



Singing Promotes Cooperation in a Diverse Group of Children

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Abstract: Previous research involving preschool children and adults suggests that moving in synchrony with others can foster cooperation. Song provides a rich oscillatory framework that supports synchronous movement and may thus be considered a powerful agent of positive social relations. In the current study, we assessed this hypothesis in a group of primary-school aged children with diverse ethnic and socioeconomic backgrounds. Children participated in one of three activity conditions: group singing, group art, or competitive games. They were then asked to play a prisoner's dilemma game as a measure of cooperation. Results showed that children who engaged in group singing were more cooperative than children who engaged in group art or competitive games.

Keywords: movement synchrony, singing, cooperation, children

The universality of music indicates that it serves, or at least once served, an adaptive purpose. Several theorists have proposed that music functions as a social tool that enables groups to develop and preserve bonds, ultimately leading to cooperative behaviors within the group (e.g., Huron, 2001; McNeill, 1995; Roederer, 1984). Indeed, a considerable amount of research provides evidence in support of music's capacity for social bonding (e.g., Kirschner & Tomasello, 2010). Singing is perhaps the most pervasive and accessible form of music. It lends itself well to performance by large groups and can be accomplished without formal training. The current study investigates the social benefits of group singing in the context of a diverse group of children in middle childhood.

What features differentiate group singing from other types of group activity? Group singing typically requires a high level of cooperation among members but so too do many other types of group activity. Other salient features include the emphasis on creative expression and the need for synchronization of body movements. This latter aspect is closely related to rhythmic entrainment, whereby performers internalize the external rhythmic pulse (Demos et al., 2012). For example, singing in unison requires synchronization of laryngeal muscles (Echternach, Burk, Burdumy, Traser, & Richter, 2016). Another layer of synchrony is provided by way of the song's pitch interval structure, which exerts subtle influences on facial and head movements (Thompson & Russo, 2007). Finally, as the phrasing of lyrics will influence respiration, group singing will also lead to synchronization of respiratory patterns (Müller & Lindenberger, 2011).

Social psychological research conducted over the last 20 years has explored movement synchrony as one explanation for the social bonding capacity of joint musical activity. Movement synchrony appears to influence interpersonal affiliation (Bernieri, 1988; Hove & Risen, 2009; Marsh, Richardson, & Schmidt, 2009; Miles, Nind, & Macrae, 2009). For example, Hove and Risen (2009) conducted a series of experiments in which they measured participants' affiliation with the experimenter following various degrees of movement synchrony. Participants were asked to tap their finger in time with a metronome. The experimenter manipulated movement synchrony by tapping along synchronously, asynchronously, or not tapping along with the participant. Results demonstrated that movement synchrony positively predicted participant ratings of affiliation toward the experimenter.

The effects of joint music making on affiliation may be mediated by increased recognition of interpersonal similarity arising from movement synchrony. Perceived similarity between individuals has been shown to increase following a task where individuals are required to move in unison (Valdesolo & DeSteno, 2011; Valdesolo, Ouyang, & DeSteno, 2010). This effect of movement synchrony on perceived similarity has also been established in children (Rabinowitch & Knafo-Noam, 2015).

Joint music making may also generate a shift in social categorization whereby the group moving together becomes a collective social unit. McNeill (1995) describes this as *boundary loss* or *we-ness*. Caporael, Dawes, Orbell, and Van de Kragt (1989) argue that when an individual redefines him- or herself as a member of a collective social

group, they become more likely to behave in ways that primarily benefit the group. Given that movement synchrony may support the generation of a collective social group, it should also enhance the tendency for individuals to behave in ways that benefit the group. Indeed, research demonstrates that movement synchrony encourages prosocial and cooperative behaviors (Anshel & Kipper, 1988; Cirelli, Einarson, & Trainor, 2014; Kirschner & Tomasello, 2010; Kokal, Engel, Kirschner, & Keysers, 2011; Valdesolo & DeSteno, 2011; Wiltermuth & Heath, 2009).

The link between movement synchrony and cooperation has been investigated through the assessment of many different prosocial and cooperative tasks. Strategic decision-making games, such as the prisoner's dilemma, are particularly effective as they evaluate whether an individual behaves in a manner that maximizes their own self-interest or that of the group. These games also provide insight into trust and loyalty toward others (see Axelrod & Hamilton, 1981).

