

The Effect of a Musical Intervention on Interpersonal and Intergroup Attitudes

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### Abstract

Research suggests that musical interventions have the ability to illicit feelings of trust and cooperation, which can increase social connections. The current study examined the different effects of music exposure and synchrony on interpersonal and intergroup attitudes. Subjects watched a video of either a White or Black individual drumming to music and either heard music or did not hear anything. On top of this, participants either did or did not drum in synchrony with the target presented. It was expected that individuals in the music and synchrony conditions would express more positive attitudes towards the drummer as well as increased self-other overlap with him. Additionally, it is expected that the effects of this condition will be more pronounced for participants who viewed a White target. Results indicated that exposure to synchrony alone can increase positive attitudes towards unknown individuals. Contrary to predictions, attitudes were more positive to Black than White targets, and if anything, music and synchrony had bigger effects on attitude responses towards the Black individuals presented than the White individuals presented.

*Keywords:* musicality, synchrony, self-other overlap

### The Effect of a Musical Intervention on Interpersonal and Intergroup Attitudes

Some researchers have suggested that humans may have adapted musical ability to increase social bonding (Huron, 2003; Loersch & Arbuckle, 2013). Loersch and Arbuckle (2013) suggest that musicality is an important part of human social bonding and fosters positive social living. In their studies 6 and 7, they found that when participants felt their sense of belonging to the group was being threatened, and were motivated to fix social ties, musical reactivity scores increased. This indicates that these participants were more affected by music when their belonging motivation was stronger. It also supports the idea that music is an important part of facilitating social bonds and that social bonding is important to mental processes that could be influenced by music.

On top of increasing social bonding, music has the ability to illicit emotional responses, and people can pick out the emotions conveyed in music even when music is from a different country or uses a different language (Swaminathan & Schellenberg, 2015). Swaminathan and Schellenberg's (2015) review demonstrated that individuals can identify, at above chance levels, emotional cues in music from other cultures. This supports the idea that music has universal emotional cues that can be detected in unfamiliar cultures. Music is also used to regulate and change emotions (Swaminathan & Schellenberg, 2015). There are cultural and universal cues that are present in music that can affect people's emotions. It has been shown that individuals who listen to happy music have increased activity in the area of the face associated with smiling, when compared to individuals who listened to sad music (Swaminathan & Schellenberg, 2015).

**Synchrony.** Synchrony is a big part of musical activity, and it has been shown that acting synchronously with another individual can increase social bonding. Bernieri (1988) conducted an experiment where one participant acted as a teacher to another participant while being

videotaped. After teaching the “student” ten words, each participant filled out a questionnaire on affect and rapport. Raters then scored the clips on movement synchrony and behavior matching between “teacher” and “student.” Bernieri (1988) found that pairs of participants who were rated higher in interpersonal coordination also rated their own interactions more positively than pairs who were not rated highly in synchrony. The study provides evidence for the idea that synchrony may foster social bonding, which is a huge part of social development and sustaining healthy relationships.

When individuals are instructed to synchronize, they report higher rates of trust and cooperation (Reddish, Fischer, & Bulbuia, 2013). Reddish et al. (2013) assigned participants to purposely drum in time with a stimulus, purposely move out of synchrony, or not move at all. Individuals who had purposely drummed in time donated the most money to the group investment in a public goods game. This supports the idea that synchrony may foster cooperation.

**Musical synchrony.** Expanding on the research started above, some researchers have looked at the benefits of musical synchrony. These benefits can be seen more specifically in group drumming. Group drumming has been shown to reduce depression, improve mental health, and reduce inflammatory responses, which reduces stress (Fancourt et al., 2016). There have even been benefits shown in children, with children as young as four positively benefiting from musical and synchronous activities like drumming (Kirschner & Tomasello, 2010). In Kirschner and Tomasello’s (2010) study, participants were randomly assigned to either a musically synchronous manipulation or a non-musical but synchronous manipulation. In the music manipulation, children walked in a circle matching steps and synchronizing their musical tempos on frogs that can be used as instruments. The non-synchronous manipulation had

children walk around and play with the same frogs, but without using the frogs musically. In this condition, children were not instructed to be synchronous or not synchronous. After this activity, children were exposed to a helping behavior test. Children who had participated in the music-synchronous condition helped more than those who were in the non-musical but synchronous condition. This supports the idea that synchrony, in the context of music, can cultivate cooperation and helpful behaviors.

Supporting this theory, Anshel and Kipper (1988) demonstrated that musically synchronous action can foster cooperation and facilitate bonding. They showed this by randomly assigning groups of subjects to passively or actively participate in either a music or no music condition. The active conditions consisted of group singing or poem reading, while passive conditions consisted of listening to music or viewing a film. Participants in the group singing condition took the most risks and trusted their partners the most, showing that music can have an effect on trust and that activities like synchrony can affect cooperation.

On top of this, Trehub, Becker, and Morley (2015) believe that music and synchrony foster trust and cooperation because that is how mothers interact with their babies. Singing keeps them “in touch” with their babies and allows them to connect more. Mothers also tend to swing their babies in synchrony with music. This is believed to make the baby feel more comfortable. Trehub et al. (2015) believe this early experience imprints on individuals, allowing music to become associated with trust, cooperation, and synchrony.

**Race.** Several studies have shown that people tend to like in-group members more than outgroup members (Fazio, Jackson, Dunton, & Williams, 1995; Greenwald, McGhee, & Schwartz, 1998; Payne, Cheng, Govorun, & Stewart, 2005). This is especially seen in implicit measures, which are useful for assessing more automatic, less controllable reactions. Greenwald,

McGhee, and Schwartz's (1998) experiment three, using stereotypical names of Black and White individuals as racial stimuli, found that White participants associated White names as pleasant more often than Black names but Black participants associated Black names as pleasant more often than White names. This supports the idea that individuals tend to like in-group members more than outgroup members.

Research suggests that musically synchronous behavior with racial outgroup members can increase positive feelings towards the outgroup (Harwood, Qadar, & Chen, 2016), and other research on musically synchronous behavior has supported the idea that musical synchrony can increase cooperation, trust, and prosocial behavior (Anshel & Kipper, 1988; Kirschner & Tomasello, 2010; Valdesolo, Ouyang, & Desteno, 2010; Wiltermuth & Heath, 2009). Based off this past research, it is possible that watching musically synchronous behavior has the same effect. A study conducted by Harwood, Qadar, and Chen (2016) expands on the idea that musical synchrony can affect trust and cooperation towards strangers, specifically racial outgroups. The researchers explored whether watching individuals of different ethnicities engaged in musical versus technological collaboration increased perceptions of the synchrony, closeness, and shared identity between these videotaped individuals. The researchers found that non-Arab participants watching videos of a White individual and Arab individual involved in musical collaboration reported higher ratings of synchrony, closeness, and shared identity, compared to those who had watched the same individuals engaged in a technological collaboration. Synchrony, closeness, and shared identity mediated the effect of the manipulation on self-reported desire for future contact with Arabs as well as self-reported attitudes towards Arabs. This increased perception of positive characteristics was related to an increased desire for contact with Arabs and a decrease in negative attitudes towards Arabs. Harwood et al. (2016) demonstrated that watching inter-

ethnic musical contact can reduce negative attitudes between ethnicities; specifically it can increase desire for future contact.

