

What kind of *affordances* are musical *affordances*?

A semiotic approach

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1 Introduction

Over the past few years a growing interest has arisen into investigating the role of the body in musical perception. Semiotics would imply that we study the body as a producer of signs that aid musical comprehension. Peirce's theory of semiotics affirms that for a sign to function as such it must be interpreted by another sign, which must in turn be interpreted by a further sign and so on, until there exists a complex network of interpretant signs which form the cognitive processes on which perception, understanding and meaning are based. Interpretant signs may be logical, emotive or kinetic. A large part of the body activity we generate when we listen to music functions as kinetic interpretant signs of the music signs. The said body signs amplify, clarify, develop, expand and explain the musical signs.

We need to develop theoretical tools with which to better understand the narrow relationship between body activity and musical cognitive processes. The term *affordance* is a notion that could help in this respect.

2. The affordances

The concept of *affordance* has been introduced by James Gibson in his *Ecological Approach to Visual Perception* theory. According to Gibson, «the *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill». ¹ Reybrouck states that they

[...] are environmental supports for an organism's intentional activities. Animals—and by extension also human beings—are sensitive to the *functional characteristics* of their environment. They perceive environmental objects in terms of what they “afford” for the consummation of behaviour rather than in terms of their objective perceptual qualities. ²

Affordances are «functional meanings» ³ that «are primarily understood as the *action* consequences of encountering perceptual information in the world». ⁴ General interpretations of this concept claim that *affordances* are the information given by one object about the possible uses that it is possible to do with it. In this way, the perceptual organism knows from the very moment of the visual perception, how to interact with the objects and anticipates the body posture required for this intervention. Ugo Volli states that the affordances are “invitations” to the action already present in the morphology of the objects: the object communicates how it

¹ JAMES J. GIBSON, *The Ecological Approach to Visual Perception*. Lawrence Erlbaum, New Jersey 1979, p. 127.

² MARK REYBROUCK, *Body, mind and music: musical semantics between experiential cognition and cognitive economy*. «TRANS», 9, 2005, <http://www.sibetrans.com/trans/>

³ WILLIAM L. WINDSOR, *An Ecological Approach to Semiotics*, «Journal for the Theory of Social Behaviour» 34/2 2004 pp. 179-198: 180.

⁴ ERIC CLARKE, *Ways of Listening*, Oxford University Press, New York 2005, p. 38.

works.⁵ They are the performances offered by the objects, the stock of actions we are able to do within the environment. By means of the affordances meaningful relationships arise from the environment.

One of the most interesting points of this notion is its focus on the relational link existing between the organism and the environment. *Affordances* are «something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment».⁶ In this way, «affordances are relational properties which pertain between organism and their environment».⁷ Moreover,

An affordance is neither an objective property nor a subjective property [...] An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychological [...]. An affordance points both ways, to the environment and to the observer.⁸

3. *Affordances* in music

The notion of *affordance* has been introduced in musical studies in several writings of researchers as Eric Clarke, Luke Windsor, Mark Reybrouck and Ruben Lopez-Cano. Each one of these authors interprets the Gibson's notion in his own way. The concept is very promising for the development of analytical operations for the study of the embodied musical cognition and signification. However this is not clear yet what kind of actions are exactly musical *affordances*.

According to Clarke, «music afford dancing, worship, co-ordinated working, persuasion, emotional catharsis, marching, foot-tapping, and a myriad other activities of a perfectly tangible kind».⁹ Moreover, he also claims that:

In the specific contexts of musical hermeneutics, musical material can be conceived as *affording* certain kinds of interpretation and not others [...] Interpretation is also *action* - the speaking, writing, gesturing and grimacing in which interpretation is manifest [...] the recapitulation of the first movement of Beethoven's Ninth Symphony *affords* writing (or speaking) about in terms of murderous sexual rage, or the heavens on fire. Interpretative writing and speaking are *forms of action* [...].¹⁰

Although this wide application of the term is an attractive proposition, its perspective diverts us from our objective. In fact, Clarke and Windsor's studies do not postulate what exactly a musical affordance is, or, to be more precise, what it isn't. In effect, therefore, the said authors consider that any action can be deemed an affordance of music.

