Special Issue

Understanding Tango Danceability by Accessing Embodied Knowledge: The "Harmonic Comfort Zone"

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"The Tango Danceability of Music in European Perspective" is the title of a research project in which the translocal genre tango argentino is examined, focusing on its history and some of its manifestations in Europe. The broad objective of the project is to determine which factors in sound, movement, and social relations are relevant to the question of "tango danceability." To access embodied knowledge of danceability by tango dancers, we designed an experiment in which tango dancers throughout Europe were asked to dance to newly composed pieces and write down their immediate reactions to it. Some of the outcomes of this experiment confirm inside knowledge I have gained as a tango dancer for more than a decade. Other aspects, such as the importance of harmonic structures, were surprising and led to insights impossible to uncover without quantitative, experimental approaches in combination with qualitative expert knowledge.

Introduction

A summer evening in Vienna. Tango dancers have gathered informally in a tango argentino dance school for a training session, a *práctica*. They dance with each other to tango music well known to them, trying out the floor and their shoes, chatting in between tracks, changing partners. A bit of excitement and nervousness is in the air as tonight there will be an "experiment" – a researcher is here to find out how they will dance to unknown tango music. A short presentation of the procedure, the couples get up, and the music starts. It sounds like tango but it is strange; there is something wrong that is hard to determine. The tempo is right, the instruments fitting, the 4/4 metre there, not too many tempo changes – all musical features required to dance tango are present. The dancers try to hold on to their partners and the music, but the tension can be seen in their faces and, to the attentive observer, in their bodies. In the middle of a piece, one of the more experienced leaders shakes her head and loudly exclaims something like "I can't dance to this crap!" – storming off the dance floor with her partner to agitatedly fill out the survey page about this particular piece of tango music.

This scene happened in June 2017, when I conducted one of a total of twelve "tango danceability experiments" with social tango dancers.[1] Scenes similar to this – but rarely so extreme – were also seen in various other places in Europe where the same experiment was carried out. The aim of the experiment was to confront tango dancers of various levels of experience with tango music that they had not heard before, and that contained musical flaws. I sought to trigger physical responses to musical stimuli with the intention of accessing dancers' embodied knowl-

1 I am grateful to all of the dancers who participated, and particularly to all of the organisers of local tango dance events who agreed to host the experiment. Without their collaboration, this research would have been impossible.

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edge of tango music, surpassing theoretical reflections that might interfere with these immediate physical responses.

In this contribution, I present the setup of this danceability test, the methods used, and one exemplary outcome of the experiment regarding the relevance of harmonic structures to the danceability of a tango composition. The experiment is part of a broader research project focusing on choreomusical aspects of tango argentino. The main aim of the overall project was to find out how music and dance in tango argentino are related, and how the development of this relationship is shaped by practitioners.[2] The project collected a combination of qualitative and quantitative data, with methods ranging from expert interviews and participant observation[3] to an online survey, dance experiments, and motion capture sessions with professional tango dance couples (see Stepputat 2021).

In this paper, I start with a short overview of tango argentino dancing in translocal context and continue with a definition of the term and concept of "tango danceability." Then, I explain my understanding of tango dancers' embodied knowledge and how it is used as the basis for the danceability experiment. Finally, I present the test setup and discuss the predominantly negative reaction of dancers to unusual harmonic structures in newly composed tango music.

Tango Argentino in Translocal Practice

There are many ways to dance tango. Genres falling under the "tango" umbrella include the ballroom tango tradition (Knowles 2009: 114–15), staged tango (known as "*tango escenario*"; see Cara 2009: 441) and localised kinds of tango, such as the Italian tango (Cámara da Landa 2015) or the Finnish tango (Padilla 2014). The tango I am concerned with is the social dance practice that started to spread from Argentina through Europe to elsewhere in the world in the first decades of the twentieth century. Known as *tango argentino*,[4] this tango is a couple dance in which two partners improvise together to music. One of the dancers has the lead, the other the follower role, yet this joint improvisation might best be understood as a physical dialogue on equal terms, within a learned movement repertoire.[5] Becoming skilled in dancing tango is a never-ending endeavour. The complexity and challenge of the dance lies not so much in complicated step sequences or acrobatic skills, but in the endless possibilities of interpreting music in an improvisational way jointly with a partner.[6]

Tango music is just as diverse as tango dance genres. Formed into a named genre at the turn of the twentieth century in the Rio de la Plata area,[7] it has diverged into many different styles – for instance, elaborate tango songs (*tango cancion*; see Pelinski 2009: 17–27), concert tango following innovations by Astor Piazzolla (Azzi and Collier 2000), and fusion genres like *electrotango* (Greco

2 The research project with the title "The Tango Danceability of Music in European Perspective" was sponsored by the FWF (Austrian Science Fund, project V 423) and hosted at the Institute for Ethnomusicology, University of Music and Performing Arts, Graz (2016–19).

3 As a tango dancer for seventeen years and an organiser of local and international tango events since 2010, I am deeply embedded in the translocal tango argentino community. Sometimes research looking from "inside out" brings difficulties that are different from those of "classical" fieldwork, where "the field" is not "at home." For an overview of research redefining "the field," see Amit (2000); for discussion of negotiations within individuals acting as both researcher and researched at the same time, see Foley (2014).

4 See Goertzen and Azzi (1999), Cara (2009), and Fares (2015) for general overviews of the spread of tango, and of the reciprocity between Europe (in particular Paris) and the Rio de la Plata region (in particular Buenos Aires).

5 See Kimmel and Preuschl (2016) and Kimmel (2019) for detailed studies of the collaborative dance improvisation in tango.

6 The lead and follower principle in tango means needing to learn the different skills associated with both of these two roles if a dancer is to adapt well to the music and to their partner. See Kimmel (2012, 2019) and Kimmel and Preuschel (2016) for thorough analysis of the leader's and the follower's asymmetric responsibilities and required skills.

7 For an overview of early tango development, see for instance Plisson (2002: 16–59), and Baim (2007: 13–48).

and Cano 2014). Tango music composed and played for dancing had its peak (called the *época de oro* of tango) in the mid-1930s to the mid-1950s, the most prominent and influential orchestras (*orquesta típica*) of the time being Carlos DiSarli and Juan D'Arienzo, among others (Link and Wendland 2016: 196–99). For many tango argentino dancers today, the music recorded in those decades is still the preferred music to dance to.[8]

At a tango dance event (*milonga*), music is provided by a tango DJ, whose skill lies in combining records that suit each other into sets of four tangos (a *tanda*). Tango dancers usually dance with one partner for the duration of one *tanda* and change partners during the intermezzo music (*cortina*) between two *tandas*. Structures like this are part of the quite elaborate codes on and off the dancefloor that are followed more or less strictly, depending primarily on the location and organiser, not the city, country, or continent. Sometimes tango musicians are invited to play live music at a *milonga*, but much more often tango is danced to recorded music.