**Study overview.** Previous work has shown that musically synchronous behavior can increase trust, cooperation, and positive attitudes towards racial outgroups, but in limited contexts. Studies have not examined if prosocial effects from musically synchronous behavior can be applied to racial outgroups. Harwood et al. (2016) only examined attitudes towards Arab individuals and in the context of watching this racial outgroup participate in musically synchronous activity, not actively participating. The current work investigates whether synchrony combined with music can influence attitudes and interpersonal closeness towards a specific individual when that individual is either Black or White. To investigate this, I presented participants with one of eight videos, either muted or with music, that presented either a Black or White target drumming, and either instructed the participant to drum along or gave no instructions relating to drumming. I then measured explicit attitudes towards the target, perceived self-other overlap with him, implicitly measured racial attitudes, and self-reported racial attitudes to test if the manipulation influenced interpersonal and intergroup closeness.

I expected the majority of participants to be White and therefore to identify with and perceive more overlap with the White targets. Due to this, I expected a main effect of race where individuals presented with a White target would express more interpersonal closeness than those presented with a Black target. On top of this, due to past research showing the benefits of synchrony and music, I expected main effects of both on interpersonal closeness. I expected participants who were instructed to act synchronously or to listen to music to have increased feelings of interpersonal closeness. Additionally, given past research showing the benefits of musically synchronous activity, I expected there to be an interaction between synchrony and

music so that participants who drummed while listening to music would have the highest perceived interpersonal closeness with the target.

Related to the findings by Loersch and Arbuckle (2013) on musicality and social bonding, I also expected there to be a three-way interaction between target race, synchrony, and music. I expected the effects of the interaction between synchrony and music to be more pronounced for individuals who saw a White target than for individuals who saw a Black target. This was expected because as stated above, most of the participants would be White and should therefore identify more with the White target. Loersch and Arbuckle (2013) showed that musicality increases social bonding within in-groups, so that effect should hold here as well.

## Methods

### Participants

A total of 573 participants (360 women, 212 men, 1 other) were recruited from the General Psychology subject pool at the University of Colorado Boulder between October 2017 and February 2018. The majority of participants were White (non-Hispanic  $n = 351$ ; Asian  $n = 68$ ; Hispanic  $n = 64$ ; Black  $n = 16$ ; Native American  $n = 7$ ; More than one ethnicity  $n = 39$ ; Ethnicity not listed  $n = 23$ ; Preferred not to respond  $n = 5$ ). Ages ranged between 18 and 50 ( $M = 19.12$ ,  $SD = 2.4$ ). Participants received partial course credit for participating in the experiment.

### Design

This study is a 2 (target race: White vs. Black)  $\times$  2 (synchrony: synchrony vs. no synchrony)  $\times$  2 (music: music vs. no music) between-subjects factorial design. Participants were randomly assigned to one of the eight conditions. Half of the participants viewed a White target ( $n = 288$ ) and the other half viewed a Black target ( $n = 285$ ). For synchrony, participants were either instructed to drum with the target (synchrony condition;  $n = 331$ ) or given no instructions



to drum with the target (no synchrony condition;  $n = 242$ ). While watching the video, participants either heard the music that the target was drumming with (music condition;  $n = 288$ ) or did not hear anything (no music condition;  $n = 285$ ). The conditions were fully crossed.

### **Materials**

**Manipulation.** All participants watched a video of a male target drumming, but they were randomly assigned to see a target who was either Black or White. There were four targets (two White and two Black) with an age range of 20 to 22, all wearing the same gray CU t-shirt. Each target was videotaped drumming. In the video, the target is sitting at the end of a table, drumming, while looking directly at the camera. The upper half of the target's torso and his hands could be seen in the video. The song the target is drumming with is "Pulse" by the artist Basspartout (2015). The video lasted for 3 minutes and 36 seconds.

The videos were tailored to each condition. There were sixteen videos total (four for each target) with eight videos presenting a White target (two muted; two with sound; two instructed to drum; two with no drumming instructions) and eight presenting a Black target (two muted; two with sound; two instructed to drum; two with no drumming instructions). I collapsed across race because I was primarily interested in the effects of the targets' race rather than the perceptions of individual targets. I intended to randomly assign participants to all sixteen target video conditions, but due to a programming error only one target was seen for each of the conditions. After the first semester of data collection, I switched the specific targets seen in each condition to ensure that positive outcomes were not due to the targets themselves (328 participants saw the first set of videos; 244 saw the second set of videos).

Half of the participants were assigned to use headphones to listen to the corresponding music (music condition). Participants in the synchrony condition additionally received the

following instructions: “You will be watching a video of Mike while he drums. Try your best to match his rhythm by drumming on the wrist pad in front of you. You will be asked questions about Mike after the video ends.” Participants in the no synchrony condition received the following set of instructions, instead: “You will be watching a video of Mike while he drums. You will be asked questions about Mike after the video ends.”

**Explicit target attitudes.** Participants were asked to report their attitudes toward the target using 12 questions with the stem: “I feel \_\_\_\_\_ toward the target.” Responses were recorded on a 7-point unipolar scale (1 = *not at all*, 7 = *extremely*). Positive unipolar attitude scores were calculated by averaging responses from the six positive attitude items (“warm,” “trusting,” “positive,” “friendly,” “respect,” and “admiration;”  $\alpha = .80$ ). Negative unipolar attitude scores were calculated in the same manner using the negative attitude items (“cold,” “suspicious,” “negative,” “hostile,” “contempt,” and “disgust;”  $\alpha = .72$ ). Higher scores on each scale indicated stronger positive or negative attitudes, respectively. Unipolar scales were used since research indicates that reciprocal effects for positive and negative attitudes may exist, but nonreciprocal effects may be demonstrated as well (Cacioppo, Gardner, & Berntson, 1997). However, to provide a single attitude measure, I also calculated an overall attitude score by subtracting the negative attitude composite from the positive attitude composite. Overall attitude scores that were positive indicated a net positive attitude toward the individual in the video; negative scores indicated a net negative attitude toward the individual in the video.

**Self-other overlap.** After completing the target attitude measure, participants indicated the extent to which they experienced self-other overlap with the target from the video. This was measured using the Inclusion of Other in the Self Scale (IOS; Aron, Aron, & Smollan, 1992), which contains seven pairs of circles that overlap to differing degrees (*Figure 1*). Participants

saw circles labeled “Me” and “Drummer” and indicated which set of circles best described the relationship between the participant and the target (“Drummer”). Pairs of circles were labeled with numbers so that “1” indicated no overlap and “7” indicated the most overlap.

**University identification.** The extent to which participants felt that being a member of the University of Colorado in-group was important to them was assessed with the University of Colorado in-group identification measure (9 questions; Loersch & Arbuckle, 2013). This was included for use as a potential moderator. Since the drummer was introduced as a CU student (and wore a CU t-shirt) in all conditions, it is possible that the participants’ identification with CU could cause participants to rate the target more positively and potentially identify more with the target. Participants responded on a 1 (“not at all/never”) to 7 (“a lot/all the time”) scale to 9 questions like: “To what extent do you feel pride when learning of the accomplishments of other University of Colorado students?” Higher scores on the scale indicated higher in-group identification with the University of Colorado, while lower scores indicated lower in-group identification (Appendix A;  $\alpha = .78$ ). Since I expect in-group identification to act as a potential moderator of the condition effects on the dependent variable, this measure was included for the completeness of the study and further analysis. However, the moderation analysis was beyond the scope of the current study and so is not reported.