⁵ UGO VOLLI, *Manuale di Semiotica*, GLF, Roma: 2000, p. 200.

⁶ GIBSON, *The Ecological...* p. 122.

⁷ WINDSOR, *An Ecological...* p. 180.

⁸ GIBSON, *The Ecological...* p. 129.

⁹ CLARKE, *Ways...* p. 38.

¹⁰ CLARKE, *Ways...* p. 204.

Mark Reybrouck has focussed his attention much more on the role of the body and motricity in musical cognition processes. Unlike Clarke and Windsor, his work is not based exclusively on Gibson's theory. His analysis is complex and employs operative concepts taken from diverse disciplines such as ecosemiotics, artificial intelligence, the psychology of sport, the philosophy of the mind or the constructivism. His writings are undoubtedly valid, but on occasions his theoretical constructions are excessively eclectic. He agglutinates concepts originating in theoretical discourses as antagonical as radical constructivism and the ecological theory of visual perception.¹¹ In effect, the latter is «essentially realist and non constructivist».¹²

According to Reybrouck, body activities that may be considered as affordances of music are:¹³

1. the sound producing actions proper,
2. the effects of these actions,
3. the possibility of imagining the sonorous unfolding as a kind of movement through time,
4. the mental simulation of this movement in terms of bodily based image schemata and
5. the movements which can be possibly induced by the sounds

This list is useful and pertinent. However, if our investigation is to centre on the role of the body in the perception of music, the actions that produce the sound, as suggested by the first point, cannot form part of the affordances. Reybrouck has played an important role in defining and understanding affordances in music. However the time has come to conceive of a simpler and more operative typology that efficiently conceptualizes body actions or faculties that music proportions us while at the same time defining more clearly what can be understood by musical affordances.

4. Proposal for a typology of music affordances

The typology I am proposing is divided into two large categories: Affordances that give rise to a *Manifest motor activity* and those that permit *Covered motor activity*. Each of the last two categories can be explained as follows.

¹¹ MARK REYBROUCK, *Biological roots of musical epistemology: Functional Cycles, Umwelt, and enactive listening*, «Semiotica», 134/1-4 2001, pp. 599-633.

¹² UMBERTO ECO, *Kant y el ornitorrinco*, Lumen, Barcelona 1999, p. 235. See also CLARKE, *Ways...* p. 17.

¹³ REYBROUCK, *Body...*

4.1. Manifest motor activity

All visible external movements that each segment of music allows us to execute along with it while we listen. The result of this activity can be directly understood as kinetic interpretant signs of the musical signs, or else as kinetic interpretants of logical and emotive interpretative signs that have previously interpreted the musical signs. It includes the following types of activity:

1) Non-musical movements and postures.

Motor attitudes or corporal postures of non-musical origin, typical of normal gesticulations developed by those groups that the music addresses or represents. Normally, corporal conduct adopted by both musicians and public is the result of mutual influence. Examples can be found in the backstreet antics of singers and dancers of the tango who imitate men from the Buenos Aires underworld;¹⁴ the gesticulation of Rap singers; the sexually sensual insinuations of the dancers and the public that attend clubs to dance to Cuban salsa or timba, etc.¹⁵

2) Paramusical movements.

All kinetic and postural activity resulting from imitating or synchronizing with any given element in the music. There exist three different levels or possibilities.

2.1) General basic synchronization:

Whenever a part of our body (a foot, our hands, fingers, head etc.) latch onto some metric aspect of the music. Synchronizing with the beat or accents or micro and macro formal metric structures. This is the most physical level as it represents a direct linking between sound properties and corporal activity.

2.2) Kinetic and postural activity related to particular musical genres:

There are genres that lend themselves to certain specific movements. Hard rock prefers vigorous and vertical up and down head movements. Pop music prefers smoother movements from side to side. Classical music from the north of India is usually accompanied by a sudden shaking of the head as if saying no on the part of both the musicians and the audience. In this case the social and cultural construction is markedly present.

