Shaping children’s racial bias through interpersonal movement

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ABSTRACT

The early emergence of racial biases points to the urgent need to understand how interpersonal experiences might shape them. We examined whether interpersonal movement shapes racial biases among 4- to 6-year-old Chinese children who had no prior contact with Black people. In Experiment 1 (N = 134), children played a musical game, moving either in or out of synchrony with a Chinese or Black adult. In Experiment 2 (N = 30), children were merely exposed to a Black adult. Across the two experiments, we found that synchronous movement increased children’s feeling of social closeness toward their movement partner to a greater extent than asynchronous movement regardless of the partner’s race. After moving in or out of synchrony with the Chinese adult, synchrony selectively increased children’s explicit positive pro-own-race bias. However, after moving in or out of synchrony with the Black adult, both movement styles reduced explicit anti-other-race bias. Experiment 2 ruled out mere exposure to an other-race person as a driving factor for these effects. Our results suggest that musical engagement may be a promising intervention for reducing negative intergroup biases.

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https://doi.org/10.1016/j.jecp.2020.104884
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Introduction

Racial biases exist in our societies and can have adverse effects on racial minorities in education, health care, employment, justice, finance, dating, and politics (Dovidio, Kawakami, & Gaertner, 2002; Green et al., 2007; Hardin & Banaji, 2013). Racial biases involve stereotypes, prejudices, and discriminatory behaviors, and they can emerge as positive biases in support of own-race individuals as well as negative biases against other-race individuals (Aboud, 2003). Intergroup contact is a useful tool for reducing racial bias and improving intergroup relations (Allport, 1954; Pettigrew & Tropp, 2006), but relatively little is known about the effects of intergroup contact on young children with no prior intergroup contact. The current study examined how intergroup contact in the form of interpersonal movement affects both implicit racial biases (e.g., automatic, consciously inaccessible; Greenwald & Banaji, 1995) and explicit racial biases (e.g., self-aware, consciously accessible; Aboud, 1988; Dovidio et al., 2002).

Past research provides compelling evidence that explicit racial biases are present from at least 3 years of age (Aboud, 1988, 2003). Three-year-old children explicitly assign more positive attributes (e.g., nice, friendly) to own-race individuals and assign more negative attributes (e.g., bad, mean) to other-race individuals (Aboud, 2003). They are also more likely to explicitly select own-race over other-race individuals to be their hypothetical summer camp counselor or swim instructor (Qian et al., 2016).

Implicit racial biases also emerge early in preschool-age children (Dunham, Chen, & Banaji, 2013; Qian et al., 2016) if not earlier (e.g., own-race looking preference in 3-month-olds as demonstrated by Kelly et al., 2005, and valence association bias in 9-month-olds as demonstrated by Xiao et al., 2018). Qian et al. (2016) used a preschool-friendly version of the implicit association test (Greenwald, McGhee, & Schwarz, 1998) and found evidence of racial bias among preschool-age children; Chinese 3- to 5-year-olds were faster at associating positive attributes (e.g., smile symbols) with own-race faces and associating negative attributes (e.g., frowny symbols) with other-race faces. This same pattern was consistently found across different cultures in countries such as Cameroon (Qian et al., 2016), Canada (Steel, George, Williams, & Tay, 2018), Singapore (Setoh et al., 2019; Singh, Quinn, Qian, & Lee, 2020), and the United States (Dunham et al., 2013).

The documentation of early-emerging explicit and implicit racial biases raises important questions for researchers and educators about how these biases can be reduced through early intervention (Aboud et al., 2012; Killen, Rutland, & Ruck, 2011). One of the best ways to reduce racial bias, according to decades of social psychological research, is to increase contact with outgroup members (Allport, 1954; Pettigrew & Tropp, 2006). During early and middle childhood, those who have more interracial contact display lower levels of racial bias, less negative interracial attitudes, and more positive evaluations about interracial friendship (McGlothin & Killen, 2006; Rutland, Cameron, Bennett, & Ferrell, 2005). Relatedly, direct contact with immigrant children reduces children’s negative attitudes toward immigrants (Vezzali, Stathi, Crisp, & Capozza, 2015). Interracial contact leads to reduced bias by increasing outgroup knowledge and empathy and reducing anxiety (Pettigrew & Tropp, 2008).

Although intergroup contact can take many forms, outcomes are optimized when certain features are present. These include contact involving equal status, common goals, intergroup cooperation, and cultural support of norms (Allport, 1954). Musical engagement may, therefore, be an especially useful context for optimizing intergroup contact. For example, singing, dancing, and performing together require interpersonal cooperation involving common goals and trust (Good & Russo, 2016; Rentfrow & Levitin, 2019). These musical interactions are highly social and encourage group cohesion (Trehub, Weiss, & Curelli, 2019). Social benefits of musical interactions emerge early in childhood (Curelli, Trehub, & Trainor, 2018). For example, preschooler dyads are more cooperative and helpful following musical play compared with non-musical play (Kirschner & Tomasello, 2009). Long-term group musical interactions may also increase children’s emotional empathy, enhancing their ability to experience another person’s emotional states (Rabinowitch, Cross, & Burnard, 2013).

