Mimicking Others' Nonverbal Signals is Associated with Increased Attitude Contagion

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Abstract

Observing nonverbal signals being directed toward unfamiliar individuals is known to influence attitudes and behavior toward those individuals. Specifically, observing biased nonverbal signals in favor of one individual over another can produce nonverbal signal-consistent attitudes among preschool children. Research has also shown that people have a tendency to mimic the behavior of others. The phenomenon of mimicking another's nonverbal emotional response and "catching" their emotions has long been established. However, it has yet to be examined whether this phenomenon is associated with attitude contagion. We hypothesized that preschool children who mimic the biased nonverbal signals of others will be more likely to adopt their social attitudes. Results of the current study indicated that as emotional mimicry became more frequent, children showed an increasingly greater probability of acquiring nonverbal signal-consistent attitudes. Moreover, the frequency of negative—but not positive—emotional mimicry was related to an increased probability of showing nonverbal signal-consistent attitudes. Our findings provide initial support for the notion that mimicking others' biased nonverbal signals may help facilitate attitude contagion.

Keywords: Social bias, nonverbal signals, children, mimicry, emotional mimicry, attitude contagion

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A child walks out to recess on the first day of school and timidly observes an unfamiliar adult setting up a game on the playground. Several of his classmates happily join the unfamiliar adult for the game and soon the timid child is smiling, watching them having fun together. After watching for a couple of minutes, he decides that the unfamiliar adult seems alright and he skips over to join them. This type of observational social learning is thought to be an essential means through which children learn about others in their social world (Bandura & Rosenthal, 1966). Moreover, the nonverbal signals that children observe being directed toward unfamiliar individuals are known to influence their attitudes and behavior toward those individuals (e.g., de Rosnay, Cooper, Tsigaras, & Murray, 2006; Skinner, Meltzoff, & Olson, 2017). The current research was designed to examine a potential moderator of this attitude contagion—the extent to which children mimic affective nonverbal signals. Indeed, others have previously speculated that mimicry of nonverbal behavior may mediate the effect of exposure to biased nonverbal signals on bias development (Dovidio, 2009). Here, we test whether preschool children who mimic the biased nonverbal signals of others are more likely to adopt their social attitudes.

The role of nonverbal signals in shaping social biases

Previous research has shown that the nonverbal signals of other people in one's social environment (even if they are unfamiliar) can impact social attitudes. This process of attitude contagion allows people to quickly and efficiently gather information about who is liked, trusted, and valued within a given social context. For example, children and adults who are exposed to an unfamiliar White person displaying negative nonverbal behavior towards a Black person (vs. positive nonverbal behavior toward a Black person) subsequently show negative attitudes toward that individual, and tend to show more generalized anti-Black bias (Castelli, Carraro, Pavan,

Murelli, & Carraro, 2012; Castelli, De Dea, & Nesdale, 2008; Weisbuch, Pauker, & Ambady, 2009; Willard, Isaac, & Carney, 2015). Nonverbal signals can also produce attitudes that are not based on social group memberships. Preschool children who observed an unfamiliar individual displaying nonverbal signals communicating warmth and friendliness toward another unfamiliar individual tended to develop more positive attitudes toward that individual (relative to someone who received cold, unfriendly nonverbal signals; Skinner et al., 2017). Similarly, Brey and Shutts (2018) examined the role of an unfamiliar teacher's nonverbal feedback on 5- to 6-year-old children's perceptions of others' intelligence. Children who received more positive nonverbal signals from the teacher while performing a reading task were thought to be smarter, regardless of the actual reading fluency that they demonstrated. Taken together, there is mounting evidence that the nonverbal signals that children (and adults) observe being directed toward others can create and shape their social attitudes. Next, we consider the role that mimicry plays in social interactions.

Social Mimicry

People have a tendency to unconsciously mimic the behavior of others, such that merely being exposed to a given behavior or emotional expression increases the likelihood that an individual observer will display that behavior or emotion (Blairy, Herrera, & Hess, 1999; Chartrand & Bargh, 1999; Lakin, Jefferis, Cheng, & Chartrand, 2003; Oberman, Winkielman, & Ramachandran, 2007). Duffy and Chartrand (2015) identify four distinct types of mimicry: facial mimicry, emotional mimicry, behavioral mimicry, and verbal mimicry. They define facial mimicry as the simple act of mimicking the facial expressions of an individual and as serving an important role in understanding emotional mimicry. The related concept of emotional mimicry is described as the automatic and unconscious act of mimicking the emotional expressions of

others (often facilitated through facial mimicry and moderated by affiliation goals). Behavioral mimicry involves mimicking body movements, mannerisms, and gestures of others, whereas verbal mimicry has to do with the mimicry of others' speech patterns and characteristics (e.g., accents). Mimicry develops early in life, with facial mimicry (e.g., sticking one's tongue out) emerging within the first few weeks of life (Meltzoff & More, 1977) and emotional mimicry (e.g., laughing) appearing in infants as young as 4- to 5-months-old (Isomura & Nakano, 2016).

