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Acquiring Group Bias: Observing Other People's Nonverbal Signals Can Create Social Group Biases

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Abstract

Evidence of group bias based on race, ethnicity, nationality, and language emerges early in the life span. Although understanding the initial acquisition of group bias has critical theoretical and practical implications, precisely how group biases are acquired has been understudied. In two preregistered experiments, we tested the hypothesis that generalized social group biases can be acquired through exposure to positive nonverbal signals directed toward a novel adult from one group and more negative nonverbal signals directed toward a novel adult from another group. We sought to determine whether children would acquire global nonverbal signal-consistent social group biases that extended beyond their explicit social preferences, by measuring children's preferences, imitation, and behavioral intentions. Supporting our preregistered hypotheses, preschool-age participants favored small and large groups whose member received positive nonverbal signals, relative to groups whose member received more negative nonverbal signals. We also replicated prior work indicating that children will acquire individual target biases from the observation of biased nonverbal signals. Here we make the case that generalized social group biases can be rapidly and unintentionally transmitted on the basis of observational learning from nonverbal signals.

Keywords

group bias; nonverbal behavior; children; observational learning; attitudes

Imagine a child arriving at a public playground with a new babysitter. The child observes his babysitter warmly smile and greet another adult as they make their way across the playground. But when she greets another one of the adults, her nonverbal behavior suddenly changes, and her voice seems to have a scornful tone. Although his babysitter does not

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explicitly verbalize her feelings toward these individuals, her nonverbal signals speak volumes. How will the child use this information? Will he develop attitudes favoring one of these two people relative to the other? Moreover, if these two adults were members of different groups (e.g., different nationalities), could this experience generalize and influence the child's attitudes toward others from those groups? The current studies examine these questions.

Social psychological conceptions of group bias often describe it as an attitude reflecting valenced associations (positive or negative) with a group of people (Brewer, 1999; Smith, 2014). These types of valenced associations with social groups emerge early in human development (e.g., Aboud, 2003; Cvencek, Greenwald, & Meltzoff, 2016; Dunham, Baron, & Carey, 2011; Pahlke, Bigler, & Suizzo, 2012; Rutland, Cameron, Bennett, & Ferrell, 2005). For instance, as early as 3 years of age, and more reliably by 4–5 years of age, children show evidence of favoring some racial groups over others (Aboud, 2003; Castelli, Zogmaister, & Tomelleri, 2009; Qian et al., 2016; Setoh et al., 2019; Shutts, 2015). Moreover, these biases have been observed at both the explicit (based on direct measures and self-reports) and the implicit (based on indirect measures of cognitive associations) level (Dunham, Baron, & Banaji, 2008). Before reaching school age, children have been shown to demonstrate biases based on gender, race, accent, and nationality, among others (e.g., Cvencek, Greenwald, & Meltzoff, 2011; Dunham, Baron, & Banaji, 2006; Hilliard & Liben, 2010; Kinzler, Shutts, Dejesus, & Spelke, 2009; McLoughlin & Over, 2017; McLoughlin, Tipper, & Over, 2018; Renno & Shutts, 2015; Richter, Over, & Dunham, 2016).

Precisely how group biases are initially acquired has been understudied, and yet understanding the acquisition of group bias has critical theoretical implications (Skinner & Meltzoff, 2019). Developmental intergroup theory (DIT) argues that there are a number of factors that signal to children which attributes are meaningful within a social context and another set of factors that lead to the development of group biases (Bigler & Liben, 2007). The factors that are said to heighten the salience of particular attributes are (a) observable characteristics that differentiate groups (perceptual discriminability), (b) the use of distinct labels to refer to different groups, (c) implicit cues that denote that groups are meaningful (e.g., groups are segregated), and (d) the proportional size of the groups (i.e., minority groups tend to be perceived as more distinctive). Once groups have been made salient to children, there are both cognitive processes (e.g., essentialism, ingroup bias) and environmental inputs (e.g., explicit messages about groups, nonverbal behavior directed toward members of different groups) that are thought to lead children to attach meaning to the groups and develop biases.

Prior work has shown that, like adults (Brewer, 1979), children readily form ingroup biases, even in the context of minimal groups (Bigler, Brown, & Markell, 2001; Bigler, Jones, & Lobliner, 1997; Bigler & Liben, 2006, 2007; Dunham et al., 2011; Patterson & Bigler, 2006). That is, merely assigning children to be members of an arbitrary group will lead them to favor that group and have more positive attitudes toward its members than members of the assigned outgroup. Although limited work has examined children's attitudes and biases toward experimentally created novel groups (in which children are not a member), there is evidence that they will readily form attitudes and biases with regard to novel groups (e.g.,

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Johnston & Jacobs, 2003; Rhodes, 2014; Roberts, Gelman, & Ho, 2017; Roberts, Guo, Ho, & Gelman, 2018; Roberts, Ho, & Gelman, 2017). For instance, relevant to the current work, children will show behavioral intentions (to give a cookie) that favor members of a privileged novel group over members of a disadvantaged novel group (Olson, Dweck, Spelke, & Banaji, 2011).

Evaluative Conditioning and Observational Learning

Early classical conditioning work indicated that neutral stimuli could develop valenced associations via repeated pairings with positive or negative stimuli (e.g., Staats & Staats, 1958). Subsequent research showed that attitudes toward social targets could be shaped in the same way, via a classical conditioning approach termed *evaluative conditioning* (De Houwer, Thomas, & Baeyens, 2001; Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010; Olson & Fazio, 2001). For example, child participants who were repeatedly exposed to a novel creature paired with a liked creature (e.g., a puppy) formed positive associations with that novel creature (Halbeisen, Walther, & Schneider, 2017). In some cases, repeated pairings are not even necessary, for instance, when groups are verbally tagged with explicitly negative information (Kang & Inzlicht, 2012).

Related work on vicarious classical conditioning has demonstrated that conditioned emotional responses can be transmitted vicariously, such that strong affective associations can be established through observing someone else go through an aversive conditioning procedure (Bandura & Rosenthal, 1966; Berber, 1962). Bandura's (1971) social learning theory builds upon this, asserting that observation of others' behavior is a key means through which people learn about the world. This adaptive ability allows adults and children to learn much more quickly and efficiently than we would if we had to learn everything first hand through trial and error (Bandura, 1971; Meltzoff, Kuhl, Movellan, & Sejnowski, 2009); and such observational learning has been shown to have neuro-biological foundations in human infancy (Meltzoff & Marshall, 2018). Bandura argued that viewing another person displaying "vocal, facial, and postural" cues in response to a stimulus (e.g., a person) can result in strong emotional biases toward or against that stimulus (Bandura, 1971, p. 13). For example, a young child who observes someone seeming warmer and friendlier when interacting with a member of one group relative to a member of another group may go on to develop biases based on this observation.

The Role of Nonverbal Signals in Shaping Group Biases

It has been theorized that nonverbal signals may be a means through which group biases are transmitted to other people (e.g., Bigler & Liben, 2007; Castelli, De Dea, & Nesdale, 2008; Dovidio, 2009; Platten, Hernik, Fonagy, & Fearon, 2010; Weisbuch & Pauker, 2011). Though the supposition that group biases can initially be acquired in this way has never actually been tested, prior work demonstrates that attitudes toward specific individuals can be acquired from observed nonverbal signals (de Rosnay, Cooper, Tsigaras, & Murray, 2006; Skinner, Meltzoff, & Olson, 2017). Children will draw inferences about who is nicer, smarter, stronger, and higher status based on the nonverbal signals that are displayed by specific individuals (e.g., Terrizzi, Brey, Shutts, & Beier, 2019) as well as the nonverbal

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signals that others direct toward target individuals (Brey & Shutts, 2015, 2018; Skinner et al., 2017).