Wiltermuth and Heath (2009) assessed cooperation using a strategic decision-making game following conditions of synchronous singing, synchronous singing-and-moving, asynchronous singing, and no singing or moving. Results demonstrated that cooperation was significantly higher in the synchronous conditions compared to the asynchronous and no moving conditions. Notably, the two synchronous conditions led to statistically comparable levels of cooperation, suggesting that group singing is just as effective without accompanying gross motor movements. Furthermore, individuals who had engaged in the synchronous conditions reported higher feelings of being on the "same team" relative to the other conditions, indicating the development of a collective identity.

The social benefits of joint music making also appear to be present in young children (Kirschner & Tomasello, 2010) and even infants as young as one year (Cirelli et al., 2014; Tunçgenç, Cohen, & Fawcett, 2015). Taken together, these studies demonstrate that joint music making is a powerful social force capable of promoting cooperative behavior across various segments of the population.

The current study is novel in that it explores the effects of group singing on cooperation in middle childhood (ages 6–11 years). Although the age in which intergroup biases emerge has not received formal consensus in the literature (e.g., see Aboud, 1988; Nesdale, 1999; Quintana, 1999, 2007), there are several reasons why middle childhood was selected as our target population. According to Quintana (1999, 2007), children at this age have reached a stage of socio-cognitive development in which they understand social hierarchies and have adopted corresponding intergroup biases. Critically, children at this age have also developed the concrete operations that give

them access to an enhanced awareness of others' perspectives and attitudes, including individuals perceived to be part of a different social group (Quintana, 1999). Thus, middle childhood may be an ideal age for an intervention that promotes prosociality in a diverse environment.

Current Study

In the current study, we assessed whether group singing would foster cooperation in a diverse group of children in middle childhood. Children in predetermined groups were assigned to one of three activity conditions: group singing, group art, or competitive games. The addition of the group art activity allows us to disentangle the prosocial benefit of movement synchrony from the prosocial benefit of cooperative and creative expression. While the singing and art conditions are both positive social interactions that involve cooperation and creative expression, singing offers an additional mechanism to promote prosocial behaviors as it embodies a rhythmic and melodic framework that may encourage movement synchrony. Therefore, we expected that group singing would lead to more prosocial outcomes than group art.

Methods

Participants

Fifty children from a YMCA summer camp in Toronto, Canada participated in this study. See Table 1 for participant descriptives.

Procedure

Participants were recruited through the YMCA summer camp located in downtown Toronto, Canada. This camp was chosen for its highly diverse camper population drawing from neighborhoods that are socioeconomically and ethnically diverse. All parents and children were informed about the procedures of the study and provided consent and assent respectively. The design was quasi-experimental, whereby children were already assigned to predetermined camp groups based on age range and program-specific camp. The study was conducted with a total of 12 different camp groups throughout the summer. Predetermined camp groups were pseudorandomized to activity conditions ensuring that ages and program-specific camps were equally represented. The study consisted of three activity conditions: group singing, group art, or competitive games. In the group singing condition, each child was asked to write down a few things they love about living

Table 1. Descriptive statistics

Condition	Sample size	Mean age (SD)	Male/female
Group singing	16	7.125 (1.26)	3/13
Group art	16	8.06 (1.73)	6/10
Competitive	18	8.44 (1.38)	7/11

in Toronto. As a group, the children incorporated these thoughts and ideas into a song that they all performed together. In the group art condition, each child was asked to write down a few things they love about living in Toronto. As a group, the children incorporated these thoughts and ideas into a mural that they all colored together. Care was taken to ensure that the group singing and group art conditions involved a similar level of cooperation. In the competitive condition, children were engaged in competitive games (e.g., coin tossing). Activities in all three conditions lasted about 30 min.

