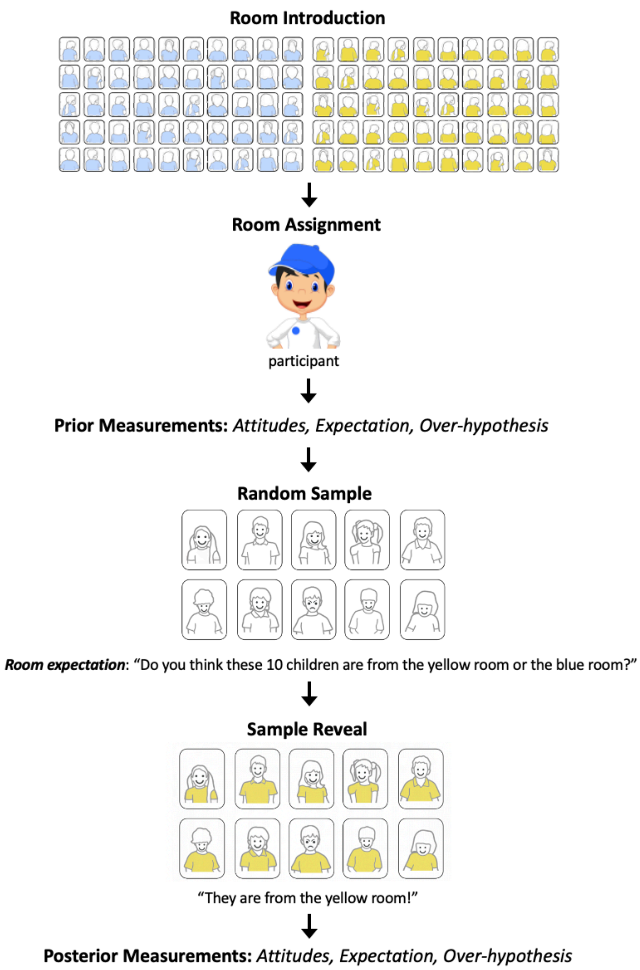

Figure 1: A visual schematic of the procedure.

Random Sample Next, the experimenter told participants that the computer would randomly pick a sample of 10 children from one of the rooms without telling them from which. Participants saw a picture of the sample of 10 children, with each child showing a smiling or an angry face. In this picture, all children were wearing "white" shirts, denoting that we still did not know from which room they had been drawn. Depending on the participant's Trait Distribution condition, the sample of children was either mostly nice (9 nice and 1 mean children) or mostly mean (1 nice and 9 mean children). The experimenter described the distribution of nice and mean children in the sample, and asked participants to repeat the distribution.

Room Expectation. Participants were asked to guess from which room the sample was drawn.

Sample Reveal Then, the experimenter revealed from which room the sample was drawn, by showing that the 10 children either wore yellow shirts or blue shirts. Participants in the Ingroup condition observed a sample from the room they were assigned to, and participants in the Outgroup condition observed a sample from the room they were not assigned to.

Posterior Measurements Finally, participants were asked the attitudes, expectation, and over-hypothesis questions again.

Results

Younger Children (5- to 6-year-olds)

Room Expectation Table 1 shows the number of 5- to 6-year-olds who expected the Majority Nice sample and the Majority Mean sample to be from the ingroup or the outgroup. We used logistic regression to predict children's room expectations (ingroup = 1, outgroup = 0) from trait distribution condition, age (z-scored), gender, and their interactions. We found a main effect of trait distribution condition. Children in the Majority Nice condition were more likely to expect the sample to be from the ingroup rather than from the outgroup, compared to children in the Majority Mean condition (β = 1.20, SE = 0.40, p = .003).

We next compared their room expectations against chance. Children who observed the Majority Nice sample were more likely to expect the sample to be from the ingroup than from the outgroup, although this trend did not reach statistical significance (Exact binomial test: $P_{ingroup}$ = .57 [.43, .70], p = .35). Children who observed the Majority Mean sample were more likely to expect the sample to be from the outgroup than from the ingroup ($P_{ingroup}$ = .29 [.17, .42], p = .002).

Table 1: Room expectation results (5- to 6-year-olds).

