# Cross-Cultural Work in Music Cognition: Challenges, Insights, and Recommendations

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Many foundational questions in the psychology of music require cross-cultural approaches, yet the vast majority of work in the field to date has been conducted with Western participants and Western music. For cross-cultural research to thrive, it will require collaboration between people from different disciplinary backgrounds, as well as strategies for overcoming differences in assumptions, methods, and terminology. This position paper surveys the current state of the field and offers a number of concrete recommendations focused on issues involving ethics, empirical methods, and definitions of ''music'' and ''culture.''

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Most research in psychology and neuroscience has been conducted on WEIRD participants—that is, individuals who hail from Western, Educated, Industrialized, Rich, and Democratic societies (for an extensive review of this issue in psychology see Henrich, Heine, & Norenzayan,

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2010). Music psychology shares this sampling bias: participants are almost always recruited from WEIRD societies, experimental materials are usually drawn from Western music, and studies tend to investigate constructs such as harmonic progressions that are disproportionately relevant to Western music.

This situation gives rise to at least two fundamental problems. First, it biases the understanding of human mechanisms for music perception and production, because WEIRD populations do not necessarily constitute a representative sample along multiple critical dimensions ranging from basic visual and spatial perception to social cognition (Henrich et al., 2010). Second, important questions regarding the biological and cultural origins of music, its relation to language and other activities, and the diversity and commonality of human music making require the kind of comparative cross-cultural approaches already common in other fields such as linguistics and anthropology. Addressing these issues will require interdisciplinary collaboration among psychologists, neuroscientists, anthropologists, and (ethno)musicologists, as well as the incorporation of methods from cross-cultural psychology into music cognition research.

The goal of this paper is to consider some requirements as well as possible challenges and benefits occasioned by such collaborations. This document outlines a list of recommendations that arose from an interdisciplinary conversation at the Max Planck Institute for Empirical Aesthetics in Frankfurt, Germany over the course of several days in October 2018. The meeting from which these recommendations emerged was not designed to generate an exhaustive checklist or set of guidelines for cross-cultural research in music, but rather to serve as a departure point for further thought. For example, a major limitation of the meeting was that it was comprised predominantly of white men and women from elite Euro-American academic institutions. Given that representation was one of the key issues raised, we debated the wisdom of publishing our summary document before more workshops could be held with a wider range of participants. We decided, however, that there was merit in sharing our thoughts and stimulating discussion of these issues, while acknowledging the necessity of further conversations with more representative and diverse voices.

This paper begins with a brief description of the disciplinary context of cross-cultural and comparative research on music, illuminating some of the sources of disciplinary tensions. It then explores four central topics—1) music and musicality; 2) culture(s); 3) ethics; and 4) paradigms and methods—and outlines some key issues and recommendations for each. We hope that this overview will prove useful to researchers planning empirical cross-cultural projects and will encourage interdisciplinary teams that bridge the sciences and humanities. Although the recommendations described here are mainly focused on cross-cultural research, many of them are also relevant to music research more broadly. All research on music could benefit from broad hypotheses that incorporate diverse ideas about how music works and by exposing the limitations of a project's musical and methodological choices.

## CONTEXT

Researchers are integrated into disciplinary subcultures with different assumptions and goals. These need to be rendered explicit to facilitate communication across disciplinary divides. Some issues raised by cross-cultural music cognition research, and the possibilities and obstacles facing interdisciplinary engagement between music psychology and ethnomusicology, have been discussed over the last decade or so (e.g., Becker, 2009a, 2009b; Clayton, Dueck, & Leante, 2013; Lawson, 2014; Tolbert, 1992; Widdess, 2012), but much remains to be resolved if we are to produce a sustained body of research in which both disciplines can be confident.