**Musical reactivity.** Participants then responded to the 15-item Subjective Musical Reactivity Scale (Loersch & Arbuckle, 2013). The scale was developed to examine participants’ subjective reaction to and enjoyment of music. Participants responded on a 1 (“not at all”) to 7 (“completely”) scale to questions like: “When I hear a fast song, I feel like becoming more active” and “When I hear a happy song, my mood begins to brighten.” Higher scores on the scale indicate higher levels of musical reactivity (Appendix B;  $\alpha = .88$ ). Musical reactivity was

included because I expect that the amount that people are affected by music will moderate condition effects on the dependent measures. It is possible that more musically reactive individuals will rate the target more positively. The measure was included in the study to ensure the fullness of the design and for future analysis, but was beyond the scope of the current study and so is not reported.

**Mood.** In order to ensure that any condition effects were not merely the result of improving participants' mood, they also completed an 8-item mood scale on which participants indicated their current mood ("I am in a \_\_\_\_\_ mood."). Participants responded on a 1 ("not at all") to 5 ("extremely") scale. The measure contains two subscales for positive affect and negative affect. Each scale was created by averaging the four responses for each mood valence. The four items for the positive subscale were: "pleasant," "friendly," "good," and "happy" (Appendix C;  $\alpha = .75$ ). The items for the negative subscale were: "bad," "sad," "angry," and "unfriendly" (Appendix C;  $\alpha = .73$ ). An overall mood score was created by subtracting the negative subscale scores from the positive subscale scores.

**Implicit racial attitudes.** Participants completed an implicit measure of attitudes, the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). The IAT has been shown to identify implicit in-group racial biases that may or may not be demonstrated by explicit attitude measures (McConnell & Leibold, 2001), which allows researchers to test biases that are implicit and could otherwise be influenced by social desirability.

The IAT presents participants with one of two types of stimuli (faces or words) on each trial. Participants are told to categorize the faces as either Black or White and the words as either pleasant or unpleasant as quickly as possible using one of the two response keys. Subjects complete "simple" and "critical" tasks. In the "simple" tasks, participants are presented with

stimuli relating to just two categories (ex: pleasant vs. unpleasant), and they are told to select the key that corresponds with the category presented. The “critical” tasks contains all four categories (ex: White images vs. Black images; pleasant vs. unpleasant words). In this task, both of the response keys are used to identify two separate stimulus types. So in congruent (prejudice consistent) blocks, participants use the same key to respond to Whites and pleasant words or Blacks and unpleasant words. In incongruent blocks, participants are asked to respond to White and unpleasant words with the same key, while Blacks and pleasant words share a response mapping. IAT responses were analyzed according to Greenwald, Nosek, and Banaji (2003) algorithm. Higher IAT scores indicate more positive association with White stimuli than Black stimuli.

**Explicit racial attitudes.** The 20-item Attitudes Towards Black Scale, (ATB; Brigham, 1993) measures self-reported negative attitudes and discomfort during interactions with Black individuals. It includes questions like: “If a black were put in charge of me, I would not mind taking advice and direction from him or her”, “I get very upset when I hear a white make a prejudicial remark about blacks”, and “Generally, blacks are not as smart as whites.” Participants responded on a 1 (“Strongly Disagree”) to 7 (“Strongly Agree”) Likert scale, and the 20 responses were averaged together (10 of the questions were reversed coded; Appendix D;  $\alpha = .84$ ). Higher scores indicate that participants have more favorable attitudes towards Black individuals.

## **Procedures**

Subjects were recruited from general psychology classes at the University of Colorado, at Boulder for partial class credit. Those who signed up for the study arrived at the experiment lab and were placed into individual rooms. Individuals were randomly assigned to condition by a

random number generator. Before viewing the manipulation, subjects indicated their consent by hitting enter on the keyboard in front of them after reading information regarding the experiment and their rights. Subjects watched a video of a male target (White or Black). The video was either muted or had music, and participants were either instructed to drum along with the target or not. Participants then answered questions about their attitudes toward the target. After completing the explicit target attitude measure, participants indicated their self-other overlap with the target (IOS), their subjective musical reactivity, and their identification with the University of Colorado.

Once participants finished these tasks, they reported their mood and then completed the IAT. After participants finished the IAT, they completed the ATB. Last, participants answered demographic questions and questions about suspicions during the experiment. After completing all of these tasks, participants were debriefed and thanked for their time. The entire study lasted about 20 to 30 minutes.

## **Results**

### **Models**

Primary analyses were tested with a 2 (target race: White vs. Black)  $\times$  2 (synchrony: synchrony vs. no synchrony)  $\times$  2 (music: music vs. no music) ANOVA for the dependent measures of explicit target attitudes, self-other overlap, explicit racial attitudes, and implicit racial attitudes. The explicit target attitudes and self-other overlap allowed me to test the effects of synchrony and music on reactions to the specific target presented. Analysis of the ATB and IAT allowed me to test whether any condition effects would also generalize beyond the individual seen to the Black racial category. The two measures allowed me assess this at the explicit (ATB) and implicit (IAT) attitude level.

In addition to the primary analyses discussed above, secondary analyses were conducted. For every dependent measure, an additional set of ANCOVAs was tested to determine whether any significant effects still held after accounting for variation in participant gender or mood. In general, mood and gender did not change the effects of synchrony, race, and music, as fully reported below.

### **Attitudes towards the Target**

**Positive attitudes.** There was a main effect of target race, but contrary to expectations, positive attitudes were significantly higher for the Black target ( $M = 4.26$ ,  $SD = 1.18$ ) than the White target ( $M = 3.76$ ,  $SD = 1.06$ ),  $F(1, 565) = 29.88$ ,  $b = -0.52$ ,  $p < .001$ ,  $R^2 = .05$ . There was a main effect of synchrony condition. Positive attitudes were also significantly higher for participants in the synchrony ( $M = 4.11$ ,  $SD = 1.12$ ) versus no synchrony conditions ( $M = 3.87$ ,  $SD = 1.18$ ),  $F(1, 565) = 8.61$ ,  $b = 0.28$ ,  $p = .003$ ,  $R^2 = .02$ . There was no main effect of music on positive attitudes.

The target race and synchrony main effects were qualified by a three-way interaction between target race, synchrony condition, and music condition,  $F(1, 565) = 6.36$ ,  $b = -0.95$ ,  $p = .012$ ,  $R^2 = .01$ . To further explore this interaction, I ran 2 (synchrony)  $\times$  2 (music) ANOVAs separately for Black and White targets. As can be seen in *Figure 2*, for Black targets, there was a significant effect of the interaction of synchrony and music on positive attitudes, with participants in this combined condition reporting significantly higher positive attitudes towards the target,  $F(1, 281) = 6.95$ ,  $b = 0.74$ ,  $p = .009$ . There was also a marginal effect of synchrony alone on positive attitudes towards the Black target,  $F(1, 281) = 3.42$ ,  $b = 0.26$ ,  $p = .065$ . As can be seen in *Figure 3*, for White targets, the two-way interaction does not hold,  $F(1, 284) = 0.73$ ,  $p = .393$ . The analysis did reveal that there was a significant effect of synchrony,  $F(1, 284) = 5.42$ ,

$b = 0.30, p = .021$ , and a marginal effect of music,  $F(1, 284) = 2.80, b = 0.21, p = .095$ , in the White target conditions.