Trait distribution condition	Room expectation	
	Ingroup	Outgroup
Majority Nice	32	24
Majority Mean	16	40

Attitudes The distribution of 5- to 6-year-olds' prior and posterior attitude scores is shown in Figure 2. We used mixed-effects ANOVAs to predict children's attitude scores from group condition, trait distribution condition, time of measurement, age (z-scored), gender, and their interactions, with random intercepts for participants. We found an interaction of trait distribution condition and time of measurement. For both the ingroup and the outgroup, children's attitudes became more negative after observing the mostly mean sample ($M_{prior} = 2.76$, $M_{posterior} = 2.47$; $\beta = -0.29$, $SE = 0.09$, $p = .002$), and became more positive after observing the mostly nice sample, although this trend was not statistically significant ($M_{prior} = 2.67$, $M_{posterior} = 2.77$; $\beta = 0.11$, $SE = 0.09$, $p = .25$).

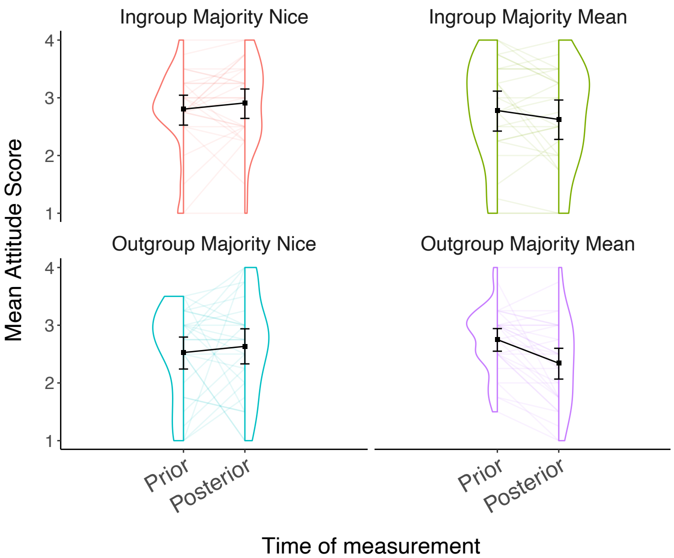

Figure 2: Distribution of 5- to 6-year-olds' prior and posterior attitude scores by condition. The error bars indicate bootstrapped 95% CIs.

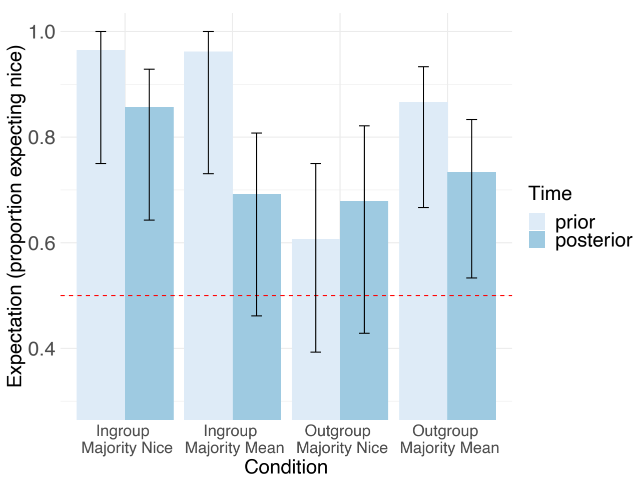

Figure 3: Proportion of 5- to 6-year-olds who expected a randomly drawn child from the room to be nice, by condition and time. The dashed line indicates chance selection (.5), and the error bars indicate bootstrapped 95% CIs.

Expectation The proportion of children who expected a randomly drawn child from the room to be nice is shown in Figure 3. We used mixed-effects logistic regression to predict children's expectations (nice = 1, mean = 0) from group condition, trait distribution condition, time of measurement, age (z-scored), gender, and their interactions, with random intercepts for participants. We found a main effect of age, and an interaction of group condition and time of measurement. With increasing age, children were more likely to expect a random child to be nice ($\beta = 1.06$, $SE = 0.45$, $p = .02$). Children in the Ingroup condition were more likely to expect a random child to be nice than children in the Outgroup condition ($\beta = 2.62$, $SE = 0.92$, $p = .004$). Observing the sample led children in the Ingroup condition to become less likely to expect a random child to be nice ($\beta = -2.31$, $SE = 0.87$, $p = .008$). Observing the sample did not significantly change the expectations of children in the Outgroup condition ($\beta = -0.13$, $SE = 0.50$, $p = .80$).