There is also some evidence that these attitudes may generalize somewhat beyond the specific targets of nonverbal signals. In Skinner et al.'s (2017) study, preschool children who observed an adult display positive nonverbal signals toward one individual and negative nonverbal signals toward another subsequently demonstrated bias in favor of the target of positive nonverbal signals and also another individual who was described as that person's "best friend." Although in this experiment, the best friend was also a member of the same group as the target, the close connection indicated by being a friend of the target and the presumed similarities between best friends may explain the generalization rather than their mere shared group membership. Thus, the present work builds upon prior work suggesting that children can acquire attitudes toward individuals from nonverbal signals, to provide the first test that nonverbally acquired bias may generalize based upon mere group membership.

Although there have been no studies in either adults or children investigating whether exposure to valenced nonverbal signals can produce attitudes toward novel social groups, we know that attitudes toward familiar social groups that are often socially stigmatized (e.g., racial groups) can be influenced through exposure to valenced nonverbal signals directed toward an individual from that group (e.g., Castelli, Carraro, Pavan, Murelli, & Carraro, 2012; Weisbuch & Ambady, 2009). For example, White participants who viewed an experimental video in which a White actor displayed negative nonverbal signals toward a Black target subsequently expressed stronger anti-Black bias than those who viewed a video in which the White actor displayed positive nonverbal signals toward the Black target (e.g., Castelli et al., 2008, 2012; Willard, Isaac, & Carney, 2015). Relatedly, this type of nonverbal racial bias was recently identified on primetime TV shows in the United States, and evidence indicated that exposure to these shows increased adults' implicit anti-Black biases (Weisbuch, Pauker, & Ambady, 2009). In other words, nonverbal signals directed toward members of a societally stigmatized group can influence attitudes toward that group. However, whether this is evidence that bias toward groups can initially be acquired in this way is unclear because nonverbal signals were fully consistent with biases that were already present in participants' social environments. Thus, these studies do not demonstrate whether group biases can be initially acquired via nonverbal signals.

Differentiating Bias Acquisition From the Activation of Existing Societal Biases

The current research is uniquely differentiated from related prior work in that it focuses on the initial acquisition of new group-based bias, as opposed to shifting attitudes toward familiar social groups. Critically, evidence suggests that just because cues are capable of shifting or increasing an existing group bias does not mean that they are capable of creating a new group bias. For instance, prior work has shown that predominantly White and Asian American participants' pro-White/anti-Black biases were uninfluenced by observing valenced nonverbal signals directed toward a White target (Willard et al., 2015). In this study, nonverbal signals only influenced group biases when they capitalized on social biases (i.e., against Black people) that were preexisting within the cultural context. When nonverbal biases were counter to group biases preexisting in the cultural context (i.e., against White

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people), they had no impact on participants' group biases. Thus, the fact that biased nonverbal signals can inflame group biases that are preexistent within a cultural context is not necessarily evidence that biased nonverbal signals can create new group biases. The present experiments examine whether observers can acquire novel group biases from exposure to biased nonverbal signals directed toward individual group members.

Attitude Transfer

Evidence suggests that information about an individual often does not immediately generalize (at least not explicitly) to their broader group (Ranganath & Nosek, 2008; Ratliff & Nosek, 2011). Attitude transfer from an individual to a broader social group can also depend upon the observer's own group membership (e.g., Chen & Ratliff, 2015; Willard et al., 2015). For instance, Black participants who were induced to develop attitudes toward a racial ingroup member (a Black individual), who was depicted as a member of a novel social group (not based on race), did not generalize those attitudes to other members of the novel social group (Chen & Ratliff, 2015). In addition, if individuals are not perceived to be typical of their group, attitudes toward an individual may not generalize to their broader group (e.g., Cameron & Rutland, 2006; Pettigrew, 1979). For example, previous findings have shown that children do not generalize their attitudes about their own grandparents to old people in general, possibly because children do not perceive their grandparents to be typical old people (Newman, Faux, & Larimer, 1997). Together, this work suggests that although attitudes toward individuals can transfer to others in that individual's broader group, attitudes do not always generalize. Evidence that attitudes do not always generalize is particularly relevant to the case of nonverbal signals, given that they are less explicit than other common attitude inductions (e.g., verbal trait descriptions about an individual, such as "vicious" or "wonderful").

Rationale for the Current Experiments

In the current research, we extend the work of Skinner et al. (2017) to examine whether exposing children to biased nonverbal signals—appearing warmer and friendlier when interacting with one individual relative to another—will create group bias in favor of that individuals' larger social group or class. The proposed process of nonverbal group bias acquisition is hypothesized to operate across the life span, but we tested this question with preschool-age children because this is an age at which many social group biases appear for the first time (Skinner & Meltzoff, 2019). Our focus on bias in favor of one group relative to another is consistent with the assertion that discrimination in contemporary Western society more often results from group favoritism than group derogation or hostility (Greenwald & Pettigrew, 2014), and related evidence that (in)group favoritism seems to emerge earlier in development than (out)group derogation (e.g., Aboud, 2003; Buttelmann & Böhm, 2014). We examine whether disparities in nonverbal signals indicating warmth and friendliness—such as facial expression, tone of voice, and body posture—during social interactions can produce generalized group biases. We hypothesized that children would generalize the social biases learned from observing nonverbal signals directed toward individuals, resulting in group biases.

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In Experiment 1, we examined whether seeing one individual receive more positive nonverbal signals than another would lead preschool children to develop group bias in favor of that individual's small group of affiliates. Prior work had demonstrated that children generalized such biases to the targets' best friends (Skinner et al., 2017). Experiment 1 tested whether such biases would be generalized to the targets' groups of mere affiliates. In Experiment 2, we tested whether such biases would be generalized much more broadly, to large classes of people (akin to "those of the same nationality").

Across both experiments we used a constellation of measures—assessing affect, cognition, and behavior—in line with the tripartite perspective on group attitudes (Jackson et al., 1996). Relative liking (i.e., preference items) served as a measure of affect (consistent with the operational definition of affective attitude components provided by Ostrom, 1969). Children's imitation (cognition/ behavior) was thought to be relevant for a couple of reasons. First, imitation can provide an indication of who children think is more knowledgeable or prestigious (Chudek, Heller, Birch, & Henrich, 2012). Second, evidence suggests that across the life span people are more likely to imitate (e.g., Buttelmann, Zmyj, Daum, & Carpenter, 2013; Cvencek et al., 2011; Howard, Henderson, Carrazza, & Woodward, 2015; Kinzler, Corriveau, & Harris, 2011; Likowski, Mühlberger, Seibt, Pauli, & Weyers, 2008; Watson-Jones, Whitehouse, & Legare, 2016), as well as mentally simulate (Gutsell & Inzlicht, 2010), the actions of ingroup members and those whom they like. Examining who children choose to provide a resource (toy) to and who they choose to interact with provided an additional measure of behavior and also offered some indication of whether nonverbally acquired attitudes have the potential to result in group disparities. By measuring children's preferences, imitation, and behavioral intentions, we sought to ascertain whether children would acquire nonverbal signal-consistent group attitudes that were reflective of all three attitude components—affect, cognition, and behavior (e.g., Jackson et al., 1996; Ostrom, 1969).

