



DISCUSSING MUSICAL CREATIVITY IN LEARNING: PSYCHOLOGICAL PERCEPTIONS AND BRAIN RESEARCH

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ABSTRACT

Musical creativity seems to be a fundamental and inherent element of the human behaviour and existence. It entails a process of creation which compared to the other arts is approached by many leading researchers as one of the oldest and most fundamental traits of human socio-cognitive development. Psychology research claims to combine all four dimensions of the personality, environment, process and product in musical creativity's decoding, resting still however in single-dimensional notions and perceptions through its realisation (i.e. left-right brain dichotomies). Neuroscience research on the other hand suggests that musical creativity does not appear to critically depend on any single cognitive process or brain region. This paper presents some of the most important biopsychological substrates existing in the lifelong learning process of and involvement with music, and synthetically discusses their content as to contemporary and future research.

KEYWORDS: Creativity, Learning, Music Education, Music, Brain, Educational Neuroscience.

Introduction

Musical creativity is an important and fascinating topic for all those interested in human creativity. As such, musical creativity seems logical to refer to all of us; directly or indirectly. Music is not any more approached just as a cultural phenomenon or an art, but it seems to entail a more universal psychobiological substance (Koelsch & Siebel, 2005; Peretz, 2001; Thaut, 2009) bringing into its frame of existence every single human psyche and brain living on this planet. On the one hand, in the music's simple creative dimension, we see people for example to sing just out of pure pleasure, or infants to use music and sound in order to creatively communicate in preschool and primary education environments. We instinctively understand and structure creative social interactions with music in karaoke bars or choir assemblies, we excel in sports or education just by following its creative but yet simple innate pathway of inspiration by using it to concentrate through exams or to mood-manage a whole gym. On the other hand, for all those who are more professionally involved with music, be they composers, educators, sound producers, performers or even caregivers, musical creativity takes an even more special meaning in their lives as it denotes and embeds - or should embed - a sure extension of their 'end product' and final outcome. "To be a great follower and distinctive 'servant' of music, one must have unusual capacity for creativity, and so create musical products of the highest quality and utmost originality" (Deliege & Wiggins, 2006: 161).

Creativity and Music

Creativity as a concept is significant to say that needs to be studied and approached in a particular way, depending on the field and era concerned. Creativity as a word and idea does not target the same components and goals in theater, film making or music for instance. Time-wise, there is a distinction in the creativity concept as well. Plato refers to 'creativity' in relation to psyche and absolute existence (Pappas, 1995) suggesting that although creation and learning in the arts - and foremost in music and theater - follows nature and thus certain rules, there should exist a certain freedom in the making and conveyance of original artistic 'artifacts'. This approach well represents the prototypical stability of the state and the individual that so much the Greek philosopher embedded in his writings - and particularly the Republic - showing that creativity is an almost non-versatile, high-end and rare virtue of the few.

Nowadays, creativity seems to have gained a momentum towards an 'every-moment-in-life' continuum, being embedded to all people's 'practices', 'learnings' and 'products'. This is where Howard Gardner rests his binary approach to the 'little c' and 'big C' creativity. The former is characterised as the "sort [of creativity] which all of us evince in our daily lives" while the latter is "the kind of big breakthrough which occurs only very occasionally" (Gardner, 1993: 29).

Creativity in music, as in between the different arts, can be communicated differently across a range of musical genres, projections and their structured social and cultural contexts (Burnard, 2012). On the one hand, there is the qualitative variety of classical music, electronic media, popular music, jazz, improvised music and 'DJing' to name but a few as relevant examples. On the other hand, composition, performance and music education for instance provide a whole new level of discussion to creativity's qualitative structure and substance. This is why questions like 'what constitutes creativity in music and how do we accomplish it'; 'what is the source of creativity'; 'what other human characteristics and processes is creativity related to'; 'are certain of its products valued more than oth-

ers' and 'how can society effectively identify and foster creativity within its educational systems' get all the more difficult to be answered. As the phenomenon of creativity has proven extremely hard to be empirically isolated, there will always be a certain ambiguity to its conception and character.

Nevertheless, scholars of music - following research and opinions from leading cognitive psychologists (Dietrich, 2004) - certainly agree that creativity belongs to both worlds of psychology and biology. It shares traits from our behaviour, emotions and neural substrates, making it imperative for someone who studies creativity to approach it through both its phenomenological and systemic paths of expression.