Interpersonal movement synchrony, or the matched timing of movements among interactants, is one important feature of musical engagement that encourages social cohesion. From an evolutionary perspective, coordinated movement is an important skill for social animals to strengthen group alli-
ances and protect the group (de Waal, 2008). In humans, interpersonal synchrony signals joint purpose and emotional connectedness and blurs the line between self and other (Valdesolo, Ouyang, & Desteno, 2010; Wiltermuth & Heath, 2009). After two or more individuals move together in synchrony (e.g., walking in step, rowing, dancing, singing), affiliative behaviors toward one another are enhanced (Wiltermuth & Heath, 2009).

Interpersonal synchrony encourages prosociality even in infants and young children (Cirelli et al., 2018). Twelve-month-old infants preferentially reach for social partners who move in synchrony with them compared with out of synchrony with them (Tunçgenç, Cohen, & Fawcett, 2015), and 14-month-old infants are more helpful toward synchronous movement partners than toward asynchronous movement partners (Cirelli, Einarson, & Trainor, 2014). Evidence from young children further indicates that interpersonal synchrony increases early helpfulness (Tunçgenç & Cohen, 2018), cooperation (Kirschner & Tomasello, 2009; Rabinowitch & Meltzoff, 2017), and sharing of resources with synchronously moving partners (Rabinowitch & Meltzoff, 2017).

Growing evidence suggests that interpersonal synchrony forges intergroup bonds. For example, 14-month-old infants help not only their synchronous movement partner but also members of that person’s social group (Cirelli, Wan, & Trainor, 2016). Synchronous movement may also reduce intergroup biases and encourage social bonds across group divides among school-age children. After assignment to minimal groups, Tunçgenç and Cohen (2016) measured children’s intergroup biases before and after an intergroup synchrony manipulation. Intergroup synchrony, compared with asynchrony, significantly reduced negative outgroup biases and encouraged cross-group affiliative behavior.

The current study

Across two experiments, we examined how intergroup contact in the form of synchronous movement, asynchronous movement, or mere exposure alters children’s interpersonal boundaries (i.e., their feelings of similarity and closeness to the interactor) and influences implicit and explicit racial biases in children.

Chinese children were recruited given that developmental research on movement synchrony has exclusively focused on Western samples, leaving it less known how non-Western populations respond to interpersonal synchrony (Trehub, 2015). Children in China also live in a racially homogeneous culture, having little or no prior experience with racial outgroup members. This presents an opportunity to examine the effects of interracial contact while minimizing potential effects of prior cross-race experience (Page-Gould, Mendoza-Denton, Alegre, & Siy, 2010). Despite this lack of exposure to racial outgroups, negative biases against Black people have been observed in preschool-aged Chinese children (Qian et al., 2016, 2019). Thus, we focused on the effects of interracial contact on the negative bias of Chinese children against Black people.

In Experiment 1, children were asked to play musical games either synchronously or asynchronously with an own-race Chinese adult (own-race interaction) or with an other-race Black adult (other-race interaction). Based on previous studies in infants and children (Rabinowitch & Knafo-Noam, 2015; Tunçgenç & Cohen, 2016, 2018), we hypothesized that children in the synchronous movement condition, compared with the asynchronous movement condition, would show increased liking toward their movement partner and more positive biases for members of their movement partner’s racial group, whether Chinese or Black. However, we also predicted that interacting with an other-race individual in general, whether synchronously or asynchronously, could have positive social consequences for mitigating other-race negative biases given the interactive and enjoyable nature of both the synchronous and asynchronous tasks and the existing evidence supporting intergroup contact as a strategy for reducing intergroup biases (Pettigrew & Tropp, 2006).

In Experiment 2, children simply played an independent coloring game in the presence of a Black adult without any personal interaction or musical experience. This experiment was conducted to rule out whether any effects observed in the other-race condition in Experiment 1 were driven by mere exposure (Dunham, Baron, & Banaji, 2006). Study materials, deidentified raw data and cleaned data, and data analysis scripts have been made publicly available via the Open Science Framework (OSF) (https://osf.io/jvh9z/). https://osf.io/jvh9z/?view_only=51792558ec32462b918d62bb7c96a536
Experiment 1

Method

Participants

In total, 134 Chinese preschoolers (66 boys and 68 girls; $M_{\text{age}} = 5.96$ years, $SD = 0.33$) were recruited from a city in the eastern region of China. All children were Han Chinese from families of diverse backgrounds (parents’ median education level = Grade 9). An a priori power analysis with G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that a total of 124 participants were needed to have 90% power to detect a small to medium-sized effect of $f = 0.21$ ($f$ ranges from 0.18 to 0.40: Qian et al., 2017, 2019) with an alpha of 0.05 (number of measurements = 2 and correlation between repeated implicit measures = 0.30 based on Qian et al., 2017, 2019). However, we received more informed consent than planned, so the additional participants were tested and included per Hangzhou Normal University research ethics committee policy.