Mimicry has been described as an evolved social tool, which allows people to quickly and unconsciously communicate affiliation with others (Lakin & Chartrand, 2003; Lakin et al., 2003). Consistent with this social connection process, 18-month-old infants who mimicked an unfamiliar adult were more likely to invite the adult to play with them (Fawcett & Liszkowski, 2012). As children get older, they begin to mimic in a way that increases ingroup affiliation. For example, 3-year-olds mimicked members of their experimental ingroup as frequently as members of their experimental outgroup, but 4- to 6-year-olds selectively mimicked ingroup members (van Schaik & Hunnius, 2016). Additionally, adults and children seem to recognize (if not explicitly) the social benefits of mimicry. Adults show increased behavioral mimicry when attempting to establish or reinforce social connections (Lakin, Chartrand & Arkin, 2008) and are less likely to mimic strangers or people that they do not like (Hes s & Fischer, 2014). This is also true of young children who will, for example, mimic ritualized yet unnecessary actions in the presence of the adult who demonstrated those actions but not an adult who demonstrated those same actions but was no longer present (Nielsen & Blank, 2011). Being mimicked has been shown to increase liking for one's interaction partner and increase positive mood (Kulesza et al., 2015; Tschacher, Rees, & Ramseyer, 2014). Moreover, evidence suggests that mimicry leads both the mimicker and mimickee to feel more attuned and connected to one another (Stel &

Vonk, 2010). Thus, mimicry is thought to be a fairly innate social tool that people use to achieve goals of affiliation and social interactions—helping them develop rapport with others and increasing their social connections (Duffy & Chartrand, 2015). In the next section, we turn to the evidence linking emotional mimicry to the spread of emotions and attitudes.

Linking Mimicry with Emotion and Attitude Contagion

Mimicry plays a critical role in social learning; children learn a great deal about socially appropriate ways of behaving and emotionally responding through mimicry (Meltzoff & Moore, 1994; Kavanagh & Winkielman, 2016). From this perspective, mimicry provides implicit information about how to navigate one's social world. Though discussion of this topic has previously focused on the learning of appropriate social responses in general, an extension on this notion would be that mimicry may foster an understanding of how to feel about and interact with specific others in our social environment—shaping social attitudes.

Emotional mimicry has been described as providing feedback about the underlying emotions that another is experiencing, better equipping observers to accurately interpret them. In fact, some have argued that one of the key purposes served by emotional mimicry is understanding others' thoughts and emotions (Hess & Fischer, 2014). Although the literature is somewhat mixed, there is evidence that emotional mimicry facilitates emotional understanding—particularly when making complex social evaluations (Ipser & Cook, 2015; Maringer, Krumhuber, Fischer, & Niedenthal, 2011; Rychlowska et al., 2014). For instance, when participants were assigned a mimicry-inconsistent task (producing vowel sounds) they were less accurate in differentiating genuine smiles and false smiles than when they were assigned to a control condition (Ipser & Cook, 2015). Given that emotional mimicry increases the ability to understand others, it is particularly relevant to attitude contagion. Specifically, mimicking may

provide information about the expresser's attitudes toward the social target (Hess & Fischer, 2017). Thus, emotionally mimicking someone demonstrating biased nonverbal signals may facilitate understanding of that individual's feelings toward the targets of their nonverbal signals.

Beyond just facilitating understanding, the work on emotion contagion suggests that mimicking emotional facial expressions actually produces a weak version of that emotion within the mimicker (Hatfield, Cacioppo, & Rapson, 1994; Laird, 1984; for a review of this see Hatfield, Bensman, Thornton, & Rapson, 2014). The tendency to "automatically mimic and synchronize movements, expressions, postures, and vocalizations with those of another person and, consequently, to converge emotionally," is known as primitive emotional contagion (Hatfield, Cacioppo, & Rapson, 1992; pp. 153-154). In fact, there is some evidence that merely contracting one's facial muscles into a specific emotional expression produces emotion-like physiological responses (Ekman, Levenson, & Friesen, 1983). Moreover, impeding this type of emotional mimicry can inhibit emotion perception and contagion (Davis, Senghas, & Ochsner, 2009; Neal & Chartrand, 2011). Although there has been some debate about the effect of facial expressions on emotional experience (often referred to as the "facial feedback hypothesis"), recent meta-analytic evidence provides support for a small but significant effect of facial expression on experienced affect from a total of 136 studies (Coles, Larsen, & Lench, 2017). There is also evidence of cross-channel mimicry and contagion, such that hearing vocalizations of anger and disgust can elicit emotion-consistent facial expressions and affective experiences (Hawk, Fischer, & van Kleef, 2012). This finding is relevant to the matter of the nonverbal spread of attitudes, given that nonverbal facial expressions and body language are often paired with variations in vocalics, which may heighten emotional mimicry and contagion. In sum, the

extant literature provides theoretical evidence that there may be a relation between mimicking the biased nonverbal signals of others and the adoption of their social attitudes.