Psychology and Musical Creativity

It was well seen a few years back in psychology research this approach where creativity was believed to be "...a component of intelligence[;] presumably of innate or inherited nature" (Deliege & Wiggins, 2006: 2). This used to be a dominant etiquette being followed in creative learning environments, sourcing from this notion that creativity can be cognitively measured (Guilford, 1950) by justifying the quantifiable space between the divergent versus the convergent thinking. In the recent years however, scholars started to turn to a more socially definable 'entity' of creativity, understanding that "...it is impossible to define creativity independently of judgements based on criteria that change from domain to domain" (Csikszentmihalyi, 1990: 198). This came to indirectly support what Elliot proposed in his article Versions of Creativity (1971) a few years earlier, suggesting that creativity should encompass two different concepts: the 'traditional' and the 'new' (see Odena, 2001; Odena & Welch, 2009 for a musicological approach). The 'traditional' concept focuses on the product as a core to creativity, while the 'new' one on this more socially structured and vague process of imaginative thinking found in valued cognitive pursuits, actions or novel ideas.

Following the latter two-fold path, more recent philosophical inquiry on musical creativity (Odena, 2001) has identified in literature four different ways to approach it, suggesting that there is a distinguishable research focus - and thus valuable understanding - on "(a) the characteristics of the creative person, (b) the description of an appropriate environment for developing creativity (c) the study of the creative process, and (d) the definition of the creative product" (Odena, 2001: 62). This focus brings into play both the practical and philosophical scopes of the creativity's 'entity', and especially for music, it could cover - and thus explain - all these different social, personal, product-related and gestalt facets that creative learning and involvement entails or could entail.

More specifically, as far as the 'characteristics of the creative person' in music are concerned, Kemp, in one of his studies (Kemp, 1996) suggests that people who get involved with music show and develop specific personality traits. These traits, according to Lund and Krauz (1994) are similar to what the wider research (James & Asmus, 2001) dictates about creative people's characteristics in other, non related to music domains. These personal characteristics could be summarised as follows: creative persons in music demonstrate in part or as a whole high independence (Kemp, 1996) imagination, unconventionality, openness, introversion, perseverance, willingness to take risks, emotional variability (James & Asmus, 2001), confidence, adventurousness and curiosity (Davis, 1989). To understand more practically all the above, let us bring in mind some examples of classical composers like Mozart, Beethoven or Paganini; a couple of modern performers like Mick Jagger (The Rolling Stones) or John Lennon (The Beatles) and

even some contemporary music pioneers like Jean-Michel Jarre (Jarre, 2012) or Vangelis Papathanasiou (Papathanasiou, 2013). They all seem indeed to be related with the above elements, bringing through creative results and outcomes in a personal, social or professional level.

Nevertheless, it would be impossible to sum up all these characteristics in just one person proclaiming that they are creative as such. As Mumford (Mumford, 2003) very aptly explains, a single model of creative behaviour, described possibly as a sum of all or some of the above characteristics, could be inadequate to describe the complexity of musical creativity's or any other art's act. This is why a set of personal variables have been suggested (Schmidt & Sinor, 1986) to come along with the aforementioned characteristics, being finally both approached and understood as one mutually and holistically connected term: a personal cognitive style. This personal cognitive style is a mental warehouse someone carries, whereupon creativity finds a fertile ground to rest and flourish. "Cognitive styles are consistent individual differences and preferences in modes of perceiving, remembering, thinking and problem solving" (Schmidt & Sinor, 1986: 161) and may well underlie creative ability in a more general manner; in music or in other domains.

What about the appropriate environment for developing creativity in music? What about the music context wherein all personal characteristics and cognitive styles could possibly unfold? As Tschmuck (2006) indicates, in the modern history of music making, and mostly in our post-modern times, three overlapping phases have been seen to emerge in terms of the environment where creative persons develop(ed) their skills, passion, thoughts and ideas in relation to this specific art in. These phases are mostly understood as shifting paradigms in music industry and structure, extending from a social creative chaos, to the emergence of creative trajectories in specific contexts and societies, finally reaching routinisation and standardisation in certain music eras (Tschmuck, 2006: 219).

Just remember the 60's music revolution, the 80's settled trajectory of wider music schooling and imprint, and the 21st century's extreme sometimes music needs and its consumer basis expansion. First, at that time of the 1960s, everything started with a somewhat hippy change in culture, where creative musicians marched at the vanguard of new values. They invited people to 'learn' and be changed by them. Then, in the 1980s, an explosion of new musical genres - like electro, techno, and freestyle - all reflecting creatively different ways to express emotions, make statements and communicate. Finally, our contemporary times of the new century, where musical creation and creative process in music is more than just an art. Music is most of the times seen as a good of cultural status, and a goal to accomplish if need for someone to be successful in their lives. Mass production, mass consumption and creative life lessons following this path of rapid change and excessive need of the new.