In total, 72 participants from one kindergarten were assigned to the own-race interaction condition (36 in the synchronous movement condition and 36 in the asynchronous movement condition), and 62 participants from another kindergarten were assigned to the other-race interaction condition (29 in the synchronous movement condition and 33 in the asynchronous movement condition). Due to experimenter availabilities, in the other-race condition one Chinese female experimenter tested 55 participants and a different Chinese female experimenter tested 7 participants. Constraints on experimenter availability also inhibited our ability to counterbalance conditions across school, which should be considered a limitation of the current study. Within each school, a matched design was used to assign children into each movement condition (synchrony or asynchrony) using children’s implicit bias scores at pretest.

Implicit bias was used in this matched design given its early emergence during preschool years (Dunham et al., 2013; Qian et al., 2016) and recent efforts’ success in reducing implicit racial bias in young children (Qian et al., 2017, 2019). This was accomplished by arranging the pretest scores from lowest to highest. Individuals with the closest implicit bias were grouped into sets of 2, and individuals within each set were randomly assigned to one of the two movement conditions.

Three female experimenters tested all participants in Mandarin. Children were eligible to participate after they provided oral assent and their legal guardians provided informed consent. Children received a sticker for participating in the study.

Procedure and materials

Procedure. Participants were tested individually in a quiet room at their school over two sessions. During Session 1, a Chinese female experimenter showed children a photo of either a Chinese woman (own-race condition) or a Black woman (other-race condition). The woman in the photo would play the role of the interactor during Session 2. The experimenter asked children to rate their feelings of similarity and social closeness to this woman. The experimenter also measured children’s implicit and explicit pro-own/anti-other racial biases using the tasks described below. During Session 2, the experimenter trained children in the Clap & Tap musical game adapted from Tunçgenç and Cohen (2018). The game required children to perform certain movements in time to beats that they heard from their individual headphones. Children alternated between tapping on the table in front of them and clapping their hands together in time to the beats. After training, the children played this game with the interactor (the woman in the photo from Session 1 to whom children had reported feelings of similarity and closeness). Following the musical game, the experimenter returned and repeated the tests from Session 1 (similarity, closeness, and implicit and explicit racial biases).

Measure of implicit racial bias. Chinese children’s implicit racial bias toward own-race Chinese people was measured using the Implicit Racial Bias Test (IRBT; Qian et al., 2016), a preschool-friendly implicit association test that has been used across different cultural contexts (Qian et al., 2016; Setoh et al., 2019; Singh et al., 2020).
The IRBT was conducted on a Microsoft Surface Pro computer with a 12-inch screen using E-Prime 2.0 (Psychology Software Tools, Sharpsburg, PA, USA). The IRBT assessed how quickly positive and negative attributes were associated with either own-race or other-race faces. Children were instructed to touch either the smile or frown symbol when they saw a face from a particular race. In the congruent condition, children were instructed to touch the smile symbol when they saw a Chinese face (own race) and to touch the frown symbol when they saw a Black face (other race). In the incongruent condition, children were instructed to touch the smile symbol when they saw a Black face and to touch the frown face when they saw a Chinese face. There were 8 practice trials, allowing for familiarization with the procedure, and 20 test trials for each of the congruent and incongruent pairings. Children were explicitly told to respond as fast as they could. Half of the children started with the congruent condition, and the other half started with the incongruent condition. The difference in response time on incongruent trials minus congruent trials was used as a measure of implicit racial bias.

Colored photos of 20 Chinese faces (10 female) and 20 Black faces (10 female) were chosen from a face database (Ge et al., 2009). Half of the Chinese faces and Black faces were randomly presented in the congruent pairings, and the other half were randomly presented in the incongruent pairings. The faces were standardized such that they were frontal views and without obvious marks such as glasses, beards, and facial makeup. All photos were cropped into an elliptical shape (hair removed for consistency). These photos were also standardized at 480 pixels (17 cm) wide and 600 pixels (21 cm) tall, with a resolution of 72 pixels per inch. Moreover, the faces were matched according to the results of a rating experiment in which all faces in the database were rated in attractiveness by Chinese adults who did not participate in the current study (Qian et al., 2016).