While Buenos Aires is seen as the hub and cultural centre for tango practice (Stepputat 2017), tango argentino is also a translocal music-dance genre. It is practised in many urban regions all over the globe, wherever public dancing is allowed and physical contact between men and women is not frowned upon. Tango dancers are connected in multiple ways into a social network:[9] first, by travelling, which includes going to other places to dance, listening to the same travelling tango DJs, or learning with the same travelling tango teachers. In Europe, people travel considerable distances to dance at regular *milongas* or weekend tango meetings (so-called *marathons*, *encuentros milongueros*, or festivals) (see Figure 1). Second, dancers are connected through social media, where experiences, opinions, and insights, as well as information about events and teachers (and shoes) are shared. Additionally, tango organisers are connected across regions in their efforts to bring dance teachers, musicians, and tango DJs to their events.

8 See Stepputat (2020) for an overview of how mainly political and economic influences caused tango music and dance to become disconnected and develop into separate genres in the second half of the twentieth century, as well as discussion of recent tendencies and approaches in their reconnection.

9 See Stepputat, Kienreich, and Dick (2019) for an initial analysis of social network structures, based on computational research methods.

Figure 1. Afternoon *milonga* at the international tango dance meeting (*encuentro milonguero*) *Esmeraldas*. Bad Gleichenberg, Austria, 2019. (Photograph by Ann Parker-Way)

Tango Danceability

The key terms I use to encapsulate the subject matter of music-dance relations in tango argentino are “tango musicality” and “tango danceability.” Both terms are commonly used in the tango community, mainly in discourses about the adequateness of movements or music within existing practices, or as an indicator of individual abilities. For the purpose of my research, and based on the use of the phrase in tango discourses, “tango musicality” is defined as the ability to understand tango music to such an extent that its physical interpretation is felt by oneself – and judged by onlookers or dance partners – to be “with” and “in” the music. To be considered a “musically dancing” tango dancer is something to which many aspire.[10] The second term, “danceability” (and its derivative “danceable”) concerns music that tango dancers can imagine themselves easily and joyfully dancing to, or music that makes them want to dance. A piece’s tango danceability is not measurable or even unequivocally definable. My premise is that what is considered danceable is always primarily based on experiences, abilities, and tastes of the individual dancer, as well as social norms. Nevertheless, some fundamental factors are identifiable in dancers’ judgements over the danceability of tango music played for dancing.

To focus on the relationship between music and danceability, I framed the following research question: What musical features are needed to make a composition seem danceable to tango dancers? To get beyond individuality and social conventions and grasp concrete features of danceable tango, I employed several research methods in parallel and in combination. One was to focus on dancers’ responses concerning the danceability of tango music. But to get the most substantial answers possible, I looked beyond interview techniques and quantitative sur-

10 Details about tango “musicality” are not covered in this paper – the issue is explored in detail in Stepputat (2024).

veys. Instead, I sought to incorporate the bodily knowledge of dancers in an experimental way, by triggering their physical responses with "strange" tango music.

Embodied Tango Knowledge

Embodiment is a term that has many definitions and many understandings. In academia, the use of the term "embodiment" or "embodied knowledge" in recent decades has often been tightly connected to a reconsideration of knowledge production that now incorporates "the body," thus overcoming the long-established categorical divide between "mind" and "body" (Csordas 1990: 7; Sklar 2008). This reconsideration of the importance of the body for knowledge production has led to a new appreciation of dance research, which is often concerned with the body and bodily knowledge (Buckland 2001). The term "embodiment" itself was first adopted in dance research in the 1960s following the groundbreaking work of Merleau-Ponty (1962),[11] and this continued further into the 1980s in dialogue with the cognitive sciences (Warburton 2011: 66). Depending on the academic tradition that the term entered, definitions, approaches, methods, and aims vary significantly (Bowman 2019: 75–90). A whole research field has developed around "embodied music interaction," [12] which looks mainly at physical reactions to musical stimuli as well as at the physical actions required to produce sounds, including the interaction between participants in both acts – and something less often considered yet nonetheless of great importance, the relation to social and cultural processes (Clayton 2017: 215). Some studies in the field of music-induced movement explore dance as an embodied reaction to music. An example of such research is Zeiner-Henriksen (2010), who analyses dancers' reactions to Electronic Dance Music (EDM), Leman and Naveda (2010), who study motion in Samba and Charleston movement repertoires, and Burger et al. (2013), focusing on freestyle physical reactions to Euro-American pop music. All of these studies highlight individual dancers' reactions to music, and correlations between musical features and physical responses.

It is worth explicitly stating that in the research presented here, my aim was not to delve into embodied music cognition or the empirical study of embodiment in tango. I do acknowledge research carried out in this field as highly relevant to understanding relations between movement and sound, and my own studies are informed by such approaches. However, I emphasise that my perspective, and the methods and analysis that follow, is built mainly on ethnomusicological and ethnochoreological research traditions, even if I venture into empirical data collection. The studies focusing on music-induced movements mentioned above contribute to the understanding of sound-movement correlations; my focus, however, is considering responses to the musical features of a predefined music repertoire through the bodily knowledge of experts in the related predefined movement repertoire. In short, I do not set out to study tango embodiment itself, but instead I use embodied knowledge in tango as a basis for my choreomusicological research.

Embodiment as method has a long history in ethnochoreological research. Klemm, Schomacher, and Söffner (2011), for instance, state that embodied knowledge is a way to "understand … not only through analysis, but also through bodily experience" (ibid.: 319). Warburton (2011) adds that "to know what dancing is or feels like, one must ask dancers what they experience or experience dance oneself" (ibid.: 68). Ethnochoreologists and ethnomusicologists build their research upon this premise as a variation of participant observation, depicting dancers'

11 Also see Csordas (1990) for a thorough overview of the establishment of embodiment as a paradigm based on the works of Merleau-Ponty and Bourdieu.

12 See the companion dedicated to the topic edited by Lesaffre, Maes, and Leman (2017) and, for example, the edited volume on "Music, Mind, and Embodiment" (Kronland-Martinet, Aramaki, and Ystad 2015).

experiences as well as experiencing – embodying – the dance practice themselves (David 2013). Therefore, in addition to being a tango dancer myself, the most important aspect of my research is incorporating tango dancers' knowledge, including their embodied skills.

My working definition of embodied (tango) knowledge underlies the research presented here; it is bodily knowledge gained through physical training and used for practising a movement system. It is, therefore, also a specific cultural knowledge, and it is knowledge that practitioners hold in individual ways and with differing abilities, yet striving towards a common aesthetic or functionality, within which variants of movement patterns are found in the individual execution of movement.[13]

Tango dancers train their bodies to carry out a defined movement repertoire, a process that focuses on combining learned steps into flexible patterns and reacting to the partner, the surroundings, and musical inputs in split seconds. In tango practice, this knowledge is used to perform (see Klemm, Schomacher, and Söffner 2011: 39) – primarily for the self and for the dance partner, but also for other tango dancers present (Tateo 2014: 310–11). The way tango dancing is learned is, of course, mainly a physical process that – like all complex movement systems – shapes the body and its particular skills. While the practitioner continues to learn, necessarily over a long time to allow the body to automatise and gain competence and skill (see Coldiron 2018), dancers obtain embodied knowledge. Although differentiating between "cognitive knowledge" and "physical knowledge" risks a return to the artificial mind-body divide (Spatz 2015: 11; see also Downey 2010), it makes sense to differentiate between the two to a certain extent here. Bodily knowledge in tango means having trained for dance practice to the point that physical responses are embedded in automated motor skills or muscle memory, and "not thought about" anymore before being carried out, the body having undergone "material change … in which past training becomes corporeal condition" (Downey 2010: S26).