Over-hypothesis The proportion of children who expected a randomly drawn child from the room to be smart is shown in Figure 4. We used mixed-effects logistic regression to predict children's over-hypothesis (smart = 1, not smart = 0) from group condition, trait distribution condition, time of measurement, age (z-scored), gender, and their interactions, with random intercepts for participants. We found a three-way interaction of group condition, trait distribution condition and time of measurement. In the Ingroup condition, children's expectations that a random child from the room was smart decreased after observing a mostly nice sample ($\beta = -5.96$, $SE = 1.69$, $p < .001$), but did not change after observing a mostly mean sample ($\beta = -0.79$, $SE = 1.56$, $p = .61$). In the Outgroup condition, children's expectations that a random child from the room was smart increased non-significantly after observing a mostly nice sample ($\beta = 2.08$, $SE = 1.69$, $p = .22$), and decreased after observing a mostly mean sample ($\beta = -7.35$, $SE = 1.96$, $p < .001$).

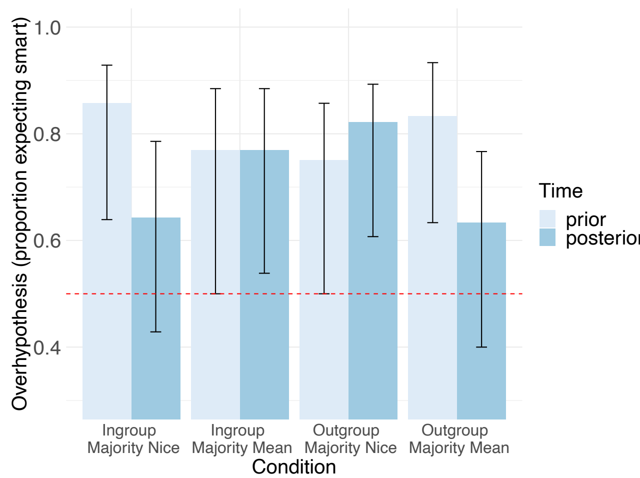

Figure 4: Proportion of 5- to 6-year-olds who expected a randomly drawn child from the room to be smart, by condition and time. The dashed line indicates chance selection (.5), and the error bars indicate bootstrapped 95% CIs.

Older Children (9- to 10-year-olds)

Room Expectation Table 2 shows the number of 9- to 10-year-olds who expected the Majority Nice sample and the Majority Mean sample to be from their ingroup or their outgroup. Logistic regression did not reveal any significant effect of trait distribution condition, age, or gender ($p > .1$).

We next compared their room expectations against chance. Children expected the sample to be from the ingroup or the outgroup at chance in both the Majority Nice condition ($P_{ingroup} = .47$ [.30, .65], $p = .86$) and the Majority Mean condition ($P_{ingroup} = .5$ [.34, .66], $p = 1$).

Table 2: Room expectation results (9- to 10-year-olds).

Trait distribution of sample	Room expectation	
	Ingroup	Outgroup
Majority nice	16	18
Majority mean	20	20

Attitudes The distribution of 9- to 10-year-olds' prior and posterior attitude scores is shown in Figure 5. We used mixed-effects ANOVAs to predict children's attitude scores from group condition, trait distribution condition, time of measurement, age (z-scored), gender, and their interactions, with random intercepts for participants. We found a main effect of age. Children's attitudes became more positive with increasing age ($\beta = 0.28$, $SE = 0.01$, $p < .001$).