Measure of explicit racial bias. The explicit racial bias task was administered following the IRBT (see similar use in Qian et al., 2016, 2019, and Kinzler, Shutts, DeJesus, & Spelke, 2009). Children were asked to self-report their preference for interacting with either an own-race Chinese person or an other-race Black person in different scenarios. Four scenarios were presented in a random order: summer camp counselor, swimming coach, music teacher, and tour guide (e.g., “If you are going to attend a music class, which music teacher would you like to choose?”). Children's preference for own-race over other-race individuals was coded as 1. The scores in four scenarios were added up and divided by 4 to obtain a proportion score with 0.50 as the no-bias baseline.

Measure of similarity. A self-report feelings of similarity questionnaire, adapted from Rabinowitch and Knafo-Noam (2015), was used to evaluate children’s perceived similarity with the interactor with whom they performed the musical game during Session 2. The questionnaire consisted of five Likert-type scale questions, with response options ranging from 1 (not similar at all) to 4 (extremely similar). The questions targeted general similarity, similarity in appearance, similarity in hobbies, and similarity in music styles. Examples of these questions included “How similar do you think you two are in general? Do you think that you two have similar hobbies? Do you think that she likes the same musical styles as you?”

Measure of social closeness. To examine how close to the interactor children felt before and after the musical game, the Inclusion of Other in Self (IOS) scale was adopted to gauge relationship closeness (see similar use in Rabinowitch & Knafo-Noam, 2015). Children were presented with a series of pairs of circles. Each pair contained two circles, with the first labeled “me” and the second labeled “she.” Children’s feelings of closeness to the interactor were indicated by the overlap between the two circles. Children were asked to select the pair of circles that best described their feelings of closeness to the experimenter: “Out of the following options, please choose the one that best reflects how you feel about the person.” Scores ranged from 1 (little or no closeness) to 6 (high level of closeness).

Interpersonal synchrony and asynchrony. After Session 1, during which we measured children’s feelings of similarity and closeness to the interactor and their implicit and explicit pro-own/anti-other racial biases, children were assigned to the synchrony or asynchrony movement condition and began Session 2. During Session 2, the Chinese experimenter, blind to children’s assigned movement condition, trained children on the musical game. This game would be used to encourage children to implicitly
and unintentionally engage in interpersonal synchrony or asynchrony with the experimenter following training.

**Stimuli**

The Clap & Tap game was adapted from Tunçgenç and Cohen (2018), who developed this task to manipulate interpersonal synchrony and asynchrony in 4- to 6-year-old children. Children in the current experiment were asked to perform certain movements in time to auditory beats (alternating bass and snare drum sounds) that they heard from their individual headphones. Music matching the tempo of these beats (a MIDI [Musical Instrument Digital Interface] version of *Twist and Shout* by The Beatles) was included to maintain children’s interest in the game. The auditory beats and music were always presented to children at 100 beats per minute (BPM), with inter-tap intervals of 600 ms. Children of this age are able to synchronize their movements with a peer or an adult (Endedijk et al., 2015) and are comfortable with perceiving and tapping to rhythms presented at this tempo (Drake, Jones, & Baruch, 2000). During 1 trial of the game, the beats and music would play for about 20 s, followed by a brief “whoop” sound. These stimuli were created using GarageBand 11.

**Training and test**

The training session consisted of two parts: demonstration and performance. During the demonstration, the experimenter showed children how to perform the claps on the snare sounds and taps on the bass sounds while the children watched and listened via headphones connected to an MP3 player. Children were also shown how to quickly stand up and sit back down when they heard the whoop sound. After watching the demonstration, children performed an entire trial independently. If they were not successful, the experimenter would demonstrate again. Once children could successfully complete 1 trial independently, the experimenter told them that they would now play the game with “my friend.” The interactor then entered the room, and the experimenter left. The interactor sat down and said, “Hello, are you ready to play the game with me?” The interactor began the game when the child was ready. In the own-race interaction condition, a Chinese female played the role of interactor, and in the other-race interaction condition, a Black female played the role of interactor.

The game consisted of 4 trials and lasted 1 min 50 s. If children were assigned to the own-race synchrony condition, the Chinese interactor and children listened to the same 100-BPM track. If children were assigned to the own-race asynchrony condition, they listened to the 100-BPM track while the Chinese interactor listened to a faster 130-BPM version of the track. Similarly, if children were assigned to the other-race synchrony condition, the Black interactor and children listened to the same 100-BPM track. If children were assigned to the other-race asynchrony condition, the children listened to the 100-BPM track while the Black interactor listened to a faster 130-BPM version of the track. To avoid possible interference effects, all children were informed beforehand that they might hear the same or different beats and that their task was to do the moves in time to the beats. During the game, the interactor looked and smiled at the children. After the game was over, the interactor said “good job” and left, and the experimenter returned.

**Synchrony/asynchrony rating**

Two researchers who were blinded to the research design rated the level of synchrony between the child participants and the interactor on a 7-point Likert scale (1 = absolutely nonsynchronous, 7 = absolutely synchronous). Interrater reliability was high (r = 0.96, p < 0.001). Mean ratings were computed and used in further analyses.

