



From Movement to Sound, from Sound to Movement: biocultural relations between dance and music

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ABSTRACT – From Movement to Sound, from Sound to Movement: biocultural relations between dance and music – This article discusses the interactions between body and sound in the creative process characterized by the relation between dance, music and sonic experiments. Based on the production *Peças Fáceis*, by Pró-Posição Group, and *Z*, by Alejandro Ahmed, this study presents theoretical approaches between Dance Studies and Embodied Music Cognition fields. It also intends to discuss what happens to the bodily perception and mediation process in artists who dance, play musical instruments and produce vocal sounds. The analyzed plays, each one in its way, defend the idea that sound and movement are no-concluded processes crossed constantly by mutual and biocultural interactions with the environment.

Keywords: **Contemporary Dance. Creative Processes. Movement. Sound. Cognitive Sciences.**

RÉSUMÉ – Du Mouvement au Son, du Son au Mouvement: relations bioculturelles entre la danse et la musique – Cet article porte sur les interactions entre le corps et le son, dans les processus de création délimités par la relation entre danse, musique et expérimentations sonores. À partir des œuvres *Peças Fáceis* du Groupe Pró-Posição, et *Z* d'Alejandro Ahmed, cette étude présente des rapprochements théoriques entre la Danse et la Cognition Musicale Incarnée, afin de réfléchir sur les processus de perception et de médiation des corps des artistes qui bougent, jouent des instruments de musique et vocalisent. Les œuvres analysées, chacune à sa façon, montrent que le son et le mouvement sont des processus inachevés, dont leur apogée est le croisement mutuel et bioculturel entre le corps et l'environnement.

Mots-clés: **Danse Contemporaine. Processus de Création. Mouvement. Son. Sciences Cognitives.**

RESUMO – Do Movimento ao Som, Do Som ao Movimento: relações bioculturais entre dança e música – O presente artigo versa sobre as interações entre corpo e som em processos de criação demarcados pela relação entre dança, música e experimentos sonoros. A partir das obras *Peças Fáceis*, do Grupo Pró-Posição, e *Z*, de Alejandro Ahmed, o estudo aventa aproximações teóricas entre os campos da Dança e da Cognition Musical Incorporada, a fim de refletir sobre processos de percepção e mediação em corpos-artistas que se movem, interagem com instrumentos musicais e vocalizam. As obras analisadas, cada uma à sua maneira, ventilam som e movimento como processos inacabados, cuja culminância se dá pelo atravessamento mútuo e biocultural entre corpo e ambiente.

Palavras-chave: **Dança Contemporânea. Processos de Criação. Movimento. Som. Ciências Cognitivas.**

The Body at the Center of the Hybrid Scene

The panoramas of Western dance and theater have presented, throughout their histories, numerous examples of integration between different arts. American postmodern dance, which broke out in the 1960s, the German *thanztheater* of the 1970s, and the physical theater that emerged in the 1980s, for example, launched hybrid works, in which different compositional logics were mixed, showing not only juxtaposed scenes, but also bodies capable of transiting between various doings. In the 21st century, more and more scenic experiences have used resources from music, theater, dance and performance, triggering – in addition to the juxtaposition of aesthetic effects occurring in parallel or alternately – the need to think about the mixture of *technés* in bodies that transition through different artistic domains¹.

The theoretical fields of theater and dance, in their historiographic and critical incursions, have drawn readings from the studies on reception, theatrical semiotics, philosophy, cultural studies, performance and anthropology, among other fields, in order to understand the diversity of the contemporary scenic phenomenon. German theater critic and professor Hans-Thies Lehmann and his study on post-dramatic theater, or the writings of French dance critic and historian Laurence Louppe, on contemporary dance poetics, are some of the important references that encompass the aesthetic discussion about the mixture of artistic languages in contemporary times (Lehmann, 2007; Louppe, 2000). However, there are still scarce investigations interested in biocultural, bodily, and cognitive dimensions, in dialogue with scientific domains capable of investigating the implications that inhabit the issues of bodies in action in these hybrid experiences.

This study focuses on two artistic works in order to reflect on the relations between movement and sound from the point of view of the processes mediated by bodies, based on specific triggers of creation. Thus, this is not a matter of observing and discussing the aesthetic aspects of works in a situation of language hybridity, but rather of looking into the extent to which the use of the body-sound relation affects artistic creation and in what manner. To that end, we will analyze two choreographic plays, one by the São Paulo group Pró-Posição and another by the Santa Catarina

group Cena 11, in which sound and movement assume a certain protagonism, and then investigate the triggers and principles involved in their creations.

The works under analysis, in addition to presenting different ways of approaching the relation between sound and movement in creating dance, provide clues for understanding how these instances communicate in the body of the artist in the scene, based not only on their poetic and artistic dimensions, but also on the biocultural and cognitive dimensions.

In the book *Biocultural Creators: Toward a New Theory of the Human*, political scientist Samantha Frost (2016) propounds a mediation between the biological and cultural fields through an inseparability that would resignify these domains: “The idea that humans are biocultural creatures provides a basis for developing richer and more detailed accounts of how social and material worlds are constitutive of the way we live and experience our lives” (Frost, 2016, p. 174).

Defying theories of subjectivity that insist on separating nature and culture, Frost argues that human beings are biocultural creatures, resulting from the interrelation between the biological and cultural features in the body. In this sense, the author advocates a space of conciliation between the biological sciences and the humanities, opening a field for studies interested both in the neurocognitive and sociocultural and political dimensions of phenomena that involve the human being (Frost, 2016).