2.3) Executant mimesis:

Imitating the playing of musical instruments and other actions producing sounds as well as any associated kinetic activity. Imitations of a solo guitar player from a rock band or imitating the gestures of singers by singing along with them. Incipient music lovers belong to this category when they imitate the gestures of a conductor by moving a finger as if it were a baton while listening to the music. It also includes imitating the gesticulation often employed by

¹⁴ RAMÓN PELINSKI. *Invitación a la etnomusicología*, Akal, Madrid 2000, p. 268.

¹⁵ RUBÉN LÓPEZ CANO, *Los cuerpos de la música. Introducción al dossier Música, cuerpo y cognición*, «TRANS», 9, 2005, <http://www.sibetrans.com/trans/trans9/indice9.htm>

musicians while playing their instruments. For example, when musicians move their heads in time with the strong beats in the bar or the gestures of the musicians as they react to the contours of the music they are interpreting.

3) Ritualization:

Motor routines with specific rules inserted into more complex text-activities. Here, music and movement are only a part of the entire performance. This includes children's games accompanied by movement. These are particularly important because on relating musical elements or events with specific movements and postures, children develop corporal elements in their musical competence. They exercise their capacity to somatize and translate musical events into body sensations. They learn to detect and use external and internal musical affordances. This also includes strict coordinated movements that are used during certain rituals such as military marches, royal entrances, wedding processions, etc.

4) Dance:

Dance is inherently a complex symbolic activity that interacts intersemiotically with music. Specific styles and kinds of music develop their own affordances by lending themselves to certain modes of dancing, while rejecting others. It is quite common for a given piece of music be accompanied by different dance movements and new affordances are being continually invented to dance to the same style of music.

4.2) Covered motor activity:

Besides explicit corporal movements, music permits us to exercise non-visible corporal activities. It also permits us to develop cognitive activity closely linked to corporal and motor activities, These elements may also function as interpretant signs that relate physical corporal activity with imagination and emotion.

1) Motor imagery and motor simulation:

Researchers like Arnie Cox, Rolf Godøy and Mark Reybrouck¹⁶ affirm that while listening to music we experience virtual motor and kinetic reactions that are narrowly related to real motor activity. In general terms, it is called *motor imagery*, *motor simulation*¹⁷ or *ideomotor simulation*¹⁸ to certain dynamic mental states in which we imagine ourselves in movement or we

¹⁶ See bibliography of these authors about this subject on LÓPEZ CANO, *Los cuerpos...*

¹⁷ ALAIN BERTHOZ, *Le sens du mouvement*, Odile Jacob, Paris 1997.

¹⁸ REYBROUCK, *Body...*

feel ourselves executing a movement that we shall never actually make.¹⁹ These mental states habitually appear during the *preparation and programming of actions*.

High and low cognitive processes that intervene in motor simulation are practically the same as those we develop in real movement situations. In both cases we activate the motor sensor controllers that connect the sensors of the central nervous system with the effector muscles.²⁰ The only difference is that the process breaks down just before activating the said effector muscles. However, this does not mean that they necessarily remain static. There exist four cases for motor simulation and imagination.

1.1) Ideomotor simulation²¹ of possible real movements producers of sound:

On occasions, listening to music we mentally imagine the type of action produced by a particular sound. Then we mentally reconstruct the movement producer of the sound. We feel it in our own body. We perceive corporally the violence or eloquence of the producing gesture of the sound, or the ease or difficulty of its realization. It is as if we ourselves had realized it. We feel in our body the effect of the *resonance* of the drumstick beating the drum, or of a nail or plectrum rasping the strings of a guitar.

1.2) Ideomotor simulation of fantastic, imaginary or make believe movements producers of sound:

This occurs, above all, with acousmatic music or electroacoustic where the sounds are produced electronically. The sound is not produced by any real physical action. However, we have a tendency to imagine the sound source in question. We construct fantasies in our imagination like glass flying through the air to gently smash, drops of water, bells, etc. despite having no real referent, all this imagination also activates corporal elements.

1.3) Corporal extension.