Regarding the race effects, slopes for race on positive attitudes when in the no synchrony and no music condition,  $b = -0.87, p < .001$ , synchrony and no music condition,  $b = -0.35, p = .050$ , and synchrony and music condition,  $b = -0.64, p < .001$ , were all significant. These slopes show that, overall, participants in conditions where a White individual was presented had lower explicit positive attitudes towards the target than conditions where a Black individual was presented.

The simple slopes of synchrony on positive attitudes when in the no music and White target condition,  $b = 0.41, p = .040$ , and music and Black target condition,  $b = 0.63, p < .001$ , were significant. This shows that the synchrony condition alone increased explicit positive attitudes towards the target. Finally, the simple slopes of music on positive attitudes when in the no synchrony and Black target condition was marginally significant,  $b = -0.35, p = .080$ , while the simple slope of music when in the synchrony and Black target condition was significant,  $b = 0.39, p = .030$ . No other simple slopes from the three-way interaction were statistically significant.

**Negative attitudes.** Similar to the effect on positive attitudes, there was a race main effect on negative attitudes,  $F(1,565) = 26.63, b = 0.49, p < .001, R^2 = .05$ . This race effect was contrary to expectations, since participants reported significantly more negative attitudes towards White targets ( $M = 3.10, SD = 1.16$ ) than Black targets ( $M = 2.61, SD = 1.09$ ). There was also a marginal main effect of synchrony on negative attitudes,  $F(1, 565) = 3.11, b = -0.17, p = .075, R^2 = .01$ . As predicted, individuals in the no synchrony conditions ( $M = 2.94, SD = 1.17$ ) reported marginally more negative attitudes towards the target than individuals in the synchrony



conditions ( $M = 2.80$ ,  $SD = 1.13$ ). There were no other significant condition effects on negative attitudes.

**Overall attitudes.** In addition to separately analyzing positive and negative attitudes, a composite bipolar attitude score was calculated (positive attitudes – negative attitudes) and analyzed with a 2 (target race)  $\times$  2 (synchrony)  $\times$  2 (music) ANOVA. Collapsing across condition, participants had net positive attitudes towards the target ( $M = 1.15$ ,  $SD = 1.99$ ), indicating that all conditions produced relatively positive attitudes towards the target,  $F(7, 565) = 7.32$ ,  $p < .001$ . Contrary to initial expectations, but consistent with the main effect demonstrated in separate analyses on positive and negative attitudes, individuals reported more positive attitudes overall towards Black targets ( $M = 1.65$ ,  $SD = 1.96$ ) than White targets ( $M = 0.67$ ,  $SD = 1.90$ ),  $F(1, 565) = 38.27$ ,  $b = -1.01$ ,  $p < .001$ ,  $R^2 = .06$ . There was also a main effect of synchrony condition; individuals in the synchrony conditions had significantly more positive attitudes towards the target ( $M = 1.31$ ,  $SD = 1.95$ ) than those in the no synchrony conditions ( $M = 0.94$ ,  $SD = 2.03$ ),  $F(1, 565) = 7.52$ ,  $b = 0.45$ ,  $p = .006$ ,  $R^2 = .01$ .

### Self-Other Overlap

There was a main effect of target race on Inclusion of the Other in the Self (IOS) scores. IOS scores were significantly higher for Black targets ( $M = 2.88$ ,  $SD = 1.46$ ) than White targets ( $M = 2.27$ ,  $SD = 1.18$ ),  $F(1, 565) = 30.74$ ,  $b = -0.63$ ,  $p < .001$ ,  $R^2 = .05$ . Higher scores indicate more perceived overlap with the target presented. As predicted, IOS scores were marginally higher for individuals in the music ( $M = 2.64$ ,  $SD = 1.18$ ) compared to no music conditions ( $M = 2.49$ ,  $SD = 1.29$ ),  $F(1, 565) = 2.96$ ,  $b = 0.19$ ,  $p = .086$ ,  $R^2 = .05$ . There were no other significant effects on IOS.

### **Attitudes Toward Black Scale**

There were no condition effects demonstrated in the 2 (target race) by 2 (synchrony) by 2 (music) ANOVA for the Attitudes Toward Black Scale (ATB),  $F(7, 565) = 0.62, p = .740$ .

### **Implicit Association Test**

One participant's data was excluded from IAT analyses because they reported recognizing one of the individuals presented in the IAT. As predicted, there was a marginally significant three-way interaction between target race, synchrony, and music,  $F(1, 565) = 3.65, b = 0.19, p = .057$ . To better understand the nature of the interaction, I conducted 2 (synchrony)  $\times$  2 (music) ANOVAs separately for Black targets and White targets. I found that the two-way music by synchrony interaction effects did not remain significant for either the Black target condition,  $F(1, 281) = 1.68, p = .195$  or White target condition,  $F(1, 284) = 1.96, p = .162$ , when examined separately.

For Black targets, there was a marginally significant effect of synchrony,  $F(1, 281) = 2.87, b = -0.06, p = .091$ . There were no main effects of either synchrony or music for White targets. The marginal three-way interaction for the full sample could have resulted from scores in the Black target and no synchrony and music condition outlier mean (*Figure 5*). This outlier could have had a major effect on the data and caused the marginal effect. Since there was a marginal effect of synchrony in the Black target condition, it is possible this influenced the overall model outcome. There were no other significant effects associated with IAT scores.

The simple slope of race when in the no synchrony and music condition was marginally significant,  $b = -0.10, p = .090$ . For the music and Black target condition, the simple slope of synchrony was significant,  $b = -0.10, p = .050$ . Finally, the simple slope of music when in the no

synchrony and Black target condition was marginally significant,  $b = 0.10$ ,  $p = .070$ . There were no other significant simple slopes from this model.

### **Covariate Analyses**

**Models.** The analyses reported above tested the primary hypotheses that the three-way interaction between race, synchrony, and music would have a stronger effect for those presented with a White than a Black target and that synchrony and music would each have effects on explicit, implicit, and intergroup attitudes. As noted, due to the fact that changes in mood could potentially affect impressions of the drummer, it was important to assess whether condition had an effect on mood. It was also important to include gender as a covariate because the gender of the target was held constant as male, and this would likely cause females to report less overlap with the target presented. The subsequent analyses involve  $2$  (target race)  $\times$   $2$  (synchrony)  $\times$   $2$  (music)  $\times$  covariate (mood or gender) ANCOVAs to see if the results reported above held after accounting for the covariates of mood or gender.

**Mood.** Before evaluating the effects of target race, synchrony, and music on each dependent measure with mood included in the model, I first examined any condition effects on mood. A fully interactional model found no significant effect of any of the independent variables or their interaction on overall mood ( $M = -1.74$ ,  $SD = 1.17$ ),  $F(7, 565) = 0.66$ ,  $p = .705$ . In order to assess the effect of mood on each dependent measures, I conducted  $2$  (target race)  $\times$   $2$ (synchrony)  $\times$   $2$ (music)  $\times$  mood ANCOVAs, with mood entered as a continuous predictor.