Dependent Measure

Immediately following the activities, children were randomly assigned into dyads and were asked to play a children's version of the prisoner's dilemma game developed by Matsumoto, Haan, Yabrove, Theodorou, and Carney (1986). Each child was given a red card and a blue card. The red card represented competition and could defeat the blue card. The blue card represented cooperation. In each round, players decided to play the red card or the blue card resulting in three potential outcomes. When one player decided to compete (red card) and the other to cooperate (blue card), the competitor won the round and earned two gems, while the cooperator earned nothing (competitive). When both players decided to compete by playing the red card, both players earned nothing (stalemate). When both players decided to cooperate by playing the blue card, both players earned one gem (equalization). Children were told that the winner of the game could trade in their gems at the end of the game for prizes. Each dyad began the game with three trial rounds to ensure that everyone understood how to play the game. Once it was clear that all participants understood the rules, the game was played for 20 trials. Participants were permitted to discuss strategy with their partner. Research assistants observed the interactions in real time and marked down the choices made by participants on each trial. While the children's version of the game has been simplified, it resembles the adult version in that cooperative action and trust are necessary in order to receive the highest payoffs. All participants were compensated with a nominal gift at the end of the study regardless of gem total.

Scoring

Each child was given a score from 1 to 4 on each trial of the game that was determined on the basis of cooperation. One point was awarded for betrayal, wherein the child played a red card despite a strategic discussion indicating cooperative intentions. Two points were awarded for competition, wherein the child played a red card without any strategic discussion. Three points were awarded for cooperation, wherein the child played a blue card without any strategic discussion. Four points were awarded for collaboration, wherein the partners had a strategic discussion indicating cooperative intentions and acted loyally, regardless of whether a red or blue card was played. The cooperation score for each participant was then computed by averaging the scores on 20 trials. Camp counselors were asked to rate the level of pre-activity friendship of each dyad on a scale of zero (= *not friends at all*) to five (= *very good friends*) in order to control for any pre-existing friendships among the participants.

Results

A break down of the mean number of trials at each level of cooperation (1–4) is seen in Figure 1. Two dyads were removed from subsequent analyses because at least one partner received scores greater than three times the interquartile range of their condition. Because cooperative behavior was nested within dyads ($ICC = .188$), we analyzed our hypotheses within a multilevel framework. Cooperation was regressed on condition, friendship, gender, and age. Condition and friendship were fixed whereas gender and age were entered as random factors. Consistent with our hypothesis, we found a main effect of condition on cooperation ($B = -.291, SE = .01, p = .008$), but no effects of age ($B = -.045, SE = .047, p = .35$), gender ($B = .06, SE = .083, p = .47$), or friendship ($B = .042, SE = .083, p = .52$). Pairwise comparisons revealed that individuals in the singing condition ($M = 2.9, SD = .49$) exhibited significantly higher levels of cooperation than those in the art condition ($M = 2.36, SD = .26, t(23.15) = 3.87, p = .001$), and those in the competitive condition ($M = 2.34, SD = .3, t(24.6) = 3.95, p = .001$). No difference was found in cooperation between the art condition and the competitive condition ($p = .82$).

To examine how cooperation might have evolved over time across trials, a follow-up analysis was run with time included in the multilevel model. There was a significant interaction between condition and trial ($B = -.022, SE = .005, p < .001$). As may be seen in Figure 2, cooperation increased across trials for the singing condition

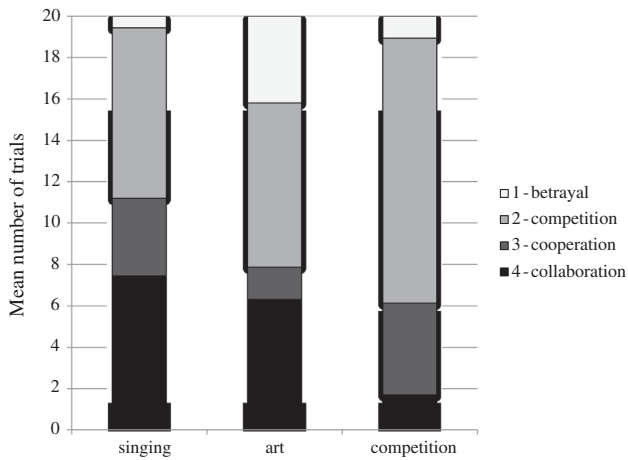


Figure 1. Mean number of trials (out of 20) for each level of cooperation on the prisoner's dilemma game following three activity conditions.

($B = .044$, $SE = .008$, $p < .001$) only. In contrast, cooperation did not change across trials for the art ($B = -.017$, $SE = .011$, $p = .123$) or competition conditions ($B = .00$, $SE = .006$, $p = .941$).