From this perspective, this study will seek to look into the artistic processes in question through a biocultural approach as to the bodies involved. To that end, the epistemological focus of Cognitive Sciences emerges as a theoretical framework to take the artistic discussion beyond the aesthetic and symbolic field.

***Peças Fáceis* (2017)**

In *Peças Fáceis*, a choreographic work by Pró-Posição Group, Baroque musical pieces mixed with other sound references serve as guiding material for the creation of danced, sung and played choreographies, in concomitance or alternance between such tasks:

A guitar-body, an accordion-body, a tambourine-body, a castanet-body.
The dancers were awakened to other activities, which need to erase the

contours of music and dance so that both materialize in each other. Body and sounds are gradually tested, rehearsing what may become a body, what may become music (Katz, 2017, p. 36).

The work resulted from a study started in 2015, which focused on the forms of mutual effects between material dimensions of sound and movement. In 2016, the project became a collaborative platform with participation of several provocative artists, such as composer and multi-instrumentalist Andréa Drigo, choreographer Helena Bastos, playwright and lighting designer Roberto Gill Camargo, producer Paola Bertolini, and musicians Ramon Vieira and Márcia Mah, with support from Proac Tender no. 4/2016 (Cultural Action Program of the State Department of Culture of the state of São Paulo)².

In this play (Figure 1), artists Janice Vieira and Andréia Nhur, who are mother and daughter, share the stage, sharing common musical memories, through minuets from *Notebook for Anna Magdalena Bach*. Alternating breaths, noises, vocalises³, voices in counterpoint⁴, percussions, and music played on guitar, accordion, and castanets, the bodies move between gestures and sounds, showing a dance that produces music.



Figure 1 – Peças Fáceis. Source: Photo by Paola Bertolini (2019).

Pró-Posição Dança, a group founded in the city of Sorocaba, state of São Paulo, Brazil, in the 1970s, has a history with numerous works built by intertwining different arts⁵. Its most recent productions, after the group's resumption in 2007, feature singing voice and live music as part of the choreographic thinking (Nhur, 2019). Janice Vieira is a dancer, choreographer and accordionist, with extensive musical training; Andréia Nhur is an actress, dancer and has training in singing, guitar and percussion. Since 2007, the artists have performed together in the group's works, emphasizing the transition of artistic languages according to their personal repertoires.

In *Peças Fáceis*, the particular interest in exploring body and sound announces a specific territory of performance in which music and dance seem to become zones of indistinction:

[...] although only the two are on stage, it is not a duo, as the music is presented as a third presence. Not as a character, but as a physicality. Sometimes it is materialized as a blow, a wind or a swing, sometimes it appears as a request for silence in the form of a whistling 'shush'. Instead of accumulating, it practices a constant emptying. It does not draw circles that close, but squiggles that stitch up announcements that are not completed. [...] Gradually, sounds become traces of melody, two voices are drawn so that two bodies can be identified by the movement that gives them shape, a movement that both comes from the sounds and makes them be born (Katz, 2017, p. 36).

The artists combine the actions of singing, playing instruments and dancing, generating a sound mobility between each gesture expressed (Figure 2). To name this movement-building process integrated with organized sound production, the group coined the term *sonorouschoreography*:

We invented this term to name a compositional logic emerging from the combination of sound and choreographic production. Although it serves to categorize a certain type of hybrid artistic construction – for bodies able to move between dance and music – this 'concept art' can also trigger complex discussions about the cognitive operations that enable bodies in multitasking (such as dance singing, speak dancing, or dance playing an instrument) (Nhur, 2019, p. 195).



Figure 2 – *Peças Fáceis*. Source: Photo by Inês Corrêa (2017).

Sound production, in this context, seems to be constructive of a crossing line that occupies creation in its compositional bases; at the same time, the movement and forms of organizing the body in space-time denote that there is an interposed choreographic feature.

By sound production, in the work of the Pró-Posição Group, we can understand as a parallel to the understanding of what music is in the conception of José Miguel Wisnik (2006): everything that comprises sound, noise and silence in an ordering system.

The play between sound and noise constitutes music. The sound of the world is noise, the world presents itself to us at all times through irregular and chaotic frequencies with which music works to extract an order from them (an order that also contains margins of instability, with certain sound patterns interfering with others) (Wisnik, 2006, p. 33).

The word choreography, on the other hand, can be read here in the light of a series of discussions that continually update it beyond the maxims of space-time unity and linear narrative, as it was credited in definitions derived from hegemonic studies on classical and modern dances⁶. Therefore, it is not a question of using the term choreography as a linear sequencing of movements in space, but rather as a spatiotemporal and sign

organization, activated by bodies specialized in the forms of motion to which they commit.

From this perspective, the Pró-Posição Group announces the idea of *sonorouschoreography* as the resource that operates movement, sound and voice in an integrated choreographic and sonorous game. The singing maintains its contour as voice used between breathing, babbling, vibration, *vocalise* and song; the instruments retain their tonal functions, but also gain other contours through the exploration of their material dimensions. The sound alternates between noise, silence and music, occupying regular tones and rhythms.

Tonal music, roughly speaking, explores the possibilities of pitches, bringing melody and harmony to the foreground (Wisnik, 2006). In the tonal system, there is a center that establishes a reference point for the hierarchy between notes. In *O som e o sentido: uma outra história das músicas*, José Miguel Wisnik (2006) goes through Gregorian chant, modern tonal music, and 20th century music, pointing out the complexities of the game between sound, silence, and noise in modal, tonal, and serial musical systems. Beyond simplified definitions, the concept of musical tonality encompasses countless discussions about its use today:

[...] the curving of the path of tonal music, which goes beyond a post-tonal and anti-tonal music (as will be the dodecaphonism and serialism), at the same time that it evokes in a different way the primitive modal music, it is the node itself and the nucleus of contemporary simultaneities (Wisnik, 2006, p. 45-46).