**Positive attitudes.** I found that mood marginally predicted positive attitudes,  $F(1, 564) = 2.62$ ,  $b = -0.04$ ,  $p = .106$ , with individuals in more positive moods tending to have less positive attitudes towards the target than those in more negative moods. Mood was added to the positive explicit attitude ANOVA to check if the effects of race and synchrony were still significant when

controlling for mood. The main effect of race on positive explicit attitudes towards the target was still significant after controlling for mood,  $F(1, 564) = 29.77$ ,  $b = -0.52$ ,  $p < .001$ , and the effect of synchrony condition on positive attitudes after controlling for mood,  $F(1, 564) = 8.93$ ,  $b = 0.28$ ,  $p = .003$  remained significant as well. Finally, the three-way interaction of race, synchrony, and music was still significant,  $F(1,564) = 5.84$ ,  $b = -0.91$ ,  $p = .016$  when controlling for mood.

**Negative attitudes.** As demonstrated in earlier analyses, race of the target affected negative attitudes towards the target. I added mood as a covariate to see if the effects of race remained. Although overall mood marginally predicted positive attitudes, it did not predict negative attitudes,  $F(1, 564) = 1.54$ ,  $p = .215$  after controlling for any condition effects. The main effect of race remained when controlling for mood,  $F(1, 564) = 26.51$ ,  $b = 0.49$ ,  $p < .001$ . Likewise, the main effect of synchrony remained marginally significant,  $F(1, 564) = 3.33$ ,  $b = -0.18$ ,  $p = .069$ .

**Overall attitudes.** Mood also marginally predicted overall attitudes,  $F(1,564) = 2.77$ ,  $b = -0.08$ ,  $p = .097$ . However, when repeating the same analysis as above for overall explicit attitudes, the effects of race,  $F(1, 564) = 38.16$ ,  $b = -1.01$ ,  $p < .001$ , and synchrony  $F(1, 564) = 7.83$ ,  $b = 0.46$ ,  $p = .005$ , remained significant when controlling for mood.

**IOS.** The 2 (target race)  $\times$  2 (synchrony)  $\times$  2 (music)  $\times$  mood ANCOVA for IOS scores found overall mood was not a significant predictor of IOS scores after accounting for any condition effects,  $F(1, 564) = 0.22$ ,  $p = .636$ . When controlling for overall mood, race of the target was still a significant predictor of IOS,  $F(1, 564) = 30.64$ ,  $b = -0.62$ ,  $p < .001$ , but music became marginally significant,  $F(1, 564) = 2.88$ ,  $b = 0.19$ ,  $p = .090$ .

**ATB.** As stated in the analyses above, there were initially no condition effects on ATB. Mood significantly predicted scores on the Attitudes Toward Black Scale after controlling for

condition effects,  $F(1, 564) = 4.79$ ,  $p = .029$ . More positive moods were associated with more positive attitudes towards Blacks.

**IAT.** In the IAT analysis, the target race by synchrony by music three-way interaction effects on IAT remained marginally significant when controlling for overall mood,  $F(1, 564) = 3.66$ ,  $b = 0.19$ ,  $p = .060$ .

**Gender.** Following the statistical design above, a 2 (target race)  $\times$  2 (synchrony)  $\times$  2 (music)  $\times$  gender (female, male) ANCOVA was conducted to evaluate if the condition effects remain after accounting for gender.

**Positive attitudes.** When gender was added to the ANOVA predicting positive explicit attitudes towards the target, it did not uniquely predict positive attitudes,  $F(1, 563) = 2.28$ ,  $p = .132$ . The effects of target race still held,  $F(1, 563) = 30.61$ ,  $b = -0.52$ ,  $p < .001$ , as did the main effect of synchrony,  $F(1, 563) = 8.79$ ,  $b = 0.28$ ,  $p = .003$ . On top of this, the interaction remained significant when adding gender to the model,  $F(1, 563) = 6.36$ ,  $b = -0.95$ ,  $p = .012$ .

**Negative attitudes.** When looking at negative explicit attitudes, gender did not have an effect on negative attitudes,  $F(1, 563) = 1.07$ ,  $p = .301$ , after accounting for condition effects. The effects of race,  $F(1, 563) = 26.80$ ,  $b = 0.50$ ,  $p < .001$ , and synchrony,  $F(1, 563) = 3.33$ ,  $b = -0.18$ ,  $p = .068$ , on negative attitudes remained significant and marginal, respectively.

**Overall attitudes.** Gender was not able to predict overall attitudes,  $F(1, 563) = 2.19$ ,  $p = .139$ . I also tested to see if the effects of both synchrony,  $F(1, 563) = 7.76$ ,  $b = 0.46$ ,  $p = .006$ , and race,  $F(1, 563) = 38.90$ ,  $b = -1.02$ ,  $p < .001$ , on overall explicit attitudes were still significant predictors when controlling for gender, and they were.

**IOS.** For the IOS, females had significantly lower scores ( $M = 2.46$ ,  $SD = 1.32$ ) than males ( $M = 2.75$ ,  $SD = 1.40$ ),  $F(1, 563) = 5.07$ ,  $b = -0.26$ ,  $p = .025$ . Race remained a significant

predictor of IOS scores,  $F(1, 563) = 29.57$ ,  $b = -0.61$ ,  $p < .001$ , but music's predictive ability decreased,  $F(1, 563) = 2.30$ ,  $p = .130$  after controlling for gender effects.

**ATB.** Gender significantly predicted Attitudes Toward Black Scale scores, with females reporting more positive self-reported attitudes ( $M = 7.14$ ,  $SD = 0.66$ ) than males ( $M = 6.78$ ,  $SD = 0.79$ ),  $F(1,563) = 33.03$ ,  $p < .001$ , towards black people.

**IAT.** Gender could predict IAT scores, with males having significantly higher scores ( $M = 0.09$ ,  $SD = 0.28$ ) than females ( $M = 0.04$ ,  $SD = 0.30$ ),  $F(1,563) = 4.33$ ,  $b = -0.05$ ,  $p = .038$ , indicating that males more easily associated White faces with pleasant stimuli and Black faces with unpleasant stimuli than females did. After adding gender to the IAT model, the race by synchrony by music three-way interaction was no longer significant,  $F(1, 563) = 3.49$ ,  $p = .062$ .

## Discussion

### Race Effects

Contrary to my hypothesis for the main effect of race, individuals presented with a Black target reported more overall positive attitudes than those presented with a White target. This could be due to social desirability bias. Social desirability bias is likely due to the racial composition of the University of Colorado. The University of Colorado student body identifies as about 66.9 percent White (University of Colorado: Diversity Report, 2017) and because our sample was 61.5 percent White, it is possible that when individuals viewed a Black target, the race of the target was salient and individuals possibly could have deduced that the study was related to race. But when individuals viewed a White target they were not aware of race, but focused more on the musical aspect of the study. This could have impacted the increase in positive attitudes seen towards Black targets because individuals wanted to present themselves as pro-minority, and when being presented with an individual of a minority population individuals

could have been more careful about their self-report attitudes towards this racial outgroup member. Self-other overlap was also higher for Black targets than White targets. This was not expected. It was hypothesized that individuals viewing the White target would have higher IOS scores than those viewing the Black target. These unexpected results could be due to individuals being conscious of the race of the target and adjusting their views to be more favorable of a stereotypically less favored race.

