

6. CREATIVITY AND NEURAL CONNECTIONS IN THE ARTISTIC CREATION PROCESS

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Abstract: *The topics addressed in this article stem from the interdisciplinary research project “Neuroscience, Creativity – Neural Connections in Artistic Creation,” initiated by the Institute for Multidisciplinary Research in Art at the “George Enescu” National University of Arts in Iași. These topics have been discussed by experts in the medical and artistic fields during a conference organized in collaboration with “Grigore T. Popa” University of Medicine and Pharmacy in Iași and the “I. I. Mironescu” Cultural Center. We aim for an interdisciplinary approach, which we consider relevant and of interest, focusing on understanding how the brain functions and the intricate neural networks engaged during the creative process, seen as the key to developing and enhancing creativity. Additionally, within the complex scope of this research theme, we will highlight several beneficial effects of art on individual and collective health. Art serves as an alternative energy source for the brain, stimulating connections between mental and physical processes.*

Key words: *neuroscience, creativity, health, emotions, neural connections*

1. Introduction

The evolution of humanity requires, in the complex and dynamic tableau of today's society, a profound understanding of how the brain functions, what connections occur in our minds, and how different centers are activated in forming neural networks during the creative process. Certainly, aspects related to creativity, the brain, creative processes, neural networks, neuroscience, or neuroplasticity have been explored and elaborated by numerous researchers in neuroscience, doctors, and artists in specialized volumes, constituting part of the bibliography that underpins our research.

The topics we will address in this article were generated by the interdisciplinary research project “Neuroscience, Creativity - Neural Connections in Artistic Creation”³¹⁶ initiated by researchers from the Institute for Multidisciplinary Research in Art at UNAGE and debated by specialists in the medical and artistic fields during the conference organized in collaboration with “Grigore T. Popa” University of Medicine and Pharmacy in Iași and the Cultural Center “I. I. Mironescu.”

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Fig. 1. Conference Poster³¹⁷

A useful and challenging initiative, the conference “Neuroscience, Creativity - Neural Connections in Artistic Creation” on October 18, 2023, represents the inaugural stage of a series of such interdisciplinary, multidisciplinary, and transdisciplinary research projects. It provides a stimulating framework for various scientific research and artistic creation activities connected to current reality, generating new perspectives for institutional collaboration between “George Enescu” National University of Arts through the Institute for Multidisciplinary Research in Art and “Grigore T. Popa” University of Medicine and Pharmacy in Iași through the Cultural Center “I. I. Mironescu.”

2. Neural Networks and the Creative Process³¹⁸

The interdisciplinary approach we propose in this article regarding understanding how the brain functions and the intricate neural networks engaged during the creative process is considered both current and interesting. In this sense, the symbiosis between art and science provides an overview of the mental processes of innovation, which is the key to the development and enhancement of creativity. It is a mechanism through which “our brain puts more neurons into play between the areas of sensory input and those of motor output, allowing the emergence of more abstract concepts and more pathways of neural circuits.”³¹⁹

Certainly, in this context, it is relevant to understand what neural networks are and how they are created. In the work “The Neuroscience of Enlightenment: Activate Your Brain”, doctors David Perlmutter and Alberto Villoldo explore the worlds of science and spirit, providing us with access codes that help activate the entire cerebral system. “Neural networks are unique patterns created by millions of interconnected neurons. Individual neurons produce nerve fibers that extend to other

³¹⁷ The graphic design of the poster was created by Vladimir Boca.

³¹⁸ Author: Researcher III PhD. Mirela Ștefănescu

³¹⁹ David Eagleman, Anthony Brandt, *Specia Rebelă*, Editura Humanitas, București, 2020, p. 59

neurons, like the branches of a tree. In other words, the neural networks in the brain consist of a group of nerve cells that have learned to discharge impulses and have connected to each other to perform a specific function.”³²⁰ Neuroscience has shown that our creative ability depends on the brain's basic network and the control network. These two operate separately but are interconnected when involved in the creative process.