It may also be important to consider the valence of mimicked nonverbal signals. That is, the relation between emotional mimicry and attitude contagion may vary as a function of the valence of mimicked nonverbal signals. Previous research suggests that people are more likely to mimic positive emotions, compared to negative emotions (Bourgeois & Hess, 2008; Hess & Bourgeois, 2010; Geangu, Quadrelli, Conte, Croci, & Turati, 2016; Rymarczyk, Żurawski, Jankowiak-Siuda, & Szatkowska, 2016a). The tendency not to mimic negative emotional expressions is argued to be because expressing negative emotions would undermine the affiliative goals of mimicry (Bourgeois & Hess, 2008). Yet, when the negative emotions are directed toward a third party, emotional mimicry may be a means of signaling allegiance with or empathy for the mimickee (Bourgeois & Hess, 2008). For instance, Hess and Bourgeois (2008) found that when anger was directed toward a third party, participants did show emotional mimicry, but only when that anger was expressed by an ingroup member.

With regard to the effect of mimicking positive versus negative nonverbal signals, the psychological literature on a negativity bias indicates that greater neural and cognitive attention is allocated to negative events, objects, and information (e.g., Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Ito, Larsen, Smith, & Cacioppo, 1998; Rozin & Royzman, 2001). This type of negativity bias has been observed even among infants and young children (e.g., Hamlin, Wynn, & Bloom, 2010; Vaish, Grossman, & Woodward, 2008), and recent findings indicate that children more readily catch social attitudes from negative nonverbal signals than positive nonverbal signals (Brey & Shutts, 2018). All of this suggests that (a) children may be more likely to mimic positive nonverbal signals (than negative nonverbal signals) directed

toward a target, but that (b) those who attend to and mimic negative nonverbal signals may be more likely to show nonverbal signal-consistent attitudes.

Current Study

The phenomenon of mimicking another's nonverbal emotional response and "catching" their emotions has long been established; however, it has yet to be examined (among children or adults) whether this phenomenon is related to attitude contagion. The goal of the current research was to test whether children who mimic the biased nonverbal signals of others are more likely to adopt their social attitudes. To do this, the current study utilized archival data from a series of four previously conducted studies assessing the impact of observed nonverbal signals on preschool children's social attitudes (Skinner et al., 2017; Skinner, Olson, & Meltzoff, in press). A subset of these data collection sessions were video recorded and these recordings were then coded for frequency of positive and negative emotional mimicry. Because the beginning portions of all four studies were nearly identical, we were able to use integrative data analysis (Curran & Hussong, 2009), pooling the data from all four studies. This approach has been described as the "gold standard" meta-analytic technique (McShane & Böckenholt, 2017). We hypothesized that mimicking the actor who displayed nonverbal signals toward the targets in the stimulus videos would be associated with a greater likelihood of nonverbal signal-consistent preferences. Moreover, given evidence of a negativity bias (even among young children), we examine whether effects vary as a function of the valence of mimicked nonverbal signals.

Children's emotional processing skills improve with age, including their ability to distinguish (Lawrence, Campbell, & Skuse, 2015; for a review see Widen, 2013) and mimic (Grossard et al., 2018) other people's emotional facial expressions. There is also evidence that emotion recognition varies as a function of gender in childhood (Lawrence et al., 2015), and

gender differences in emotional mimicry have been observed among adults (Dimberg & Lundquist, 1990). In addition, children and adults are more likely to mimic ingroup members than outgroup members (Buttelmann, Zmyj, Daum, & Carpenter, 2013; Yabar, Johnston, Miles, & Peace, 2006). Thus, child gender (all individuals displaying nonverbal biases in the stimulus videos were women) and age were included as covariates in our analyses.

Method

Participants

All data collection session recordings that we were able to obtain from the previous studies (Skinner et al., 2017; Skinner et al., 2018) were used for analysis. The final sample included 283 children (53% boys, M_{age}= 58.19 months, *SD*= 6.73 months, range: 36 months to 71 months). Participants were identified by their parents as: White (75%), Multiracial (17%), Asian (5%), or another racial or ethnic group (3%).