### **Synchrony Effects**

Overall, individuals in the synchrony conditions reported significantly more overall positive attitudes than those in the no synchrony conditions. This main effect of synchrony on explicit attitudes implies that acting synchronously with an individual can increase positive attitudes towards that individual. It was also found that synchrony had a marginal effect on negative attitudes towards the target. Individuals in the synchrony conditions reported less negative attitudes towards the target than the individuals in the no synchrony conditions. This supports the previous literature that acting in synchrony with another individual can produce more positive feelings towards that individual and reduce negative feelings towards the individual.

### **Music Effects**

There was also a marginal effect of music condition on self-other overlap scores. As predicted, those in the music conditions reported marginally higher self-other overlap with the target than those in the no music conditions. This could indicate that listening to music with another individual increases feelings of similarity and overlap with that individual. Not surprisingly, male participants reported more overlap with the target than female participants did.

This is likely because the target present was male, so females do not feel as much overlap as males due to the gender difference.

### **Musical Synchrony Effects**

This study provided evidence that music and synchrony, outside of day to day contexts, can improve social relations towards strangers and outgroup members. These results were achieved in a four minute intervention, so it is possible that longer interventions may result in more significant and long-lasting positive impacts. I did not find support for my two-way interaction hypothesis: I expected that participants in conditions that involve combined music and synchrony would report more positive attitudes and more overlap with the target individual.

It was also expected that there would be a race by synchrony by music interaction for interpersonal closeness. The results partially support this hypothesis, with positive explicit attitudes and IAT affected by the three-way interaction. As supported by the analysis of simple slopes, positive explicit attitudes were highest in conditions where Black targets were presented and lowest in conditions where White targets were presented. This implies that individuals who were presented with a Black target had an increase in positive attitudes towards the target when compared against individuals who viewed a White target.

The study provided evidence that implicit biases could be affected by synchrony, race, and music condition. Synchrony with music conditions saw an increase in positive biases towards the race of the target, in conditions where participants viewed a White target. Individuals in the White target by synchrony by music condition had more positive association with White stimuli than Black stimuli. Those in the Black condition, on average, did not have more positive associations with Black stimuli. The marginal effect of synchrony in the Black target condition



implies that they may be able to foster more positive feelings towards the target and this may have transferred onto implicit perceptions of the outgroup the target was associated with.

### **Study Limitations and Future Directions**

The study was conducted in individual rooms, where participants were by themselves unsupervised. It is possible that participants did not follow the instructions given on the screen or were distracted by personal items like phones. This is unlikely due to the main effects of synchrony, race, and music found above. It is also possible that those in the music conditions unintentionally moved more synchronously with the target, even not when in the synchrony condition, which could have caused the music intervention to have somewhat of an effect on the dependent measures. The intervention was also very short, so it is possible the effects were weaker than they would be with a longer intervention.

The marginal, instead of significant, effects of the three-way interaction on IAT and explicit positive attitudes could be due to the fact that the intervention was administered through a video on a computer. Passively interacting with a video is much different than actively interacting with a live person in the same room. Previous studies demonstrating the positive outcomes of synchrony have been done with in-person and not virtual interaction (Kirschner & Tomasello, 2010; Wiltermuth & Heath, 2009;). It could be interesting to explore whether effects would be stronger if the manipulation was administered with live targets.

It is possible that I did not see any significant effects of condition on Attitudes Toward Blacks Scale scores because of the short intervention, or even because participants were only exposed to one member of the outgroup. If participants would have been exposed to multiple members of the outgroup during the manipulation, it is possible that the intervention would have a stronger effect. It is also possible that individuals were influenced by social desirability bias.

Asking people whether they like Black people tends to be a common area where people respond desirably due to cultural and social pressures. This could have influenced the lack of differences in scores between conditions.

On top of the limitations listed above, the majority of the sample consisted of college aged individuals from a general psychology course. This means that the findings demonstrated in this study can only generalize to the college population. The fact that these findings can only generalize to a college population is a major limitation because I cannot be sure that the same manipulation presented to older adults or younger children will have similar findings with what is presented here. It is important to extend this study to include children and older adults to see if the findings are consistent. Also, the sample was taken from a general psychology course, which may attract more socially conscious individuals. It may also have caused participants to be more aware of the race of the target because of racial experiments discussed in their class. On top of this, the sample was taken from Boulder, Colorado, which is a very progressive college town. Boulder is known for being very open and progressive towards minority populations, so it would be interesting to replicate this study in a more rural and less minority positive area to see if the results are similar.

Greitemeyer (2011) showed that prosocial lyrics can decrease aggressive thoughts, behavior, and affect. He had participants listen to either two prosocial or two neutral songs. Aggression was measured through an aggressive word completion task. Participants who had listened to the prosocial songs had lower rates of aggressive word completion than the those who has listened to neutral songs, showing that prosocial songs decrease aggressive thoughts. The current study did not involve music with lyrics to avoid the confound of the lyrics causing significant effects on dependent measures. It would be interesting to see if adding music with

lyrics to this manipulation could increase the three-way interaction. Adding prosocial songs to the intervention presented in the current study could potentially increase positive attitudes and overlap with outgroup members.

Lastly, this was not a manipulation conducted in a real world setting. It is important to check to see if the effects of the manipulation hold when applying them to real world situations. One way to apply this intervention to more real world contexts would be to have free drumming classes at a predominantly White college with Black instructors and have some sort of donation for Black Lives Matter or other explicit measure outside of the class that participants have to walk by. This would provide a more real world context for the manipulation.

### **Conclusion**

The current study examined the effectiveness of a musical intervention on interpersonal interaction. Previous studies have shown the effect of music and synchrony on explicit attitudes and prosocial behavior. I hoped to expand on these past studies to determine whether synchrony or music, or the combination of synchrony and music, creates the strongest effects on attitudes. Participants who were in the Black target by synchrony by music condition reported the highest positive attitudes towards the target while those in the White target by no music by no music condition had the lowest reported positive attitudes towards the target. The results presented in the current paper support the use of music and synchrony for improving social interactions between strangers and potentially outgroup members.