Music was and is capable of changing the way people see their lives. Music is capable of projecting a social demand through its context and activity, and it is more than capable as an art to nurture change and mind openness through its content-context mutual fermentations. After all, one thing may be said for sure: creative potential in music can be linked to situational factors projecting non-conformity and rebelliousness (Helson, 1999). And this seems to go well hand-in-hand with environments that foster diversity (Tschmuck, 2006: 223) as well as physical and/or emotional (motivational) support (Fryer, 1996).

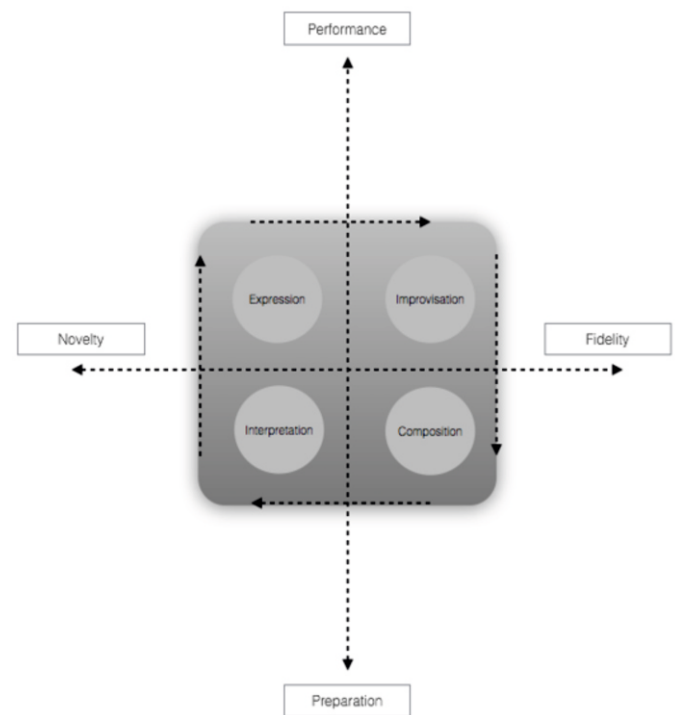
Webster (1996) discusses elements like the financial support someone should have, the family conditions in place, the societal expectations, the existing peer pressure as well as the availability of resources for music to flourish. Fryer (1996), adding to Webster's approach, pinpoints a more emotional perspective, suggesting that a personal space - either physically or mentally constructed - is needed for someone to be [musically] creative, until they feel comfortable to share it. In the modern real-life educational context, teachers suggest that the most appropriate environment to enhance musical creativity can be coded under two wider categories: the emotional and the physical ones (Odena & Welch, 2009). Making and feeling music is not about emotions or about a physical blueprint of organised sounds only. It is about this collective environment where all physical senses, needs and mental aspirations come simultaneously into work, providing a path towards self-esteem and self-perception. In different or similar societal environments, music provides identity; it is a connection to the world.

The creative process is the third area that music psychology research and music education practice have focused on the last few years. Analysing the specifics of this area, Deliège and Wiggins (2006) presented a schematic space of four major arenas in musical creativity (figure 1), substantially accepting the notion that 'creativity is a collective process of [different] actions...' (Tschmuck, 2006: 231). These different actions, or 'arenas' as Deliège and Wiggins call them, depict in a circular - and thus contiguous - process the relation that exists in between the four major domains (composition-interpretation-expression-improvisation) of musical creativity. They suggest that according to their nominal focus, the relevant creative process is, or should be proportionally related to either preparation, fidelity, performance or novelty. Nevertheless, some people seem to realise their creative musical efforts only by investing on what is mostly appreciated nowadays as the 'problem-solving' procedural paradigm (Plummeridge, 1980). This popular approach, which characterises creative thinking as a 'problem-solving' activity and is fervently followed up to our days, sources from this psychological view

that people can mentally compartmentalise facts and figures related to creativity, in order to achieve the desired creative effect or path of progression (Gilhooly, 1996; Guilford & Hoepfner, 1966). However, whether the latter is true or not, it should be certainly acknowledged that "creative problem solving is a process where individual subelements have to be gathered into a whole structure...The emphasis is upon [the final] organisation..." (Collins, 2005: 194-195).