Our current interest in cross-cultural music cognition might be said to recapitulate some aspects of *comparative musicology* of the late 19th and early 20th centuries, a time when the approaches that would develop into music psychology and ethnomusicology were deeply entwined (see review in Clayton, 2009). Comparative musicology emerged in the late 19th century and flourished in the early 20th century. Inspired by Gestalt psychology, it was motivated by theories about the origins and structure of music and explicitly aimed to uncover universal trends and features of music (Hornbostel, 1975; Nettl, 2015; Nettl & Bohlman, 1991; Sachs, 1962; Savage & Brown, 2013; Stumpf, 1911/2012). Comparative studies by researchers such as Carl Stumpf, Erich Moritz von Hornbostel, Charles Myers, Curt Sachs, and Alan Lomax raise complex ethical questions. On the one hand, such research attempted to assert the value of non-Western music that had previously been dismissed; on the other hand, their attempts to use Western scientific frameworks to do so have been criticized as perpetuating ideologies of the imperial powers (Clarke, 2014; Clayton, 2007, in press; Lomax, 1968; Nettl & Bohlman, 1991; Savage, 2018).

With the growing influence of North American cultural anthropology, carefully detailed ethnographies of specific communities increasingly replaced comparative approaches. The Society for Ethnomusicology was

founded in 1955 as an explicit break with the tradition of comparative musicology. In broad terms, ethnomusicology emphasized participant observation, and raised cultural relativism to the level of axiom (Nettl, 2015). The formation of the discipline in explicitly relativistic terms occurred in tandem with a wave of independence and anti-colonial movements across the globe. Beginning in the 1970s and continuing through the early 1990s, many disciplines in the social sciences and humanities underwent a thorough self-critique by investigating their epistemological and institutional origins in colonialism. This resulted in a tendency to emphasize ''partial'' (rather than ''universal'') knowledge, the particular and the local (e.g., studies of particular cultures at particular historical moments), and the contingencies of cultural and social variation. ''Pluralization,'' ''social construction,'' and ''giving a voice'' to marginalized peoples became the watchwords of the day. The bulk of contemporary ethnomusicological research happens in the shadow of this so-called ''interpretive turn'' of the late 20th century, also known as the ''crisis of representation'' (Barz & Cooley, 2008). This raises a challenge for the psychology of music, which has not faced such a crisis, and which has traditionally aimed towards the general: any generalizing and cross-cultural perspective on music must be able to define its object in a culturally independent way, yet whether such a thing is possible has been questioned (Blacking, 1973; Hood, 1971). This has routinely resulted in a form of knowledge production that unduly separates ''European'' and ''Non-European'' music: The focus on ''difference'' rather than similarities brings other problems, because it has been understood, for example, to betray ''a subconscious desire to cast African music into another sphere where it can complete Europe's lack'' (Agawu, 2003, p. 174).

Cross-cultural music cognition research thus requires a critical awareness of a larger historical context; for example, the history of Western imperialism and colonialism. Without such awareness, researchers may be unable to anticipate how their statements will be interpreted by their colleagues and the broader public, leading to further division and misunderstanding.

## MUSIC: ISSUES

Many empirical studies on music start with the observation that music is ubiquitous, often without supporting evidence (a rare exception is recent work by Mehr et al., 2019). Although music may seem like an intuitive and obvious concept, the absence of a unanimously embraced definition of music renders cross-cultural and cross-domain definitions problematic. Considering sound as ''music'' and music as sound (i.e., equating music cognition with auditory cognition) is predicated on culturally based agreement negotiated within and between groups, which changes over time. The term encompasses a variety of concepts surrounding human activities that may include structured sound (especially in terms of pitch height, pitch duration, timbre, and form), communicative meaning, rituals, and constitutive body movements (singing, playing an instrument, gesturing, clapping, dancing).

Cross-culturally, conceptions of music vary greatly. What is heard as music by an outside listener may not function as such within the society that produces the sound; even different individuals within a society may hear or conceive of the sounds differently (for a review, see Trehub, Becker, & Morley, 2018). Examples include the Islamic *adhan*, the Muslim call to prayer, which is not generally considered to be ''music'' despite its high degree of aestheticization and sharing of *maqam* tonal structures. Another example is the use of sound as curative practice among Gnawa sufis in Morocco, often misunderstood in the West as ''music.'' Meanwhile many cultures, such as the Kaluli in Papua New Guinea, consider bird song and music to be deeply interconnected (Feld, 1982). In Western music, composers such as John Cage have challenged conceptions of what counts as ''music'' through compositions like *4'33''*, a 1952 piece that famously calls on the pianist to execute a series of staged instructions without playing a single note. Even the assumption that a person has a coherent, enduring, or consistent view or attitude on some subject—such as what constitutes music—is not always warranted.