Creative abilities are not predetermined, but we can cultivate and train creativity with the right tools, willpower, and in the right environment, leading to flexible and open-minded thinking towards new perspectives. An interesting metaphor about creativity is found in the book “The Left Brain Speaks, the Right Brain Laughs” by physicist, technologist, and novelist Ransom Stepherson, who provides a look at the neuroscience of innovation and creativity in art, science, and life. “Creativity occurs when you reach into the hat and pull out a rabbit, but before you can pull out a rabbit, you have to pull out a lot of lint.”³²¹

In other words, the entire creative process requires a lot of work, perseverance, along with the freedom and courage to try new things. We should not fear failure; “celebrating failure could be a key to creativity.”³²² Of course, this entire complex mechanism is nourished by the “tangled string of talent, ability, and passion.”³²³ Thus, we need lateral thinking, to be open to as many ideas as possible, and to delve into unexplored areas of the mind. “When ideas begin to simmer to the surface, periods of coherent resonance will occur, and the best ideas will spread networks of potential action throughout the entire brain.”³²⁴

David Eagleman and Anthony Brandt, delving into the human creative system, argue in the book “The Runaway Species” that creativity does not arise out of nothing but “results from the compression of history into new, shiny forms.”³²⁵ In fact, leveraging and connecting existing things and ideas stimulates the creative process. Another important element in amplifying creativity is the social factor. Humans are social beings; they create connections with each other, share ideas, and want to impress others, operating “in a vast network of interdependencies.”³²⁶ Thus, creativity emerges as a social action, allowing us to “plant mental seeds”³²⁷ for each other.

In general, creativity involves a laborious cerebral process in which all accumulated knowledge and experiences are engaged, passion, the desire for innovation, accentuated by the constant interaction among people. In this context, a natural question arises: why are some people more creative than others? How does the creative process work? Will Gompertz, in the book “Think Like an Artist” describes the essential role of creativity in our development as a society and how creative thinking works. „Over the years, I've come to realize that there are a few

³²⁰ David Perlmutter, Alberto Villlolo, *Neuroștiința Iluminării, activează-ți creierul*, Editura For You, București, 2018, p. 91

³²¹ Ransom Stepherson, *Creierul stâng vorbește și creierul drept râde – O privire asupra neuroștiinței inovării și creativității în artă, știință și viață*, Editura Prestige, București, 2023, p. 197

³²² Ibidem

³²³ Ibidem

³²⁴ Ibidem

³²⁵ David Eagleman și Anthony Brandt, *op. cit.*, p. 44

³²⁶ Idem, p. 39

³²⁷ Idem, p. 59

easily identifiable traits that characterize all successful creative people, from novelists and film directors to scientists and philosophers. I don't mean strange and mystical qualities, but the basic practices and processes that allow talents to flourish. Practices and processes that, if adopted, can help the rest of us unleash our latent creativity”³²⁸. In other words, how each person understands their creative potential animates essential skills for stimulating creative thinking: confidence and boldness, utilized, of course, in their respective fields. “The Beatles were just a bunch of young people who had free time and enough confidence to convince themselves and then the whole world that they were musicians”³²⁹.

3. Influences of the Arts on Health and Creativity³³⁰

Within this complex framework of research, we highlight a series of beneficial effects of art on individual and collective health. Art serves as an alternative source of energy for the brain, stimulating connections between mental and physical processes. Thus, we aim to emphasize some common goals shared by various distinct yet intersecting fields and to whet the appetite for more thorough research on an interdisciplinary theme that we consider both current, necessary, and of major interest.

We start with the premise that art is a means of knowledge, expression, communication, and reflection of reality and human experience. Health is linked to well-being, encompassing a WHOLE—physical, emotional, mental, and spiritual—both individually and socially. Creativity, whether scientific, conceptual, or artistic, represents the capacity to capture the essence and entirety of an individual, community, or society.

Throughout history, medical specialists with a profoundly humanistic vision have not only promoted the values of the sciences but also the cultural and artistic values in their various forms. The list of physician painters, sculptors, musicians, versatile doctors, and artistically inclined medical professionals is very rich and impossible to hierarchically assess. Many aspirations of scientists and artists are shared. For instance, William Butler Yeats succinctly stated, “Art educates the mind and heart,” while the renowned Albert Einstein expressed the conviction that “Artistic education is the key to understanding the world and becoming who you truly are.” Art brings a whole series of benefits and can assist humanity in various ways, such as:

- a) Expression and communication of emotions: Art provides a means to express and communicate emotions and feelings that may be difficult to put into words or convey through other methods. It can be liberating and therapeutic for those who practice or experience it;
- b) Stress reduction and improvement of well-being: Engaging in artistic activities, such as music, theater, dance, painting, drawing, or sculpture, can help reduce stress levels and enhance well-being. Focusing on the artistic process can have a calming and relaxing effect;
- c) Development of creativity and critical thinking: Art encourages creative and

³²⁸ Will Gompertz, *Gândește ca un artist. Învăță cu van Gogh, Picasso sau Andy Warhol cum să fii creativ în orice domeniu*, Editura Polirom, Iași, 2016, p. 13