In relation to this latter element of organisation, Wallas (Wallas, 1945) was one of the first who illustrated how an individual's creative thought could be organised. He suggested four different stages, where preparation (the problem or situation or desire is investigated in all directions), incubation (the individual does not consciously think about them), illumination (the appearance of the 'happy idea') and verification play, as a gradually deployed holistic structure, a major role in the creative process. This is whereupon musicians like Byrne and Sheridan (1998, 2001) based their creative music models, bringing to the fore music education constructs like the O.R.I.E.N.T.. This model inherently means that "options (O) are identified; reviews, revisions, or reflections (R) are carried out; there is an opportunity for an interim evaluation (IE), and new thoughts (NT) can be [finally] introduced" (MacDonald, Byrne, & Carlton, 2006) in a creative music context, hence presenting the musical creative thought in and out of formal or informal music learning contexts in a more organised way.

The fourth research focus in music psychology incorporates questions such as whether 'there are certain products of creativity valued more than others' and 'what exactly are the benchmarks for assessing the quality and functionality of these products' (Deliège & Wiggins, 2006). There are many musicians or broadly speaking music lovers, who mostly seek to find and measure creativity in terms of the final product's qualities or characteristics. This necessarily is not bad by nature, as it has already been verified that the aesthetic qualities found in a music product could denote, or indicate creativity by itself, indeed (Odena, 2001). The only problem to this end of enquiry is that for a creative product to be perceived as such, an "objectively identifiable aesthetic value" (Odena, 2001: 63) or set of criteria needs to be evident in order for an objective aesthetic appreciation to be finally plausible. As (Plummeridge, 1980) claims in his work, "to what extent we can talk about 'bad' or 'good' [products of a creative process] is a notoriously difficult issue...[B]eauty is in the eye of the beholder" (p.37).



Neuroscience and Musical Creativity

Analysing the 'person', the 'environment', the 'process' and the 'product' is just one but yet summative way to approach music's creative whole through psychology. This holistic approach has significantly occupied many scholars for the last half century in one way or another, while it may well represent a much desired multifaceted decoding of this distinguished human characteristic, providing a 'big picture' on how to structure, understand and ultimately enhance musical creativity in educational, social or interventional settings. However, due to this mostly single-domain research path, a simplistic approach has been unfortunately adopted in large audiences, promoting myths like the right-left brain paradigm, the overly strict convergent versus divergent thinking approach, or even the focused versus defocused attention states. If someone wants to be creative, they have to use more of their right brain; convergent thinking is what it takes to achieve creativeness, or that defocused states of mind is the only way to reach higher creative results. Many wrong implications have been developed around creativity's functional consensus, reaching to favour over-simplified creative

social and educational constructs, or to even lobby towards false human traits in order to explain procedures and decisions related to creativity. This oversimplification could be found in some of these schools for example which choose to base their students' enrollment criteria on the way the candidates pay attention - or not - to certain processes of music production or expressiveness (i.e. strict rules on sight-reading during exams) or on the way they should approach and deploy specific musical tasks embedded in improvisation or composition.

Fortunately, neuroscience research came in to complete the picture, significantly altering this mono-dimensional approach. Neuroscience now provides through its enquiries a more solid - but admittedly immature and with a lot to uncover in the near future - debate on how we can better understand the processes and biological characteristics of creativity. What is known through neuroscience is not much, and as Dietrich (2004) claims, "there is no sound theoretical framework on the neural basis of creative thinking..." (p. 823). To this exact matter a significant point needs to be made: it is difficult to study creativity in plain neuroscientific terms because it cannot be studied in these overly controlled environments that most of the neuroscientific laboratories promote and demand. Nevertheless, seeing creativity 'as a fundamental activity of human information processing' (Boden, 1998) researchers have clearly managed to decode certain properties of the creative neural substrates.

The dominant model of creativity research in neuroscience is the one of 'the creative cognitive approach'. According to this approach, 'creativity is far from a magical event of unexpected random inspiration... Instead, it is a mental occurrence that results from the application of ordinary cognitive processes' (Smith, Ward, & Finke, 1995). This is how musical creativity is discussed in neuroscience, functionally realising music's structure as a sum of processing and cognitive thinking states. Improvisation for instance, can be defined under these terms 'as the spontaneous generation, selection and execution of novel auditory-motor sequences' (López-González, 2012).

