DISTRIBUTED AGENCY

N. J. Enfield
and
Paul Kockelman

Published 2017 by Oxford University Press

FOUNDATIONS OF HUMAN INTERACTION

CHAPTER 16

Social Bonding Through Dance and 'Musiking'

BRONWYN TARR

INTRODUCTION: SOCIAL GROUPS

From a biological perspective, successful interpersonal interactions are critical in the establishment and maintenance of social groups. As a gregarious species, much of our survival depends upon these social groups; more cohesive and tightly bonded networks are well coordinated, and group-level selection predicts that members of these groups are more likely to survive than those acting alone or in less bonded units (Dunbar and Schultz 2010). In humans, experimentally manipulated social support influences a range of physiological measures such as blood pressure, cortisol levels, and heart rate, and social isolation is correlated with reduced life expectancy (for a review see Thorsteinsson and James 1999).

Primate social groups (particularly those of anthropoid primates) are characterized by a large number of interpersonal relationships between non-kin and non-sexual partners. These "social bonds" (feelings of, and behaviors signaling, closeness and affiliation) are frequently termed "friendships," and form the backbone of our social networks. Large, complex, and cohesive social groups place a high cognitive load on interacting members; each agent needs to establish interpersonal connections and keep track of ongoing interactive histories with other agents in their social network (Dunbar 1998). These cognitive constraints associated with sociality contribute toward a species-specific upper limit to group

size, a relationship that is reflected by covariance between mean group size and neocortical volume (relative to the remaining volume of the brain; Dunbar 1998).

We have particularly large social networks (approximately 150 individuals) compared to our primate cousins, who establish and maintain their smaller networks predominantly via reciprocal allo-grooming (reviewed in Dunbar 1998). Grooming is subject to time constraints: it is typically a dyadic activity, and the number of individuals one can groom in a day is limited by the amount of time that can be spared from other activities, such as foraging and sleeping (Dunbar 1998). In the case of large human groups, this time investment is unfeasible. Our extensive networks require bonding behaviors that can involve multiple agents building affiliation simultaneously, or "grooming at a distance" (Dunbar 2012).

DANCE AS A MEANS OF "GROOMING AT A DISTANCE"

A number of different behaviors are likely to have helped humans establish social bonds with multiple individuals simultaneously, and to maintain those bonds with relatively little time investment. One hypothesis is that rhythmic bodily movement and synchronization may have played (and continue to play) an important role in contributing to group cohesion and social bonding. This has been termed the "social bonding hypothesis" of dance, although it is generalizable to other activities involving music (e.g., Koelsch 2014).

To our knowledge, there is no human culture that does not possess some form of group music-making and dance. Clearly the stylistic and socio-contextual details of these activities are by no means homogenous across cultures, making definitions of these activities challenging. Nevertheless, underpinning this diversity is the curious fact that the production of organized, expressive sound (broadly "music") and the coordination of our movement to music of some form and with others (broadly "dance"), are prominent features in ritual, religion, and human expression generally (Ehrenreich 2008; Tomlinson 2015). Arguably, these activities are fundamentally cooperative in nature; not only do they demand complex sensorimotor coordination, but we tend to do these activities with others. Music-based group activities demand some degree of coordination of actions and cooperation in terms of establishing a joint goal and shared intention (Koelsch 2014). The social bonding hypothesis suggests that ritualized group dance and music activities fosters social contact, social cognition, homogenous emotions, communication, coordination, cooperation, and group cohesion (Koelsch 2014). Furthermore, as we can engage in these activities simultaneously with many individuals, music-based activities could provide an effective means of bonding on a large scale.

Evidence that social bonding arises from, and also is signaled by, various music-based activities has been provided by, inter alia, ethnographers, historians, ethnomusicologists, biomusicologists, and experimental researchers. Empirical studies have focused on the fact that music-based activities generally involve participants synchronizing their movements to a rhythmic beat (usually provided by music), and to one another.