Music is movement; acceleration, retention, precipitation, staticism, ascending and descending fragments, etc. On occasions music permits us to experience sensations of corporal movement that we do not effectuate in reality but that we project onto it. Just as a telescope expands the possibilities of our own eyes, or a ladder expands our capacity to stretch ourselves in order to reach for something, music is a kind of *expansive prothesis*²² of the motor possibilities of our own bodies. Through it we move in imaginary spaces. We move in ways that would be physically impossible. Music is a way of colonizing the surrounding space. In the same manner as when we shout we extend our presence beyond our actual location, the audition

¹⁹ M. J. MAHONEY AND M. AVENER, *Psychology of the elite athlete. An explorative study*. «Cognitive Therapy and Research», 1 1987, pp. 135-141; and MARK REYBROUCK, *Musical Imagery between Sensory Processing and Ideomotor Simulation*, «Musical Imagery», I. Godøy and H.Jørgensen (eds.), Swets & Zeitlinger, Lisse 2001, pp. 117-136: 129.

²⁰ REYBROUCK *Musical Imagery*... pp. 129-130.

²¹ REYBROUCK, *Body*...

²² ECO, *Kant*...

permits us to approach real or imaginary spaces, whereby we take control of them with the movement our extended body realizes through the music.

1.4) Kinetic somatization or motor empathy: ²³

The sensation of movement caused by the music that we experience in our own body. For example, when we feel that certain musical passages take root in our stomachs or in our heads. It has a lot to do with what François Delalande has termed as *empathetic audition*.²⁴

2) Other types of metaphorical projections of *image schemata*:

All these processes depend on *image schemata* as proposed by the theory of corporal cognition expounded by Mark Johnson.²⁵ This theory affirms that the corporal experiences we develop from childhood form non-rational and non-propositional abstract cognitive patterns denominated *image schemata*. We metaphorically project these patterns towards more abstract or complex cognitive domains so as to adapt them to our corporal dimension to thus understand them better. Everyday language is full of corporal metaphors. We use them to better conceptualize abstract concepts like time, moral and philosophical terms, mathematics, etc. This theory is widely applied to music in order to explain certain processes of conceptualization, categorization and musical comprehension.²⁶

This is a map of corporal and motor activity that functions like the corporal and motor affordances of music. Each listener finds in each piece of music, or in each different style, certain affordances and not others. This gives rise to a number of queries. Are all affordances heard by a listener in a given piece of music the same as those heard by other listeners? How are affordances generated? What role do affordances play in musical cognition? We shall respond to these questions briefly.

5. Public and private affordances.

Affordances are strongly determined by society. However, «for different organisms, affordances will differ [...] Moreover, affordances are fluid relative to individual perceptual

²³ REYBROUCK, *Body...*

²⁴ FRANÇOISE DELALANDE, *La terrasse des audiences du clair de lune: essai d'analyse esthétique*, «Analyse musicale», 16 1989, pp. 75-84.

²⁵ MARK JOHNSON. 1987. *The body in the Mind*. Chicago: University of Chicago Press.

²⁶ For a bibliography and some critics on this subject see ALICIA PEÑALBA, *El cuerpo en la música a través de la teoría de la Metáfora de Johnson: análisis crítico y aplicación a la música*, «TRANS», 9 2005, <http://www.sibetrans.com/trans/trans9/indice9.htm> and RUBÉN LÓPEZ CANO, *Setting the body in music. Gesture, Schemata and Stylistic-Cognitive Types*, Paper presented at «International Conference on Music and Gesture», University of East Anglia 28-31 August 2003. On-line version: <http://www.lopezcano.net/>.

development».²⁷ In this way, «to a person, a wooden chair affords sitting, while to a termite affords eating. Equally, the same chair affords self-defense to a person under attack -an illustration of the way in which an organism can notice different affordances according to its own changing needs».²⁸ Affordances that a musical object offers a listener can vary in accordance with different constraints. These constraints can be of a biological, physiological, anthropological, cultural, social psychological, circumstantial or contextual nature. Affordances emerge from the negotiation and interaction of all these different constraints.

6. Problems of the ecological theory of visual perception.

Despite the potential involved in affordances, the ecological theory as a whole includes hypotheses and principles that are quite problematic such as, for example, their opposition to certain cognitive principles that we shall analyze below.