In the absence of a universal definition, some researchers adopt working definitions of the concept of music. For example, Blacking (1973) uses ''humanly organized sound'' and Brandt, Gebrian, and Slevc (2012) use ''creative play with sound'' to distinguish music from noise or animal vocalizations, while Honing (2018) distinguishes between ''music'' as a sociocultural construct and ''musicality'' as a set of biological capacities that allow for the production and perception of sounds as music. A long and differentiated discourse surrounds shared evolutionary roots and intersections between music and language (Brown, 2000; Feld & Fox, 1994; Mithen, 2007; Patel, 2008). Some neuroscientists such as Koelsch (2012) and Arbib (2013) have even argued that music is processed as a ''special kind of language.'' Other scholars contend that language is functionally specialized for communicating mental states (Pinker & Bloom, 1990), and that music is a byproduct of the language and auditory faculties (Marcus, 2012; Pinker, 1999), leaving open the possibility of functional specialization in specific forms of music (e.g., signaling attention to infants; Mehr

& Krasnow, 2017). Another approach highlights the differences between music and language. For example, many have pointed to the presence of discrete pitches and/or regular rhythms as features that distinguish music from language (Fitch, 2006; Lomax, 1968; Savage, Brown, Sakai, & Currie, 2015).

## MUSIC: RECOMMENDATIONS

While these examples illustrate the fluidity of concepts of ''music'' and ''musicality,'' there is little systematic information about the range of diversity within each of these categories. One of the major challenges for cross-cultural music cognition research is to map this variation in a way that is both comparable and meaningful across cultures. Such an endeavor could take various forms, from doing musical ethnography including participant observation and interviews in diverse musical cultures (e.g., Feld, 1982; Seeger, 1987) to synthesizing the vast body of existing musical ethnographies in anthropological, encyclopedic, or quantitative perspectives (Blacking, 1973; Mehr et al., 2019; Nettl, Stone, Porter, & Rice, 1998) to performing controlled experiments cross-culturally (Fritz et al., 2009; Hannon & Trehub, 2005; Jacoby & McDermott, 2017, Jacoby et al., 2020; Margulis, Wong, Simchy-Gross, & McAuley, 2019; Mehr, Singh, York, Glowacki, & Krasnow, 2018; Perlman & Krumhansl, 1996, Polak et al, 2018; Ullal, Hannon, & Snyder, 2014) including full factorial combinations of cultural materials and listeners (e.g., Curtis & Bharucha, 2009; Czedik-Eysenberg, Reuter, & Wald-Fuhrmann, 2020; Eerola, Himberg, Toiviainen, & Louhivuori, 2006; Laukka, Eerola, Thingujam, Yamasaki, & Beller, 2013; Stevens, Keller, & Tyler, 2013; Wald-Fuhrmann, Klein, & Lehmann, 2020; see discussion in Patel & Demorest, 2013).

Key questions for future research might focus on those aspects of music that have been identified as most common cross-culturally and that seem to be the least shared with other domains or other species. One strategy is to focus on aspects of music that show up repeatedly throughout the world—the use of discrete pitches, isochronous beats, group performance, and extensive repetition predominate in most of the world's musics but not in most languages (Savage et al., 2015). Conversely, other questions could focus on those aspects of music that are *least* common cross-culturally. Taking a cue from evolutionary biology, which has a long tradition of focusing on outliers and low-frequency phenotypes, cross-domain research could study borderline cases to extend working definitions for music and musicality beyond their current limitations. For example, while isochronous meters predominate in music around the world (Savage et al., 2015), Malian dance drumming features non-isochronous metric beat subdivisions. This case challenges our theoretical understanding of the mechanisms that support rhythm perception and production (see further details in Polak, Jacoby, & London, 2016; Polak & London, 2014). Balinese gamelan with its cyclical structure, as another example, counters broad assumptions of hierarchical structure in music (Stevens & Byron, 2016; Tenzer, 1998, 2000).