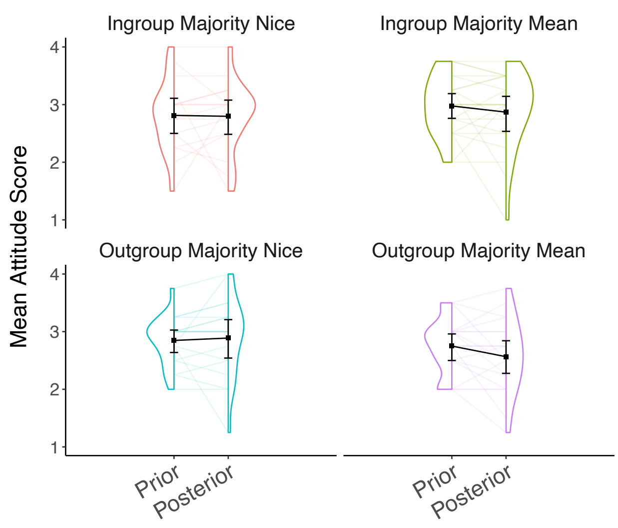

Figure 5: Distribution of 9- to 10-year-olds' prior and posterior attitude scores by condition. The error bars indicate bootstrapped 95% CIs.

Expectation The proportion of children who expected a randomly drawn child from the room to be nice is shown in Figure 6. We used mixed-effects logistic regression to predict children's expectations (nice = 1, mean = 0) from group condition, trait distribution condition, time of measurement, age (z-scored), gender, and their interactions, with random intercepts for participants. We found a main effect of time of measurement. Children were less likely to expect a random child to be nice after observing *any* sample ($\beta = -2.14$, $SE = 0.65$, $p = .001$).

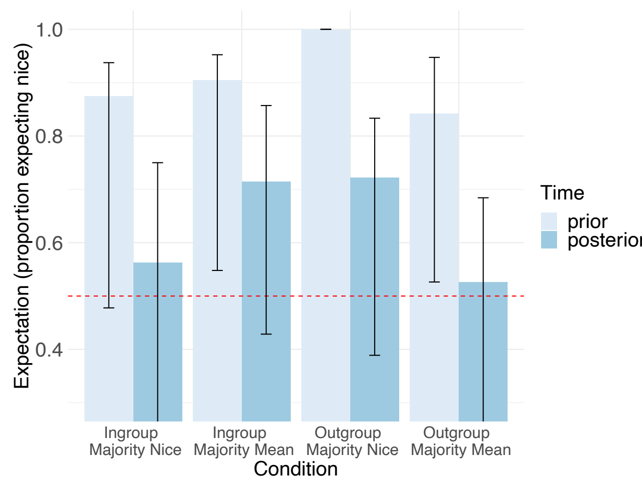

Figure 6: Proportion of 9- to 10-year-olds who expected a randomly drawn child from the room to be nice, by condition and time. The dashed line indicates chance selection (.5), and the error bars indicate bootstrapped 95% CIs.

Over-hypothesis The proportion of children who expected a randomly drawn child from the room to be smart is shown in Figure 4. Mixed-effects logistic regression did not reveal any effects of group condition, trait distribution, time of measurement, age, or gender on children's over-hypothesis ($p > .07$).

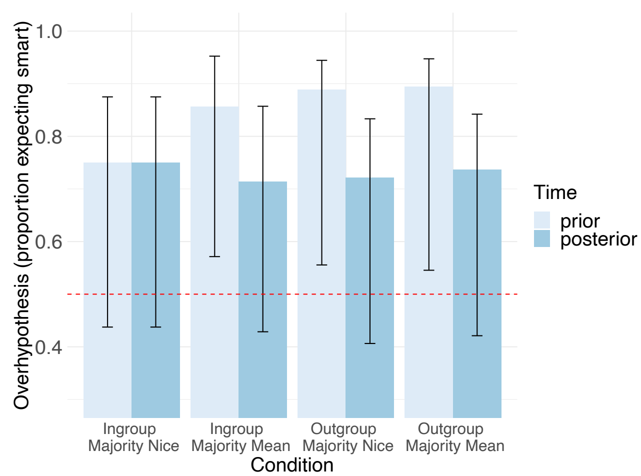

Figure 7: Proportion of 9- to 10-year-olds who expected a randomly drawn child from the room to be smart, by condition and time. The dashed line indicates chance selection (.5), and the error bars indicate bootstrapped 95% CIs.