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Figures

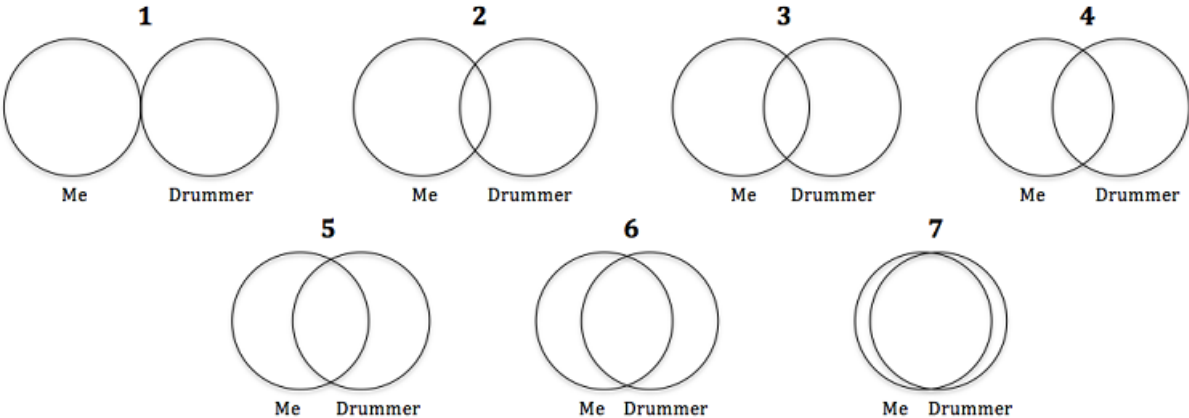
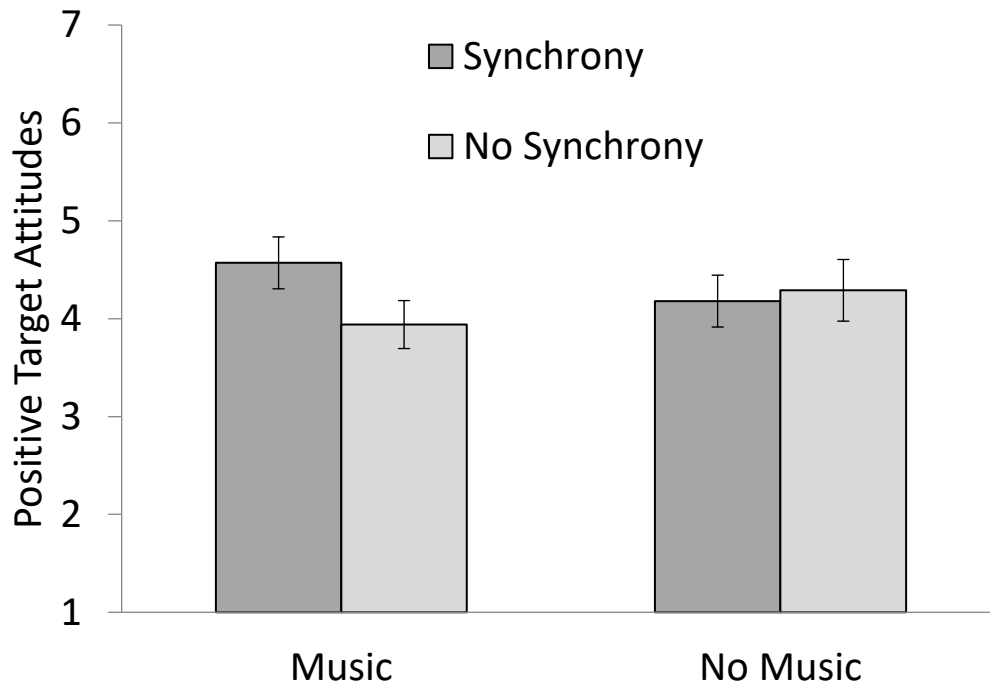
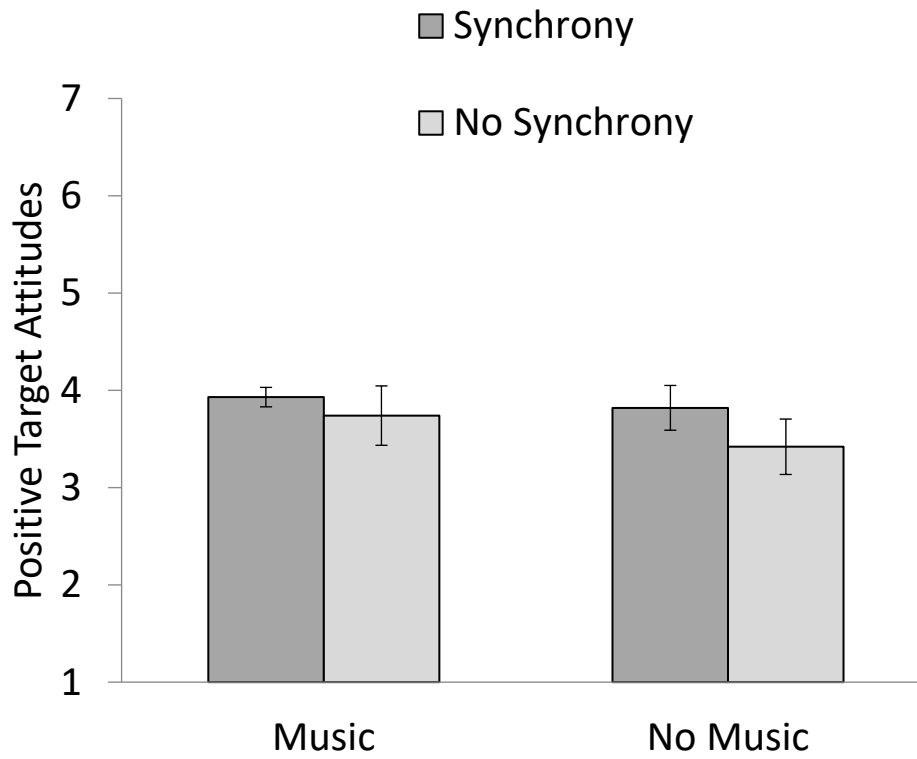


Figure 1. IOS measure

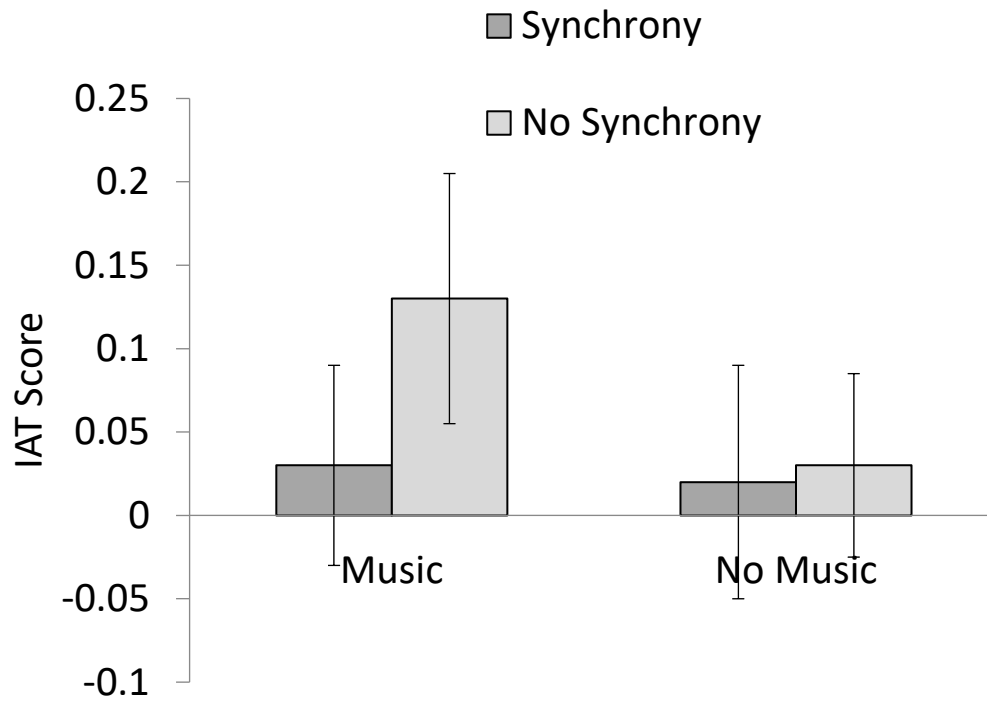


*Figure 2.* Conditional Explicit Positive Attitude Means and 95% Confidence Intervals for Black Target.