All scientific research involves a tradeoff between experimental control and ecological validity. The latter can be amplified by turning to paradigms that incorporate diverse musics and performance scenarios rather than relying on the most readily available and commonly used materials. Alternatively, ecological validity can be increased by using paradigms built on extremely simple stimuli, such as two- or three-interval rhythms, which serve as common musical building blocks around the world (see Jacoby & McDermott, 2017, for an example of using a simple rhythm to characterize cross-cultural differences). Collaborating across disciplines may also expand opportunities for diverse and inclusive studies of music perception; Barwick (2012) encourages the inclusion of music and the temporal arts in language documentation. Finally, the greater availability of technologies including audio, video, motion capture, and machine learning may allow for the study of music performance behavior within broader contexts such as dance and ritual, improving accuracy for the quantitative study of naturalistic human activities.

Implicit within the notion of multiple concepts for music and musicality is the notion of cultures that might construe these ideas differently. Yet what precisely a culture consists of and how it might successfully be operationalized are subjects of significant debate.

## CULTURE(S): ISSUES

The human capacity to create culture depends on the accumulation of materials across time. These accumulating materials can include diverse aspects of human behavior, including knowledge and skills, bodily and perceptual dispositions, material artifacts, values, memories, and meanings, among other things. Cultural materials are shaped by the complex sociality evident in the acts of practice and transmission: exposure and participation through listening, modeling, imitation, mentoring, and pedagogy (Cross et al., 2013; Henrich, 2016; Mesoudi, 2011; Richerson & Boyd, 2005; Tomlinson, 2015, 2018). They are also shaped, at a basic level, by environmental constraints and affordances. Different ecologies—physical, biological, and social—have framed the evolutionary and historical emergence of myriad varieties of cultural expression; the clustering of these

materials leads to the coalescing of diverse ''cultures'' (Cross, 2009; Patel, 2018).

These cultures can be discerned, for heuristic purposes, at various levels from small-scale (e.g., family traditions, occupational subcultures, communities of style) to large-scale (modern national cultures). It seems clear, however, that cultures, the product of broadening circles of sociality, are rarely if ever clearly bounded, discrete, or closed. An individual can be affiliated with more than one culture (in terms of the distinctions noted above) or have various degrees of belonging to a culture. Shorthand equivalences between ''culture'' and such factors as ethnicity, nationality, or country of residence do not capture these complexities. Labels like ''Balinese,'' ''Navajo,'' or ''North American'' are inevitably generalizations, since musical practices and conceptualizations vary between locations, by social categories such as gender, ethnicity, or class, and according to lines of transmission or affiliation groups. The issues that arise along these kinds of divisions are of a similar kind and significance, but easier to overlook.

It follows from these multiple affiliations and varied degrees of contact that the question of exposure to influences from ''other'' cultures, a question arising with the very notion of ''cross-cultural,'' does not yield neatly demarcated answers. This is especially true in the modern world of globalized communicative technology, but it arises in the first place from the complexities of social transmission that give rise to human cultural diversification. This rich interconnectedness makes it challenging to judge and quantify exposure within cross-cultural research paradigms.

Researchers are culturally situated actors. Their choices of research questions and how to approach those questions, their framing of the questions, their very epistemologies, and their interactions with the materials and research participants are all shaped by their own cultural exposure. This exposure may influence their assumptions and intuitions and the form of their interactions with participants in ways not captured by a simple or monolithic understanding of culture. The concentration of research resources in the Global North—despite the fact that many cultural practices of interest are distributed throughout the globe, with notable cultural variation in the southern hemisphere in particular—raises significant problems.

When researchers attempt to ask questions about the effects of culture on music cognition, it is not always clear how culture is being defined or should be defined or operationalized. Researchers have defined culture by geographic region, language, citizenship, self-reported cultural identity, and so on. If the construct of culture is intended to reflect an individual's history of experience listening to music, it is critical to define or describe assumptions about which shared musical experiences apply, and to acknowledge that individuals may have listening experiences from multiple cultural contexts.