We speak of the presence of tonal systems in *Peças Fáceis* because there are oscillations between melodies, noises, timbres and silences, making tonal and antitonal melodic-harmonic organizations coexist.

And as its creators defend, movement and sound are performed by “skilled bodies” (Nhur, 2019, p. 195) transiting between the languages of dance and music. Therefore, from the point of view of the body that performs (Figure 3), we are not talking about a random connection between sound and movement, but about a drawing constituted by joint paths in the task of moving and playing/singing.



Figure 3 – *Peças Fáceis*. Source: Photo by Paola Bertolini (2019).

Z (2018)

Z is a research and creation in dance with direction and performance by the artist Alejandro Ahmed in interaction with an electric guitar and other materials such as magnetized plates and loop station pedals (for recording overlapping sounds). Resident choreographer, artistic director and dancer at Grupo Cena 11 Companhia de Dança⁷, Ahmed (Figure 4) has made his mark in the contemporary scene since the 1990s with impactful productions, resulting from a continuous research about the body, its limits, its relations with the environment and with the other.

In the solo Z, the performer works with vocalized sounds and uses the guitar with the intention of guiding a melodic and kinetic game based on effects such as reverb, echo and feedback. The work has shared direction and rehearsals by Mariana Romagnani, costumes and production by Karin Serafin and lighting and sound interlocution by Hedra Rockenbach⁸.



Figure 4 – Alejandro Ahmed in *Z*. Source: Photo by Cristiano Prim.

The work, named as musical-choreographic, develops in the interrelation between the ideas of choreography and *generative composition*. Aiming at a structured creation based on causality and co-authorship between environment and body, Ahmed brings *generative composition* as an attempt to bring together the notions of perception and adaptation as mechanisms of negotiation between bodies (Serafin, 2018).

In *Z*, the instrument is a sonorous object devoid of its traditional function, that is, devoid of its tonal logic. The voice also does not appear as organized sound. Between noises and silences, the guitar is handled outside its convention; the voice, on the other hand, appears as a cry, a groan, a babble, an attempt or the rest of a word.

[...] At the intersection between body-sound and sound-matter, few are the shows that investigate the gap that determines sound and body to inhabit both contexts simultaneously. It is necessary that the performer understands their physical quality not only as gesture, but rather the gesture as an extension of the body's internal sound, therefore its representation. Since the sound of the body is active and contaminable, it is still necessary that the performer finds the devices to reinvent their own gesture, so that it is not a mere rhythmic illustration. Alejandro Ahmed includes an intermediary to the internal and external of the body itself a guitar, in order to, through (but not only) its sonorous and vibrational qualities, institute a ritualization of how the gesture can be prior to the discursive, therefore to the illustrations [...] (Filho, 2018, blog Antropositivo).

Although he is alone on the scene (Figure 5), with the uniqueness of his physical conditions at stake, Ahmed brings to light, on his solo, the unfolding of issues raised over the more than 25 years of dance research alongside Cena 11.



Figure 5 – Alejandro Ahmed in *Z*. Source: photo by Beto Assem.

In the 1990s, the group ventured into the relation between body, pop culture, punk and technology. In the 2000s, it expanded the narratives about risk, with the famous falls that marked its signature in that period. In the 2010s, it started to look into the key issues that move the idea of choreography, bringing readiness as a way to destabilize the body's repertoires in unforeseen situations (Figure 6).

Therefore, if the notions of perception and adaptation cross the making of *Z*, asserting an intermittent arrangement between body and environment, this logic is made of the innumerable traces that constituted the trajectories present in the history of Cena 11:

For at least 10 years, the Cena 11 Group has produced choreographic works as the development of investigative projects on issues of corporeality,

ambiences and their repercussions on behavior, establishing parameters for experimentation in stages that constituted formulations called procedures. That is how *Projeto skr* consisted of 5 procedures in which different investigative parameters were tested on the idea of freedom based on discipline and rules, which resulted, after 3 years, in the show *Skinnerbox*. In 2008, the focus on the relations between corporeality and ambience mediated by technological resources resulted in the *SIM* project - *integrated actions of consent for occupation and resistance*, whose focus is the experience of autonomy tested by the manipulation of sounds, visuals, contacts and body movements as restrictive, coercive factors that suggest actions whose unplanned character causes destabilization or consolidation of response patterns (Britto, 2011, p. 6-7).

Researchers such as Fabiana Dultra Britto and Máira Spanghero, among others, have been addressing the fabric of Cena 11's artistic processes as a continuity composed of multidirectional paths, in which the relation between body and environment seems to prevail as a recurring point in Ahmed's concerns. Britto collaborated as a theoretical interlocutor of the group and Spanghero wrote the book *A dança dos encéfalos acesos* (2003), whose theoretical incursion on dance and technology made use of five creations of the group to conclude that "[...] the dance of the enlightened brains shows that the most refined technology is that which lives in the body" (Spanghero, 2003, p. 122).

In this sense, when proposing the friction between perception and adaptation as triggering the *generative composition* present in *Z*, it is understood that perceiving and adapting are verbs resulting from a body that is actively involved in the relations it has with its surroundings.



Figure 6 – Alejandro Ahmed in Z. Source: Photo by Beto Assem.

In the context of cognitive studies, perception has been conceived no longer as a brain process of internal representation, but as an enactive activity, triggered by movement and interaction with the environment. For the philosopher of the mind, Alva Noë (2004), perception is something that happens to us, so that the perceptual content is not a photograph represented internally, but an active and bodily exploration. In order to perceive, it is necessary to track the movements related to the world, according to practical bodily knowledge (Noë, 2004). “From the standpoint of the enactive approach, all perceptual representation, whether the result of dorsal or ventral stream activity, depends on the perceiver’s deployment of sensorimotor skills” (Noë, 2004, p. 19)⁹.