Experiment 1

In Experiment 1, we sought to test whether exposing children to more positive nonverbal signals directed toward one novel individual (relative to another) could lead them to develop generalized biases in favor of the social group that the target of more positive nonverbal signals belongs to. We introduced preschool-aged children to two unfamiliar groups of people—members of one group were all dressed in the same color shirts and members of the other group were all dressed in shirts of a different color. Next, children observed a prerecorded interaction on video (drawn from Skinner et al., 2017), in which an adult actor displayed positive nonverbal signals toward a novel adult from one group and negative nonverbal signals toward a novel adult from another group. We used adult models to display the nonverbal signals because some evidence suggests that young children are more likely to conform to the attitudes and beliefs of adults than children (McGuigan & Stevenson, 2016) and ascribe more informative value to adults' gestures (Kachel, Moore, & Tomasello, 2018). After watching the video-recorded interaction, children answered a series of questions designed to assess their biases toward the adults in the video and each adult's social group.

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In line with recent calls for preregistration in the behavioral sciences (Finkel, Eastwick, & Reis, 2015; Lindsay, 2015; Nosek, Ebersole, DeHaven, & Mellor, 2018), we preregistered our experiment, hypotheses, and analyses. Our preregistered hypothesis was that after observing one (randomly assigned) individual receive more positive nonverbal signals than another individual, children would exhibit generalized bias in favor of people from the same social group as the person who received more positive nonverbal signals. The two adults to whom bias was directed were unfamiliar to the child, matched to each other in gender, race, and age, and the individual who received more positive nonverbal signals was randomly assigned. In this way, we tested for the acquisition of generalized group bias using novel groups for which the participants could not have had prior biases one way or another ("novel group design"). Through the peer review process, the reviewers recommended several changes to our preregistered analysis plan and therefore, for full transparency, the online supplemental materials includes analyses that follow the preregistration exactly, and the analyses reported in the main text adopts the modifications suggested in the review process.

Method

Participants.—A priori power analysis, carried out using G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007), indicated that to detect an effect size of $d = .45$ (the average effect size in previous work, Skinner et al., 2017) for the planned two-tailed t test, with an alpha of .05 and power = .80, a sample of 41 participants would be needed. We chose to recruit a substantially larger sample in step with recommendations indicating that larger samples are preferred to adequately power behavioral studies (e.g., Fraley & Vazire, 2014). We predetermined our stopping rule, which was defined as 80 participants (forty 4-year-olds, forty 5-year-olds; with equal numbers of boys and girls at each age) with complete data who passed the manipulation check. Our preregistered design and analysis plan is available on Open Science Framework: https://osf.io/92jxa/?view_only=2b265205af744de2bc173d03a118ba34. To reach our predetermined stopping point, we had to recruit 110 participants from the local community through the University of Washington Child Participant Pool, a computerized database of thousands of children in the greater Seattle area. Children most often enter this database at birth when their parent voluntarily returns a postcard mailed from the participant pool, but some participants join at later points via community event recruitment. Reviewers requested that we include all participants in analyses rather than only those who passed the manipulation check and we have done so in the main text. The online supplemental materials reports analyses including only those participants who were specified in the preregistration.

Fifty-five percent of the participants were boys (M_{age} = 58.02 months, SD = 5.29 months). They were identified by their parents as White (82%), multiracial (12%), Asian (4%), or another racial or ethnic group (2%). Although measures of socioeconomic status (SES) were not included in this experiment, our experience recruiting children from this subject pool indicates that participants tend to be from middle or upper-middle SES backgrounds with parents who tend to be college graduates. Children received a small toy in exchange for their participation. All testing was done in a laboratory at the university after the parent signed an informed consent form. The university's institutional review board approved all experimental procedures (IRB#: STUDY00004316). Data from Experiment 1 is available on

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Open Science Framework: https://osf.io/4dtb7/?view_only=4d0598ce6b3940cd85d01af7fb1b67d9.

Materials and procedure.—Children were seated at a table in front of a laptop computer and after providing verbal assent, they were told that they would be watching a video and then answering some questions. To allow children to become comfortable with pointing to items on the computer screen, the experimenter first asked children to point to a series of four colored shapes on the screen. If children failed to correctly identify the items, the experimenter (who was seated adjacent to the child) demonstrated the correct response. Once children had correctly identified the colors in the warm-up section, they moved on to the primary task of interest.

In the introduction to the primary task, children were presented with the still images of two adult women (hereafter referred to as the targets), one in a dark red shirt and the other in a black shirt, surrounded by smaller images of 15 other people who were members of each targets' group (indicated by shirt color). Adults were chosen to be the targets of nonverbal signals consistent with the idea that children may develop social biases from observing the nonverbal signals that adults demonstrate toward one another. After introducing children to the two color groups, all of the group members except the two targets disappeared from the screen and children were informed that they would be watching a video of those two people, and that they should pay close attention to see what happens. They were then exposed to a brief video (~30 s) in which a series of two different female adults (henceforth referred to as expressers) displayed—one after another—nonverbal biases toward the adult targets. Two expressers were included in the video to increase the impact of nonverbal signals, providing some indication of consensus in the nonverbal biases. Expressers wore different color shirts from the targets and one another (one wore orange and the other wore white) and their group membership was not mentioned by the experimenter. Stimulus videos were identical to those used in previous work (Skinner et al., 2017).

In each scene, one of these expressers was shown in the middle of the screen with the two targets flanking her on the left and right. Expressers greeted each target individually by saying "hi" and then one of the expressers produced two identical toys (colorful eggs) and provided each target with one of the toys. Throughout the video, the expressers displayed positive nonverbal signals (e.g., smiling, warm tone of voice, eagerly distributing the toy, leaning in) toward one of the targets and negative nonverbal signals (e.g., scowling, cold tone of voice, reluctantly distributing the toy, leaning away) toward the other target. Which target was nonverbally preferred (i.e., the target in the red shirt or the black shirt), which target was greeted first, and which side of the screen the preferred target appeared on were counterbalanced across participants. The targets responded identically (neutral-positive) whether they received positive or negative nonverbal signals and the exact same words were spoken to each target. All children watched the stimulus video twice before moving on to complete the first set of dependent measures. The videos of the stimulus conditions are available on the Open Science Framework: https://osf.io/4dtb7/?view_only=4d0598ce6b3940cd85d01af7fb1b67d9.

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Experimenters who conducted the study were trained to maintain neutral affect during stimulus presentation and either look down at the experiment sheet or at the computer screen, so as to avoid making direct eye contact with the child during the video (even if the child turned to look at them). Whenever the experimenters gestured to the targets/groups on the screen they did so in counterbalanced order, such that (depending upon counterbalance condition), they always pointed to the target on the left first and then the target on the right (or vice versa). If children asked any questions about the video (e.g., “does she not like her?”), experimenters were trained to respond with “I don’t know” and then redirect the child back to the experimental protocol. Thus, experimenters were trained to respond in as standardized a way as possible. This approach of having an experimenter seated with children throughout the experiment is common in research with young children (e.g., Castelli et al., 2008; McLoughlin & Over, 2017; Olson et al., 2011; Schug, Shusterman, Barth, & Patalano, 2013; Skinner et al., 2017).