Materials and Procedure

All four of the studies included in this archival analysis began similarly. First, children were introduced to the two targets (adult women) presented in still images, one in a black shirt and one in a dark red shirt. Children were told that they would be watching a video of the two people in the still images. Next, they were exposed to a 30-second video in which two other adult women (referred to as expressers) displayed negative (cold, unfriendly) nonverbal signals toward one target and positive (warm, friendly) nonverbal signals toward the other. On several occasions throughout the video, the expressers displayed positive nonverbal signals (e.g., smiling, warm tone of voice, leaning in) toward one of the targets and negative nonverbal signals (e.g., scowling, cold tone of voice, leaning away) toward the other target. There were a total of

six instances of nonverbal signals directed toward the targets (three toward each target) and the language directed toward the two targets was identical in content.

Specifically, in the opening scene, a woman was shown in the middle of the screen with the two targets flanking her on the left and right. The woman turned to greet each target individually by saying "hi." In the second scene, a different woman appeared in the center of the screen and she also turned and said "hi" to each target individually, then in a subsequent exchange, she produced two identical toys (colorful eggs) and turned to provide each target with a toy, saying "this one's for you" with each distribution. Between each exchange the expresser faced the audience, and thus was not displaying nonverbal signals toward either target. Videos were edited such that the targets responded identically (in a relatively neutral manner) whether they received positive or negative nonverbal signals. Which target was nonverbally preferred (red-shirt target vs. black-shirt target), the location of the preferred target (left or right side of the screen), and which target was greeted first were all counterbalanced across participants. Stimulus videos are available on Open Science Framework at https://osf.io/6bbup/.

Dependent measures and manipulation check. After watching the video twice, children were asked which one of the individuals they liked the best, and to which of the individuals the experimenter should give a stuffed toy (prosocial giving)[1]. Children who selected the target of positive nonverbal signals were scored as having nonverbal signal-consistent attitudes. Although we were primarily interested in children's explicit preference (who they liked best), as this is the most direct measures of attitude (63% of children preferred the target of positive nonverbal

[1] An additional thirteen children completed the dependent measures in a different order. Because these children responded to a different set of items after they initially watched the stimulus videos we were unable to include them in these analyses.

signals), we also report exploratory analyses of the prosocial giving outcome (62% of children gave the toy to the target of positive nonverbal signals) in Supplemental Materials. The procedure after that point varied considerably across the four studies, thus the focus of the current analyses is this initial portion that was nearly identical across studies. At the end of each study, children were presented with a still image of the targets and one of the women who displayed nonverbal biases in the video. Children were asked to indicate which of the two targets the woman in the center of the screen liked the best. Children who identified the target of positive nonverbal signals were scored as providing the correct response. This item was included to index children's attention to the video and awareness of the nonverbal bias demonstrated by the expresser.

Coding of Emotional Mimicry. We focused on emotional mimicry, given that it was anticipated to be more associated with attitude contagion than verbal or behavioral mimicry (e.g., repeating words from the video). Emotional mimicry was operationalized as facial affect indicative of positive (e.g., smiling) or negative (e.g., frowning, scowling, disgust) emotion, matching the valence of the nonverbal signals being displayed toward a target at that point in the video. Our coding approach centered on lay interpretations of the affect being displayed by the child, rather than a taxonomy of their facial movements (e.g., facial action coding). It is noteworthy to mention that there were some children who exclusively engaged in verbal and/or behavioral mimicry (mouthing words) without affect, although this was fairly uncommon. Three coders were initially familiarized with the experimental stimulus videos in order to learn the procedure of the original studies, and when positive and negative nonverbal signals were

delivered. Next, coders watched some of the archival participant videos to practice identifying the auditory cues indicative of when nonverbal cues were being presented to the participant. A small subset of videos was coded and then discussed by all coders to ensure consistency. Once consensus was achieved, two coders watched and independently coded each video in the dataset for the presence of emotional mimicry. All discrepancies between coders were resolved by a third coder, who served as the tiebreaker.

We were later encouraged by reviewers to recode the videos for frequency of mimicry (and valence of mimicked nonverbal signals), thus we subsequently completed a second round of coding. Two coders watched and independently coded all videos (in which emotional mimicry had previously been identified) for frequency of positive and negative emotional mimicry. As previously mentioned, each video included six exchanges with the targets (three with the target of positive nonverbal signals and three with the target of negative nonverbal signals), and because children watched the videos twice there was a grand total of 12 opportunities for children to emotionally mimic the nonverbal signals directed toward the targets. Thus, each child received a positive mimicry score between 0 and 6 and a negative mimicry score between 0 and 6 (and a total mimicry score between 0 and 12). Coders were in perfect agreement about frequency coding scores the majority of the time (77% of positive mimicry scores and 77% of negative mimicry scores). All discrepancies were resolved by having both coders rewatch the video and come to a consensus (no tie breaker was needed). All coders were blind to counterbalance condition and children's responses to the dependent measures (i.e., whether or not they showed nonverbal signal-consistent attitudes).