6.1. Construction of affordances

Gibson points that «when the constant properties of constant objects are perceived (the shape, size, color, texture, composition, motion, animation, and position relative to other objects), the observer can go on to detect their *affordances*».²⁹ Gibson calls these constants *invariants*. For the ecological theory, environment is structured by itself. The organism has no need to reconstruct anything in its mind as it perceives this invariant structure in a direct manner. Some ecological research applied to music set out to detect invariants in musical affordances.³⁰ But if affordances are relational, an interaction between the subject and its environment, then what sense is there in isolating an element when what interests us is precisely the link? The properties of the link cannot be reduced to the properties of its components. On the other hand, can we refer to universal invariants as inherent and ontological properties of the objects? This would be metaphysics. We are human beings embedded into a culture and this fact conditions our relations with our environment.

6.2. Ecologism versus cognitivism

The ecological approach to perception, categorically rejects some notions of cognitivism such as mental representations. In this paper I shall not be studying the validity this concept. The idea of mental representation belongs to outdated versions of classical cognitivism. More

²⁷ WILLIAM L. WINDSOR, *Through and around the acousmatic: the interpretation of electroacoustic sounds*, In «Music, Electronic Media and Culture», S. Emmerson (Ed.), Ashgate, London 2000, pp. 7-35: 11.

²⁸ CLARKE, *Ways...* p. 37.

²⁹ JAMES J. GIBSON, *The Senses Considered as Perceptual systems*, Houghton-Mifflin, Boston 1966, p. 285; quoted in CLARKE, *Ways...* p. 36.

³⁰ WINDSOR, *Through...*

recent developments have discussed this term.³¹ What I am really interested in emphasizing here is that there are cognitive notions that ecologism cannot overlook. For example, the notions of *learning* and *knowledge*. Gibson made it very clear that «the simplest affordance, as food, for example, or as a predatory enemy, may well be detected without learning by the young of some animal, but in general learning is all-important for this kind of perception».³² The latest musical developments in ecological theory do not refer to this learning procedure, nor how it is obtained, where it is stored and how it shows itself during perception. Recent theories of decentralized mind affirm that this knowledge is distributed within the environment, the mind and the body and is articulated precisely during the perception-action phase.³³ This point is of particular importance in order to understand musical affordances as relational vehicles between subjects, society and musical objects.

6.3. Ecologism and culture

The ecological theory assures us that the environment is perceived directly without the intervention of culture and its instruments such as language. This argument causes serious problems in applying ecological theory to music as music is one of these cultural instruments. This theory is mostly conceived in order to explain the conduct of animals in their natural environment. In this context, survival is the ultimate objective of all perception. Obviously, there is a problem in pretending to explain perception and musical signification using the survival hypothesis. With the idea of maintaining the coherence of the theory and adapting it to cultural phenomena, musical ecologists construct discourses that are much too complex to explain extremely obvious cultural phenomena.³⁴

The problem of cultural mediation in the culture of perception stems once again from a simplistic conception of cognition. A model of dissipated mind, decentralized and emergent is much more effective to explain the interaction of culture and nature in our conception of the world.³⁵ Perception is guided for the *emergent constraints* that rise from the *interaction of local constraints* that belongs to different realms:

³¹ RUBÉN LÓPEZ CANO, 2004. "From Pragmatics to Enactive Cognition. A new paradigm for the development of musical semiotics". Paper presented at «Second International Symposium on Musical Language Sciences». Saint-Rémy-de-Provence (France). October 14-17-2004. On-line version: <http://www.lopezcano.net/>.

³² GIBSON, *The Senses...* p. 285; quoted in CLARKE, *Ways...* p. 36.

³³ See ANDY CLARK, *Being there. Putting Brain, Body and World Together Again*, MIT press, Cambridge 1997 and ANDY CLARK and DAVID J. CHALMERS, *The Extended Mind*, «Analysis», 58 1998, pp. 10-23.

³⁴ See for example WINDSOR. *An Ecological...*

³⁵ LÓPEZ CANO, "From Pragmatics..."

