Cross-cultural convergence of musical features

Sandra E. Trehub

Department of Psychology, University of Toronto Mississauga, Mississauga, ON, Canada L5L 1C6

Singing, rhythmic movement to music, and musical instruments, blown or struck, are pervasive, with a deep history (1). Ethnomusicologists do not dispute the existence of core abilities that support a variety of musical activities across cultures, but they are generally averse to notions of universals involving musical structure or form (2). In their view, the music of every culture is unique, being governed by systematic but arbitrary conventions. Although scientists who study music focus primarily on cognitive and neural processes (3), they regard universal musical features as an empirical question, as do Savage et al. (4) in PNAS. To date, however, scientists have relied almost exclusively on convenience samples of Western listeners and Western instrumental music, limiting the potential generality of their findings. Savage et al. apply rigorous classification criteria and phylogenetic comparative methods to a large global set of musical recordings, documenting an impressive list of musical features that are near-universal (i.e., statistical universals). The authors also identify a number of feature dependencies and music-making contexts that have high prevalence rates. The findings of Savage et al. raise provocative questions about musical structure, functions, and origins.

Savage et al. (4) failed to find absolute universals or features that were evident in every musical performance in their global sample. Nevertheless, they identify several statistical universals or features with a wide geographic distribution. In the pitch domain, those features include discrete pitches, a limited pitch set (seven or fewer pitches), division of the octave into unequal intervals, and small intervals. In the rhythm domain, these universals include an isochronous beat (i.e., equal timing between beats), two- or three-beat subdivisions (e.g., duple or triple meter), and limited duration values. The division of continua, such as pitch and duration, into discrete elements permits the generation of infinite patterns from finite elements and facilitates pattern recognition and learning (5). An isochronous beat enables predictive timing, which is necessary for synchronized performances.

Savage et al. (4) found that performances occurred primarily in groups that featured male vocalists and instrumental accompaniment (also by males). Group musical activity enhances social cohesion, mediated in part by oxytocin and endorphin release (6). With respect to sex disparities in musical performance, these are a likely consequence of social structure rather than biology (7). Egalitarian participation in music is evident in egalitarian societies, such as the BaYaka Pygmies of central Africa (8), who engage in extended bouts of energetic singing (Fig. 1).

The sampling procedure adopted by Savage et al. (4) drastically reduced the possibility of identifying absolute universals. Instead of culture or language group as the unit of analysis, the authors used individual recordings as units of analysis without regard to their importance or frequency of occurrence in the culture of origin. Accordingly, a single instance of music lacking a particular feature (e.g., the voice) would rule out that feature as an absolute universal. The sampling scheme of Savage et al. was motivated by the diversity of music within cultures, but its effect was to reduce the similarities across cultures. The eminent ethnomusicologist Bruno Nettl claims, on the basis of qualitative rather than quantitative analysis, that all societies have vocal music, some music with a regular pulse or meter, and some music with only three or four pitches (9). If Nettl’s claims are verifiable in the Savage et al. (4) dataset, then they must be considered...
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The process of intergenerational transmission is constrained by limitations of the learner or what is known as the “learner bottleneck” (5). That process can be viewed as a sieve, with only a subset of the melodies heard—for example, those with a small pitch set, small intervals, an isochronous beat, and repeated musical figures—passing from one generation to the next. The result, as borne out by computational and experimental studies of iterated learning (14), is increased regularity and communicative efficiency along with increased tailoring of the input (music in this case) to the processing capacities of learners. Rather than survival of the fittest, the process is more like survival of the simplest, accounting for the convergence of musical features across time and culture. Each generation introduces innovations or embellishments, but those innovations must face the test of intergenerational transmission. The musical materials used by Savage et al. (4) focus largely on musical products rather than processes, their universals provide some guidance for comparative investigations.

Discrete pitches, a limited pitch set, small intervals, and an isochronous beat enhance the learnability of patterns for human listeners (5), and they may do so for nonhuman learners as well. Those features may have helped bulbilines cement their reputation as singers of human songs. After long-term exposure to German folk tunes that were whistled, hand-raised bulbilines succeeded in reproducing the pitch and temporal patterns of 25- to 50-note sequences in solo and antiphonal contexts (alternate singing) with their human tutor (12). Moreover, the birds did so in a manner that implied chunking and hierarchical representation of the patterns. Beat perception and synchronization, also thought to be uniquely human, has been demonstrated in parrots (13) and a few other species, albeit with child-like (i.e., imperfect) proficiency.

The music of any era is influenced by cumulative cultural transmission over generations, centuries, or even millennia (5). The origins of musical universals are likely both biological and cultural, and they may do so for nonhuman learners. The process of intergenerational transmission is constrained by limitations of the learner or what is known as the “learner bottleneck” (5). That process can be viewed as a sieve, with only a subset of the melodies heard—for example, those with a small pitch set, small intervals, an isochronous beat, and repeated musical figures—passing from one generation to the next. The result, as borne out by computational and experimental studies of iterated learning (14), is increased regularity and communicative efficiency along with increased tailoring of the input (music in this case) to the processing capacities of learners. Rather than survival of the fittest, the process is more like survival of the simplest, accounting for the convergence of musical features across time and culture. Each generation introduces innovations or embellishments, but those innovations must face the test of intergenerational transmission. The musical materials used by Savage et al. (4) focus largely on musical products rather than processes, their universals provide some guidance for comparative investigations.

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