Results

Predictors and Frequency of Emotional Mimicry

To examine whether frequency of emotional mimicry varied as a function of child age and gender we conducted a negative binomial regression analysis (to account for the distribution of this count data) in which mean-centered age (in months) and gender were included as predictors of emotional mimicry. Age was not a significant predictor of mimicry (b = –0.03, SE = 0.02), $t(280)$ = –1.61, p = .109, 95% CI [–0.06, 0.52]. Child gender also was not associated with frequency of emotional mimicry (b = 0.10, SE = 0.21), $t(280)$ = 0.47, p = .641, 95% CI [–0.32, 0.52].

Total mimicry scores ranged from 0 to 8, with 40% of children showing at least one instance of emotional mimicry (M = 1.00, SD = 1.64). Positive mimicry scores ranged from 0 to 5, with 33% of children showing positive mimicry (M = 0.61, SD = 1.05). Negative mimicry scores ranged from 0 to 5, with 20% of children showing negative mimicry (M = 0.39, SD = 0.95). A negative binomial regression indicated that, consistent with prior literature, children showed a significantly greater frequency of positive mimicry than negative mimicry (b = 0.47, SE = 0.14), $t(282)$ = 3.35, p < .001, 95% CI [0.20, 0.75].

Emotional Mimicry and Attitude Contagion

First, we examined whether the frequency of emotional mimicry in general was associated with nonverbal-signal consistent social preferences (whether or not children favored the target of positive nonverbal signals). To do this, we conducted a binary logistic regression analysis testing the linear and quadratic effects of frequency of emotional mimicry on children's

probability of favoring the target of positive nonverbal signals. The quadratic term was included because we speculated that the link between emotional mimicry and bias contagion may be curvilinear. That is, there might be a bigger difference in bias contagion between children who mimic once and those who never mimic than there is between those who mimic, for example, five times versus four times. Mean-centered age (in months), gender, the specific study the child participated in, and whether they got the manipulation check correct[2] were all included as control variables (main effects only). Whether children passed the manipulation check was a significant predictor in the model, $\chi^2(1, N = 283) = 15.15$, $p < .001$, $OR = .23$, 95% CI OR [0.11, 0.49]. Children who passed the manipulation check (*Probability* = .71) were significantly more likely to show nonverbal-signal consistent attitudes than children who failed the manipulation check (*Probability* = .36). The study in which the child participated was also a significant predictor of nonverbal signal consistent attitudes, $\chi^2(3, N = 283) = 8.31$, $p = .040$. Moreover, boys (*Probability* = .62) were significantly more likely to show nonverbal signal-consistent attitudes than girls (*Probability* = .45), $\chi^2(1, N = 283) = 7.45$, $p = .006$, $OR = .48$, 95% CI OR [0.29, 0.81].

With regard to the key predictor of interest—frequency of emotional mimicry—there was a significant linear effect ($b = 0.59$, $SE = 0.24$), $\chi^2(1, N = 283) = 6.30$, $p = .012$, $OR = 1.81$, 95% CI OR [1.14, 2.88]. This was qualified by a statistically significant quadratic effect ($b = –0.10$, $SE = 0.04$), $\chi^2(1, N = 283) = 4.88$, $p = .027$, $OR = 0.91$, 95% CI OR [0.83, 0.99]. These effects remained largely the same when covariates were not included in the model, although the

[2] This was used as exclusion criteria in some of the original studies. To preserve statistical power and retain as many participants as possible, we chose to use this item as a covariate rather than exclusion criteria. See Supplemental Materials for analyses excluding children who failed the manipulation check, all statistical inferences remain the same.

quadratic effect dropped to marginal significance (p = .062). As illustrated in Figure 1, as frequency of emotional mimicry increased the probability of favoring the target of positive nonverbal signals increased, although this effect began to decrease at frequencies between one and two standard deviations above the mean. Thus, the effect of mimicry becomes weaker with each additional instance. Next, we examined whether the effect of frequency of emotional mimicry varied as a function of whether the child mimicked negative emotion or positive emotion.