To sum up, my premise is that tango dancers have embodied knowledge extending beyond what is possible to verbalise. This knowledge includes the ability to judge music as more or less danceable for those employing tango movement repertoire. To tap into this embodied knowledge of danceability, I constructed an experiment meant to bring to light aspects beyond those openly debated among tango dancers.[14]

Constructing the Experiment

In 2011, I conducted a first danceability experiment in my home tango community in Graz, Austria. Five couples participated,[15] each willing to endure dancing to the weirdest of tango musics. They filled out a short questionnaire after dancing to each piece. I selected six musical features for test. All of these features were and continue to be actively discussed among tango dancers with regard to their influence on tango danceability. The first feature was **sound quality**, concerns about which tend to relate to two scenarios: either when historical records have been

13 Variants of movement patterns are termed *allokines* in ethnochoreology; see Kaeppler (1972).

14 Suffice it to say, even if a physical response is triggered, it needs to be translated back into words for the sake of analysis and academic processing. In this stage, information is lost, re- or even mis-interpreted. This unsolvable semiotic problem (see Bowman 2019: 81–2) is something a researcher needs to be aware of – and they need to accept the flaws of the method in the absence of a better one, as long as the written word is still perceived to represent "the pinnacle and yardstick of academic propriety within academia" (ibid.: 85). An exciting attempt to surpass words in presenting research about embodied phenomena is the online open access *Journal on Embodied Research*, whose contributions are all in video format. See https://jer.openlibhums.org/

15 Four mixed couples and one couple comprised of two female dancers participated. The age of the dancers ranged between 34 and 57 – all of them were active dancers (dancing at least once a week) with at least two years of tango dance experience.

badly transferred and therefore contain too much disturbing noise with a narrow bandwidth, or when tracks are too heavily compressed and this compression is audible. Discussions about bad sound quality centre on whether listening to such recordings is too disturbing and distracting for dancers to focus on the music. The second feature was **instrumentation**. The most common instrumentation in tango for social dancing is that of the *orquesta típica*, consisting of piano, bass, two bandoneons, and two violins. Some formations include a cello or viola, while large ensembles have additional violins and up to six bandoneons. In the second half of the twentieth century, quite different instrumentations entered the tango music market: an ensemble like TubaTango, consisting of guitar, clarinet, tuba, and bandoneon, for instance; or the many professional musicians of diverse musical backgrounds also playing tango arrangements in whatever ensemble size and instrumentation was available. A number of tracks from such formations were played at *milongas* in the 1990s and 2000s, causing debates among tango dancers about whether this is appropriate tango music for dancing or not.

The third feature put **metre** into focus. Tango dance music has a prominent and clear beat structure. A bar consists of four beats, of which either all four (*marcato in quatro*) or the first and third (*marcato in dos*) are emphasised. Tango dancers basically step on the first and third beat, sometimes adding steps in double time or pausing. In more contemporary recordings, the regular bar structure is sometimes broken, for instance by changing to irregular metric structures or by including (solo) passages without any metre at all. The fourth feature was extreme **tempo changes**. In the *época de oro*, tango music was quite stable, with few obvious *acceleran-dos* or *ritardandos*. When tango as concert music became increasingly established in the 1960s and 1970s,[16] tempo changes started to appear as a prominent feature. The fifth feature tested was **monotony**. Tango music's complexity is often grounded in melodic organisation. Melodic motifs or phrases are varied, sequenced, played by different instrument groups in the ensemble, or supported or replaced by countermelodies. Dancers have the option to interpret either rhythmic or melodic elements, and to focus on one or the other instrument group. If a piece has none of these layers, tango dancers criticise it as being monotonous. This debate in the tango community arose prominently when dancing to "non-tango" or "alternative tango" music became vogue in the late 1990s. Pop songs often lack such melodic and rhythmic layers, as do many *electrotango* tracks.

The last feature tested was the only one not particularly bound to tango dancing, but more generally to feeling comfortable in dancing to certain music: previous **knowledge of a piece**. It is much easier to interpret musical features physically if a dancer has an intimate familiarity with what they are hearing. In such cases, dancers have an advanced knowledge of the music's progress and can choose and prepare their movements, giving their improvisatory creativity more space to unfold. This is of particular importance for leaders, whose responsibility it is to progress the joint movements of the couple, but it is nonetheless also true for followers who, within their frame of movement possibilities, also shape the joint movement or add embellishments in accordance with musical features. In addition, research into music preference has shown that people tend to prefer music that they have heard more often and with which they are better acquainted (Schäfer and Sedlmaier 2009: 488). The results from an online survey indicate

16 Caused by the fear of taking part in any public gathering under the military regime in Argentina (1976–83), tango dancing declined sharply, to be revived again after the return to democracy. Tango had lived on as concert music and was developed further in such directions by Argentinian musicians in Argentina and in exile (see Cara 2009: 444).

that this is also true for tango dancers,[17] and in addition, that they judge known and liked pieces to be more danceable.

I chose 24 recorded tracks, each deliberately highlighting one of the six features above in a way expected to seem unusual or challenging when couples danced to the music. This became the basis on which to explore the roles of these features in dancers' perceptions regarding danceability. Where I could not find suitable tracks, I manipulated recordings to fit the requirements. For instance, I manipulated the sound quality of contemporary recordings, and changed tracks originally showing constant tempos so that there were now passages at higher and lower speeds within the recording. To include different tango musical styles, for each of the six musical features, I selected recordings from four musical categories. These were 1) *época de oro* original recordings, 2) new recordings of *época de oro* tango, 3) *electrotango*, and 4) non-tango (alternative tango). I combined the tracks into groups containing one piece from each of the four musical categories. This resulted in a very long evening for the participants, with six times four musical pieces to dance to, even if all pieces were faded out after two minutes. To relax the atmosphere and strain on mind and body, I gave dancers short breaks after dancing to each group of four pieces. They were asked to at least try dancing to each piece for some time but were allowed to stop at any time if inclined. After each piece, they had time to fill out the questionnaire. The questionnaire focused on the same yes/no questions for each piece, including: "Do you like the piece?" "Have you danced to it before?" and "Do you know the piece?" An additional open-ended question asked for information on what they liked or felt disturbed by in the track.