Dependent measures assessing individual social bias.—The individual social bias items were included to assess the replicability of previous findings (Skinner et al., 2017).

Social preference.—Children were first presented with a still image of the targets from the video and asked to point to the target they liked best.[1] The experimenter scored whether children chose the target who received more positive nonverbal signals.

Behavioral intentions (resource provision).—Next, children were presented with a stuffed toy and asked to point to the target that they thought the experimenter should give the toy to, as a means of assessing resource provision to the targets. The experimenter scored whether children chose the target who received more positive nonverbal signals.

Imitation (verbal).—Participants were presented with another brief video (~30 s) of the same individuals. In this video, after greeting the targets (repeating the nonverbal signals displayed in the first video), one of the expressers picked up a novel object (a rectangular wooden block with holes in it), inquiring about what it is. In counterbalanced order, each of the targets provided a linguistic label for the object (“snegg” or “hoon”). After playing the video twice, the experimenter physically produced the object that had been shown in the video and repeated the labels provided by each of the targets. Then the experimenter asked whether the child thought that the object was a snegg or a hoon (order counterbalanced). If alternative responses were provided, children were prompted to indicate who they thought was right about the object label (by pointing). The experimenter scored whether children chose the label provided by the target who received more positive nonverbal signals.

Dependent measures assessing generalized group bias.—After completing the three dependent measures assessing individual social bias, children moved on to complete the three dependent measures assessing generalized group bias. Items were presented in the order in which they are listed unless otherwise stated. Recent work indicates that using images of individuals to assess attitudes about an entire social group is not ideal given that

[1]Children were also asked whether they liked that target “a little bit better” or “a lot better,” though we did not include this measure in our preregistered analysis plan and therefore did not include it in our analyses.

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such measures can be highly dependent upon idiosyncratic features of individual exemplars (Cooley & Payne, 2017), thus most of our measures focus on generalization to the group overall rather than generalization to individual group members.

Social preference.—For the group preference measure, the experimenter presented the image of the targets with their groups (from the introduction to the primary task at the beginning of the experiment), asking children to point to the group that they liked best. The experimenter scored whether children chose the group whose member received more positive nonverbal signals.

Imitation (action).—Next, participants were presented with a small purple cone and the experimenter indicated that "maybe the people from these groups know what to do with it," before playing videos of a member of each group (not the targets) demonstrating a novel action with the cone. One individual turned it over and pretended to drink out of it and the other put it on her head (due to an error in counterbalancing a member of the nonverbally preferred target's group demonstrated the hat action in five out of the eight counterbalance conditions, rather than four). Videos were played sequentially in counterbalanced order although they were presented next to each other on the computer screen. After playing each video twice the experimenter handed the cone to the participant, requesting that they demonstrate what to do with it. Participants who were reluctant to perform an action with the object were prompted to describe what to do with it, and if they were still reluctant to respond they were asked to point to the person (from the videos) who "knows what to do with it." If alternative responses were provided, children were prompted to indicate which of the two demonstrated actions was most appropriate. The experimenter scored whether children chose the action demonstrated by the group (representative) whose member received more positive nonverbal signals.

Behavioral intentions (to interact).—Participants were informed that the experimenter needed to briefly do something in another room and that a member of one of the groups would come in to play with the child while the experimenter was out. Children were then given the opportunity to select which group they would like their new interaction partner to come from, by pointing to one of the two groups presented on the screen. The experimenter scored whether children chose the group whose member received more positive nonverbal signals. The experimenter then stepped out of the room, returning seconds later to indicate that nobody from the chosen group was available, and that therefore the activity would now be complete.

Manipulation check.—Children were shown an image of the two targets and one of the expressers, and asked which of the two targets the expresser liked the best. The manipulation check item was presented immediately before the measure of behavioral intentions to interact, which was framed as being an entirely different activity, limiting our ability to place the manipulation check at the very end of the experiment. When we designed the experiment, we intended to use this item as criteria for excluding children (as noted in our preregistration). However, the peer review process included the request that we report the analyses using all participants—which is what we report here. Of the 110 children recruited,

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93 passed the manipulation check (85%, significantly more than chance, $p < .001$). See the online supplemental materials for full results reported exactly according to our preregistration.

Results

Analysis approach.—We initially preregistered plans to conduct *t* tests as the primary analyses because that is what was done in Skinner et al. (2017). However, in the intervening time we became aware of a preferred method for dealing with the nonnormal distribution of the data. Here we report results using the more appropriate multivariate logistic multilevel modeling approach. Using SAS 9.4M5 PROC GLIMMIX, we estimate the probability of selecting the target of positive nonverbal signals or their group (across the six binary dependent measures). Fixed effects of type of bias (individual or group) and type of item (preference, imitation, behavioral intentions) were also included in the model, as well as a random intercept for participants[2] (statistical syntax for the multivariate logistic multilevel model is provided in the online supplemental materials). This allowed us to test whether responses to individual social bias items significantly differed from responses to generalized group bias items and whether participants' responses varied across the different types of measures (as some were traditional measures of group bias and others, such as imitation, were related but distinct constructs). This approach also allowed us to retain participants who provided incomplete data and control for family wise Type I error, which is inflated when separately analyzing two sets of related dependent variables (e.g., individual and group-level bias). Because there is presently no consensus on how to appropriately calculate standardized effect sizes in multilevel models (Peugh, 2010), we provide exact p values, odds ratios, and 95% confidence intervals (CI) for the odds ratios. Results following the preregistered analysis plan are reported in the supplement, all statistical inferences remained the same regardless of which statistical approach was used.

Children did not show significant evidence of a t-shirt color preference ($B = 0.22$, $SE = 0.12$), $t(109) = 1.71$, $p = .090$, odds ratio [OR] = 1.22, 95% CI [0.97, 1.55]. The percentage of participants who showed nonverbal signal-consistent biases on each specific item are provided in Table 1.

Individual social bias and generalized group bias.—We predicted that overall, children would exhibit bias in favor of the individual who received positive nonverbal signals in the stimulus videos and generalize their attitudes to the targets' larger groups. As predicted, results indicated that children selected the target of positive nonverbal signals (or their group) at a rate significantly greater than chance (probability = 0.58, $B = 0.33$, $SE = 0.12$), $t(109) = 2.82$, $p = .006$, $OR = 1.38$, 95% CI [1.10, 1.74]. Consistent with the advice of Bolger, Stadler, and Laurenceau (2012), we conducted Monte Carlo simulations on this model to estimate its power (using the "simr" package in R; Green & MacLeod, 2016). These simulations indicated that Experiment 1 was well-powered (82.40%, 95% CI [79.90, 84.71]) to detect the observed effect of nonverbal signals. There was not a significant effect

[2]The model did not converge when type of bias was included as a random effect across participants, and the estimated G matrix was not positive definite when a random intercept of item was included in the model. Degrees of freedom vary as a function of the random effects included in the model.

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of type of bias, indicating that participants' level of individual social bias and generalized social group bias did not differ in magnitude ($B = 0.14$, $SE = 0.17$), $t(508) = 0.79$, $p = .428$, $OR = 1.15$, 95% CI [0.82, 1.62]. There also was not a significant effect of type of item, such that responses to the preference, imitation, and behavioral intention measures did not significantly differ from one another, $F(2, 508) = 0.61$, $p = .545$.