SYNCHRONY AND SOCIAL BONDING

Experiments involving simple finger tapping, walking, and rocking in chairs have demonstrated that engaging in coordinated, specifically synchronized, activities increases interpersonal closeness. Compared to asynchronous or solo conditions, performing movements in synchrony leads to increased trust between co-actors, liking each other more, being more willing to help each other, and feeling similar in personality (literature reviewed in more detail in Tarr et al. 2014). These positive effects on social bonding are evident when individuals perform synchronized movements in small groups of three or four and when the synchronized action involves singing and/or moving (Wiltermuth and Heath 2009) and dancing with others to music (Tarr et al. 2015). Furthermore, the capacity for synchronized tasks to increase interpersonal social bonding is evident from a young age: children are more likely to display helping behavior after moving and singing in synchrony than those in a non-musical control condition (Kirschner and Tomasello 2010).

These studies demonstrate that performing similar movements in a predictable, rhythmic fashion leads to individuals feeling socially bonded. This phenomenon is thought to be based on action-perception networks facilitating a blurring of the sense of "self" and "other" during synchronized action (e.g., Demos et al. 2012), which leads to a social bond between actors. Additionally, there is growing evidence that synchronized action is associated with various neuropharmacological mechanisms (see chapter 15 by Cohen in this volume). For example, synchronized rowing (see chapter 15) and dancing in synchrony (Tarr et al. 2015) elevates pain threshold, a common proxy measure for endorphins due to the close relationship between opioids and perception of pain. Given the role of endorphins in social bonding across a range of other mammals, it is plausible that opioids play a role in underpinning the social closeness that arises during synchronized bonding activities such as dance (Tarr et al. 2014).

In addition to synchrony, a number of other important factors contribute toward increased interpersonal affiliation when dancing together. For example, shared attention with co-actors, working toward a joint goal and improved mood

after successful co-engagement, all contribute to increasing feelings of closeness. These elements do not arise exclusively in music-based activities, and are clearly evident in a range of human behaviors such as team sports (see chapter 15). What sets dance apart from other similarly complex, coordinative, and exertive human activities is the fact that it involves responding directly and purposefully to music.

How Music Moves and Bonds Us

Music adds to the social bonding effects that can arise in situations of group coordination in various ways. First, people spontaneously synchronize to music (Janata et al. 2012), and as a consequence music encourages and facilitates occurrences of synchrony. People naturally entrain to a rhythmic beat embedded in music, and are capable of doing so from a very young age (discussed in more detail in Koelsch 2014). Music can therefore establish a shared and predictable, rhythmic scaffolding, thereby facilitating synchronization of timing between multiple individuals. In large groups, it is difficult to coordinate synchrony and observe the movements of all the other participants simultaneously, arguably making "self-other" merging a less likely prospect. Rhythmic music can facilitate synchrony for large numbers of people, perhaps by providing a central "other" to which each participant can direct their attention (e.g., drill marching), thereby leading to the social closeness described above.

Indeed, synchrony with music *itself* appears to improve interpersonal affiliation. Demos et al. (2012) found that participants who performed a chair-rocking task to music reported feeling more connected to each other than those who performed the task without background music. This interpersonal connectedness was predicted by synchrony with the music, and not by synchrony with one another. Accordingly this study suggests that synchrony to music is sufficient to cause bonding effects, and synchrony *between* people may be irrelevant when they are engaging with a shared external source of rhythm as provided by the music.

But the effects of music go beyond its capacity for facilitating synchronous movement. In addition to the predictability provided by a rhythmic beat, listening to music induces strong emotional and pleasurable effects. These arise via core brain regions generally involved in processing affect (including areas that are responsible for releasing endorphins), and those associated with reward and motivation (Koelsch 2014). When we engage with shared music alongside others, this can homogenize participants' emotional states (Koelsch 2014), which could theoretically play an important role in increasing interpersonal cohesion and decreasing social conflict.