Results from the Pre-Test

The ratings from the pre-test were of course not statistically significant, as only ten people participated. Much more interesting and helpful than a quantitative evaluation of the yes/no questions was the analysis of the qualitative responses to the tracks, as well as the physical responses captured by the test being filmed for its whole duration. For some of the features, the results were clear: extreme changes in tempo and absence of a metre make a tango piece undanceable, or at least very difficult to dance to if one has no previous knowledge of the piece. The majority of dancers agreed on this. Especially in the unclear metre category, four of the five couples stopped their dancing long before the music was faded out, and the other couple did not even start dancing. This comes as no surprise, considering that the most basic element in tango dancing – the step – is so tightly bound to the beat/bar structure. Without any perceivable beat structure, dancers had nothing to hold on to.

The feature of bad sound quality, on the other hand, yielded no discernible pattern in the responses: participants rated the pieces very differently, more in accordance with their individual taste than the quality of the sound. Responses concerning instrumentation were similarly ambivalent across the comments of the dancers as a group. Ratings and comments for this category also related mainly to other features of the tracks; if they liked the piece, they enjoyed dancing to it, regardless of the instrumentation. This phenomenon was also observable in their dancing – facial expressions, durations until stopping dancing, and creativity in movement all indicated that some clearly enjoyed the tracks more than others.

17 Created for another part of the project, this online survey asked tango dancers to rate 80 tango pieces for their danceability (see Stepputat, Kienreich, and Dick 2019: 7–16 for full details). Part of the analysis of this survey involved an evaluation of previous knowledge of a piece in relation to its perceived danceability (ibid.). We showed that knowledge of a piece correlates strongly with it being liked and dancing to it being enjoyed.

Two further factors with less clear patterns in the qualitative responses, and thus inspiring deeper exploration, were monotony and previous knowledge. In both categories, as for instrumentation and sound quality discussed above, the individual taste for a style or particular piece overlapped with the rating of the piece. While in written comments concerning monotony certain pieces were described as "dull," "uninspiring," or "monotonous," these evaluations had no clear correspondence with how well the piece was liked or how danceable it was judged. Finally, my test for whether knowledge of a piece influenced perceived danceability proved to be faulty: my intention was to offer pieces that participants would not know, but several did in fact recognise some of them. Among the few who were not familiar with them, the assessment of the tracks was too diverse to deduce any notable patterns.

Main Test Research Design and Overall Results

Altogether, the test showed just enough results to encourage further investigation and insight to improve subsequent tests through learning from the flaws of this one – the general idea of a pre-test. With this knowledge, my team and I began to conduct the main danceability test.[18] We omitted the features related to metre and tempo, as they were too obvious. Sound quality was also left out because of what seemed to be its relatively minor relevance: even if a piece is played back with bad quality, that does not contribute substantial information about how its musical features relate to danceability.

As noted above, a crucial factor that coloured all of the responses was the participants' previous knowledge of a piece. If existing music is used for such a survey, this circumstance is impossible to control. Fortunately, generous resources available to the project allowed for a perfect solution: the composition of new tangos. The style of tango music was narrowed down to only one: new recordings of tango in *época de oro* style. It was necessary to create four new pieces in that style, as tango dancers are used to dancing to four tangos with one partner through the established *tanda* format. Since some of the results concerning the musical parameters highlighted in the pre-test were trivial or unclear, it was necessary to go more deeply into the musical structures of tango argentino that might influence danceability on a subtler level.

In 2016, Robert Schmidt, German tango pianist, composer, and arranger, agreed to take on the task of composing the four new tango pieces. After several long discussions and joint analyses of the tracks that were rated most danceable in the online survey,[19] we arrived at the plan to implement a negative test: three of the tangos would each play with one particular feature, incorporating it into the composition in an unusual, "faulty" way, while the fourth tango would aspire to be an **ideally danceable** tango (labelled the "ideal" piece, Graz 1). The feature we identified for incorporation into the first experimental piece (the "phrase" piece, Graz 2) was **uneven phrase length**, departing from tango's typical even phrase structure of eight or sometimes four bars. The second piece (the "melody" piece, Graz 4) was to include several parallel and **overlapping melodic lines** in the piano, bandoneon, and violin parts, sometimes even the bass – the antithesis of monotony, with an overabundance of material for dancers to interpret, making it difficult to find lines to latch on to. The third tango (the "harmonies" piece, Graz 3) played with **unusual harmonic structures**. While most *época de oro* standard pieces use a I-IV-V structure, our composition added complex harmonic progressions that did not always end on the tonic as one would expect.[20]

18 The project was indeed a team effort. In addition to all the dancers and musicians who contributed over the length of the project, I was supported at all stages by several people: Christopher Dick (senior assistant), Wolfgang Kienreich (collaborator), Mattia Scassellati (student assistant), and Kurt Schatz (contracted assistant).

19 See the results from the online survey at http://www.dancetangomusic.com/pub/dtm-piece-rank-2018.pdf

In November 2016, Robert and his three fellow tango musicians Peter Blazeowsky (bass), Michael Dolak (bandoneon), and Mathias Leupold (violin) recorded the four pieces. The plan was to take the recordings to as many local *prácticas* as possible, cooperating with local organisers but always carrying out the test ourselves; we did not want to burden local organisers with the complexities of the test, and we wanted to make sure that the experiment was carried out in a comparable way. Over the following three years, we visited twelve locations in nine European countries, engaging a total of 208 participants (see Table 1). The choice of the European towns did not follow any particular pattern, the main factor simply being the willingness of a local organiser to host the event. Nevertheless, we tried to incorporate as many countries and as many different locations as possible. It turned out that the locations drew a north-south line through Europe from Finland down to Spain.

The setup for this experiment was similar to that of the pre-test: participants of all ages and experiences were invited to take part in the test which, as noted, was hosted in cooperation with local *milonga* or *práctica* organisers at their regular dance venues.[21] The whole experiment was filmed after permission was obtained from the dancers; those not comfortable being filmed were assigned space to dance out of frame. We assumed that participating couples would be accustomed to each other as dance partners – they were asked not to change partners between dances, but they were allowed to change the lead and follower roles. Participants were invited to fill out a survey on each of the four tangos directly after dancing to the respective pieces. The survey was always professionally translated into the local language to make sure no cross-language misinterpretations occurred.[22] While they sat to fill out the survey, the music was played again, at a softer volume, to help them recall what they had recently heard and to keep the short-term physical memory active. Dancers in the pre-test were tagged with colour buttons on their backs, with the same colour mark applied to their questionnaire so that their filmed physical responses could be matched with their questionnaire responses. Although this strategy seemed useful at the time, dancers felt uncomfortable with their identity being revealed in this way. Therefore, this marking was omitted in the main test, although it might have provided further useful data.