Discussion

The results of Experiment 1 replicated prior work indicating that following exposure to biased nonverbal signals directed toward two targets, children will tend to favor the target of more positive nonverbal signals relative to the target of more negative nonverbal signals (Skinner et al., 2017). Moreover, we extended this work, confirming our preregistered hypothesis that exposure to biased nonverbal signals would result in generalized social group bias. These biases went beyond basic preferences, such that children were also more likely to imitate and showed a behavioral preference toward (were more likely to want to interact with) those in the target of positive nonverbal signals' group. Results also indicated that children's generalized bias in favor of people from the same social group as the person who received more positive nonverbal signals was no weaker than their bias in favor of the target of positive nonverbal signals herself.

A limitation of this experiment is that although children were asked about their attitudes toward the groups, it is possible that children were primarily basing their responses on their biases toward the individual targets of nonverbal signals, who were in the schematic when measuring group preference and behavioral intentions to interact. In Experiment 2 we directly addressed this issue and also modified the design of Experiment 1 in ways that allow even stronger inferences about children's generalization of nonverbally acquired bias to large social groups.

Experiment 2

In Experiment 2, we sought to test whether exposure to biased nonverbal signals could lead to the initial acquisition of social group biases that generalize to entire classes of people, such as people from a given country. Previous findings indicate that preschool children show biases based on geographic origin (e.g., McLoughlin & Over, 2017; McLoughlin et al., 2018) and understand that people from the same place often share common characteristics, such as language and accent (DeJesus, Hwang, Dautel, & Kinzler, 2018; Hwang & Markson, 2018; Weatherhead, White, & Friedman, 2016). Furthermore, work on children's conceptions of nationality (which are not yet constructed in the mature adult manner) indicate that preschool children of the age tested here are particularly likely to construe it as biological and fixed (Hussak & Cimpian, 2019).

We tested whether children generalized their attitudes beyond the specific targets shown, to others from the same geographic location, by presenting them with images of two fictional places (simple "maps") which were accompanied by a new set of residents each time the maps were presented. Thus, over the course of the experiment, participants were exposed to more than 65 people from each place. Cross-cultural evidence indicates that most children have at least a primitive understanding of simple maps by the age of four (Blades et al.,

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1998) and fictitious national groups, similar to those used here, have previously been used in work examining the development of intergroup biases among children (Verkuyten & De Wolf, 2007). Throughout the experiment, we avoided linguistic references to the people as "groups" (which may directly convey affiliation); we simply referred to them as being from one place or the other place. Thus, the only properties linking the targets to others of their "nationality" was the description that they were from the same place and their featural similarity (i.e., they wore the same color shirt; clothing often marks national/cultural groups). Children were then exposed to nonverbal signals directed toward a single individual from each place. The recipients of nonverbal signals were never presented with anyone else from that place, but they were referred to as being from one place or the other, for example, from "Redvale." Finally, children were asked a series of questions to assess their biases in favor of the individuals and, more generally, people from each of the places. Our preregistered hypothesis was that preschool-age children would form biases in favor of people from one place relative to another place, following a single incident of exposure to biased nonverbal signals directed toward just one representative of each place.

Method

Participants.—We used the same criteria as Experiment 1 for setting our sample size. To reach a sample size of 80 participants who completed all items and passed the manipulation check (our predetermined stopping rule), we had to recruit 111 children from the same local community database as Experiment 1. Children who previously participated in similar studies (e.g., Experiment 1, pilot studies, etc.) were not eligible to participate in Experiment 2. Participants were 55% boys (M_{age} = 58.21 months, SD = 6.25 months) and were identified by their parents as: White (70%), multiracial (18%), Asian (6%), Latinx (2%), or Black (1%); and three parents declined to identify their child's race. Children received a small toy in exchange for their participation. The university's institutional review board approved all experimental procedures. Our preregistered design and analysis plan is available on Open Science Framework: https://osf.io/dtj5m/?view_only=912716abd06d40eeaae2eaec3c7e4cb8 and analyses that are exactly consistent with that plan are available in online supplemental materials. In the main text we modified the analysis plan in line with the requests received in the peer review process. Data from Experiment 2 is also available on Open Science Framework: https://osf.io/d7jrt/?view_only=007611529da74fc3bdb0519401a934e2.

Materials and procedure.—The assent and warm-up procedures were identical to Experiment 1. Following the warm-up questions, children were presented with images of two places, referred to as *Redvale* and *Blackpine* (order of presentation and side on the computer screen were counterbalanced across participants). Next, they were presented with images of 16 people who live in Redvale and 16 people who live in Blackpine superimposed on the images of the places (see Figure 1). Children seemed to appropriately interpret the concept of people coming from different places as evidenced by occasional comments referring to their own and other cities, states, and countries, such as, "I live in Seattle" or "Where is Washington?" when presented with the maps of the two places. All residents of Redvale were dressed in dark red shirts and all residents of Blackpine were dressed in black shirts, and this detail was explicitly pointed out to children during the introduction. The

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color of the shirts was the only physical feature that differentiated residents of Redvale from residents of Blackpine. Next, children were informed that they would be watching a video of someone from Redvale and someone from Blackpine and that they should pay close attention to see what happens. They were then exposed to the same video of nonverbal bias used in Experiment 1, before completing the first set of dependent measures. The PowerPoint slides used for stimulus presentation are available on Open Science Framework: https://osf.io/d7jrt/?view_only=007611529da74fc3bdb0519401a934e2.

Dependent measures assessing individual social bias.—The measures of social preference, behavioral intentions (resource provision), and imitation (verbal) were identical to Experiment 1. We also added an additional measure of imitation to increase the number of measures assessing responses to the targets of nonverbal signals to four.

Imitation (action).—For this additional action imitation item, the experimenter produced a novel object (a cylindrical metal container) and told children that she did not know what to do with it but that maybe the people from the videos did. The experimenter then played videos of each target demonstrating a novel action with the object (rolling it across the table or tapping on it like a drum). Videos were played sequentially in counterbalanced order and presented next to each other on the computer screen. After playing each video twice the experimenter asked children, “What do you think I should do with it?” If children were reluctant to perform an action they were prompted to point to the person who “knows what to do with it.” The experimenter scored whether children selected the action demonstrated by the individual who received more positive nonverbal signals.

Dependent measures assessing generalized group bias.—After children completed the four dependent measures assessing individual social bias, they completed four dependent measures assessing generalized group bias in the order listed below (unless otherwise stated).

Social preference.—The experimenter presented the images of the two places with 16 novel residents of each place superimposed on top of the place. Children were asked to indicate who they like better “people from Redvale or people from Blackpine” (order counterbalanced). The experimenter scored whether children pointed to the group whose member received more positive nonverbal signals.

Imitation (action).—Next, the experimenter produced another novel object (a gray tube) and indicated that she was not sure what to do with it, but that the “people from Blackpine or Redvale might know”—pointing to each place (a new set of 16 residents superimposed on each) as she spoke. The experimenter then played videos of someone from each place (not the targets) demonstrating a novel action with the object (putting it up to her eye like a telescope or blowing through it). Videos were played sequentially in counterbalanced order, although they were presented next to each other on the computer screen. After playing each video twice, the experimenter asked children which action was the correct use of the object. The experimenter scored whether children chose the action (by either pointing to the video or miming the action) demonstrated by the individual from the same place as the target who received more positive nonverbal signals.