The notion of *generative composition*, used in Z, seems to relate to the idea of generative art created by autonomous systems in mathematical or random combinations, since the frequencies produced by the vibration of guitar strings generate feedback, tremors and fall of materials, showing the communication between all the material dimensions put there. On the other hand, such *generative composition* also seems to underline the concept of choreography as a dance technology, mediated by a body that transits between what it already knows and the unpredictability of the environment.

It must be said that the artist suffers from imperfect osteogenesis, has great bone fragility and has had considerable hearing loss in recent years. Thus, moving becomes a construction of possibilities permeated by risks, while sounds, rather than formulating melodic and harmonic orders, become exchanges between autonomous material dimensions.

Perception and Cognition: levels of interaction between movement and sound

In the field of studies on human listening, science was, for the most part, engaged in investigating sound as a concrete object and external to the body. However, when investigating only sound as an external phenomenon, perception became secondary.

From the perspective of embodied cognition, sound becomes guided by the experience of listening, triggering that the relation between the body and the sounds of the world is mediated by perception.

Marc Leman (2008), one of the most important authors in the field of *Embodied Music Cognition*¹⁰, argues that musical perception is triggered by the sensorimotor system (Leman, 2008). In his book, *Embodied Music Cognition and Mediation Technology*, Leman introduces a model that describes the relation between human behavior and the environment, analyzing the synchrony between action and perception, and exploring different levels of coupling of the body with music. Based on the hypothesis of bodily intentionality – related to the idea of *perception as simulated action* (Berthoz, 1997) –, the author argues that the human body is a biologically designed mediator that transfers physical energy to a mental level – activating experiences, values and intentions – and, in an inverse process, transfers mental representations to the material form.

Alain Berthoz (1997), French engineer and neurophysiologist, when stating that perception is a simulated action, considered that it could not precede cognition. According to him, to perceive is to know, because perception is not only the interpretation of sensory messages, but it is judgment and decision making. Based on studies derived from pragmatism and functional psychology from the 19th century, Berthoz argued perception as a form of prediction, activation and ignition, to the detriment of its meaning as registration or storage. In the book *Le sens du mouvement*,

he argued that cognitive functions are endowed with an impulse towards the development of the ability to reorganize action according to chance, a process that would require the development of a memory of the past, of the faculties of predicting and simulating the future (Berthoz, 1997).

Based on research by Berthoz, Marc Leman explains that bodily intentionality can be understood as an emergence of the relation between action and perception, activated by the sensorimotor system, which would act as a trigger for this process, that is, it would be the effect emerging from the coupling between perception and action (Leman, 2008).

In the context of the sound experience, bodily intentionality would coordinate sound forms as resonances in the behavior of the human body, whereas cerebral intentionality would interpret the source of the intentions attributed to music. Thus, the sensorimotor system would be responsible for transforming musical energies into an imaginary world formed by objects containing qualities, intentions, objectives and valences (that is, physical attributes that are trainable, such as resistance, speed, coordination, flexibility, mobility, etc.) and vice versa (Leman, 2008).

This perspective understands that sensorial information (musical energy of the environment) evokes motor traits (simulated or performed), as if music were the product of its own action on the body (Leman, 2008). The gestures used by an instrumentalist or by a non-specialist body that moves to the sound of music can be linked to explosions of musical energy that resonate outside the body, generating sound and, above all, rhythmic correlations (Leman, 2008).

According to Leman, there are three levels of bodily imitation related to sound. The first is *synchronization*, governed by the ideomotor principle, in which rhythmic patterns evoke biomechanical resonances at a lower sensorimotor level. Tapping one's feet on the floor, following the rhythm of an external sound source, or moving one's body to the beat of music are some basic examples of this type of interaction. The second level is *tuning*, guided by high-level addressing, expressed in terms of melody and harmony. Similarly to the idea of radio tuning, where a radio receiver adjusts to the wavelength of the radio emitter, the tuning occurs not by the rhythm, but by the seizure of the frequencies. When we use a tuning fork to sing, for example, we tune the note emitted by its metallic vibration to our vocal vibration. Finally, there is

empathy, which would correspond to the imitation of the emotional intentionality of music, that is, its expressiveness (Leman, 2008).

If we applied such levels of communication between body and sound to the aforementioned works – *Peças Fáceis* and *Z* –, we would have to take into account the logics of composition established in each creative process. *Peças Fáceis*, although it presents sounds and movements that were not foreseen at times, it brings together pre-defined musical and choreographic grammars. *Z*, on the other hand, is purposely created from unfinished sound and bodily events, between distinct physicalities: body, guitar, floor, magnetic plates, chains and others.

In *Peças Fáceis*, *synchrony*, *tuning* and *empathy* are sometimes regulated by the game between baroque minuets and other musical references sung vocally, and sometimes through the sound of musical instruments, making movement and sound coexist in a regime of organized mutuality, which culminate in known harmonic fields. The show begins with a game of breaths that is gradually replaced by reference notes sung by vibrations, *vocalises* and *diphonic* singing¹¹. Between combined movements and gestural repetitions, the performers execute a Minuet in G Major by Christian Petzold and Johan Sebastian Bach, emitting two voices in counterpoint. In a second moment, sounds struck on a guitar trigger the movements of a body moving on the floor. Integrating *synchronization* and *tuning*, noise gradually takes on the tonal shape of yet another Petzold and Bach minuet – now played on the guitar in conjunction with legs, hip and arms movements, on the floor. In other segments of the work, cultural repertoires rub against one another, announcing an encounter of body-sound *empathy*, triggered by the memorial intentionalities between sound and movement. This appears when performer Janice Vieira dances and hums loose and disconnected fragments of the song *O bêbado e a equilibrista* (by João Bosco and Aldir Blanc), or when she plays castanets with remnants of movements that resemble a flamenco dance¹².