**Results and discussion**

**Synchrony/asynchrony manipulation check**

To check the manipulation of interpersonal synchrony and asynchrony, we conducted an independent-samples *t* test on mean synchrony rating scores for the own-race and other-race interaction conditions separately. For the own-race interaction condition, we found a significant difference between the synchrony condition (M<sub>synchronous</sub> = 5.24, SD = 1.61) and the asynchrony condition (M<sub>asynchronous</sub> = 2.60, SD = 1.10), *t*(70) = 8.13, *p* < 0.001, Cohen’s *d* = 1.91. For the other-race interaction con-
dition, we also found a significant difference between the synchrony condition ($M_{\text{synchronous}} = 6.26, SD = 1.12$) and the asynchrony condition ($M_{\text{asynchronous}} = 2.30, SD = 1.64$), $t(60) = 11.15, p < 0.001$, Cohen's $d = 2.79$.

**Participant exclusions**

For the own-race interaction condition, 13 participants were excluded from further analyses because 3 children did not complete all measures and 10 children did not follow instructions during the musical game (i.e., 7 were assigned to the synchrony condition but received a mean synchrony rating score smaller than 4, and 3 were assigned to the asynchrony condition but received a mean synchrony rating score larger than 4). This left 27 participants in the own-race–synchrony movement condition and 32 participants in the own-race–asynchrony movement condition in the following analyses. For the other-race interaction condition, 8 participants were excluded because 1 child did not complete all tasks and 7 children did not follow instructions during the musical game (i.e., 2 were assigned to the synchrony condition but received a mean synchrony rating score smaller than 4, and 5 were assigned to the asynchrony condition but received a mean synchrony rating score larger than 4). This left 27 participants in the synchrony movement condition and 27 participants in the asynchrony movement condition.²

**Implicit pro-own/anti-other bias**

We used D scores to indicate whether participants showed implicit pro-own/anti-other bias. The D score is the difference between the mean response latencies of contrasted conditions divided by the standard deviation of response latencies across the conditions (Greenwald et al., 2003). Positive D scores indicate a preference for own-race Chinese relative to other-race Black, and negative scores indicate a preference for other-race Black relative to own-race Chinese.

To examine whether Chinese children showed implicit pro-own/anti-other bias, we performed one-sample $t$ tests to compare their implicit bias scores at pretest with zero (no bias). Replicating previous results with Chinese children (Qian et al., 2016), we found that children expressed a significant implicit pro-own bias at pretest, $D = 0.37, t(113) = 7.22, p < 0.001$.

To further examine whether interpersonal movement might affect children's implicit pro-own/anti-other bias, a univariate analysis of covariance (ANCOVA) was performed with race (own race or other race) and condition (synchronous movement or asynchronous movement) as the between-participant variables and implicit pro-own/anti-other bias at pretest as a covariate on children's implicit pro-own/anti-other bias at posttest. The main effects of race, $F(1, 108) = 3.72, p = 0.056$, and condition, $F(1, 108) = 0.61, p = 0.438$, as well as the interaction between race and condition, $F(1, 108) = 1.73, p = 0.191$, did not reach significance. These results provide no evidence to suggest that children's implicit racial bias was influenced by their movement experience or interaction with the own-race or other-race interactor.

**Explicit pro-own/anti-other bias**

To examine whether Chinese children showed explicit pro-own/anti-other bias at pretest, we performed one-sample $t$ tests to compare their explicit bias scores with 0.50 (no bias). Replicating previous findings (Qian et al., 2016), we found that Chinese children expressed a significant explicit pro-own/anti-other bias at pretest ($M = 0.67, t(112) = 6.20, p < 0.001$.

A univariate ANCOVA was performed on explicit bias posttest scores with race and condition as between-participant variables and explicit bias pretest scores as a covariate. A significant interaction between race and condition was found, $F(1, 108) = 5.59, p = 0.020$, partial $\eta^2 = 0.05$. Post hoc analyses were conducted for own-race and other-race interactions separately with a Bonferroni-adjusted alpha level of 0.025 per test (.05/2). The means and standard errors are presented in Fig. 1A (own-race condition) and Fig. 1B (other-race condition).

² Removing 10 participants in the own-race condition and 7 participants in the other-race condition who did not follow instructions in the Clap & Tap game reduces variability in the sample, but it does not change the conclusions or statistical decisions.
For the own-race interaction, we found a significant condition effect, $F(1, 56) = 7.17, p = 0.010$, partial $\eta^2 = 0.11$, suggesting that children in the synchrony condition displayed significantly stronger explicit pro-own/anti-other bias than those in the asynchrony condition ($p = 0.010$). Paired-samples $t$ tests revealed increases in explicit pro-own/anti-other bias for children in the own-race synchrony movement condition from pretest ($M = 0.56, SD = 0.36$) to posttest ($M = 0.68, SD = 0.30$), $t(26) = -2.95, p = 0.007$, Cohen's $d = 0.57$. The changes in bias for children in the asynchrony condition from pretest ($M = 0.67, SD = 0.27$) to posttest ($M = 0.55, SD = 0.32$) did not reach significance, $t(31) = 1.91, p = 0.066$.