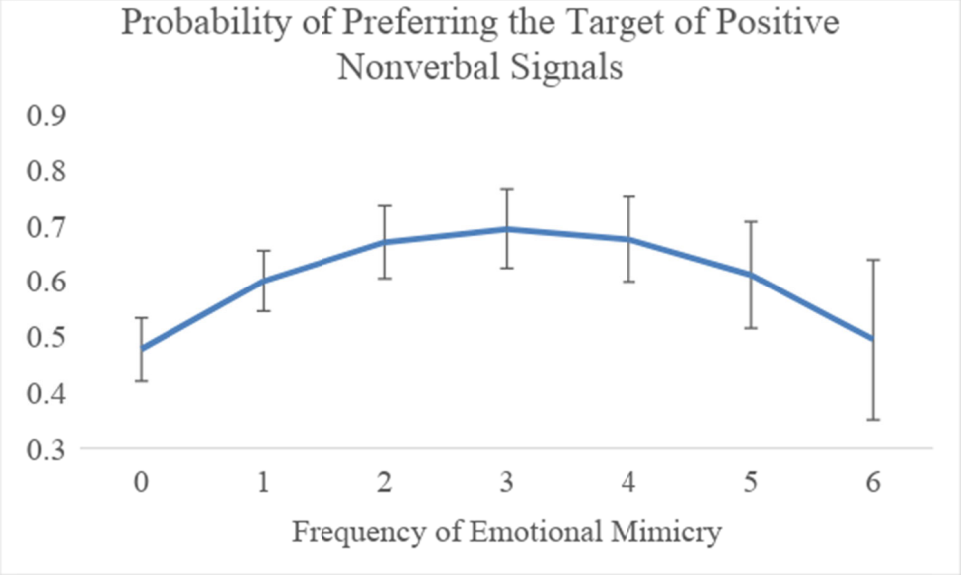

Figure 1. The probability of preferring the target of positive nonverbal signals (i.e., bias contagion) as a function of frequency of emotional mimicry. Probabilities significantly differ from chance at frequencies of 2, 3, and 4 (ps < .05), and marginally differ from chance at a frequency of 1 (p = .075). Probability estimates for frequencies over 4 are very noisy because 94% of children had frequency scores under 5.

Negative emotional mimicry. Using the same analysis approach we employed for testing the effects of emotional mimicry in general, we examined whether the frequency of negative

emotional mimicry was significantly related to whether children favored the target of positive nonverbal signals. Results indicated that the linear effect of negative emotional mimicry was significant ($b = 0.95$, $SE = 0.44$), $\chi^2(1, N = 283) = 4.69$, $p = .030$, $OR = 2.58$, 95% CI OR [1.09, 6.10]. The quadratic effect was only marginally significant ($b = –0.22$, $SE = 0.11$), $\chi^2(1, N = 283) = 3.79$, $p = .052$, $OR = 0.80$, 95% CI OR [0.64, 1.00]. Statistical inferences remained largely the same without including control variables in the model, although the quadratic effect became statistically significant ($p = .048$). As illustrated in Figure 2, as frequency of negative emotional mimicry increased the probability of favoring the target of positive nonverbal signals increased.