In the work *Z*, the communicational levels between body and sound are revealed in other dimensions: rhythmic beats and movements are sometimes synchronous, sometimes random; *tuning* generates random encounters and mismatches between different frequencies and *empathy* operates in terms of strangeness between that which sounds and that which moves. When performer Alejandro Ahmed, seated in a chair, with an

electric guitar propped vertically on his lap, touches the steel strings with steel fingers/reeds on his fingers, his gestures are amplified in the air, creating synchronous and anachronous drawings to the sounds produced by the guitar. The sound *overlapping* of the string notes – through the use of the *looping* device that records one sound over another – encounters the performer's hands and head gestures, tracing – more than a harmonic *tuning* – another type of overlap between sound and movement. As for *empathy*, it is interesting to note that the game of disharmonious frequencies, resulting from the type of sound produced by the unconventional use of the guitar or voice, can cause listening discomfort in the audience. It appears that the relation between movement and noise, then, empathically raises a state of destabilization, not only in the body-performer, but also in the body-spectator.

Although classifying multiple interactions into only three possibilities, this triad formed by *synchronization*, *tuning* and *empathy* can help us understand immediate responses between listening, movement and production of sound in the body. However, if we tried to investigate internally the choreographic elaborations carried out by a body specialized in dance, when the proposal is to produce sound and movement in different organizational patterns, what other cognitive mappings could emerge?

American physician, biologist and physicist-chemist Gerald Edelman, in *Wilder than the sky* (2005), presents the nervous system as a variety of small parts segregated in their functionality, which interact in diverse combinations capable of generating integrated properties. His objective is to show how a complex system can trigger the integration of its parts and, at the same time, maintain many different states crossing the properties of these parts (Edelman, 2005).

Certainly, complex behaviors such as dancing, singing or playing an instrument involve high-level cognitive aspects, such as planning or imagining movements and sounds. However, recent research in the field of Dance Neurocognition has attested to the importance of local decisions (not centralized by the Central Nervous System) in sensory-motor processes such as walking or moving an arm, in conjunction with more complex cognitive operations.

Based on the observation and neurophysiological analysis of insect movement and biological knowledge, Cruse and Schilling defend the hypothesis that the cognitive system does not form an independent system, separate from the reactive action of the peripheral parts of the body, but acts in constant transition between reactive control (sensorimotor) and more centralized solutions (Cruse; Schilling, 2016, p. 53-61): “Both motor control and thinking (as well as imagining) appear to be produced by the same neuronal mechanisms, a finding that has great impact for the understanding of our brains” (Cruse; Schilling, 2016, p. 54).

This reactive motor control concerns the sensory-directed system, whose function is to coordinate the movements of different parts of the body and react to unexpected disturbances without the command from the *higher centers*. That is, it is about understanding that the sensorimotor system can decide and act, locally, between positions, balances and flows, according to its repertoire of motility and its action skills (Cruse; Schilling, 2016).

This means that complex tasks, such as moving the body according to a specific movement habit that requires training, in conjunction with the action of singing within a specific melodic chain, trigger not only a game between *synchrony*, *tuning* and *empathy*, but also operations integrated between the sensorimotor system and the central nervous system. It would be the same as engaging in an intimate conversation between perception and cognition, understanding that the perception of each body differs by its motor repertoires and action skills. (Fogassi; Ferrari; Gesierich; Rozzi; Chersi; Rizzolatti, 2005 apud Cruse; Schilling, 2016).

In *Peças Fáceis*, the idea of skill appears in the outline of a dance whose movements are recognizable within an aesthetic frame and of sounds that migrate from noise and silence to tonal organizations. Thus, it is understood that the artists perform their bodily and musical repertoires, integrating them.

Z's performer, as opposed to recognizable gestures and the functionality of the musical instrument, seems to seek exposure of neuromotor negotiations between the different layers of the perception-cognition game.

However, it is necessary to emphasize that there is no possibility of canceling the motor habits present in any sound-movement interaction, even if it is the objective of an artistic research to demonstrate unexpected encounters between that which sounds and that which moves. Now, if bodily intentionality articulates sound forms as resonances in the sensory-motor system, and this is always endowed with a repertoire, the communication between movement and sound is not an unknown event, but a kinetic recurrence.

In this sense, when Ahmed responds to the sound as raw material, tracing movements that are known to him – because they have been conquered by the habit of his motor skills –, what we see is not a random encounter, but the exercise of exposing the communication of the sound energy dissipating in space with the kinetic energy produced by a body specialized in a particular way of moving.

Cognition and Culture: systems in resonance

The inseparability between perception and action, suggested here as the main agent in the communication between sound and movement, depends on the dynamics present in the game between nature and culture. According to Marc Leman, the way an organism receives sound energy from the environment and transforms them into actions or abstract concepts depends on an ecological perspective, mediated by the resonance between the domains of the natural and of the cultural (Leman, 2008).

Taking the construction of musical instruments as an example, Leman presents the *touching-listening-judging-changing* cycle as a process of modeling the balance between the limitations of nature and culture in the context of sound recognition. In order to manufacture a bell, in Western culture, it was necessary to turn the disharmonious quality of bronze, until its material dimension was adjusted to a harmonic ideal. *Touching* the object to generate physical vibrations; *listening* to understand the vibrations; *judging* to compare and *changing* the physical conditions of the object aiming at cultural adaptation for future judgment, these would be the principles of an action and reaction cycle guided by a culturally located harmonic ideal (Leman, 2008).