![Graph A](image1.png)

**Fig. 1.** Explicit racial bias before and after the synchronous and asynchronous movements with an own-race Chinese interactor (A) and with an other-race Black interactor (B) or mere exposure with an other-race Black interactor (C). A score higher than 0.50 indicates a preference for own-race Chinese faces relative to other-race Black faces. Error bars represent standard error of the mean.
For the other-race interaction, the main effect of condition was not significant, $F(1, 51) = 0.45$, $p = 0.507$. Children in the other-race condition, regardless of synchronous or asynchronous movement, showed reduced explicit pro-own/anti-other bias from pretest to posttest (both $t$s > 2.93, $ps < 0.007$). These results suggest that when interacting with a Chinese person, synchronous movement, but not asynchronous movement, selectively increased explicit liking for Chinese people in general. However, when interacting with a Black person, both synchronous and asynchronous movements increased explicit liking for Black people in general.

**Feelings of similarity**

To examine whether interpersonal movement affected children’s feelings of similarity with the interactor at posttest, a univariate ANCOVA was performed with race and condition as the between-participant variables and feelings of similarity at pretest as a covariate. The main effect of race was significant, $F(1, 108) = 5.34$, $p = 0.023$, partial $\eta^2 = 0.05$. Children in the own-race interaction condition reported significantly stronger feelings of similarity with the interactor than children in the other-race interaction condition. The main effect of condition and the interaction between race and condition were not significant (both $Fs < 0.68$, $ps > 0.411$). Paired-samples $t$ tests revealed a significant increase in children’s feelings of similarity from pretest to posttest regardless of the interactor’s race (both $ps < 0.016$). These results suggest that interactions with both own-race and other-race individuals, whether synchronous or asynchronous, increased children’s feelings of similarity with the interactor and that the magnitude of this increase was larger in the own-race interaction condition.

**Feelings of social closeness**

A univariate ANCOVA with race and condition as between-participant factors and pretest social closeness scores as a covariate was conducted to examine children’s feelings of social closeness to the interactor at posttest. Means and standard errors are presented in Fig. 2A (own-race condition) and Fig. 2B (other-race condition). The main effect of condition was significant, $F(1, 108) = 5.00$, $p = 0.027$, partial $\eta^2 = 0.04$, suggesting that children in the synchronous movement condition felt closer to the interactor than those in the asynchronous movement condition. Paired-samples $t$ tests revealed a significant increase in children’s feelings of closeness to the interactor from pretest to posttest for children in both the synchrony and asynchrony movement conditions (both $ps < 0.017$). The main effect of race and the interaction between race and condition were not significant (both $Fs < 0.56$, $ps > 0.456$). These results suggest that, regardless of the race of interactor and movement condition (synchronous or asynchronous), children’s feelings of closeness to the interactor increased from pretest to posttest. However, the magnitude of the increase was larger for children in the synchronous movement condition. Correlations between changes in implicit and explicit racial biases and reported feelings (similarity and social closeness) were reported in the Appendix, for two conditions separately.

Taken together, the results of Experiment 1 demonstrate that children who moved synchronously versus asynchronously with an own-race interactor increased explicit liking for Chinese people. However, for children moving with the other-race interactor, explicit liking for Black people increased regardless of movement condition (synchrony or asynchrony). We also found that children in both the synchronous and asynchronous movement conditions experienced enhanced feelings of similarity and closeness to the interactor regardless of interactor race but that children in the synchronous movement condition felt closer than those in the asynchronous movement condition. Implicit racial bias remained unchanged from pretest to posttest across conditions.

**Experiment 2**

The goal of Experiment 2 was to rule out the possibility that the effects observed in the other-race condition in Experiment 1 were driven by mere exposure to the Black person. As suggested by the mere exposure effect (Bornstein, 1989; Dunham, Baron, & Banaji, 2006; Zajonc, 1968) perceptual familiarity generally “breeds” liking, and thus even passive exposure to outgroup members may lead children to develop more positive outgroup attitudes. To address this possibility, we recruited a new group of children and introduced them to a Black adult, but the children did not interact directly with this person.
Method

Participants
In total, 30 Chinese children (14 boys, 16 girls; $M_{\text{age}} = 5.78$ years, $SD = 0.18$) were recruited from a different kindergarten in the same geographic region as kindergartens in Experiment 1. Participants were matched in age and gender to participants in Experiment 1. The same female Chinese experi-

Fig. 2. Feelings of closeness to an own-race interactor before and after the synchronous and asynchronous movements with the own-race interactor (A) and to an other-race interactor before and after the synchronous and asynchronous movements with the other-race interactor (B) or to an other-race interactor before and after mere exposure with the other-race interactor (C). Error bars represent standard error of the mean.
menter tested all participants in Mandarin. A different Black female experimenter than the Black woman in Experiment 1 was introduced to the children.