For some people, this approach may seem too systemic or even shallow. It may be argued that it does not take into account any 'philosophical', to put it mildly, humane traits. However, neuroscientific inquiry is very practical and real, indeed, noting here that musicians are one of the first and most fit populations to study creativity on in this particular way, due to their intensive, long-term and contextually variable training. Their style, mode and characteristics of life (i.e. hours and starting point of active connection with the musical phenomenon) is said to promote a significant imprint on their neural circuits. This is probably why neuroscientific research on musical creativity started seeing a rise the last couple of decades. Several research projects, spanning as far back as the mid-80's (for a complete review please see Dietrich, 2004; Sawyer, 2011), have used techniques like the Electroencephalography (EEG), the functional Magnetic Resonance Imaging (fMRI) and the Positron Emission Tomography (PET) for deeper and more detailed investigations.

What musical research on creativity has found through neuroscience, confirms the wider notion about psychology research to be over simplistic. On the one hand, projects implicating musical performance practice, improvisation and composition present a variable activation on the brain at the prefrontal cortex, the premotor and the supplementary motor areas, some temporoparietal areas, the visual cortex, the thalamus, the basal ganglia, the hippocampus as well as the cerebellum (i.e. Dietrich, 2004; Gibson, Folley, & Park, 2009). On the other hand, the same or other neuroscientific research projects in musical creativity have presented some times contradictory evidence of deactivation of these brain regions that regulate emotions: the limbic and paralimbic areas (i.e. Limb & Braun, 2008). Through this latter research oeuvre, it seems that brain blocks like the hippocampus, amygdala, hypothalamus and parts of the parietal and occipital cortices diminish their involvement during 'creative' tasks (see figure 2 as an example) in order for the artist to reach the desirable creative outcome.

In the last few years, new research endeavours on musical creativity have been conducted, employing new research methods and brain scanning techniques. These endeavours came to confirm the previous multi-regional and bimodal (activation-deactivation related) evidence, while extending some times their creativity research in an interdisciplinary manner. Berkowitz and Ansari (2010), using the fMRI technique, examined some expertise related elements in brain activity between musicians and non musicians. They found significant differences in neuronal activity between the experiment group and controls, pinpointing a major deactivation in the right temporoparietal junction (rTPJ) of the musicians during a melodic improvisation task.

Two years earlier, Friis-Olivarius and colleagues (2009) studied music improvisation in relation to linguistic behaviour using fMRI. Knowing from previous experiments in musical creativity that the right Dorsolateral Prefrontal Cortex (rDLPFC) is linked with non-verbal creative behaviour - while neuroimaging evidence in wider creative behaviour show clear verbal associations through the left DLPFC - they investigated the involvement of left- and right-lateralised prefrontal brain activations during improvisation interactions. In their experiment, participants had to improvise a musical answer to a given musical rhythmic phrase. They found that, compared to controls, only the left DLPFC was activated during the process of the musical response, finally suggesting that linguistic behaviour could be possibly resembled in creative communication during

musical improvisation.

One last research project on musical creativity by Gruzelier et al. (in press) simultaneously focused on rehearsed and unrehearsed music performance, creative improvisation and sustained attention, employing the EEG/Neurofeedback technique mainly on 11-year old school children; all at a novice level. The researchers compared the Alpha/Theta (A/T) brainwave bands over the sensory-motor rhythm (SMR) and attention, presenting two different neurofeedback protocols in order to investigate learning and creativity paths. Results showed a positive representation of the protocols' usage in the particular setting, extending their benefits to creativity and communication ratings along with SMR for creative improvisation and unrehearsed music performance. This implies once more that more than one brain regions is responsible for creative tasks to be completed, following this notion of a neuronal active relationship between different 'creative' neuronal substrates.