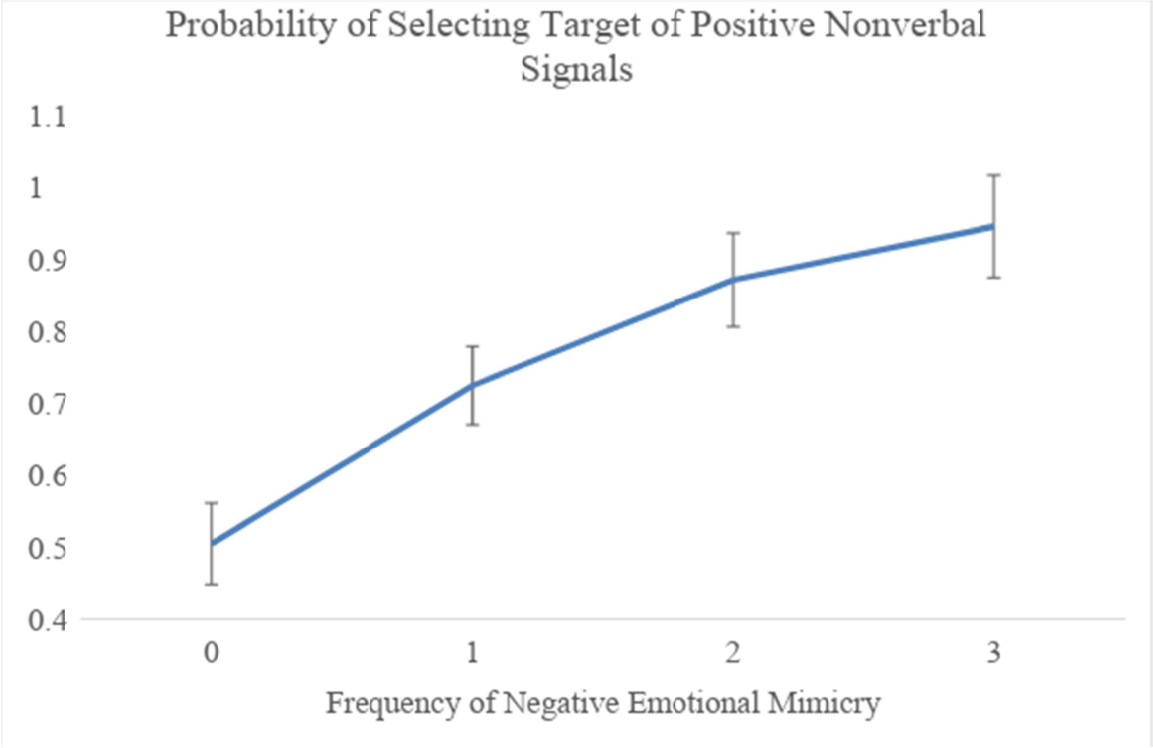

Figure 2. The probability of preferring the target of positive nonverbal signals (i.e., bias contagion) as a function of frequency of negative emotional mimicry. Probabilities significantly differ from chance at all frequencies greater than zero (ps < .05).

Positive emotional mimicry. Using the same analysis approach that we employed above, we tested the impact of frequency of positive emotional mimicry. Results indicated that the linear effect of positive emotional mimicry was nonsignificant ($b = 0.43$, $SE = 0.34$), $\chi^2(1, N = 283) = 1.63$, $p = .202$, $OR = 1.54$, 95% CI OR [0.79, 3.00]. The quadratic effect of positive emotional mimicry was also nonsignificant ($b = –0.10$, $SE = 0.10$), $\chi^2(1, N = 283) = 1.04$, $p = .307$, $OR = 0.90$, 95% CI OR [0.74, 1.09]. Statistical inferences remained the same without including control variables in the model. Thus, taken in isolation, frequency of positive mimicry was unrelated to bias contagion.

Discussion

Results of the current study provided initial support for our hypothesis that mimicking biased nonverbal signals would be associated with increased attitude contagion. Among preschool children, as frequency of emotional mimicry increased, the probability of catching the biases that they were exposed to—showing nonverbal signal-consistent attitudes—increased. However, each additional instance of mimicry seemed to have a weaker impact—as indicated by the quadratic effect. Moreover, examination of the valence of mimicked emotional nonverbal signals indicated that mimicking negative nonverbal signals was related to attitude contagion. As mimicry of the negative nonverbal signals directed toward the target became more frequent, the probability of showing nonverbal signal-consistent attitudes significantly increased. Frequency of mimicking positive nonverbal signals, on the other hand, was unrelated to attitude contagion. Taken together, it appears that mimicking negative nonverbal signals directed toward an individual is associated with acquiring biases against that individual. This suggests that preferences for the target of positive nonverbal signals may have had more to do with avoidance

of the target of negative nonverbal signals than attraction to the target of positive nonverbal signals.

This is consistent with the literature on negativity bias, which shows that people tend to weight negative stimuli more heavily than positive stimuli (e.g., Hamlin et al., 2010; Vaish et al., 2008). Yet, we did not find that children were more likely to mimic negative nonverbal signals, in fact, consistent with prior literature, children mimicked positive nonverbal signals significantly more frequently than they mimicked negative nonverbal signals. Taken together with prior work, these findings support the notion of a negativity bias when it comes to nonverbal signals, such that exposure to (Brey & Shutts, 2018) and mimicry of negative (vs. positive) nonverbal signals results in more robust attitude contagion.

It is worth noting that our approach to mimicry coding captured the frequency of facial expressions that were valence-consistent with the individual expressing nonverbal biases, but did not require that it be an exact reproduction of their expression. This approach is consistent with Hess and Fischer's (2013) take, that people tend to mimic the valence of emotional expressions, though not always the specific muscle movements. Several studies support the notion that emotional mimicry goes beyond the reproduction of visually observed expressions. For example, a recent study found that people who were exposed to facial anger and fear expressions showed arm muscle contractions that were consistent with the emotion of the facial expressions that they were exposed to (Moody, Reed, Van Bommel, App, & McIntosh, 2017). Other work has shown that listening to emotional vocalizations (e.g., grunts, gagging, laughter, sobs) can elicit facial expressions consistent with the emotions those vocalizations represent (Hawk et al., 2012). Taken together, this suggests that people may tend to embody the emotions that they are exposed to rather than simply mirror them exactly.

Prior work has shown that children's capacity for deliberate mimicry increases with age (Grossard et al., 2018), yet we found no relation between mimicry and age. However, this may be explained by the restricted age range in these studies, which were not designed to assess age-related change. Some previous work suggests gender differences in mimicry among adults (Dimberg & Lundquist, 1990), yet meta-analytic evidence indicates that results are mixed (Lehane, 2015). The current findings provide no evidence of gender differences in mimicry among preschool children. To our knowledge, gender differences in mimicry have not previously been examined among children, thus it is possible that preschoolers do not show the gender differences in mimicry that adults do. Alternatively, these gender differences in mimicry may exist among children but not be detectable with the level of precision afforded by our approach. Most of the prior work that has identified gender differences in mimicry compared facial muscle activity rather than observable facial mimicry (Lehane, 2015).