**Procedure and materials**

The same pretest–posttest procedure was used as in Experiment 1. Instead of being trained on and participating in the musical game, children were asked to sit across the table from a Black female adult and draw pictures. Children and the adult were told to draw pictures independently without any communication. This drawing activity lasted about 2 min, similar in length to the musical game.

**Results and discussion**

No participants were excluded, leaving 30 participants for data analysis. To examine whether mere exposure to an other-race person affects children’s implicit and explicit attitudes toward Black people as well as their feelings of similarity and closeness to this particular Black woman, we conducted paired-samples t tests comparing pretest scores with posttest scores. For all dependent variables, differences between pretest and posttest scores were not significant (all ts < 1.56, ps > 0.129). Thus, we found no evidence to suggest that mere exposure affects children’s implicit racial bias, explicit racial bias, or reported feelings of similarity and closeness to this woman.

**General discussion**

The early emergence of racial biases reinforces the urgent need for interventions to reduce racial biases. The primary purpose of the current study was to examine whether movement synchrony with an own-race or other-race individual can blur interpersonal boundaries (feelings of similarity and social closeness to the interactor) and influence implicit and explicit racial biases in children. In Experiment 1, we found that synchronous movement increased children's feelings of social closeness to the interactor to a greater extent than asynchronous movement regardless of this person’s race. However, synchrony influenced explicit racial biases differently depending on the race of the interactor. When children moved with an own-race Chinese person, their explicit liking for Chinese people in general increased only following interpersonal synchrony. When children moved with an other-race Black person, explicit liking for Black people in general increased similarly for children in both movement conditions. Experiment 2 ruled out the possibility that these positive effects on explicit racial bias after playing the musical game with a Black experimenter were due to mere exposure to a Black person.

Consistent with our hypothesis, we found that synchrony increased children’s feelings of closeness to the interactor to a greater extent than asynchrony. These results are also consistent with previous studies indicating that synchrony selectively increased children’s helpfulness, trust, and cooperation to their synchronous partner (Cirelli et al., 2014; Rabinowitch & Meltzoff, 2017; Tunçgenç & Cohen, 2018; Tunçgenç et al., 2015), extending these findings to a previously untested collectivist social group.

More important, in the own-race condition, we found that the affiliative effects of synchrony further extended to the racial group of the interactor. Children reported an increased desire to interact with Chinese people in general after moving in synchrony, but not asynchronously, with a Chinese person. This extends previous work suggesting that synchrony encourages helping toward the friends of synchronous partners (Cirelli et al., 2016). These results also highlight that increased social affiliation following interpersonal synchrony to specific individuals and the groups to which those individuals belong may come hand in hand with increased social avoidance of other groups.

After interacting with the other-race interactor in Experiment 1, children in both movement conditions reported feeling more similar and closer to this individual, although the effects on social closeness were exaggerated for children in the synchrony condition. However, the importance of synchrony is less clear when investigating how explicit biases change after children interact with the other-race experimenter. Regardless of movement condition, the musical game decreased explicit bias against Black people in general. This is consistent with studies reporting that cross-race contact increases out-group liking in children (Aboud et al., 2012; Vezzali et al., 2015). It is possible that the cooperative fea-
tures involved in the musical game may optimize interracial contact, thereby reducing interracial biases, given the well-documented benefits of cooperation (Allport, 1954; Gaertner et al., 1999). In the current study, even when playing the game asynchronously, the musical game is highly interactive, cooperative, pleasant, and socially engaging. Future research is needed to disentangle which aspects of this musical game led to the reduction in anti-other-race bias.

The possibility that these effects were driven by simply being exposed to an other-race person was explored in Experiment 2. Previous work with adults suggests that mere contact may be particularly effective for highly prejudiced participants (Dhont & Van Hiel, 2009), especially when such contact is relatively novel in a person’s life (Ramiah, Hewstone, Voci, Cairns, & Hughes, 2013). However, in Experiment 2 we found no evidence to suggest that mere contact with an other-race person drove the effects found in the other-race condition of Experiment 1.