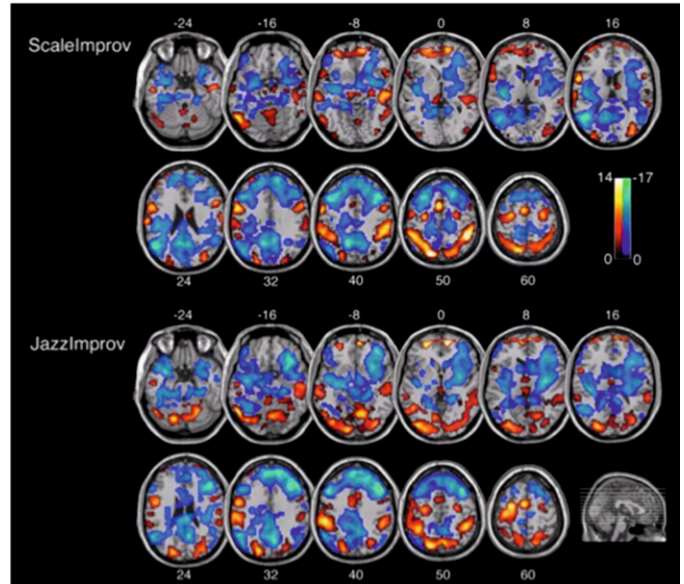


Figure 2. Example of multiregional and interhemispheric activation in musical creativity: Axial slice renderings of mean activations (red/yellow scale bar) and deactivations (blue/green scale bar) associated with improvisation during Scale and Jazz paradigms. Reproduced with kind permission by the authors ((Limb & Braun, 2008)

But what about emotion? Has there a path of specific neuroscientific research been followed in order to unveil possible behavioural connections to what we feel in creative processes and how we emotionally bring the final result to be a whole? In psychology research on musical creativity, scholars have seen indeed a great deal of inquires in-between the emotional state and behaviour of a person, its extension to the environment and the creative product as such. Unfortunately, in the neuroscience world 'no mention has been made about how creative behaviour interacts with aesthetic judgement or emotion' (López-González, 2012) up to this point. However, as it is already a general social assumption that emotion does guide artistic creativity, it would not be a surprise to very soon see related investigations on the specific domain, trying possibly to connect what we feel, when we feel it and how musical creativity is finally perceived and realised by the brain in this very complicated but similarly universal process (Cross, 2001).

Concluding Thoughts

The research and evidence described here look at the two-fold nature of creativity's research approach and what dynamics - or extensions - the biology and psychology study has brought together in the creative music context the last few decades. We clearly see that both psychology and biology research serve a specific advancement path to their own ends, and that they firmly discuss a variety of mechanisms, sources or explanations related to creativity's substance or enhancement.

On the side of biology, as Sawyer (2011) also suggests, we should definitely keep in mind that (a) not only one brain part is active during creative musical tasks, meaning there is no just one brain block referring to creativity, (b) that both hemispheres show equal activation, (d) that when engaged in musical creative tasks the same brain areas could be similarly active when involved in everyday and ordinary tasks, (e) that unconscious processes are involved in an effective creative result, and (f) that there is a certain importance given in the domain specific expertise, as brain processes connected to the domain get surely refined in terms of creativity and its realisation.

On the side of psychology, creativity seems to be interpreted as the continuous negotiation of existing social, procedural or product elements, different many times in quality, magnitude and inherent processes, considering the entry or exit point of discussion or its desired goal. It is well conceivable that there is no one

way to approach musical creativity, in either behavioural or social terms, while this limitation is well depicted in the extended research oeuvre followed at different levels and end-notions.

Are there any specific rules we need to follow in order to synthesise a successful music education context based on the above, one might finally ask? Are there total creative music environments which worth entering at a minimal learning cost if some or all of the above evidence can be followed curriculum-wise? It would be very risky to provide a single answer to this question, especially when research and study on the one hand shows such a wide variance of learning scopes and decoding approaches of creativity, and on the other hand educational practice unfortunately substantiates examples where creativity is stifled in music (teaching and learning) rather than encouraged (Burnard, 2012); all this despite the rich and fruitful debate currently in progress.

In this paper's point of view, it is crucial to understand that staying up to date in relation to the connection biology and psychology offers, could provide us with a wider frame of functional and creative educational performance. Considering this, and although there might not exist certain successful paths to follow, we could say that the more tools we have in our educational and developmental warehouse to employ, the more chances we have to 'create' creative learning opportunities. It seems logical therefore to try and enhance holistic experiential approaches, favouring first as many parts of the brain as possible, scaffolding at a second stage a positive psychological environment for learning to flourish. And we should not forget this metaphor of the health care system as far as the the research of the creative music education contexts is concerned. As most of the health care takes place out of hospitals - because not all medical cases are emergencies or of terminal importance - most of music education takes place outside the formal educational environments and thus, a freer approach on where to find or what to expect from creative learners and teachers might provide more links to the above mentioned interdisciplinary study of creativity. Relevant research should probably follow a riskier path of methodological inquiries, bringing more explicitly into its proceedings special populations (like musical savants or autistic children) making usage of new psychobiological learning models (i.e. neopiagetian educational approaches; see Rose and Fischer, 2009 for more info) or social interrelations and profiles (i.e. the millennia generation profile; see Howe and Strauss, 2000 for more info).

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