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Imitation (verbal).—We added an additional measure (of verbal imitation) to increase the number of measures assessing group generalization to four. For this item, the experimenter produced a metal clip, informing children that she was not sure what it was called, but that perhaps the people in Redvale or Blackpine had a name for it—returning to the images of the two places and a new set of 16 residents superimposed on each place. The experimenter then asked what they call it, in Redvale (order counterbalanced) before pressing a button on the image of Redvale, which played a recording of many voices in unison saying, "that's a chab" or "that's a tark" (as if a chorus was all speaking together, to communicate the group effect). Readers can hear these audio recordings by accessing the experimental materials online. Then, the same was done with Blackpine, and the voices in unison provided the alternative label (chab or tark). After playing each audio recording twice, the experimenter reminded children what people in each place called the object and asked whether they thought the object was a chab or a tark. The experimenter scored whether children chose (by saying it out loud or pointing to the group that provided it) the label provided by people from the same place as the target of more positive nonverbal signals.

Behavioral intentions (to interact).—Finally, we assessed children's behavioral intentions to interact with people from each place. Because some children in Experiment 1 were frightened by the prospect of the experimenter leaving the room and a stranger coming in, we changed our measure of behavioral intentions for Experiment 2 to something less threatening (having another adult join the activity, rather than replace the current experimenter). Children were presented with the images of the two places (with a new set of 16 residents superimposed on each place) and informed by the experimenter that a third person was needed for the next activity. They were told that they could choose whether someone from Redvale or Blackpine (order counterbalanced) came to join them for the activity. The experimenter scored whether children pointed to the class of people whose member received more positive nonverbal signals. After the child made their choice the experimenter left the room, returning seconds later to indicate that nobody from the chosen place was available, therefore the activity would now be complete.

Manipulation check.—The manipulation check was administered immediately before the measure of behavioral intentions to interact and was identical to the manipulation check employed in Experiment 1. A total of 84 children (76% of the sample) correctly identified the target preference depicted in the stimulus video, which was significantly greater than chance, $p < .001$. As with Experiment 1, we report the results for all children whether or not the passed the manipulation check in the main text, and the results for only those who passed the manipulation check (as per the original preregistration) in the online supplemental materials.

Results

Analysis approach.

Again, we used a multivariate logistic multilevel model to predict the probability of selecting the target of positive nonverbal signals or their group (across the eight binary dependent measures). Fixed effects of type of bias (individual or group) and type of item (social preference, action imitation, verbal imitation, behavioral intentions) were included, as well

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as a random intercept for participants[3] (statistical syntax provided in the supplement). Results according to the preregistered analysis plan are reported in the supplement, statistical inferences remained largely the same regardless of approach (although the effect on the generalized prejudice measure was $p = .052$).

Children showed no evidence of a t-shirt color preference ($B = -0.09$, $SE = 0.13$), $t(110) = -0.74$, $p = .462$, $OR = 0.91$, 95% CI [0.71, 1.17]. Percentage of participants who showed nonverbal signal-consistent biases on each specific item are provided in Table 1.

Individual social bias and generalized group prejudice.—We predicted that children would exhibit bias in favor of the individual who received positive nonverbal signals in the stimulus videos and generalized group bias in favor of people from the same place as the individual who received more positive nonverbal signals. As predicted, results indicated that children selected the target of positive nonverbal signals (or their group) at a rate significantly greater than chance (probability = 0.59, $B = 0.37$, $SE = 0.13$), $t(107) = 2.94$, $p = .004$, $OR = 1.45$, 95% CI [1.13, 1.87]. We ran Monte Carlo simulations on this model to estimate its power in the same way as described in Experiment 1. These simulations revealed that Experiment 2 was well-powered (84.60%; 95% CI [82.21, 86.78]) to detect the observed effect of nonverbal signals. There was not a significant effect of type of bias, indicating that participants' individual social bias and generalized group bias did not differ in magnitude ($B = 0.23$, $SE = 0.18$), $t(107) = 1.28$, $p = .202$, $OR = 1.26$, 95% CI [0.88, 1.79]. There also was not a significant effect of type of item, such that responses to the preference, action imitation, verbal imitation, and behavioral intention measures did not significantly differ, $F(3, 640) = 1.95$, $p = .121$.

Discussion

Experiment 2 confirmed our preregistered hypothesis that exposure to biased nonverbal signals could produce largescale group biases in favor of entire classes of people. Preschool-age children formed group biases in favor of people from one place relative to another place following a single incident of exposure to biased nonverbal signals directed toward just one representative of each place. Critically, these biases went beyond simply preferring people from one place relative to the other. Our findings indicated that children were also more likely to imitate the words and actions demonstrated by the target of positive nonverbal signals' group and preferred to interact with members of the target of positive nonverbal signals' group. Thus, children showed an overall tendency, across a constellation of dependent measures, to favor those of the same nationality as the target of positive nonverbal signals.

The current experiment replicates and greatly extends prior work (Skinner et al., 2017) indicating that children will tend to favor a target who receives more positive nonverbal signals from others to another target who receives more negative nonverbal signals. We also found that participants' individual target biases did not differ in magnitude from their social

[3]In this experiment the estimated G matrix was not positive definite when a random intercept of item was included in the model, however we were able to include (the model converged) type of bias as a random effect, thus the effect of type of bias was allowed to vary across participants.

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group biases. This result is particularly noteworthy because: (a) the specific targets of nonverbal signals never appeared with anyone else from their place of origin and (b) over the course of the experiment children were exposed to 65 different individuals from each place. Thus, children generalized their attitudes beyond the initial target and close others, resulting in generalized group bias in favor of one entire group or "nationality" of people over another.

It is worth noting that children responded to questions about their individual target biases prior to responding to the questions about their social group biases. Although this approach of assessing attitudes toward individual group members before assessing overall group attitudes is not uncommon in social psychological research (e.g., Batson, Chang, & Rowland, 2002; Batson et al., 1997), this leaves open the possibility that asking children about their attitudes toward specific targets may have impacted their responses to the generalized group bias items. Pearson correlation analyses suggested that the number of times the specific target of positive nonverbal signals was selected was only moderately correlated ($r = .34$) with the number of times that their group was selected, and we observed no evidence that children's biases systematically increased (or decreased) with subsequent items, as would be expected if there was a general tendency to increase or decrease bias across trials. Nonetheless, it would be worthwhile for future studies to examine this question without first assessing attitudes toward the targets (or counterbalancing the order in which these items are presented). One other procedural concern with this study might be that although the original targets of positive and negative nonverbal signals were not present on the screen for the group bias questions, children may have incorrectly inferred that they could select the original target for the behavioral intentions (to interact) item, driving this result. Future work might better deal with this concern by stating directly that only the people who are present on the screen can be selected.