This example – based on the construction of an artifact – points to a broad discussion on the natural-cultural quality of the perception of harmonic and disharmonic sounds¹³ and of the cognitive relation we have with what we hear. Despite pondering different views on to what extent nature and culture could determine the categories of listening, the author argues that these two instances act in a two-way manner, through a process of resonance mediated by the subject's perception-action (Leman, 2008).

In *Peças Fáceis*, the artists vocalize in counterpoint, using minuets by Bach and Petzold, while moving with repetition of gestures traced in diagonals and circles, generating combinations of harmonic sounds and ordered movements. In another moment, the minuets are crossed by other sound references, such as percussive and random sounds, Sephardic songs, Spanish *rasgueos*, waltz, baião and coco. From what seems to be a miscellaneous sound, the order always stands out, organizing the polyphony in autonomous melodic lines that intersect harmoniously. In a precise search for tuning and tonality, *Peças Fáceis* reveals the exploration of the musical references of the performers, conflicting the gestural repertoires with a constant *sonorocoreographic entrainment*¹⁴.

Z, in turn, explores other agreements between nature and culture, as it exposes the ambiguity of the perception of what is not harmonious and stable.

The relation between sound perception and ambiguity can be justified by the evolutionary character that marked the preference for stable tones. Before the human production of artifacts, many disharmonic sounds characterized the relation between body and environment, whereas, after the repeated use of manufactured materials, the perception was gradually adjusted to an environment of harmonic tones. And if the preference for harmonic tones were not enough, studies show that there is still a perceptual preference for the fundamental frequency of sound (*pitch*), to the detriment of overtones (Leman, 2008):

During the course of evolution, stability is rewarding, and hence biological functions may develop toward the aspect of information that is most stable (less ambiguous) in the structure of physical energy. In contrast with pitch, for example, the phase structure of the harmonic tone complex is not stable. Consequently, its perception will be highly ambiguous (Leman, 2008, p. 60-61).

Such evolutive adjustments are due to a dense relation between cognition and culture, whose evolutive dynamics hold constant negotiations between body and environment. What is more or less stable – in terms of harmony or disharmony in the case of sound and of gestural standardization with regard to movement – comprises not only the aesthetic choices made in the production of a work, but also the cultural and research contexts that surround it.

Thus, it is not a matter of understanding the cultural evolution of the interactions between body and sound as a linearly directed progression: “Rather, it [cultural evolution] can be understood as an effect of interaction between local cultural constraints and natural constraints which may lead to the formation of trajectories toward particular cultural attractors” (Leman, 2008, p. 70-71).

Final Considerations

This study propounded some possible aspects of the interrelation between sound and movement in artistic processes whose interest revolves around the relation between dance and sound production. With the intention of advancing in the discussions about body, cognition, art and culture, we looked into the research of some authors from Neurosciences and Cognitive Sciences, using their meanings inferentially¹⁵.

The artistic processes discussed here, by situating the body as the central object of their creation – through an investigative stance resulting from poetics developed over the years –, invite us to look beyond the critical and aesthetic analyses of their works. They are artists inventing complex corporealities and sonorities, whose implications raise other ways of thinking about the relation between body and environment. Furthermore, this research interface, by addressing hybrid artistic experiences, corroborates to broaden the notion of dance itself. Now, dance, as an intermittent field of construction, brings with it an interdisciplinary vocation – sometimes undisciplined¹⁶ – to deal with all the diversity it produces. Consequently, the issues arising from this expanded art lead us to argue also with theoretical tools from various fields of knowledge.

It is true that the discussion proposed here about the interactions between dance and music in hybrid artistic creations is far from exhausted. However, with some clues launched, we may conclude that movement and sound, codependent in their perceptual-cognitive-cultural processuality,

incite not only a reciprocal biocultural interrelation, but also trigger the possibility of artistic inventions that are increasingly attentive to the processual and provisional nature of the body.

Notes

- ¹ Numerous contemporary works present artists with mixed backgrounds, working in hybrid works that cross dance, music, and theater: *(Not) a Love Song* (2007), by French choreographer Alain Buffard, *En attendant* (2010) and *Cesena* (2011), by Belgian choreographer Anne Teresa De Keersmaeker, *Can we talk about this?* (2011), by English director and choreographer Lloid Nilson, *Avante, Marche!* (2015), by Belgian directors Alain Platel and Frank Van Laecke, *Cabras* (2016), by Brazilian director Maria Thaís, *Outros* (2018), by director Márcio Abreu for the Minas Gerais group Galpão, and *Arco* (2018), by Brazilian dancer and musician Ângelo Madureira, among others.
- ² Images of the process can be seen in the mini-documentary on the staging. Available at: <<https://www.youtube.com/watch?v=pG0cDfyZQRU>>, and at the Plataforma Sonorocoreográfica project website: <<https://www.pecasfaceis.wixsite.com/proposicao>>.
- ³ *Vocalise* is a vocal exercise used by students and singers, which consists in singing one or more vowels in specifically arranged melodic lines (Anglés; Pena, 1954).
- ⁴ The counterpoint dates back to the polyphonic music of the 16th century and refers to the use of one or more autonomous melodic lines occurring at the same time, but connected by an interval and harmony logic. “The counterpoint is the simultaneity of melodies, with each line following independently from the others horizontally, and aligning to make harmonic sense vertically [...]” (Martineau, 2014, p. 281, translated from Portuguese).
- ⁵ The Pró-Posição Group was founded in 1973, in Sorocaba/SP, by dancers Janice Vieira and Denilto Gomes (1953–1994). With productions that were bold, engaged, and linked to counterculture, the group stood out in the Brazilian dance scene of the 1970s and 1980s. For ten years, it actively participated in movements such as Teatro de Dança at Sala Galpão, in São Paulo, and Oficina Nacional de Dança Contemporânea, from Bahia, participating in a first generation of contemporary dance artists in Brazil. In 2007, the group was resumed through the partnership between Janice Vieira and Andréia Nhur, with autobiographical works, centered on the relation between body, memory, and hybrid languages (dance, theater, and music). Since then, it has worked continuously, producing shows,