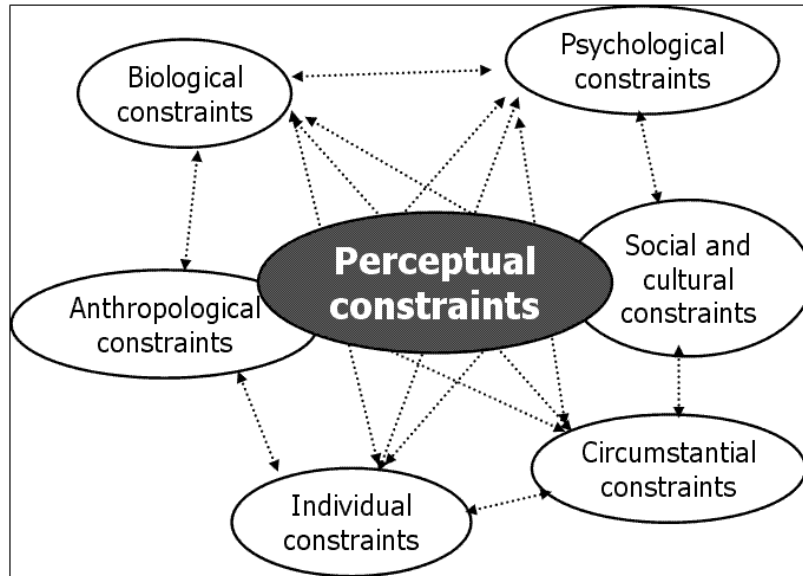


Fig. 1. Perceptual constraints emerge from the interaction of local constraints.

7. Conclusions

As far as this research paper is concerned, musical affordances are the totality of all manifest or hidden motor and corporal actions that music permits us to perform on her. It is possible that there exist affordances of another type that permit actions of a different kind. These, however, do not enter the scope of this study.

Affordances are functional meanings of music. They emerge from the interaction between i) the properties of music- simultaneously understood as an acoustic object and as a socio-cultural practice- and ii) musical competences in coordination with specific requirements of the listener. Affordances develop out of a prior *perceptual history*, that is to say, the set of perceptions and repeated corporal interactions with the music. Their conformation depends as much on individual experiences as on social orientation. Meanings produced in a direct and living manner intervene, also, just as much as those transmitted in an indirect manner.

There is no need to exercise motor actions that musical affordances offer in order to construct body or motor meaning. We directly perceive the actions. We perceive ourselves as if we ourselves were making them.

Affordances fulfill several cognitive functions such as:

- Helping to corporally categorize music and its elements.
- Collaborating in building meanings.
- Developing non rational and non propositional aspects of musical competence.

- Helping in tasks of recognition and memorization of musical elements and aspects that are not based on processes of lineal logic.
- Allowing music to act as a cognitive extension of the body and its motor skills.
- Permitting us to approach music in a much deeper way.

From Peirce's semiotic theory we may conclude that the base of signification is within the network of interpretant signs formed following the first sign. Body activity developed during the audition work as embodied signs that form part of this network. The body signs are then articulated together with other logical and emotive interpretant signs to thus confer meaning to the music. It all forms a unity: thoughts, emotions and movements; what happens inside and outside of the mind; the interior world, imagination, emotions and the physical world. At that moment a complex reality emerges where it is not possible to distinguish between the sounding object and the perceiving subject. It is a solid and continuous unity that coincides with the phenomenological maxim «music is me when I listen to music».³⁶

Affordances are entities that are somewhere between effective corporal action and tacit motor-corporal knowledge. They prove that musical competence is non centralized knowledge that is distributed between the mind and the environment. They constitute a continuum between the "outside" and the "inside" where the body functions as a point of union.

Affordances is a concept originating in the ecological theories of Gibson's visual perception. However, in my opinion, the present status of this theory does not offer satisfactory explanations concerning the perception, signification and cognition of music. In this way and from the perspective of this study, it is necessary to disentangle the concept of affordances from the rest of the principles of ecologic theory. It has to be implanted in more advanced theories such as the paradigm of enactive cognition with semiotic foundations. This is the admittance of a needed sequester. I hope that our much appreciated ecological colleagues will can bring themselves to forgive us. Meanwhile we shall continue dialoguing with them.

³⁶ THOMAS CLIFTON, *Music as Heard: A Study in Applied Phenomenology*, Yale University Press, New Haven, 1983.