Previous research has shown that when adults are motivated to infer the emotions of others they show increased emotional mimicry (Murata, Saito, Schug, Ogawa, & Kameda, 2016). Thus, mimicry in the current study may have been heightened by the fact that children were instructed to watch the video closely and see what happened to the targets. Although in everyday life, children are not often instructed to infer the emotions of those around them, they may nonetheless be highly motivated to do so. Particularly when it comes to unfamiliar people and social contexts, children should be highly motivated to infer the emotions of trusted adults to determine how to respond and behave.

It is important to note that contextual factors (e.g., liking of the expresser) moderate emotional mimicry (Hess & Fisher, 2013), thus merely observing someone demonstrating biased nonverbal signals will not necessarily lead to mimicry or attitude contagion. Evidence suggests

that people are less likely to emotionally mimic those who they dislike (Hess & Fischer, 2014), which is compatible with balance theories of attitudes (Heider, 1958). That is, the fact that people are more likely to mimic those that they like may help explain why they are more likely to adopt attitudes that are consistent with those who they like. In the studies that our archival data were drawn from, the expressers of nonverbal biases were trained to be engaging to young children but were unfamiliar to them. If those expressing nonverbal bias had been familiar to children (e.g., parents or teachers) or individuals whom children already really liked, we conceive that mimicry (and attitude contagion) may have been considerably more frequent.

Limitations and Future Directions

The measure of mimicry used in the current study was rather coarse. Because this study capitalized on archival videos—which were rather low resolution—subtle emotional mimicry could not be detected using the current approach. Coders were also aware of when nonverbal signals were being demonstrated by the expressers, which may have biased them to perceive mimicry slightly more often than they otherwise would have. However, all coders were blind to the key outcome being predicted—children's attitudes. Future studies, designed to measure nonverbal signals in this context, should utilize higher resolution video or physiological recordings of facial muscle movement (Hess & Fischer, 2013). Studies that utilize more fine-grained measures of mimicry (e.g., facial EMG) will help us to better understand these processes in the future. It is also important to note that the analyses reported here were somewhat exploratory. We initially coded for presence (vs. absence) of mimicry, but then revised our approach to examine frequency upon suggestion from reviewers.

Although we have conceptualized mimicry as possibly facilitating bias contagion, it is unclear whether emotional mimicry had any causal influence on children's attitudes. Given the

design of the study, it is possible that children who were more engaged with and attentive to the videos were both more likely to mimic the individuals expressing nonverbal biases and show evidence of bias contagion. Additionally, it is possible that the association between mimicry and attitude contagion is only correlational and simply reflects factors like emotion understanding and emotion induction (Hess & Fischer, 2017). By utilizing designs employed by previous mimicry work (e.g., having participants engage in another task that is incompatible with emotional mimicry) future research can begin to examine whether mimicry actually facilitates bias contagion.

Finally, another worthwhile consideration for future investigation is the role that individual differences in empathy might play. Individuals who are high in trait empathy are more likely to mimic others than those that are low in trait empathy (e.g., Rymarczyk, Żurawski, Jankowiak-Siuda, & Szatkowska, 2016b; Sonnby-Borgstrom, Jonsson, & Svensson, 2003). Thus, those that are high in empathy might be particularly susceptible to attitude contagion. However, the effects of empathy may vary as a function of whether it facilitates mimicry of those expressing nonverbal biases, mimicry of the targets of nonverbal biases, or both.

Conclusions

The current research—which is the first to examine the relation between emotional mimicry and attitude contagion (among children or adults)—indicated that preschoolers who emotionally mimicked nonverbal biases showed increased attitude contagion. Moreover, when mimicry was broken down by valence, only preschoolers who mimicked negative nonverbal signals (e.g., frowning), showed increased attitude contagion. Mimicry of positive nonverbal signals (e.g., smiling) was unrelated to attitude contagion. Although the findings observed here are somewhat preliminary, they are notable as the first to show evidence of a link between

emotional mimicry and increased attitude contagion. The fact that any relation between mimicry and attitude contagion could be detected in this archival dataset (e.g., with rather low resolution video footage) suggests that the association between emotional mimicry and attitude contagion may be much more robust if more sensitive measures of mimicry are utilized. Moreover, the current study provides evidence of somewhat naturalistic emotional mimicry, given that, unlike most studies of mimicry, the stimuli were not deliberately designed to elicit mimicry. In sum, our findings provide initial support for the notion that mimicking others' biased nonverbal signals may help facilitate attitude contagion.

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