## CULTURE(S): RECOMMENDATIONS

Operational definitions of culture can be informed by collaboration with ethnographers, sociologists, local experts, or cultural insiders. Understanding the perspectives of participants (the ''subjects'' of the research) can be important, and, given that so many different musical styles and forms exist within even a small social group, the selection of representative musical examples is best done with the involvement of cultural experts or insiders. While some questions can be addressed with reduced materials such as sequences of sine tones, others require more real-world materials. Maximizing the representativeness of these choices can also be accomplished by incorporating variation across materials. A study could sample music that accompanies a wide variety of behaviors (e.g., singing to a baby, dancing, participating in a ritual) or that varies along a specific parameter (e.g., rhythms played at different tempi).

Formal music training is widely used as a criterion to differentiate between individuals with or without musical ''expertise,'' yet this distinction can be irrelevant in some cultural contexts. Sociological and demographic criteria (such as individuals who obtain a significant part of their income from playing music, invest significant part of their time in music-making, or apprenticed in music) can be used alongside objective measures of musical abilities such as accuracy in finger-tapping or singing (see, for example, Polak et al., 2018). Demographic groups can be selected a priori or emerge from research findings or analysis. Researchers should also remain willing to redefine a demographic group based on insights that emerge in the field.

In light of the multiple affiliations and range of possibilities in defining culture, cross-cultural research need not necessitate travel to a remote community, but could involve a different social group or subculture in the researcher's locality. This approach might allow richer investigations of music and culture than exist within the framework of traditionally conceived ''cross-cultural'' work. For example, musicians in a city like New York may participate in multiple subcultures actively playing genres such as classical music, jazz, punk rock, and electronic noise music, and listeners adapt their harmonic expectations to the style at hand (Vuvan & Hughes, 2019). Similarly, within the same ethnically diverse city it can be possible to identify groups of individuals whose

exposure to particular musical structures (e.g., Afro-Cuban rhythm) can occur over a lifetime of listening and dancing, through explicit instruction in a college music course, incidental exposure in clubs or on the radio, or not at all (Getz, Barton, & Kubovy, 2014). The challenges that characterize cross-cultural work at the macro level also characterize work across smaller-scale divisions, but at these smaller levels they may be more addressable with the tools, theories, and terms of sociology. Although music psychology usually integrates a range of sociodemographic factors, an even closer interaction between sociological and psychological approaches could help illuminate the role of small-scale cultural differences.

### ETHICS: ISSUES

Cross-cultural research requires enhanced ethical considerations because there are often substantial power differentials, as when researchers from wealthy institutions in the Global North conduct experiments with poor participants in the Global South. Ethical concerns have long played a key role in ethnomusicological research, and it is crucial to learn from the experience of ethnomusicologists in order to maximize positive impact and minimize negative impact (e.g., Barz & Cooley, 2008; Pettan & Titon, 2015). Successful cross-cultural research will require careful consideration of ethical questions such as the following: What is the impact of the knowledge we create and the ways in which we acquire that knowledge? What are the potential unforeseen implications of our methods and the ways in which our findings might be used? In what instances might the use of collected data (e.g., video, audio, motion-capture) help or harm the individuals or cultures involved?

History is full of examples of unintended negative consequences of cross-cultural anthropological research, especially regarding prominent topics such as race, sex, and violence (e.g., Kuper & Marks, 2011). Ethnomusicology provides further examples of unintended negative consequences, such as unauthorized sampling of ethnomusicological recordings (e.g., Feld, 2000). This highlights the importance of considering implications beyond the direct research project into secondary uses, to avoid situations where musical recordings or other data produced from cross-cultural research are exploited by other parties after publication. At this stage, the field of cross-cultural music cognition is small enough to have few cautionary examples, but we must learn from our sister disciplines to avoid repeating their mistakes.