Ninety-six of the participants identified as "female," 112 as "male," and none chose "other." After each tango, participants were asked to indicate if they had danced as leader or follower. Five age groups were represented: 0–20 years (one person), 20–30 years (11), 30–40 years (34), 40–50 years (62), 50–60 years (73), and 60–70 (26), while two people did not mark their age. Participants' dance experience ranged between 1–3 years (91 people), 4–10 years (64), and more than 10 years (52); one person did not answer. Among the dancers, eight people classified themselves as professional dance teachers, and 27 as parttime dance teachers. Dance frequency was daily (10 people), several times a week (115), several times a month (64), or infrequent (19). We also ascertained participants' level of musical education by enquiring as to their duration or level of experience in playing an instrument or singing according to the following categories: no experience (100 people), 1–3 years (34), 4–10 years (33), more than 10 years (40); one person did not answer.

20 The scores and recordings of the four compositions are available online:
Graz 1 (recording): https://phaidra.kug.ac.at/o:121089 Graz 1 (score): https://phaidra.kug.ac.at/o:121088
Graz 2 (recording): https://phaidra.kug.ac.at/o:121090 Graz 2 (score): https://phaidra.kug.ac.at/o:121091
Graz 3 (recording): https://phaidra.kug.ac.at/o:121092 Graz 3 (score): https://phaidra.kug.ac.at/o:121093
Graz 4 (recording): https://phaidra.kug.ac.at/o:121094 Graz 4 (score): https://phaidra.kug.ac.at/o:121095

21 Compensation for participants differed between the events depending on the hosts' preferences. While some asked for free ice cream for all, others suggested chocolate and red wine, free drinks of the participants' choice, or free entrance to a subsequent *milonga*.

22 For this I am grateful to Hjard Rune Jensen, Rebeka Kunej, Zoltán Németh, Mattia Scassellati, Elina Seye, and Lluís Solsona Sabanés.

Of the people with musical education, two classified themselves as professional musicians and thirteen as part-time musicians.

Questions around the issue of danceability were more refined, distinguishing between individual taste, experience, and general assessment of a piece. The relevant questions for this category were: "Was the piece easy to dance to?" "Did you enjoy dancing to the piece?" and "Do you think this piece is danceable?" Answers to these questions were elicited on a 0–3 scale, with 0 meaning "not at all" and 3 equating to "very much." In addition to these general questions, participants were provided with adjective lists from which they could choose words to help them evaluate each piece. The list of 33 adjectives was compiled in a brainstorming session with tango dancers and musicians (conducted in German), the goal of the session being to find as many adjectives as possible to describe how music can sound and how it can make one feel, in the context of listening or dancing to tango. This approach was a deliberate compromise between staying as close as possible to the dancers' unfiltered judgements of the music, saving them time in answering the questionnaire while still obtaining individualised answers, and ultimately, maintaining an exploratory approach while still being able to quantify the results. Dancers were also given the option to add comments in a free text field, though few made use of this opportunity.

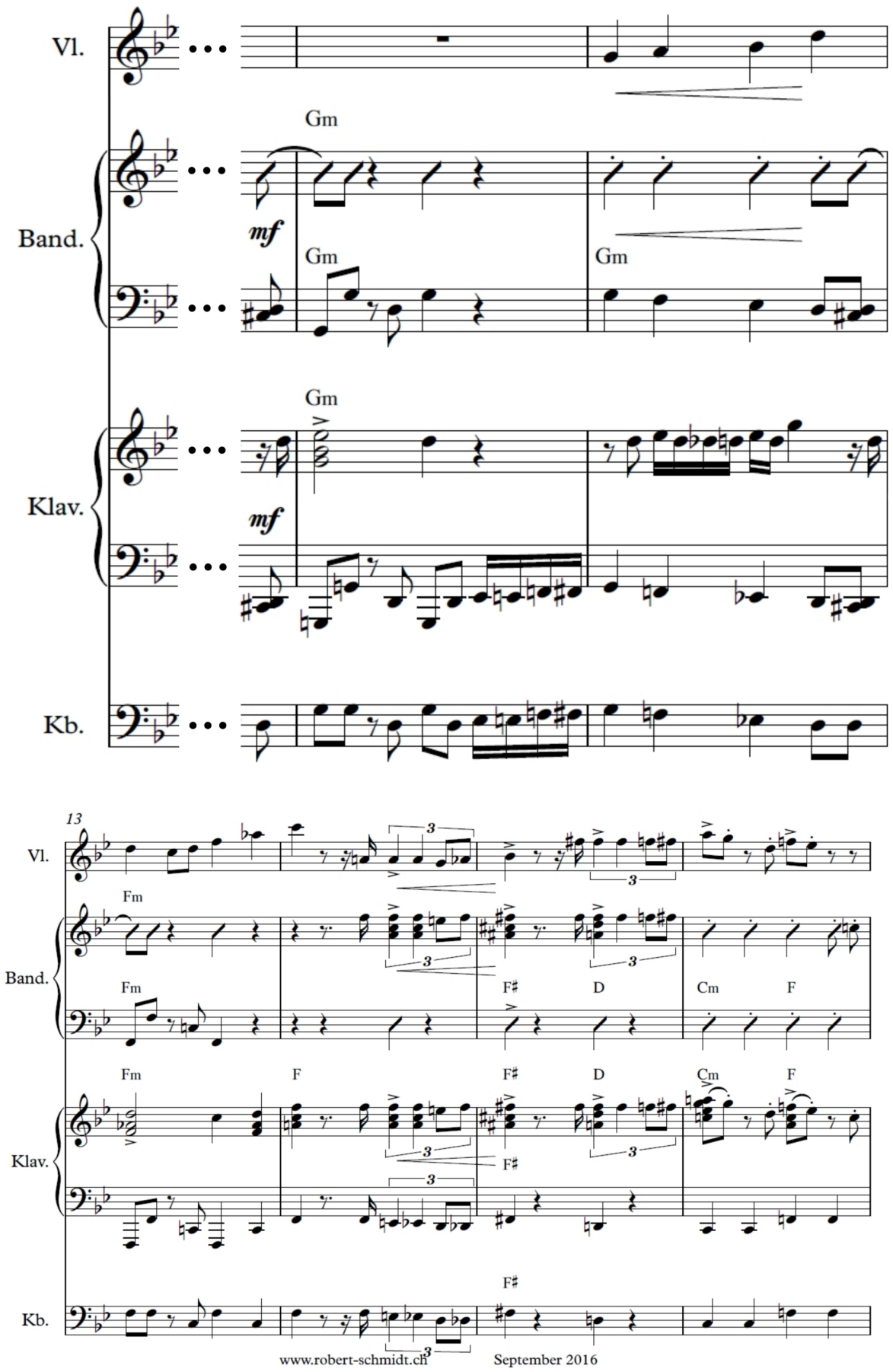
Location	Date	Host
Graz (AUT)	07.03.2017	Práctica Studio Ki
Wien (AUT)	11.06.2017	SaTho-Tango Práctica
München (GER)	04.07.2017	Milonga Bailongo Giesinger Bhf
Berlin (GER)	04.08.2017	Práctica Tango tanzen macht schön
Berlin (GER)	12.08.2017	Práctica Nou Mitte
Celje (SLO)	25.09.2017	Práctica Milonguero?Sí!
Budapest (HUN)	10.02.2018	Práctica Hőlgyválasz
Barcelona (ESP)	21.02.2018	Milonga La Yapa en Café de las Artes
Maribor (SLO)	11.03.2018	Práctica Vetrinski Dvor
Pordenone (ITA)	06.05.2018	Práctica El abrazo cerrado
Tampere (FIN)	12.06.2018	Práctica La Fábrica del Tango
Trondheim (NOR)	17.09.2019	Práctica Trondheim Tangoklubb

Table 1. Locations and dates of the tango danceability tests.