Aside from moving us emotionally, music literally moves us. According to PET scans, intense pleasurable responses experienced when merely listening to music (and not moving physically) are associated with activation in areas of the brain involved in movement control (Blood and Zatorre, 2001). More often than not, listening to music *does* induce some form of actual physical movement, be it simple head bobbing, foot tapping, or finger tapping in time with the rhythmic beat. At a neurological level, certain elements of music are particularly good at inducing a motor response, for example certain tempos. At a higher level, the ability of music to induce body movement and dance has been described as "groove" (e.g., Janata et al. 2012), and certain musical styles with particular musical elements appear better at inducing groove. The close relationship between music and our often spontaneous and unconscious urge to move is likely a consequence of a tightly coupled and ancient relationship between movement and music, originating from a time when our engagement with music was directly linked to a performance of agency.

"MUSIKING": AN EXPRESSION OF AGENCY

Our immense aptitude and appreciation for sound and movement as a means to express, communicate, and connect has probably been part of humanity for a very long time. The oldest identified instruments (bone "flutes") are dated to approximately 50,000–35,000 years ago (for references see Kirschner and Tomasello 2010), but arguably our first instruments were our voice and body. When music first originated, our bodies likely acted as a moving, percussive instrument (Cummins 2009). Indeed, at the most fundamental level, it is not possible to create sound without vibration, and, by extension, the production of music requires movement. Consequently, movement is involved when we use any instrument to produce sound, but also when we attach bells, shakers, heels, and so on to the body to accentuate the production of sound associated with each step or movement. When our bodily movements contribute to musical stimulus (for example when we have bells attached to our stomping feet) we are exercising agency over the production of the music. Clapping, snapping, and stomping while dancing is evident in many cultures today, with both audiences and performers using their bodies to create, or at least add, to the musical stimuli. Indeed, in many cultures, music and dance are considered indistinguishable and some languages do not have separate words to describe them (Blacking 1995).

This close link between movement and music fits with Christopher Small's term "musiking," defined as "[taking] part, in any capacity, in a musical performance, whether by performing, by listening, by rehearsing or practicing, by providing

material for performance (what is called composing), or by dancing" (Small 1998:9). Given that dance most likely co-evolved with music as a means of generating rhythm and sound (Cummins, 2009), it is understandable that music tends to make us want to move, and specifically *synchronize*, with the musical beat. In matching our movements in time to a musical rhythm, we are simulating the timing of movements that could have conceivably contributed toward the production of that rhythmic beat.

The ability to have agency over the production of musical sounds through movement has been shown to have significant physiological and psychological effects. For example, varying the degree of musical agency for people exercising in a group can influence their ability to perform strenuous exercise and their mood. In a high agency condition, exercise machines were linked to musical output software such that a musical sound resulted from each movement, and consequently individuals "created" music as they exerted themselves (Fritz et al. 2013). This experiment (and others by the same authors) demonstrated that when movement (during group exercise) results in musical feedback, participants perceived exertion to be lower, reported enhanced mood, and felt a greater desire to exert themselves further, in comparison to when they were exercising while listening (passively) to independently provided music not connected to their movements (Fritz et al. 2013). According to these results, musical agency (i.e., executing purposeful movement that results in musical sounds) feels good and improves the capacity to withstand strenuous exercise.

Although the exercise scenario described above is clearly a contrived case of musical agency, the findings likely reflect the fact that we are wired to engage with music in a context in which we do in fact have agency over the production of sound. In reality, unless we are a member of a band or play a musical instrument, we more frequently engage passively with music, which rarely involves a context in which our movements directly contribute to the music. We frequently enjoy prerecorded music, which involves a decoupling of our engagement with that music from the social context and movement evident at its source. Under these modern circumstances, and in the absence of having any of our music-induced movements actually result in some direct contribution to the music, perhaps when we move to music we are attempting to *pretend* we possess some agency over the production of that music. The more tightly we couple our movement with the music, for example, the better we synchronize our movement with the beats, the more convincing is this simulated agency. In this manner, even if we are not actually making the music to which we dance, our synchronization with the

musical beat simulates movement required to explain, or physically justify, that musical beat.