Reciprocity should be a central ethical concern in cross-cultural research. Researchers build careers on information (words, sounds, images, ideas) collected from participants. What do we give back to the communities we study? We need to consider ways to gather data that avoid the ''extractive'' dynamics of classical colonization and that account for the transactional aspects of ethnography. Such questions should be considered in terms of big-picture issues as well as specific details, including the process of ethical approval by Institutional Review Boards (IRBs). For example, are participants paid for their time, are recordings returned, and are royalties equitably shared? Is payment distributed equitably across multiple sites?

We should also consider the degree to which our research is meaningful to participants and their larger environment, and ways of reframing it to maximize interest and benefit to participants. If we are using etic (outsider) concepts in our research questions, how closely do they correspond with emic (insider) concepts? Integrating formal feedback mechanisms with research participants can help to ensure that our methods and discourse are engaging to them and that we are aware of local hierarchies (e.g., power dynamics within communities) and how our research impacts and is shaped by those hierarchies.

### ETHICS: RECOMMENDATIONS

Recognizing that larger structural problems exist in institutions and in society more broadly, a number of recommendations can help ensure that cross-cultural empirical work on music proceeds ethically. First, representation and diversity along racial, cultural, national, gender, sexual, and socioeconomic lines matter. As noted, one of the limitations of the authorship of this paper and of music psychology research more generally is our lack of diversity. Scientists in the relevant fields should take proactive steps in recruitment and retention to rectify this issue in the future.

Best practices in cross-cultural empirical research should involve collaboration with individuals from the area in which it is taking place. This might include academics from local institutions, such as local experts in psychology, music, or anthropology. In some situations, it may be possible, even advisable, to collaborate closely with cultural insiders who lack relevant formal training in music but have other complementary expertise (e.g., linguists, sociologists, geographers or public health workers who have experience working with specific communities or in remote locations), or ''cultural bearers'' such as performing musicians of the practices under study who may or may not have formal academic training. Attribution and credit for these colleagues should involve named acknowledgment and/or co-authorship. Scholars can strengthen research infrastructure in the

communities with which they engage. For example, scholars can share complex technology with other scholars who would not otherwise have access to it. Resources are available to guide researchers in such best practices, for example, Guidelines for Ethical Research in Australian Indigenous Studies (Australian Institute of Aboriginal and Torres Strait Islander Studies, 2012).

Researchers can keep ethics at the forefront of their cross-cultural projects by considering a series of critical issues. First, they can consider the ways that empirical cross-cultural work can address racism, marginalization, and lack of diversity. They should aspire to design their studies in ways that avoid giving primacy to any particular cultural paradigm. Cultural and musical materials should be used ethically, with the cultural significance of the materials respected and accounted for. The danger of appropriation should be considered when creating research materials such as recordings. Research results should be shared with the communities that contributed to them, and the contributions of people within the community should be acknowledged. So-called informants should be integrated within research teams, and the disciplines and its methods and language should be made more appropriate for diverse communities.

### EMPIRICAL METHODS: ISSUES

Decisions about data collection affect the results that emerge and the conclusions that are drawn, depending on the choice of observational perspectives, measures, and methods. It is important to separate questions about the mode of data collection from questions about the quality of the data. *Every* mode of data collection represents tradeoffs among many factors, including insider knowledge or lack thereof, reproducibility, precision, bias, accuracy, logistical feasibility, cost, invasiveness, ecological validity, and pragmatics. Researchers aim to minimize the potentially negative impact of all of these tradeoffs. In every case (e.g., human participant observation, behavioral experimentation, neuroimaging), empiricism aims for data that are asreproducible and valid as possible.

Cross-cultural inquiry presents unique concerns that often require original methods or solutions. An important challenge is the potential lack of conceptual common ground between researcher and participants, a factor that might lead to mistranslations, misunderstanding, and the absence of explicit, formalized terms for core research concepts. It can be problematic to impose external concepts, notation, or measures on participants from a different musical culture. For instance, it may be problematic to ask for perceived emotions expressed by music without having established that music is used to express emotions in a given cultural context. Moreover, using a certain notation system to emphasize pitch relationships may be problematic without taking into account the tonal system of a musical practice, or its relation to other, typically non-notated aspects such as ornament and timbre (see Pearson, 2016, for an example emphasizing the importance of aspects in Indian music that are not notated).