Discussion of An Exemplary Result: Dancers' Reactions to Unusual Harmonic Progressions

Individual ratings by more than 200 participants leave us with a significant amount of material for investigation and analysis.[23] For the rest of this paper, I focus on ratings of the newly composed tango that incorporated more complex harmonies and chord progressions than any *época de oro* tango for dancing would. This "harmonies" tango ranked lowest of all for danceability. The excerpt of the score in Figure 2 provides an impression of the piece. Bars 10 to 19 include the repetition of the first phrase in part A, leading to the cadence and transition to part B.

23 All results from the project in combination are published in Stepputat (2024).


Vl.
Band.
Klav.
Kb.
Gm
mf
13
Fm
F
F♯
D
Cm
www.robert-schmidt.ch
September 2016

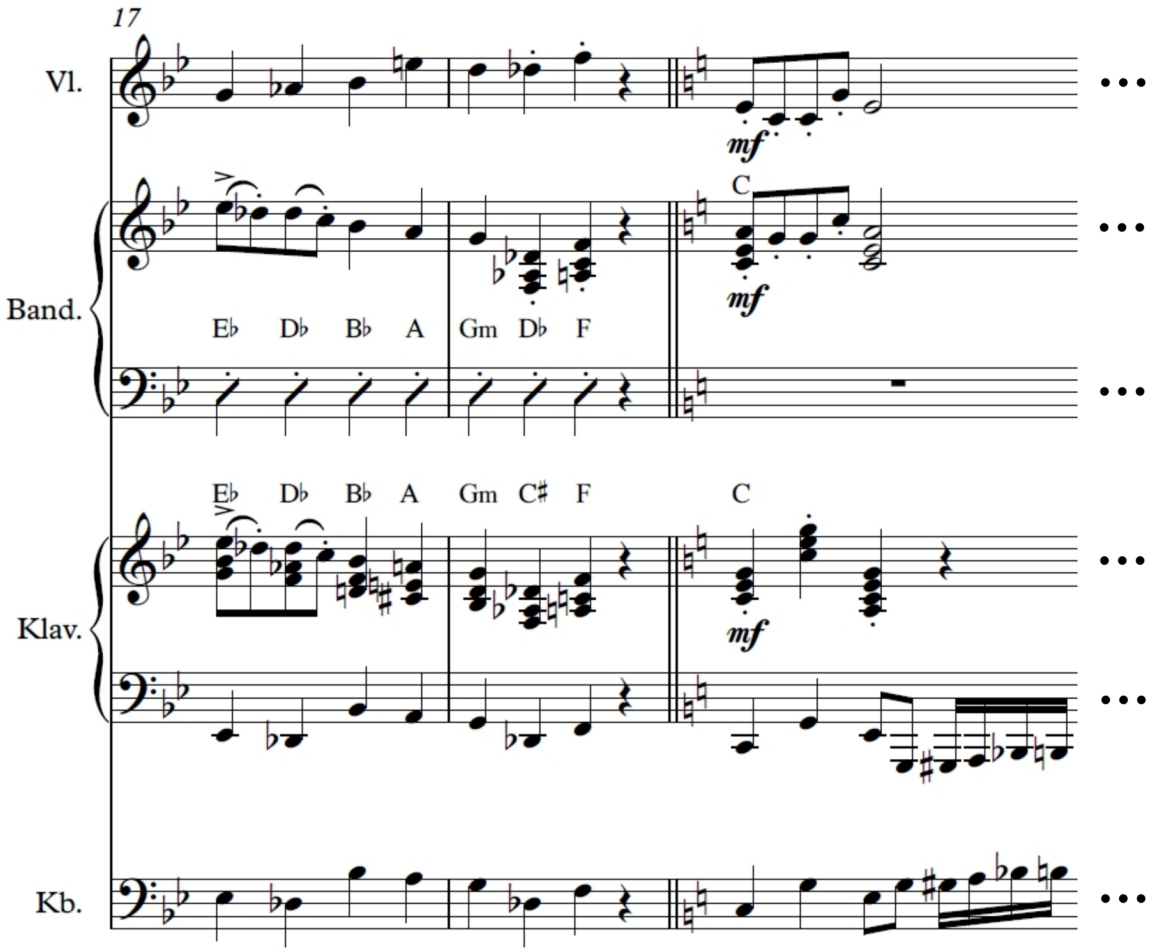


Figure 2. Excerpt from the "harmonies" tango by Robert Schmidt, 2016 (used with permission).

In *época de oro* tango, melodic features are much more prominent than harmonic ones (Peralta 2008: 111–17). The main function of the harmonies is to underline the melodic progression. Tonal complexity is mostly found in the melodies, for instance in use of additional notes in the melodic line that fall outside of the functional chords (ibid.). Link and Wendland (2016) define the harmonies used in tango as belonging to the "functional major-minor tonal system," and they add that if chromatic harmonies and jazz-influenced extended chords are included – which has increasingly been the case since the 1950s – the harmonic structures nevertheless always stay in an "essentially functional diatonic framework" (ibid.: 34). The most often used harmonies according to Peralta (2008) are tonic (I), dominant (V), subdominant (IV), and secondary dominants (V/V) and (V/IV), in both major and minor modes (ibid.: 122). A characteristic feature is a cadence of V-I or IV-V-I, and sometimes a German augmented sixth chord followed by V-I (ibid.: 118).

In the "harmonies" tango example above, the harmonies depart drastically from these general rules. For instance, the cadence in bar 18 is far removed from a IV-V-I structure; instead two distantly related chords follow the Gm (I), an abrupt progression that is unusual in tango in general, and particularly so at cadence points. Part B then starts with a chord of C, which is the dominant of the final F chord of the cadence, but not directly related to the root key of Gm. Robert Schmidt in fact stated that he deliberately chose chords similar to the correct functional progressions, but with subtle differences, jokingly calling them "pretence functions" (*Scheinfunktionen*).

These harmonic changes occur, however, at the “right” metrical locations, important accented beats in a bar (see Dawe, Platt, and Racine 1993: 795). In tango, these are mostly the first and the third beats, and in cadences, the first, second, and third beats.