CONCLUSION

Humans' social agency occurs in the context of large, interconnected social networks that are established and maintained by a variety of group activities, such as dance. Our tendency to move in time to music, and the ubiquity of music-based activities such as dance are important aspects of what makes us human. Dance and synchronizing to music facilitates interpersonal closeness, providing a means to build and maintain large social groups. Furthermore, the way we engage with music is likely embedded in an ancient history, in which movement, sound, and agency were intertwined. Based on this account, music-making and dance, which are conceptualized here as a single, coupled concept—"musiking"—provides an invaluable, naturalistic empirical and theoretical platform for understanding foundations of our social agency.

REFERENCES

Blacking, J. 1995. Music, Culture, & Experience: Selected Papers of John Blacking. Chicago/London: University of Chicago Press.

Blood, A. J., and R. J. Zatorre. 2001. "Intensely Pleasurable Responses to Music Correlate with Activity in Brain Regions Implicated in Reward and Emotion."Proceedings of the National Academy of Sciences of the United States of America 98: 11818–11823. doi:10.1073/pnas.191355898.

Cummins, F. 2009. "Rhythm as an Affordance for the Entrainment of Movement." Phonetica 66: 15–28. doi:10.1159/000208928.

Demos, A. P., R. Chaffin, K. T. Begosh, J. R. Daniels, and K. L. Marsh. 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.

Dunbar, R. I. M. 1998. "The Social Brain Hypothesis." Evolutionary Anthropology 6: 178–190. doi:10.1080/03014460902960289.

Dunbar, R. I. M. 2012. "On the Evolutionary Function of Song and Dance." In Music, Language and Human Evolution, edited by N. Bannan. 201–214. Oxford: Oxford University Press.

Dunbar, R. I. M., and S. Shultz. 2010. "Bondedness and Sociality." Behaviour 147: 775–803. doi:10.1163/000579510X501151.

Ehrenreich, B. 2008. Dancing in the Streets: A History of Collective Joy. New York: Metropolitan.

Fritz, T. H., J. Halfpaap, S. Grahl, A. Kirkland, and A. Villringer. 2013. "Musical Feedback during Exercise Machine Workout Enhances Mood." Frontiers in Psychology 4: 921. doi:10.3389/fpsyg.2013.00921.

Janata, P., S. T. Tomic, and J. M. Haberman. 2012. "Sensorimotor Coupling in Music and the Psychology of the Groove." Journal of Experimental Psychology 141: 54–75. doi:10.1037/a0024208.

Kirschner, S., and M. Tomasello. 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.

Koelsch, S. 2014. "Brain Correlates of Music-Evoked Emotions." Nature Reviews Neuroscience 15: 170–180. doi:10.1038/nrn3666.

Small, C. 1998. Musicking: The Meaning of Performing and Listening. Hanover, NH: Wesleyan/University Press of New England.

Tarr, B., J. Launay, and R. I. M. Dunbar. 2014. "Music and Social Bonding: 'Self-Other' Merging and Neurohormonal Mechanisms." Frontiers in Psychology: Auditory Cognitive Neuroscience 5: 1–10. doi:10.3389/fpsyg.2014.01096.

Tarr, B., J. Launay, E. Cohen, and R. I. M. Dunbar. 2015. "Synchrony and Exertion during Dance Independently Raise Pain Threshold and Encourage Social Bonding." Biology Letters 11: 1–3. doi:10.1098/rsbl.2015.0767.

Thorsteinsson, E. B., and J. E. James. 1999. "A Meta-analysis of the Effects of Experimental Manipulations of Social Support during Laboratory Stress." Psychology & Health 14: 869–886. doi:10.1080/08870449908407353.

Tomlinson, Gary. 2015. A Million Years of Music: The Emergence of Human Modernity. Cambridge, MA: MIT Press.

Wiltermuth, S. S., and C. Heath. 2009. "Synchrony and Cooperation." Psychological Science 20: 1–5.