General Discussion

Across two experiments we found that observation of others' biased nonverbal signals can result in the acquisition of novel biases in favor of certain groups and classes of people relative to others. These findings support our prediction that group biases can spread through "third-party" observations of others' interactions (Repacholi, Meltzoff, Toub, & Ruba, 2016). That is, consistent with prior research on evaluative conditioning (e.g., Hofmann et al., 2010) and theorizing about the power of nonverbal signals (Bandura, 1971; Bigler & Liben, 2007; Castelli et al., 2008, 2012; Dovidio, 2009; Platten et al., 2010; Weisbuch & Pauker, 2011), our work actually tests experimentally whether seeing someone display more positive nonverbal signals toward a member of one group (relative to another) can lead observers to develop bias in favor of that individual's larger social group or class.

The current findings are the first to demonstrate that nonverbal signals can produce novel biases that generalize to entire groups and classes of people. Much like classes of people that exist outside of the lab (e.g., people from a particular nation or of a certain ethnicity), the two fictitious social groups that children were exposed to in Experiment 2 differed "culturally"—in clothing, dialect (object labels), and the manner in which they used objects. These findings suggest that nonverbal signals can produce generalized group biases that

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shape children's group preferences, their behavioral intentions toward groups, and their willingness to adopt their cultural practices (i.e., imitation), reflecting all three attitude components—affect, cognition, and behavior (Jackson et al., 1996; Ostrom, 1969). Thus, the observation of nonverbal signals is not limited to exacerbating group biases that are preexisting within the cultural context (Castelli et al., 2008, 2012; Weisbuch et al., 2009; Willard et al., 2015); rather, our findings demonstrate that nonverbal signals can lead to the acquisition of generalized group biases (though further work is necessary to assess the degree to which these effects generalize to the complexity of real-world contexts).

Theoretical Considerations

Our design was built upon the principles of DIT (Bigler & Liben, 2006, 2007). Our experimental paradigm presented groups as perceptually discriminable (based on shirt color), while explicitly labeling and referring to individuals based on their group membership (e.g., being from Redvale) and physically segregating individuals based on shirt color (implicitly reinforcing the relevance of group membership)—features that DIT emphasizes as signaling that a group distinction is meaningful. Thus, in line with DIT, we had multiple factors that are thought to establish the psychological salience of person attributes, which presumably led children to categorize individuals by group. Having established the salience and relevance of these groups, the information provided by the expressers' nonverbal signals then provided valenced associations upon which a group bias could be built.

The present work focused on the preschool years because this is the age at which children most typically begin to develop racial and ethnic biases (Dunham et al., 2008). Prior research indicates that children already show national ingroup favoritism by preschool age (e.g., McLoughlin & Over, 2017; McLoughlin et al., 2018). The current findings extend upon this work, indicating that children of this age will also develop biases in favor of national groups that they are not members of. Nonetheless, we must be cautious about generalizing these findings to children at other ages. Preschool children have a tendency to focus on one salient concrete feature of something at the expense of others—known as centration (Piaget, 1965), which may have led them to come to more extreme conclusions from observed nonverbal signals. Relatedly, given evidence that young children are prone to "essentializing" nationality (Hussak & Cimpian, 2019; see also Davoodi, Soley, Harris, & Blake, 2019), our preschool-age participants may have been particularly likely to generalize attitudes toward unfamiliar individuals to their national group.

Previous research with adults had shown that attitudes toward individuals do not always generalize (e.g., Chen & Ratliff, 2015; Newman et al., 1997; Pettigrew, 1979), nor do they always immediately impact explicit attitudes toward the group (e.g., Ratliff & Nosek, 2011). The fact that attitudes toward the targets did immediately transfer to their groups in the current studies may have to do with the age of our participants; young children may be more prone to immediately generalize their attitudes than adults. Furthermore, our emphasis on the groups, without providing any individuating information about the targets, may have led to more rapid attitude generalization (Ranganath & Nosek, 2008). It is also possible that the subtler cues (nonverbal signals vs. describing targets as "vicious" or "wonderful") presented

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in the current experiments impacted attitude transfer. Evaluative conditioning work indicates that associations are most likely to develop when valenced stimuli are not extremely evocative (i.e., subtler), as they are more likely to result in source confusion (Hofmann et al., 2010; Jones, Fazio, & Olson, 2009). To the extent that nonverbal signals elicit source confusion (e.g., Were the expressers less friendly toward one of the targets or was one of the targets less friendly toward the expressers?), they may lead to more rapid attitude generalization.

These findings are also relevant to work on stigma by association, the finding that a companion of an individual from a stigmatized social group will often be imbued with some of that stigma—negatively impacting perceptions of the companion (e.g., Goffman, 1963; Pryor, Reeder, & Monroe, 2012). Other work has shown that the positivity associated with a group (e.g., attractive women) can result in more positive evaluations of their associates (e.g., a man who is observed in their company; Rodeheffer, Proffitt Leyva, & Hill, 2016; Sigall & Landy, 1973). Thus, this line of work has largely focused on how attitudes associated with a specific social group might color attitudes toward a nonmember of the group, who is nonetheless associated with the group in some way (Neuberg, Smith, Hoffman, & Russell, 1994). The current work provides suggestive evidence that this process could also work in the opposite direction. That is, attitudes toward individuals colored attitudes toward the entire social group that they are associated with.

We now wish to address several theoretical issues and more speculative implications of this work.

Imitation.—Though not a direct measure of bias, the inclusion of dependent variables involving imitation has some interesting implications. Previous work has suggested that merely imitating someone can produce positive attitudes toward them (Adank, 2015; Adank, Stewart, Connell, & Wood, 2013). That is, engaging in imitative behavior may have implications for attitude formation. Therefore, it is notable that in these studies we observed preferential imitation (on the action and verbal imitation measures). Even more speculatively, other child peers may observe children's imitation in the situations modeled in the current experiments, perceiving it as affiliative (Powell & Spelke, 2018), which could in turn lead them to develop their own biases in the same direction. If these processes occur—something future work might investigate—they may contribute to the spread of bias across individuals, classrooms, and neighborhoods.

Behavioral intentions.—The finding that children's behavioral intentions reflected bias may also have broader implications for the reification of group biases. By choosing to interact with the target of positive nonverbal signals' group, children would be affording themselves more opportunities for contact with members of that group (and fewer opportunities for contact with the target of negative nonverbal signals' group). Given evidence that intergroup contact is associated with reductions in bias (Pettigrew & Tropp, 2006; Tropp & Prenovost, 2008), the choice to interact with members of the target of positive nonverbal signals' group could also reinforce biases in favor of that group. Evidence from the other behavioral intention measure (resource provision) further illustrates the ways in which such biases may go on to impact the targets of nonverbal signals (and their groups),

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given that even small advantages that are afforded to a group can accumulate over time to result in group disparities (Valian, 1998).

Evidence that children can form new group biases and extend them to whole classes of people based on mere observation is important for theory and practice, inasmuch as the brief nonverbal manipulations used in the current experiments are perhaps a sliver of what people are exposed to in the real world. In everyday social environments, people may be exposed to incidents of nonverbal bias demonstrated by several different familiar people toward multiple targets from a particular social group. For instance, children may observe family members, teachers, and acquaintances demonstrating nonverbal signals toward multiple individuals of a particular race, ethnicity, or national origin that are slightly colder than those that they demonstrate toward others. The fact that in our current experiments children had the capacity to acquire new group biases raises the question of how these laboratory results relate to everyday experiences. On the one hand, this phenomenon may be more extreme outside the laboratory. Thus, although the effects observed in the current experiments are somewhat small, they may result in much stronger group biases when accumulated over time (Abelson, 1985).