This piece achieved an average rating of 1.75 out of 3 for the question “Was the piece easy to dance to?” 1.55 out of 3 for the question “Did you enjoy dancing to the piece?” and 1.70 out of 3 for “Do you think this piece is danceable?” These figures are all lower than the equivalents for each of the other three tangos in the experiment, with this tango scoring a full 0.69 points below the top ranked piece with 2.39 in the “danceability” category (reassuringly, the “ideal” tango scored highest in all categories).[24] This low ranking was largely independent of age group (at 2.00, 2.27, 1.62, 1.62, 1.79, and 1.50 respectively) and category of experience in tango dancing (at 1.80, 1.71, and 1.53),[25] and there was no significant difference between the ratings given by leaders (1.71) and by followers (1.67). Dancers with musical education ranked the piece equally low (1.68) as those without (1.69). Figure 3 contains the mean values for the ratings of all four tango compositions, grouped according to the three questions concerning the danceability of pieces.

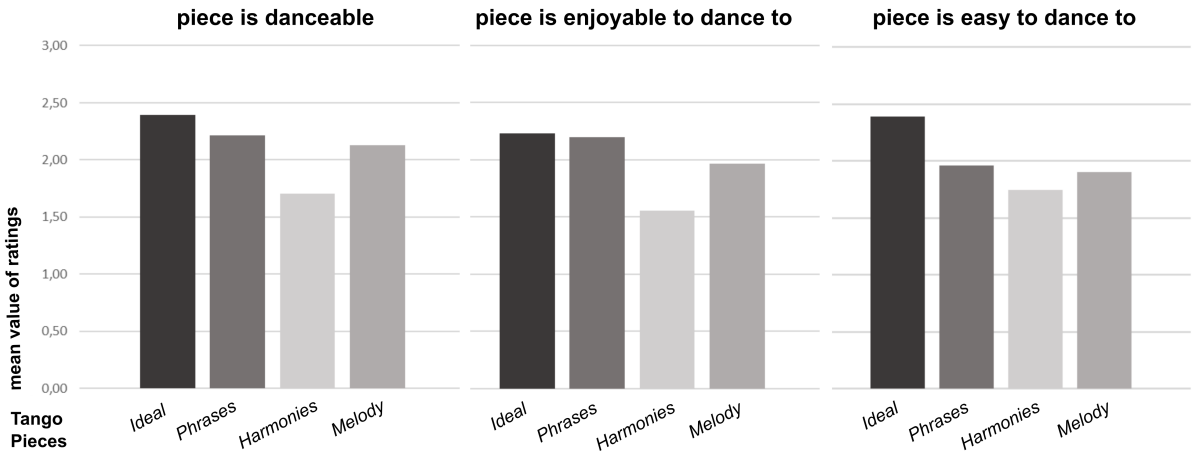


Figure 3. Ratings for the four tango compositions. Graphic by Wolfgang Kienreich and Kendra Stepputat.

The exploratory approach chosen for the selection of adjectives brings with it both interesting results that may be closer to the dancers’ unfiltered opinions, but also the problem of ambiguity. Some of the adjectives are explicit while others are open to interpretation, and only a certain number are distinctly positive or negative. To avoid potential flaws in interpretation as much as possible, I first grouped the adjectives into three categories: positive, negative, and ambiguous. Eight of the 33 total adjectives have a clearly negative connotation. Of these, seven were associated more often with the “harmonies” piece in comparison to the others – this tango was described as “exhausting” by 22% of the participants, “boring” (24.5%), “confusing” (20.7%), “inharmonious” (16.8%), “static” (7.2%), “unrelaxed” (15%), and “monotonous” (15.8%). This is a rather clear indication of the overall negative judgement of the piece. Three more adjectives from the ambiguous category were also attached most often to the “harmonies” piece: “unconventional” (23.1%), “surprising” (18.8%), and “unusual” (19.7%) These three adjectives all refer to the unpredictability of the piece.

24 Due to the high standard deviation of 0.7 and 0.9, small differences in the data should not be overinterpreted. However, that all three questions yielded the same order supports the general conclusions.

25 The variation of values between the dance experience categories lies well within the standard error range.

The top adjectives chosen to describe the piece were "boring" (24.5%), "pleasant" (23.6%), "challenging" (23.1%), "unconventional" (23.1%), and "exhausting" (22%). "Pleasant" is the only clearly positive adjective connected to this piece. This rating correlates with a category of dancers who considered the piece to be danceable overall: 29 of 54 participants who chose a "very much" rating concerning its danceability also said that the piece was "pleasant," and of 65 participants choosing the second highest danceability rating, 18 also judged the piece to be "pleasant." Only one person of those rating its danceability level as "not at all" and one person choosing the second lowest rating called the piece "pleasant."

Many of the ratings were very close to each other in absolute numbers, and there was no adjective that was chosen by more than 24.5% of the participants, which is comparatively low.[26]

Some statements from the open text fields are also of relevance here, being in line with the negative and ambiguous adjective selections. Participants with musical backgrounds remarked on issues related to harmonic aspects, noting, for instance, the "un-harmonic breaks," that it was "inharmonic," had "too many jumps in the keys," showed "interesting harmony because of unusual twists," or that it contained "disturbing changes in harmony." Many other statements expressed confusion and surprise, especially regarding the ending ("unexpected and unusual ending," "surprise effects," "peak was missing – one expects a highlight, but it fails to appear," and "ending too abrupt"). I particularly appreciated one condescending statement: "Hope this never ends up in a tanda."

Interpretation: Dancers Prefer Comfort-zone Harmonies

Tango dancers disliked this piece most in comparison to the other three pieces. There was no obvious difference between the individual ratings for participants' "enjoyment" in dancing to the piece and the general assessment of the piece's danceability. This points to the interpretation that the "un-danceability" of this piece was strongly linked to its enjoyability.

The choices of adjectives to describe the tango were, in many cases, as expected. Since the issue was the complex and unusual harmonic structure, "inharmonious," "surprising," "unconventional," and "unusual" were self-evident choices. The positive term "pleasant" was attached to the piece only by those who judged it to be danceable overall, and almost never by those who responded "not at all" for the danceability question. Interestingly, "pleasant" was the term used most often for all four tangos in sum, with the "harmonies" piece ranking third.

A group of related negative adjectives describe the perceived quality of the music as "static," "monotonous," and "boring." There is no obvious correlation between dance or music experience and associating this tango with one of these three adjectives. Compared to two of the other three compositions, this piece did not have more repetitions or fewer variations (the exception being the "melody" piece, which had much more virtuosic and complex melodic elements, this being its essential feature). I can only speculate on why participants felt the "harmonies" tango was static and boring. It might be an indicator that dancers were not able to relate to the music, that nothing "captured" them or allowed them to follow the piece's progress as the usual harmonic structures do, along with the rhythmic and melodic structures. It is also possible that preoccupations with the harmonic structures kept dancers from perceiving any melodic progressions, leading to this negative assessment. Or, they simply might have thought other elements in the music

26 Other tangos saw some much clearer ratings for single adjective categories – for instance, 50.5% rated the "ideal" tango "pleasant."

(for instance the melodic progression or the use of rhythmic features) to be boring and this value overruled the perception of the harmonic features.