The results of these experiments raise interesting questions about the effect of synchrony in different social contexts. Synchrony selectively influenced interracial attitudes most clearly when children interacted with their own-race members. When engaging with the other-race interactor, both synchronous and asynchronous musical engagement reduced explicit racial bias. One possibility is that children’s expectations for synchronous movement may differ for own-race versus other-race interactions. Chinese children interact with own-race people extensively on a daily basis, and these interactions may often involve interpersonal synchrony (e.g., when singing, performing music, or dancing with teachers, parents, or peers). In the current study, when interpersonal contact occurred in this musical context, children might have expected synchronous movement from an own-race interactor but not from an other-race interactor.

One limitation of the current study is that the discrete nature of our video-recording prevented us from analyzing subtle behaviors such as duration of eye contact and mutual smiles between the children and the interactor. Future studies are needed to explore how these facets of social interaction may vary across synchronous and asynchronous interactions with own-race and other-race individuals. Previous research has shown that synchronous interactions encourage higher levels of mutual smiling and eye contact but that these measures do not mediate the effects of synchrony on social affiliation (Tuncgenç & Cohen, 2018). Future studies are also needed to examine whether the effects found in the current study could generalize from one other-race group (e.g., Black people) to another (e.g., White people). This may be possible considering that “secondary transfer effects” of intergroup contact have been found to improve attitudes not only toward the outgroup as a whole but also toward other noncontacted groups (Pettigrew, 2009).

Although we predicted that musical intergroup contact would influence children’s implicit racial biases, we found no evidence to support this hypothesis. It is possible that implicit racial bias, unlike explicit racial bias, is not as malleable following brief interpersonal contact (Lai et al., 2016). It has been suggested that contact quantity, such as repeated exposure to other-race people, predicts implicit racial bias, whereas contact quality with other-race people better predicts explicit racial bias (Prestwich, Kenworthy, Wilson, & Kwantat, 2008). The contact manipulated in the current study, simply a brief single-session experience, might not have been sufficient to reduce implicit racial bias. It is also possible that there are different developmental origins and underlying processes for these two forms of bias (Gawronski, 2019; Gawronski & Bodenhausen, 2006). Explicit bias may be learned from differential social experiences about own-race versus other-race people (e.g., social learning from adults and peers, social interaction with other-race individuals). In contrast, implicit bias may stem from early perceptual experiences of processing own-race versus other-race faces (e.g., recognition vs. categorization). For example, Qian et al. (2017, 2019) reduced children’s implicit anti-other-race bias by teaching Chinese children to differentiate between different other-race Black individuals. The same training, however, did not affect their explicit anti-other-race bias. In the current study, children interacted with only one Black experimenter. Perhaps an intervention that combines a highly social live interaction, such as the musical game used in the current study, with a context where children gain experience in differentiating and recognizing various other-race individuals could reduce both explicit and implicit anti-outgroup biases in Chinese children.

Taken together, the current study provides new insight into the effects of intergroup contact on young children’s interpersonal relationships and racial biases. Children felt socially closer to both own-race and other-race individuals after participating in a musical game with them, especially if this
game encouraged higher levels of interpersonal synchrony. This replicates the social affiliation effects of synchrony documented in previous work using children from a previously untested population. When exploring how this musical game influenced group-level racial biases, we found that synchrony with an own-race interactor selectively enhanced explicit pro-own-race bias but that both synchronous and asynchronous interpersonal movements with an other-race interactor reduced anti-other-race bias. Our results confirm the flexibility and malleability of racial biases at an early preschool age, an understudied population for bias interventions (Lai et al., 2016; Qian et al., 2017, 2019). Practically, our findings provide compelling evidence for live interventions to mitigate racial conflicts and point to musical engagement as a child-friendly context for high-quality intergroup contact.

Acknowledgment

This research was supported by a grant from the National Natural Science Foundation of China (31771227) to Genyue Fu, and the Provincial Distinguished Discipline Construction, Talent Training and Research Innovation Grant from School of Education, Hangzhou Normal University to Chengfei Yu.

Author responsibilities

M.Q., G.F., and L.C. conceived and planned the experiments. M.Q. and C.Y. carried out the experiments and performed data analysis. M.Q. and C.Y. took the lead in writing the manuscript. L.C. provided critical feedback and helped to shape the research, analysis, and manuscript.

Appendix

Correlations between differences in implicit and explicit racial biases and reported feelings in two conditions from pretest to posttest in Experiment 1.

<table>
<thead>
<tr>
<th>Own-race interaction</th>
<th>Implicit bias</th>
<th>Explicit bias</th>
<th>Similarity</th>
<th>Closeness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit bias</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Similarity</td>
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<td>–0.16</td>
<td></td>
</tr>
<tr>
<td>Closeness</td>
<td>0.02</td>
<td></td>
<td>–0.15</td>
<td>–0.03</td>
</tr>
<tr>
<td>Other-race interaction</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit bias</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>Closeness</td>
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<td></td>
<td>0.09</td>
<td>0.38**</td>
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</tbody>
</table>

**p < 0.01.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2020.104884.

References