Discussion

The current study explored the influence of group singing on cooperation in a diverse group of children. Children in predetermined groups were randomly assigned to a 30-min activity involving group singing, group art, or competitive games. Group singing led to the highest levels of cooperation. Group art and competitive games were not distinguishable with respect to cooperation.

Previous research has demonstrated the positive influence of joint music making on cooperative behavior in children (Kirschner & Tomasello, 2010); however, the current study is the first to empirically demonstrate such benefits in middle childhood. This is a potentially important finding especially in the diverse classroom because of the increased reliance of ethnic and racial categories at this age (see Quintana, 1999, 2007).

Inasmuch as cooperation is linked to social cohesion, it seems possible that the singing may have also helped to foster a collective identity. While the current study emphasized a superordinate identity (i.e., Torontonians) in both the singing and the art conditions, children in the singing condition were more likely to cooperate, suggesting collective group membership. Thus, it appears likely that group singing was more effective than group art at altering the focus of group boundaries and inducing a sense of *we-ness*. Moreover, singing appears to have set children on a trajectory leading to an enhancement of cooperation over time.

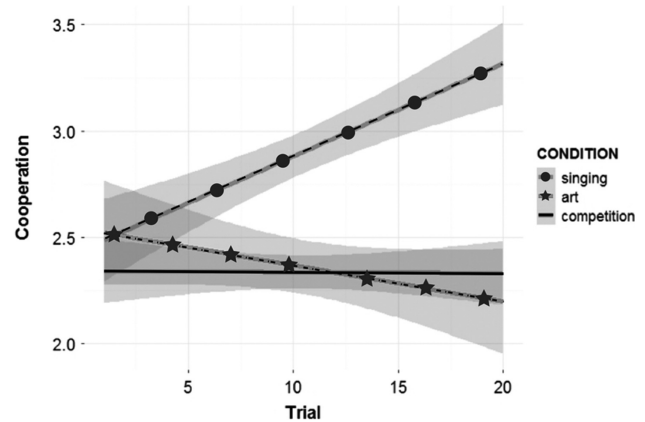


Figure 2. Mean level of cooperation across 20 trials.

Limitations and Future Research

The current study has some limitations that should be considered when interpreting the results. First, the study does not provide a means of deciphering the extent to which hedonic factors may have been responsible for the social benefits of group singing. Future research should consider taking a measure of enjoyment or mood that would allow for statistical control over the influence of hedonic factors. Second, our interpretation of the results would have benefited from inclusion of a control group whereby children completed no activity. Third, the current study investigated cooperation in a diverse environment; however, we were not able to directly manipulate an intergroup variable. Future research would benefit from a design that systematically assigns participants to intergroup dyads in order to directly assess the benefits of singing on intergroup cooperation.

Conclusions

Group singing appears to foster an increase in cooperative behaviors in a diverse group of children. We argue that these cooperative gains are the result of movement synchrony. The findings of this study have important implications for fostering positive social relations in the diverse classroom.