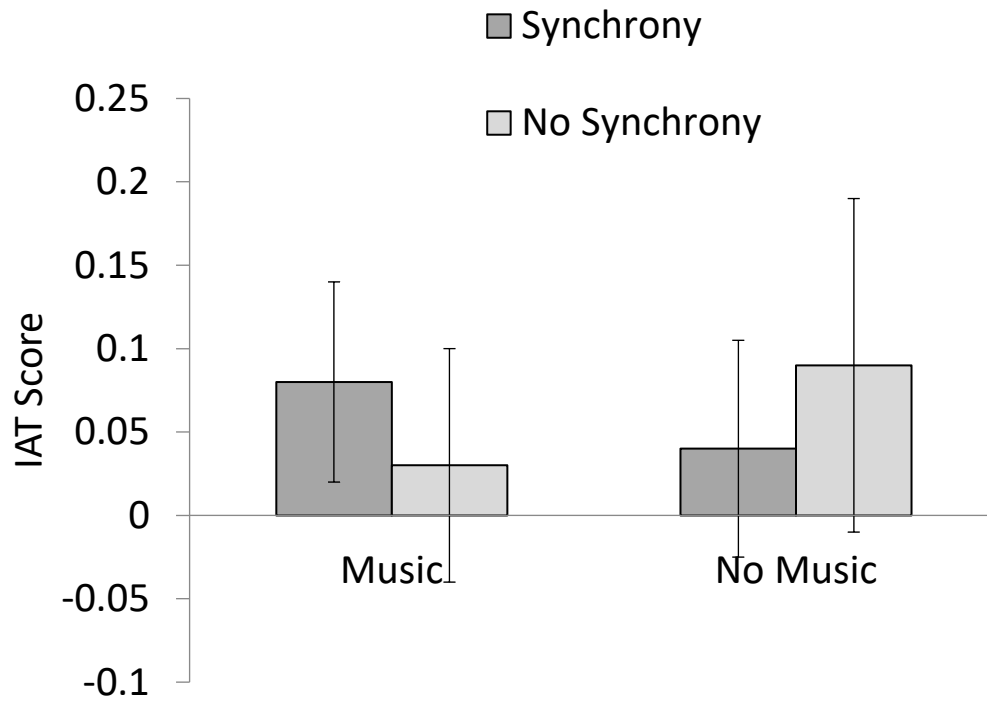




*Figure 3.* Conditional Explicit Positive Attitude Means and 95% Confidence Intervals for White Targets.



*Figure 4.* Conditional IAT score and 95% Confidence Interval for Participants who viewed Black Targets.



*Figure 5.* Conditional IAT score and 95% Confidence Interval for Participants who viewed White Targets.

## Appendix A

*In-Group Identification*

IG1. To what extent do you feel pride when learning of the accomplishments of other University of Colorado students?

IG2. To what extent do you dislike those people who attend CSU?

IG3. How much do you have in common with other students who attend the University of Colorado?

IG4. How important is being a University of Colorado Buffalo to you?

IG5. To what extent do you agree with the following statement? “When I interact with others, I tend to think of myself as a University of Colorado student.”

IG6. How much does being a University of Colorado student say about who you really are?

IG7. If you had a child who was considering attending the University of Colorado, how disappointed would you be if they chose to get a degree from another university?

IG8. To what extent do you agree with the following statement? “Knowing that I am a University of Colorado student tells other a lot about me.”

IG9. How often do you wear clothing associated with the University of Colorado (e.g., CU sweaters, caps, shirts, etc.)?

## Appendix B

*Musical Reactivity*

MR1: When I hear a fast song, I feel like becoming more active.

MR2: When I choose music, I select it based on how it will make me feel.

MR3: When I listen to music, I can feel it in my body.

MR4: When I listen to music, I can feel it affect my mood.

MR5: I feel a strong emotional attachment to my favorite songs.

MR6: When I hear a sad song, my mood begins to darken.

MR7: If music wasn't a part of my life, I would be a completely different person.

MR8: When I hear a slow song, I start to slow down my actions.

MR9: When I hear a happy song, my mood begins to brighten.

MR10: My life would lose meaning if I couldn't listen to music.

MR11: When I listen closely to music, I start to lose track of my immediate surroundings.

MR12: When I listen to music my head moves along with the beat.

MR13: When I hear music, my foot starts tapping along with the beat.

MR14: If the right song comes on, I have trouble following another person's conversation.

MR15: If I close my eyes and listen to music, the rest of the world starts to fade away.

## Appendix C

*Mood*

Instructions: Please indicate the extent to which you agree with each of the following statements.

(1 - *not at all*; 5 - *extremely*)

**Positive Mood**

M1. I am in a(n) pleasant mood.

M2. I am in a(n) friendly mood.

M3. I am in a(n) good mood.

M4. I am in a(n) happy mood.

**Negative Mood**

M5. I am in a(n) bad mood.

M6. I am in a(n) sad mood.

M7. I am in a(n) angry mood.

M8. I am in a(n) unfriendly mood.

## Appendix D

*Attitudes Towards Black Scale (ATB)*

Instructions: Please indicate on a 1 (strongly disagree) to 7 (strongly agree) scale the extent to which you agree with each statement.

ATB1. If a black were put in charge of me, I would not mind taking advice and directions from him or her.

ATB2. If I had a chance to introduce black visitors to my friends and neighbors, I would be pleased to do so.

ATB3. I would rather not have blacks live in the same apartment building I live in.\*

ATB4. I would probably feel somewhat self-conscious dancing with a black in a public place.\*

ATB5. I would not mind it at all if a black family with about the same income and education as me moved in next door.

ATB6. I think that black people look more similar to each other than white people do.\*

ATB7. Interracial marriage should be discouraged to avoid the “who am I?” confusion which the children feel.\*

ATB8. I get very upset when I hear a white make a prejudicial remark about blacks.

ATB9. I favor open housing laws that allow more racial integration of neighborhoods.

ATB10. It would not bother me if my new roommate was black.

ATB11. It is likely that blacks will bring violence to neighborhoods when they move in.\*

ATB12. I enjoy a funny racial joke, even if some people may find it offensive.\*

ATB13. The federal government should take decisive steps to override the injustices blacks suffer at the hands of local authorities.

ATB14. Black and white people are inherently equal.



ATB15. Black people are demanding too much too fast in their push for equal rights.\*

ATB16. Whites should support blacks in their struggle against discrimination and segregation/

ATB17. Generally, blacks are not as smart as whites.\*

ATB18. I worry that in the next few years I may be denied my application for a job or promotion because of preferential treatment given to minority group members.\*

ATB19. Racial integration (of schools, businesses, residences, ect.) has benefitted both whites and blacks.

ATB20. Some blacks are so touchy about race that it is difficult to get along with them.\*

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\*= Reverse coded item