research, and training activities. Among its most important works, the following stand out: *Boiação* (APCA Award, 1976), *Silêncio dos Pássaros* (APCA Award, 1978), *A trilogia do cisne* (composed of *Swan Corpo Adaptado*; *O Cisne, minha mãe e eu*, and *Linhagens* – APCA Award 2013 for Research on Dance), *Vis-à-Vis* (Governador do Estado Award, 2013), and *Peças Fáceis* (2017 Denilto Gomes Award, nominated for the 2017 APCA Award for best dance show). In 2013, the group's history was registered in the documentary *Figuras da Dança – Janice Vieira* (produced by São Paulo Cia. De Dança), aired on the TV Cultura, CURTA, and ARTE 1 channels. Available at: <<https://www.proposicaodanca.com.br>>.

- ⁶ The term choreography, forged initially in 1700, with the publication of the book *Choreographie ou l'Art de Décrire la Danse par Caractères et Signes Démonstratifs*, by Raoul-Auger Feuillet (1700), coined an isomorphism between the dance room and a blank page, that is, it ascribed a perspective of linear writing to the act of creating a dance (Lepecki, 2010). This view, added to the common sense that defines choreography as a sequential connection of steps, was impacted by diverse uses of space-time in modern and contemporary dances, to the point of taking the discussion to other perspectives on the term.
- ⁷ The Company emerged in the city of Florianópolis, state of Santa Catarina, Brazil, in 1993 and has since operated in the artistic production of dance, having become a national and international benchmark due to the artistic relevance of its proposals and the uninterrupted investigative character. Its research history received the 2014 Honor of Cultural Merit from the Ministry of Culture and the Federal Government. It was awarded by the São Paulo Association of Art Critics (APCA) four times – 2014, 2012, 2007, 1997 – and also by the Bravo Award, Sérgio Motta Art and Technology Award, Transmídia Itaú Cultural, Bolsa Vitae and Rumos Itaú Cultural. The company's productions are: *Respostas sobre Dor* (1994); *O Novo Cangaço* (1996); *In'Perfeito* (1997) – APCA Award for Best Scenic Design; *A Carne dos Vencidos no Verbo dos Anjos* (1998); *Violência* (2000); *Projeto SKR* (2002); *SKINNERBOX* (2005); *Pequenas frestas de ficção sobre realidade insistente* (2007) – Sergio Motta Art and Technology Award / Bravo! Prime de Cultura Award, Best Dance Show / APCA Award for Research on Dance; *Embodied Voodoo Game* (2009); *Guia de ideias correlatas* (2009); *SIM<*; *Ações integradas de consentimento para ocupação e resistência* (2010); *Carta de amor ao inimigo* (2012) – APCA Award for History of Research on Dance; *Sobre expectativas e promessas* (2013); *Monotonia de Aproximação* and *Fuga para 7 Corpos* (2014) –

APCA Award for Best Creation in Dance and *Protocolo Elefante* <<https://www.cena11.com.br>>.

- ⁸ Excerpts from the show can be watched at: <<https://vimeo.com/281288085>>.
- ⁹ According to Noë, perceiving is a dexterity of bodily activity resulting from the inseparability between brain functions. When discussing visual perception, the author contradicts the separation proposed by Bridgeman (1992; 2000 apud Noë, 2004), in which the ventral area of the brain would be responsible for perceptual representation and identification, while the dorsal area would be linked to action. Rather, the enactive perspective employs an integrated approach between perceiving and acting, with movement as a catalyst (Noë, 2004).
- ¹⁰ Embodied Music Cognition is an area of musicology interested in the role played by the human body in interaction with musical activities. The Embodied Music Cognition paradigm is an extension of a previous paradigm, in which cognition and perception are understood as coupled events. Currently, two major fields share the interests of studies in this field: 1 – the exploration of the notion of embodiment and its consequences with regard to the relation between body, expressive gestures, and music; 2 – the research on embodied cognition linked to musical affects (Leman et al., 2018).
- ¹¹ Diphonic singing is a vocal technique that enables the singer to produce more than one note at the same time, through the emission of the fundamental frequency and, concomitantly, one of its harmonics.
- ¹² Teaser of the show: <<https://www.youtube.com/watch?v=UN5fqEigrIk>>.
- ¹³ Harmonic sounds are stable because they are built on the relation between a fundamental frequency and its integer multiples, while disharmonic sounds are unstable because they are composed of partial tones that are not integer multiples of the fundamental frequency (Leman, 2008). Some percussion instruments such as cymbals and chimes, for example, create complex and disharmonic sounds, whereas, in string instruments such as guitar or piano the sounds are stable (since they approximate or are equivalent to integer multiples of the fundamental frequency).
- ¹⁴ The concept of *entrainment* has been applied to music in order to understand the different interactions between rhythmic systems and their relations with human attention. The studies of Martin Clayton (2007) on the rhythmic interaction in irregular musical experiences indicated the possibility of emergence of a natural metric in the body. However, such process involves not

only the synchronous relation between the participants of a musical performance, but the continuous mutual adjustment that constitutes it, as well as delaying and advancing time as a live experience of playing/singing together (Dahl et al., 2010).