³²⁹ Idem, p. 14

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unrestricted thinking. Engaging in artistic activities can help develop problem-solving skills and critical thinking, as it requires finding unique and unconventional solutions;

d) Improvement of communication skills: Art can be an effective tool for communicating ideas and messages in a non-verbal form, contributing to the development of communication and expression skills, providing a platform to convey meanings and values;

e) Sensitization to social issues: Art can be used as a means to raise awareness of social, economic, and political issues. Many artistic works address sensitive subjects and encourage critical reflection on the world we live in, sometimes taking on subversive tones;

f) Enhancement of cognitive skills: Memory, concentration, and attention. Participation in artistic activities positively stimulates and develops the brain and nervous system;

g) Fun and joy: Art provides an excellent method of relaxation, distancing from everyday problems, and deriving satisfaction from one's own creativity;

h) Expression of individual, collective, and societal identity and culture. Through art, people can preserve and transmit the cultural heritage and traditions of communities.

Certainly, the benefits of the arts can vary for each individual, as everyone experiences and engages with art in unique ways. When engaging in artistic activities, the connection between the mind and body is stimulated, and mental and physical processes are thus activated and correlated. In the artistic creation process, connections are made on multiple levels: connecting with oneself, grounding in the present through perception and action, and connecting with the environment by being here and now. Therefore, art has beneficial effects on both individual and collective, social health.

The interdependence between art and health is worth emphasizing. It is evident that artists need tranquility, comfort, and a sense of well-being to create. In the realm of artists, we have our dilemmas in assessing the value of an artistic product. Because art can be practiced either as an act of knowledge (in modern terms, artistic research) or as a means of self-display (exhibition). In "Measure for Measure," William Shakespeare centers the theme of discernment as an attribute of human intelligence. The appreciation and understanding of art are largely subjective and personal, and the interpretation and expression of emotions associated with art are specific human experiences. In his play "Uncle Vanya," the physician and playwright A.P. Chekhov, through his character Dr. Astrov, states, "Everything in a person must be beautiful; the face, the clothes, the soul, and the thoughts."

As an artist, I have asked and continue to ask questions such as: What are emotions? What does intelligence mean? What does emotional intelligence mean? I found some possible answers in Eckhart Tolle's "The Power of Now": "Emotions are the body's response to thoughts." In other words, behind each emotion is a thought. Emotions are generated by mental activity. Or in other words, mental processes overflow into emotions, chemical reactions, and physical actions.

A well-executed theater performance, such as one by Silviu Purcărete, evokes emotions and reactions ranging from laughter to tears, in a very varied range. What

actually happens in the spectator's body? What happens in our bodies when we listen to our favorite music, or conversely, to one we cannot stand? What happens in the body when we watch a work of art film? But when we are horrified by a horror film? What influences do we receive for our health when we are ecstatic in front of a masterpiece of painting or sculpture? What about in front of kitsch?

Art therapy employs integrative methods, engaging both the mind and body, not just the body (as in the case of sports practice) or just the mind (as in word-based psychotherapy, meditation). Integrative art combines different forms of art and therapies to support well-being, personal growth, healing, and transformation. This involves using artistic techniques and practices along with medical and therapeutic techniques. The goal is to allow the person to express and explore themselves, with emotions, thoughts, and experiences, in a creative way and to find understanding, healing, and harmony through art.

The connection between arts and neuroscience is complex and fascinating. On the one hand, neuroscience studies the brain and the nervous system in relation to cognitive processes, emotions, and human behavior. Thus, neuroscience can provide a deeper understanding of how the brain functions during the artistic experience. Art, on the other hand, is a form of creative expression that involves imagination, emotions, abstract thinking, and aesthetic perception. These aspects of art are closely related to the functions of the brain and the nervous system. The artistic experience can stimulate the release of neurochemicals associated with pleasure and emotion. Physiological parameters improve, such as cortisol, the stress hormone.

For art creators, studies show that the release of dopamine is stimulated, on different circuits. Neurostimulators act together, in a spiral toward improvement or toward worse. Serotonin and adrenaline seem to be “more at hand” in the situation of consuming art and the unknown, the unexpected, strong sensations. Also, participation in artistic activities can improve cognitive functions, emotional resilience, and induce states of relaxation and meditation.