Discussion

The goal of the present study was to examine whether statistically representative counterevidence about social groups can change 5- to 6-year-olds' and 9- to 10-year-olds' attitudes and beliefs about the groups. We showed children the trait distribution of a sample of children randomly drawn from either their ingroup or their outgroup, and examined whether that changed their attitudes and beliefs about the group.

Five- to 6-year-olds showed clear ingroup biases. First, when children were asked to guess from which group the sample was drawn, those who observed the mostly nice sample were more likely to guess the sample was from their ingroup (rather than from their outgroup), compared to those who observed the mostly mean sample. Second, when asked whether a randomly drawn child from the group would be nice or mean, children who were asked about the ingroup were more likely to expect the random child to be nice, compared to those who were asked about the outgroup. These results are consistent with the past literature on ingroup bias for minimal groups (Dunham, 2018), and suggest that our minimal group manipulation was successful for 5- to 6-year-olds.

Observing the sample changed 5- to 6-year-olds' attitudes. Consistent with our hypotheses, children's attitudes toward both the ingroup and the outgroup became more positive after observing a mostly nice sample, and more negative after observing a mostly mean sample. However, children showed a negativity bias – the mostly mean sample had a stronger negative effect on their attitudes than the mostly nice sample had a positive effect (the latter was not statistically significant). Contrary to our hypotheses, children did not process the evidence in a biased way – the effect of the sample was similar for the ingroup and the outgroup.

Observing the sample also changed 5- to 6-year-olds' expectations about the distribution of nice vs. mean individuals in the groups. Children were less likely to expect a randomly drawn child from the ingroup to be nice after observing a sample from the ingroup (regardless of the trait distribution). This change was largely driven by children who observed the mostly mean sample (Figure 3), consistent with our hypotheses. However, why did children show less positive expectations after observing a mostly nice sample? Children's prior expectations about their ingroup were at ceiling (93% of children expected a random child to be nice), suggesting that they had a strong belief that most or all children in their ingroup were nice. Thus, even a sample consisting of 10% mean children might undermine this strong belief. In contrast, the sample had weaker effects on children's expectations about the outgroup – their expectations changed in the predicted directions, but these changes were not statistically significant.

The pattern of change in children's expectations about the trait "smart" was similar to that of the trait "nice", except after observing a mostly mean sample from the ingroup. This suggests that children might have generalized what they learned about the distribution niceness to the distribution of smartness. However, children showed an ingroup bias when generalizing a negative trait distribution – their expectations about smartness for the outgroup decreased after observing a mostly mean sample from the outgroup, but their expectations about smartness for the ingroup did not change after observing a mostly mean sample from the ingroup.

Unlike 5- to 6-year-olds, 9- to 10-year-olds did not show ingroup biases. When asked to guess from which group the samples were drawn, they guessed at chance. They did not show more positive attitudes and beliefs toward the ingroup than toward the outgroup. Thus, our minimal group manipulation was less successful for 9- to 10-year-olds, possibly because the minimal group paradigm was adapted from a study with 5-year-olds (Dunham et al., 2011). In addition, observing the sample had little effect on older children's attitudes and beliefs. The only change was that children's expectations about the distribution of niceness in both the ingroup and the outgroup decreased after observing the sample (regardless of the trait distribution). Since the minimal group manipulation was unsuccessful for older children, it remains unclear whether the sample can change 9- to 10-year-olds' attitudes and beliefs about minimal groups.

In conclusion, the present study provides initial evidence that 5- to 6-year-olds are sensitive to the trait distribution in statistically representative counterevidence and use that information to change their attitudes and beliefs about minimal groups. Five- to 6-year-olds also showed a negativity bias and an ingroup bias when they were learning from the statistically representative counterevidence – they were affected by negative information more than positive information, and they were more likely to generalize negative information about the outgroup than negative information about the ingroup. Thus, 5- to 6-year-olds might need stronger positive evidence about the outgroup in order to change their negative biases about the outgroup.

In the next study, we will use the same paradigm to examine whether statistically representative counterevidence can change children's attitudes and beliefs about familiar social groups (racial groups in the U.S. and ethnic groups in Israel), for which children have stronger prior biases. These findings contribute to our understanding of the malleability of intergroup bias in childhood, and have important implications for designing intervention programs to combat biases.

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