- ¹⁵ The idea of inference appears here as a resource used to transpose notions studied in fields such as Neuroscience, Cognitive Sciences and Musicology to the context of artistic processes in dance. Thus, without the intention of applying concepts from laboratory experiments to a reflection on artistic practice, we made an inferential appropriation of some ideas in an attempt to guide this reflection.
- ¹⁶ The concept of undiscipline appears in the writings of Helena Katz and Christine Greiner in the field of body and dance studies. The term goes beyond the limitation of disciplinary frames, suggesting that the inter and trans prefixes would not be sufficient to cover the flow of knowledge that crosses certain fields of knowledge (Greiner, 2005).

References

- ANGLÉS, Higinio; PENA, Joaquín. **Diccionario de la Música Labor**. Tomo II. Barcelona: Editorial Labor, 1954.
- BERTHOZ, Alain. **Le Sens du Mouvement**. Paris: Editions Odile Jacob, 1997.
- BRITTO, Fabiana Dultra. Corpo, dança e ambiente: configurações recíprocas. In: ENCONTRO NACIONAL DE PESQUISADORES EM DANÇA, 2., 2011. **Anais...** Salvador: Associação Nacional de Pesquisadores em Dança, 2011. P. 1-10. Disponível em: <<http://www.portalandia.org.br/anaisarquivos/6-2011-2.pdf>>. Acesso em: 15 jan. 2020.
- CRUSE, Holk; SCHILLING, Malte. Getting cognitive. In: BLÄSING, Bettina; PUTTKE, Martin; SCHACK, Thomas (Ed.). **The neurocognition of Dance: mind, movement and motor Skills**. New York: Psychology Press, 2016. P. 53-74.
- DAHL, Sofia et al. Gestures in Performance. In: GODOY, Rolf; LEMAN, Marc. **Musical Gestures: sound, movement and meaning**. New York: Routledge, 2010. P. 36-68.
- EDELMAN, Gerald. **Wider than the sky: a revolutionary view of consciousness**. London: Penguin, 2005.
- FEUILLET, Raoul-Augur. **Choreographie, ou l'art de d'écrire la danse par caractères, figures et signes 10 démonstratifs**. Paris: Bibliothèque Nationale de

France, 1700. Disponível em: <<https://gallica.bnf.fr/ark:/12148/btv1b86232407/f15.image>>. Acesso em: 18 jan. 2020.

FILHO, Rui. _Z. Resenhas do JUNT4: festival internacional de dança. **Antropositivo**, São Paulo, 2018. Disponível em: <<https://www.antropositivo.com.br/single-post/2018/11/15/JUNT4-2018>>. Acesso em: 18 jan. 2020.

FROST, Samantha. **Biocultural creatures: toward a new theory of the human**. North Carolina: Duke University Press, 2016.

GREINER, Christine. **O Corpo: pista para estudos indisciplinados**. São Paulo: Annablume, 2005.

KATZ, Helena. Peças Fáceis verticaliza os estudos sobre memória e gesto. **O Estado de São Paulo**, São Paulo, ano 138, 2017. P. 36. Disponível em: <<https://cultura.estadao.com.br/noticias/teatro-e-danca,pecas-faceis-verticaliza-os-estudos-sobre-memoria-e-gesto,70001803371>>. Acesso em: 02 jan. 2020.

LEHMANN, Hans-Thies. **Teatro pós-dramático**. Tradução de Pedro Süsskind. São Paulo: Cosac & Naify, 2007.

LEMAN, Marc. **Embodied Music Cognition and Mediation Technology**. Cambridge: The MIT Press, 2008.

LEMAN, Marc et al. What Is Embodied Music Cognition? In: BADER, Rolf (Ed.). **Springer Handbook of Systematic Musicology**. Berlin; Heidelberg: Springer Handbooks, 2018. P. 747-760.

LEPECKI, André. Planos de Composição. In: GREINER, Christine; SANTO, Cristina Espírito; SOBRAL, Sonia. **CARTOGRAFIA Rumos Itaú Cultural Dança 2009-2010**. São Paulo: Itaú Cultural, 2010. P. 13-20.

LOUPPE, Laurence. Corpos híbridos. In: SOTER, Silvia; PEREIRA, Roberto (Org.). **Lições de Dança 2**. Rio de Janeiro: UniverCidade Editora, 2000. P. 27-40.

MARTINEAU, John (Org.). **Quadrivium: as quatro artes liberais da aritmética, da geometria, da música e da cosmologia**. Tradução de Jussara Trindade de Almeida. São Paulo: É Realizações, 2014.

NHUR, Andréia. Memórias de mãe e filha. **Revista Aspás**, São Paulo, Universidade de São Paulo, v. 9, n. 1, p. 185-197, ago. 2019. Disponível em: <<https://doi.org/10.11606/issn.2238-3999.v9i1p185-197>>. Acesso em: 15 jan. 2020.

NOË, Alva. **Action in perception**. Cambridge: MIT Press, 2004.



SERAFIN, Karin. **Z**. Florianópolis: 2018. Disponível em: <<https://karinserafin.wixsite.com/artistas/z>>. Acesso em: 18 jan. 2020.

SPANGHERO, Maíra. **A dança dos encéfalos acesos**. São Paulo: Itaú Cultural, 2003.

WISNIK, José Miguel. **O Som e o sentido**: uma outra história das músicas. São Paulo: Companhia das Letras, 2006.

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