Thus, we consider that the connection between arts and neuroscience can be valuable in the therapeutic field. As we know, art therapy is used to treat a wide range of conditions, such as mental health disorders, chronic pain, or psychological trauma. By understanding the neurological mechanisms involved in artistic processes, therapists can adapt and optimize artistic interventions to support the recovery and well-being of patients.

4. Creativity and the Brain-Music Connection³³¹

Creativity is a crucial element of human existence, whether it involves art or not. Since ancient times, humans have had to find creative ways to satisfy their basic needs, whether they are physiological, emotional, or social in nature. As research has advanced to a high level in modern times, and human needs are treated from very complex perspectives, the cognitive approach between neurophysiological processes and anthropological activities has become an objective reality.

Classifying human activities strictly based on the traditional conception of brain hemispheres is no longer a relevant approach. The right hemisphere is not

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solely responsible for creativity, just as the left hemisphere is not solely responsible for concrete activities. As in any other field, the most honest approach is one of balance, where we observe the intertwining of collaborating elements. The weight of the benefits gained through practicing the arts or what is known as “mere exposure” – the mere exposure to works of art – is known and studied. These benefits manifest in various fields, including the social, professional, and, last but not least, physical and mental health. For a more effective view, let's take a few moments to focus on the connections between brain science and music.

An honest first step is to observe the musical result from the perspective of the four attributes of sound, namely pitch, duration, intensity, and timbre. Specialists in the fields of psychology and physics have demonstrated that these can be separated for individual analysis. Through this technique, an individual's preference for certain musical styles can be tested and explained from the perspective of neural construction. The primary milestone concerning preferences and a person's relationship with music is the intrauterine period. Researcher Alexandra Lamont from the UK found that at the age of one, children have a predisposition toward music heard before birth, and furthermore, they recognize it.

At this stage, it is more relevant for the study subject that the musical piece to which they are exposed is already in their memory playlist than whether they inherently like the music style itself. Additionally, the perception of musical pieces of varying degrees of complexity is the responsibility of a brain structure involved in attention – the frontal lobes and the anterior cingulate cortex, which develop gradually, especially after the age of 7, according to researcher Mike Posner. In light of this remark, the difficulty of interpreting a canon song by a preschooler is easy to understand. However, in support of the idea that art in general and music in particular have several benefits for the human brain, various exercises for training attention and concentration have been conceived or identified over time.³³²

Another important aspect of the relationship between music and the brain is the remedial role that music can play in mental disorders such as depression. Numerous researchers have addressed this increasingly relevant and equally complex topic. Rich lists of classical music titles have been created that can be helpful in different phases of depression. Some psychologists have observed the beneficial role of music written by a specific composer, while others consider the outlined musical expression important. However, recently, we learned of a different perspective that complicates the understanding of the psychic process: that a certain musical style or composer will not always have a positive effect.

Neurologist Oliver Sacks, in “Musicophilia: Tales of Music and the Brain,” recounts a series of different and very interesting contexts: one patient has an immediate positive reaction to any cheerful, positive song, regardless of the composer; another is immune to the musical stimulus until hearing a completely unknown piece, which miraculously softens his feelings; another patient, who knew his sensitivity to Schubert's music and turned to it in one of the acute moments, has the unpleasant surprise of listening to Schubert without any effect.³³³ The good news

³³² See Daniel Levitin, *Creierul nostru muzical. De ce suntem fascinati de armoniile sonore*, Litera Publishing, Bucharest, 2022, pp. 242-243

³³³ See Oliver Sacks, *Muzicofilia. Povestiri despre muzică și creier*, Editura Humanitas, București, 2021, pp. 307-310

is that the emotional reaction to music is widespread not only at the cortex level but also at the subcortex level, meaning that sound art can be perceived even in cases where the brain is severely affected.

5. Conclusions

In conclusion, we can affirm that the connection between arts and neuroscience provides a deeper perspective on how the brain and nervous system influence and are influenced by artistic experience. This association can have significant implications in the therapeutic field and in understanding the human being as a whole.

The complex functional structure of the human brain is debated by numerous scholars, and the progress of science provides us with numerous insights into understanding the mechanisms behind the formation of neural networks and the quality of connections between neurons, as well as aspects related to the generation of cognitive, sensory, or motor functions that form the basis of talent and creativity. “Creativity is the fuel for the progress of our rebellious species.”³³⁴

Therefore, by understanding the possibilities that arise through the fascinating combination of arts and sciences in the direction of innovation, creative thinking, and how they can be stimulated, we manage to address all the challenges we face in our continuously developing society.

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³³⁴ David Eagleman and Anthony Brandt, *op. cit.*, p. 243

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