Psychology often attempts to bypass these issues by accessing nonverbal, implicit knowledge. Tasks are designed to uncover biases, beliefs, and representations that may not be explicitly available or verbalizable. This approach represents a potentially exciting means of interacting with participants nonverbally within cross-cultural research designs.

### EMPIRICAL METHODS: RECOMMENDATIONS

One of the most challenging aspects of cross-cultural research is devising appropriate tasks. Responses to seemingly straightforward questions can be misconstrued. For example, David McAllester's questions about Navajo adults' aesthetic responses to music were interpreted as pertaining to the listeners' health (McAllester, 1954. pp. 4–5).

Tasks that involve rating scales, explicit answers, or emotional responses may lack ecological validity and pose interpretative problems. One example of a problematic measure is the common Likert (rating) scale with values spaced between two opposing adjectives (e.g., pleasant, unpleasant). This presupposes a tendency to interpolate between extremes, which is not present in all cultures (Evans & Levinson, 2009). When rating scales are used, the number of scale steps could be limited to three or four to enable clear labeling of each scale step with appropriate adjectives or pictures. Where such scales are used, a control experiment is necessary to validate understanding of the scale (see, for example, McDermott et al., 2016). These and other materials used across cultures should be pilot tested in collaboration with experts in the culture.

One strategy for minimizing misinterpretation is to avoid the use of language and musical notation, with their attendant translation issues. Numerous approaches could accomplish this goal such as the use of physiological measures (Cameron, Bentley, & Grahn, 2015) or production tasks like tapping along with a rhythm or singing a melody (Jacoby & McDermott, 2017, Polak et al., 2018; Ravignani, Delgado, & Kirby, 2016; Ullal et al., 2014). The use of music information retrieval (MIR) methods on large corpora of recorded materials has advantages as well as potential biases (Tzanetakis, Kapur, Schloss, & Wright, 2007). MIR, for instance,

successfully captures low-level acoustic features of music (e.g., pitch, loudness), but fails to capture some higher-level aspects of musical structure such as ornaments that are readily perceptible to listeners within a culture. When MIR methods succeed in capturing higher-level aspects, they are often based on Western theoretical models (e.g., 12-note equal-tempered scales) and trained on human ground-truth data from Western listeners, resulting in biases toward such musical systems (see the review of MIR limitations in De Valk et al., 2017). There is increasing interest in expanding MIR methods to apply to folk and non-Western music, but substantial challenges remain for the cross-cultural application of automated methods (van Kranenberg et al., 2007; Lartillot & Ayari, 2014; Mehr et al., 2019; Panteli, Benetos, & Dixon, 2018; Sato et al., 2019; Serra, 2014, 2017; Six, Cornelis, & Leman, 2013). Because there is no single best system at present, it seems advisable to use multiple analyses of music and behavior, testing for convergent validity.

## CONCLUSIONS

Because music and musical concepts vary from culture to culture, a research question that is relevant to one domain (e.g., pitch perception) may not be equally relevant to understanding culturally situated music (e.g., a group that does not use pitch in the same way that Westerners typically do). Careful attention to musical practices within a particular culture can allow researchers to generate hypotheses that are not limited by their assumptions about how music works. Close collaboration with ethnographers, local researchers, and informants can enhance the research enterprise, giving rise to entirely new questions and methods and preventing critical misunderstandings.

In sum, cross-cultural approaches present exciting new avenues for empirical work in music, with significant pitfalls. Advances in this area of research will require robust collaboration between scholars from different disciplinary backgrounds. Accordingly, a key final recommendation is for continued constructive cross-disciplinary discussion about best practices. A greater number and variety of voices should be brought to the table to develop research agendas, designs, and theories that can promote progress in empirical cross-cultural research.

## Author Note

Authors Nori Jacoby and Elizabeth Hellmuth Margulis contributed equally to this work.

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