Seemingly contradictorily, the "harmonies" piece was also assigned the adjectives "confusing," "exhausting," "unrelaxed," and "challenging" – participants felt they could not relax while dancing to the music. A piece that feels exhausting does not have the potential to be a dancers' favourite.[27] The number of responses highlighting the cluster "boring/monotonous/static" and "confusing/exhausting/unrelaxed" was very similar, with both low in absolute numbers. It is not possible to interpret anything distinct from the results about these two clusters – the choice of adjectives was too varied to find a clear pattern. Much more obvious was the overall use of negative adjectives and the low ratings in the areas of enjoyment and danceability. The piece was not well liked as accompaniment for dancing, but the reasons for this are not clear. Indeed, this result comes as a surprise, as in discourses about danceability among tango dancers, harmonic structures are not an issue.

Perceptions of harmonic structures in relation to rhythmic features of tonal music have been studied by several researchers in differing experiments. It would fall far beyond the scope and aims of this paper to include a review of research in this area. Yet a general idea relevant to the research presented here is that harmonic features have an important influence on the holistic perception of music, and they have the potential to overrule accent perception within the frame of diatonic tonal contexts common in Euro-American musics (see, for example, Dawe, Platt, and Racine 1993; Prince, Thompson, and Schmuckler 2009; White 2019). Because the tango dancers who participated in the danceability experiment were well acquainted with Euro-American music, the insights from such experiments might also underlie the prominent impact that unusual harmonic structures in tango music have in the negative judgements of this piece. The importance of harmonic over rhythmic features might also explain why this tango was rated lower than those with unusual rhythmic and melodic structures although all three were equally "wrong." However, this is just a suspicion; the experiment was not "controlled" enough to state anything conclusive in this regard.

Another phenomenon related to the low ranking of unusual harmonies is the issue of expectancy in music (see, for instance, Schmuckler 1989). Solberg and Dibben (2019) sum this up:

> The prevailing model of musical pleasure that has shaped psychological investigations is the expectancy based account. This means that we experience music as pleasurable when our expectations regarding it are either fulfilled or violated … Pleasure and emotional arousal are related to our expectations regarding the musical content being fulfilled, delayed, or violated. (ibid.: 372)

Research on expectancy has largely considered listening to, rather than moving to music. Because tango dancers improvise to music, it is likely that surprising elements are perceived as even more disturbing than they may be in listening contexts. The "harmonies" piece certainly confounded tango dancers' expectancies regarding harmonic progression (see Bharucha and Krumhansl 1983). They are familiar with many tango pieces that use harmonies in a specific way, especially involving functional progressions and V-I cadences. The violation of these expectancies is almost certainly a factor in why the composition was not perceived as pleasurable, signified by the low ratings for enjoyment when dancing to it, as well as by the adjective cluster "confusing," "exhausting," and "unrelaxed." It is likely that the element of moving to the music was a factor in these judgements.

27 The exhaustion here is a negative mental exhaustion, not a physical one, which can be a very positive experience.

Often, surprising results are those that open up new insights – this is definitely one such case. Had I asked tango dancers how important they consider "harmony" in tango, their answers would probably have highlighted the importance of harmony within a couple, but probably not in the music. An explanation could be that dancers are not in the habit of analysing the music they dance to, and they would therefore not be able to verbally pinpoint the importance of harmonies. But a small majority of tango dancers in the test (51.7%) did report having undertaken a musical education, so presumably they would have been capable of understanding and verbalising musical concepts to at least some extent. Taking myself as an example, having been educated in both music and dance since childhood, I consider myself able to understand – to a certain degree – the music I listen to and to be able to judge and explain what pleases or displeases me in certain pieces. Nevertheless, it had never occurred to me that complex and unusual use of harmonies would be something radically disturbing to the danceability of a tango. So, it seems reasonable to conclude that lower levels of musical education are not the key reason for the discourse of tango dancers not strongly connecting harmonic structures and danceability. A better explanation is that few existing tango recordings include such complex harmonies, and if they do, they are considered undanceable as a result of other musical elements as well.[28] If dancers are never confronted with an unusual harmonic spectrum, how should they be aware of its importance?

This is how seeking to access embodied knowledge in an experimental way can yield insights that may be difficult, if not impossible, to gain otherwise. The results from this tango danceability experiment clearly show how closely connected default harmonic structures are to dancers feeling relaxed (rather than confused or exhausted) yet engaged (rather than bored) with the music, thereby making a piece "enjoyable" to dance to. Building from this connection, I call the default harmonic tango structures the "harmonic comfort zone" for dancers. I suspect that if a piece stays within the functional harmonic structures, releases tension at cadences, and returns to the tonic regularly, dancers feel comfortable, and they can relate to it. The relative importance of these three harmonic elements cannot be asserted here, as they were not tested separately in this experiment. Further experiments would have to be carried out to isolate whether use of functional harmony, prototypical cadences, or returns to the tonic are of most significance.

Conclusion

Accessing embodied tango knowledge through musical cues has yielded important insights. The experiment showed that the tapping into bodily knowledge – the physical responses that are embedded in automated motor skills or muscle memory – instead of theoretical, reflected knowledge in tango yields results that go beyond verbalised responses to research questions. This is apparent, for instance, in the unforeseen result concerning the importance of reliable harmonic structures. The "harmonies" tango ranked lowest for perceived danceability of all the pieces in the experiment, indicating that the unusual harmonies fell outside expectancy for harmonic progressions, causing the dancers to feel either bored or exhausted. I conclude that the "harmonic comfort zone" is an important indicator of the perceived danceability of a tango piece. This result is of importance because discussions among tango dancers about danceability mostly focus on rhythmic and melodic variety, and harmonic aspects are not part of this danceability discourse. A holistic understanding of tango danceability needs to combine different perspectives and meth-

28 For example, I used the track "Brasas" from the album *12 Postales* by the contemporary tango ensemble La Camorra for the pre-test in the category "metre" (see the track at https://www.youtube.com/watch?v=2iQc-Smzf0Hs&list=OLAK5uy_m498OVjK_9XTJwEg99ROBhkoQ-aV0RTeY&index=3&t=0s). In addition to the unclear metre, this piece also falls into the category "unusually complex harmonies" – La Camorra play concert tango, not tango for dancing.

ods. The setup of the danceability experiment combined qualitative expert knowledge with quantitative data. I consider the blending of the two essential for my research and, based on results demonstrated here, a strategy worth pursuing further.[29]

In summary, the results presented here show that 1) functional harmony consistent with the expected range and default uses – the harmonic comfort zone – is important in judgements surrounding the danceability of tango music intended for dancing; and 2) highlighting embodied knowledge as a means of explicating musical structures relevant to danceability in tango has proved useful in this context. Ultimately, my aim is for results from this research to be valuable for tango dancers and tango composers alike, contributing new insights for ongoing discussions about tango danceability in the translocal tango community.

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29 The upcoming book already mentioned contains results from all of the experiments, including an analysis of the other three tangos composed for the danceability experiment.

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