On the other hand, there are aspects of the experimental context that likely heightened children's tendencies to rapidly form biases. For instance, we are not always attending to others' interactions, a necessary requirement to learn from their nonverbal signals. We also typically have more information about and experience with the groups in our social environment than children had in these experiments. One's own personal experiences (intergroup contact; Allport, 1954) with members of other groups may override the impact of biased nonverbal signals. How these various factors play a role in fostering bias will need substantial additional investigation before we can speak to how representative the current work is.

Limitations and Future Directions

There are several features of the design that were picked strategically for this study but that can also be considered as limitations, such as always responding the individual items before the group items, using t-shirts to signal groups, using a constellation of items to assess bias (i.e., preference, imitation, behavioral intentions), and having an experimenter accompany child participants while they responded to dependent measures. Future work might vary these different features to examine how they relate to observed effects.

Another limitation of the current research is that these experiments cannot separate biases in favor of the target of positive nonverbal signals' group from biases against the target of negative nonverbal signals' group. We only know that the former was favored relative to the latter. However, group preferences of this kind can result in discrimination and group disparities, even in the absence of negative attitudes (Greenwald & Pettigrew, 2014). Relatedly, we cannot differentiate between the effects of positive nonverbal signals and negative nonverbal signals, although recent work indicates that both positive and negative nonverbal signals can shape attitudes when contrasted with neutral nonverbal signals (Brey & Shutts, 2018). Our design may also have forced participants' hands, by providing no neutral option. Dichotomous options can exacerbate what is actually a mild preference,

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making a preference appear much stronger than it is. Nevertheless, it is important to point out that there are also many situations that require the selection of one person (or several people) over others (e.g., selecting a class partner or teammate).

Much remains to be seen about how the effects of nonverbal signals operate outside the lab. The current findings demonstrate that biases can be acquired this way, but not that they typically are acquired this way. For instance, our laboratory studies involved rather obvious nonverbal signals, whereas the biased nonverbal signals that children are exposed to in their natural social environments may be subtler and situated within a complex flow of events. Whether children would respond to more subtle nonverbal signals in an experimental paradigm, like the one used here, is unknown. Also, we do not know how long these group biases last. Presumably the effect of a single incident of exposure to nonverbal bias would be time delimited, but it remains to be tested how quickly biases fade and whether, in the real world, multiple exposures to nonverbal bias demonstrated by several individuals create more durable group biases. Future research could also assess the cumulative effects of subtle, everyday incidents of nonverbal bias modeled by trusted individuals (e.g., parents and teachers) over time, in real-world settings. People are more likely to simulate and adopt the attitudes of close others (Smith & Mackie, 2016)—thus they might be particularly likely to absorb the nonverbal biases of family members and close friends.

Although the current study focused on preschool children's acquisition of generalized group biases from adult models, children may also acquire biases from their peers. The influence of peers becomes increasingly large as children grow beyond the preschool period (Ausubel, Montemayor, & Svajian, 1977; Kandel & Lesser, 1972). Relatedly, it may also be important to consider how those who pick up generalized group biases from observations of others may go on to demonstrate biased nonverbal signals themselves, and that this could perpetuate biases. Among adults, implicit biases have been shown to predict discrepancies in the nonverbal signals they directed toward members of different groups (Kurdi et al., 2019; Oswald, Mitchell, Blanton, Jaccard, & Tetlock, 2013). Moreover, once social biases have been established, people are known to selectively seek out, attend to, remember, and propagate information that is consistent with their biases (Dunham et al., 2011; Nickerson, 1998; Over, Eggleston, Bell, & Dunham, 2018; Schug et al., 2013). Further research that examines the nonverbal signals of those who have acquired biases in this way will contribute to a more comprehensive understanding of how generalized group biases are established, transmitted, and maintained.

Conclusions

The findings presented here show that new group biases can be created through mere observation of biased nonverbal signals demonstrated by others. Nonverbal signals are abundant in our social environments and evidence suggests that they tend to be difficult for people to control (Weisbuch & Ambady, 2008). Our findings suggest that even limited exposure to biased nonverbal signals (directed toward a single group member) can produce generalized group biases. Taken together with evidence that group biases often "leak out" through nonverbal behavior (e.g., Dovidio, Kawakami, & Gaertner, 2002; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Richeson & Shelton, 2005) outside of

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individual's conscious awareness and deliberate control, we speculate that exposure to biased nonverbal signals may be an important process through which group biases are rapidly and unintentionally transmitted within the culture. Moreover, our findings indicate that this process of nonverbal group bias acquisition is already in operation in early childhood, prior to the start of first grade.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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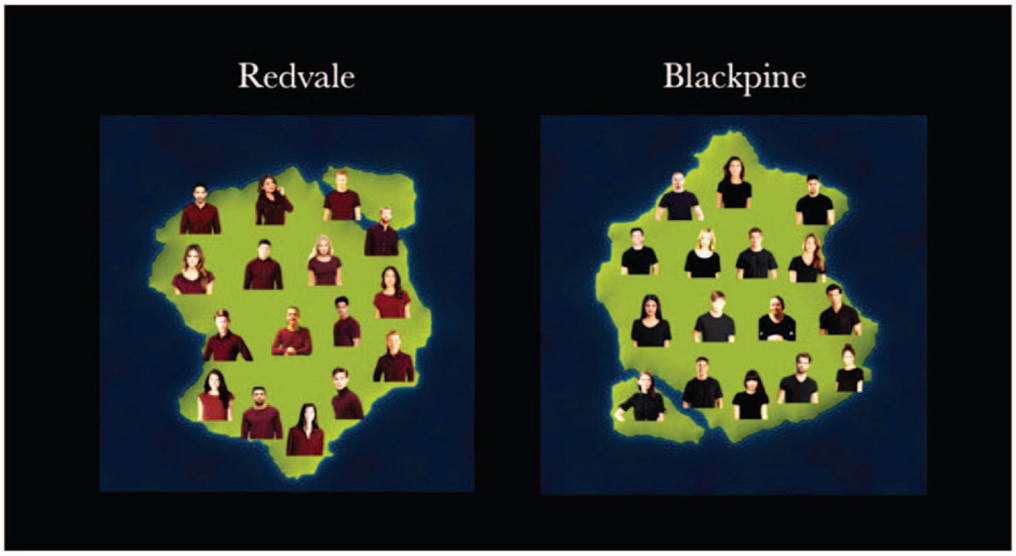

Figure 1.
Example image from Experiment 2, depicting the two fictitious places (Redvale and Blackpine) and a sample of the residents of each place.

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Table 1

Percentage of Children Who Showed Nonverbal Signal-Consistent Bias on Each Item

	Social preference		Imitation (action)		Imitation (verbal)		Behavioral intentions	
Experiment	**Individual**	**Group**	**Individual**	**Group**	**Individual**	**Group**	**Individual**	**Group**
Experiment 1	55% (*n* = 104)	53% (*n* = 105)	—	55% (*n* = 102)	62% (*n* = 105)	—	59% (*n* = 108)	59% (*n* = 97)
Experiment 2	63% (*n* = 110)	48% (*n* = 108)	58% (*n* = 108)	52% (*n* = 106)	66% (*n* = 107)	61% (*n* = 106)	52% (*n* = 111)	58% (*n* = 106)

Note. Reported *n* for each item indicates the number of children who responded to each specific measure.

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