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References

- Aboud, F. E. (1988). *Children and prejudice*. New York, NY: Blackwell.
- Anshel, A., & Kipper, D. A. (1988). The influence of group singing on trust and cooperation. *Journal of Music Therapy*, 25, 145–155. doi: 10.1093/jmt/25.3.145
- Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science*, 211, 1390–1396.
- Bernieri, F. J. (1988). Coordinated movement and rapport in teacher-student interactions. *Journal of Nonverbal Behavior*, 12, 120–138. doi: 10.1007/BF00986930
- Caporael, L. R., Dawes, R. M., Orbell, J. M., & Van de Kragt, A. J. (1989). Selfishness examined: Cooperation in the absence of egoistic incentives. *The Behavioral and Brain Sciences*, 12, 683–699. doi: 10.1017/S0140525X00025292
- Cirelli, L. K., Einarson, K. M., & Trainor, L. J. (2014). Interpersonal synchrony increases prosocial behavior in infants. *Developmental Science*, 17, 1003–1011. doi: 10.1111/desc.12193
- Demos, A. P., Chaffin, R., Begosh, K. T., Daniels, J. R., & Marsh, K. L. (2012). Rocking to the beat: Effects of music and partner's movements on spontaneous interpersonal coordination. *Journal of Experimental Psychology: General*, 141, 49–53. doi: 10.1037/a0023843
- Echternach, M., Burk, F., Burdumy, M., Traser, L., & Richter, B. (2016). Morphometric differences of vocal tract articulators in different loudness conditions in singing. *PLoS One*, 11, e0153792. doi: 10.1371/journal.pone.0153792
- Hove, M. J., & Risen, J. L. (2009). It's all in the timing: Interpersonal synchrony increases affiliation. *Social Cognition*, 27, 949–960. doi: 10.1521/soco.2009.27.6.949
- Huron, D. (2001). Is music an evolutionary adaptation? *Annals of the New York Academy of Sciences*, 930, 43–61. doi: 10.1111/j.1749-6632.2001.tb05724.x
- Kirschner, S., & Tomasello, M. (2010). Joint music making promotes prosocial behavior in 4-year-old children. *Evolution and Human Behavior*, 31, 354–364. doi: 10.1016/j.evolhumbehav.2010.04.004
- Kokal, I., Engel, A., Kirschner, S., & Keysers, C. (2011). Synchronized drumming enhances activity in the caudate and facilitates prosocial commitment – If the rhythm comes easily. *PLoS One*, 6, e27272. doi: 10.1371/journal.pone.0027272
- Marsh, K. L., Richardson, M. J., & Schmidt, R. C. (2009). Social connection through joint action and interpersonal coordination. *Topics in Cognitive Science*, 1, 320–339. doi: 10.1111/j.17568765.2009.01022.x
- Matsumoto, D., Haan, N., Yabrove, G., Theodorou, P., & Carney, C. C. (1986). Preschoolers' moral actions and emotions in prisoner's dilemma. *Developmental Psychology*, 22, 663–670. doi: 10.1037/0012-1649.22.5.663
- McNeill, W. H. (1995). *Keeping together in time: Dance and drill in human history*. Cambridge, MA: Harvard University Press.
- Miles, L. K., Nind, L. K., & Macrae, C. N. (2009). The rhythm of rapport: Interpersonal synchrony and social perception. *Journal of Experimental Social Psychology*, 45, 585–589. doi: 10.1016/j.jesp.2009.02.002
- Müller, V., & Lindenberger, U. (2011). Cardiac and respiratory patterns synchronize between persons during choir singing. *PLoS One*, 6, e24893. doi: 10.1371/journal.pone.0024893
- Nesdale, D. (1999). Social identity and ethnic prejudice in children. In P. Martin & W. Noble (Eds.), *Psychology and society* (pp. 92–110). Brisbane: Australian Academic Press.
- Quintana, S. M. (1999). Children's developmental understanding of ethnicity and race. *Applied and Preventive Psychology*, 7, 27–45. doi: 10.1016/S0962-1849(98)80020-6
- Quintana, S. M. (2007). Racial and ethnic identity: Developmental perspectives and research. *Journal of Counseling Psychology*, 54, 259–270. doi: 10.1037/0022-0167.54.3.259
- Rabinowitch, T. C., & Knafo-Noam, A. (2015). Synchronous rhythmic interaction enhances children's perceived similarity and closeness towards each other. *PLoS One*, 10, e0120878. doi: 10.1371/journal.pone.0120878
- Roederer, J. G. (1984). The search for a survival value of music. *Music Perception: An Interdisciplinary Journal*, 1, 350–356. doi: 10.2307/40285265
- Thompson, W. F., & Russo, F. A. (2007). Facing the music. *Psychological Science*, 18, 756–757. doi: 10.1111/j.1467-9280.2007.01973.x
- Tunçgenç, B., Cohen, E., & Fawcett, C. (2015). Rock with me: The role of movement synchrony in infants' social and nonsocial choices. *Child Development*, 86, 976–984. doi: 10.1111/cdev.12354
- Valdesolo, P., & DeSteno, D. (2011). Synchrony and the social tuning of compassion. *Emotion*, 11, 262–266. doi: 10.1037/a0021302
- Valdesolo, P., Ouyang, J., & DeSteno, D. (2010). The rhythm of joint action: Synchrony promotes cooperative ability. *Journal of Experimental Social Psychology*, 46, 693–695. doi: 10.1016/j.jesp.2010.03.004
- Wiltermuth, S. S., & Heath, C. (2009). Synchrony and cooperation. *Psychological Science*, 20, 1–5. doi: 10.1111/j.1467-9280.2008.02253.x

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