THE LOCALIZATION OF THE FRONTAL AND PARIETAL AREAS OF REPRODUCTION IN CLASSICAL ARTISTS AND MUSICIANS

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Abstract: Improvisation in art is one of the most enigmatic processes of human creativity, often occurring on the border between the conscious and unconscious. This article examines the neurophysiological basis of improvisational activity, focusing on the role of the frontal and parietal cortex in classical musicians and artists. The localization and functional interaction of these areas during the creative act, including improvisation in painting and musical performance, are examined. It is concluded that improvisation activates a unique neural network, balancing cognitive control and spontaneous expression.

Keywords: neuroplasticity, improvisation, frontal cortex, parietal cortex, artistic creativity, music, neuroaesthetics, creativity, visual art, musical improvisation

Introduction. Improvisation is the highest form of human creativity, where conscious knowledge meets spontaneous expression. In the context of classical music and painting, improvisation requires complex coordination of memory, perception, motor skills, and abstract thinking. But what happens in the brain of an artist or musician during the creative flow?

Modern neuroscience, using functional magnetic resonance imaging (fMRI), EEG, neurostimulation, and neuropsychology, offers an increasingly profound understanding of how the frontal and parietal cortices interact during improvisation. These two areas play key, yet opposing, roles: the frontal cortex is often associated with self-control and planning, while the parietal cortex is involved in the integration of sensory information and spatial imagination.

What is the distribution of their functions during the creative act? In this article, we will examine in detail the neurobiological foundations of improvisation in classical artists and academic musicians, as well as the activation patterns of various brain regions depending on the nature of artistic activity. 1. The Concept of Improvisation in Classical Art

1.1 Musical Improvisation

Improvisation has a long tradition in classical music: Johann Sebastian Bach, Mozart, Liszt, and Beethoven were all excellent improvisers. Improvisation on the organ, piano, violin, or any other instrument requires not only mastery of technique but also the immediate construction of a musical statement.

1.2 Improvisation in Painting

Although classical art is more often associated with deliberate composition, many artists (including Leonardo da Vinci and the late Turner) improvised as they worked. This manifested itself in changes of concept, spontaneous brushstrokes, and the use of chance - especially in the late academic and romantic periods.

Improvisation in art is essentially the creation of something new without relying on a predetermined plan. It requires not only a sense of form and structure, but also the ability to be mentally flexible, adapt quickly, and expressively emotional.

2. The Frontal Cortex: The Center for Planning and Self-Reflection

2.1 Location and Functions

The frontal cortex, especially its prefrontal regions (dorsolateral prefrontal cortex, ventromedial PFC), is responsible for:

• executive control;
• cognitive flexibility;
• attention regulation;
• suppression of impulsive reactions;
• goal-directed behavior.

In many creative tasks, the frontal cortex acts as a “conductor” - organizing interactions between various sensory and motor areas of the brain.

2.2 Functional Deactivation during Improvisation

An interesting neurophysiological discovery is that improvisation often results in deactivation of certain regions of the prefrontal cortex, especially the dorsolateral region. This state is sometimes called "hypofrontality." A 2008 study (Limb & Braun) of jazz pianists found that during improvisation, activity in the medial prefrontal cortex increases, while activity in the dorsolateral prefrontal cortex decreases. This allows the performer to "turn off the inner critic" and immerse themselves in the creative flow.

In artists, similar processes can be observed during spontaneous painting - for example, during a free, unconventional brushstroke.

3. The Parietal Cortex: Sensory Integration and Visualization

3.1 The Parietal Lobe and Its Functions

The parietal cortex plays a central role in:

spatial imagination;
sensorimotor integration;
orientation within the body;
attention to external stimuli;
manipulation of abstract images.

The right parietal lobe is particularly active in artists, as it is involved in processing visual-spatial information. In musicians, the left parietal cortex is activated when working with musical notation, chord structures, and planning a musical phrase.

3.2 Role in Improvisation

During improvisation, the parietal cortex helps:

visualize the composition;
coordinate hand movement across the instrument or canvas;
manage attention;
switch between internal imagination and external sensory feedback. Studies of artists drawing in an fMRI scanner (Solso, 2001) show activation of the intraparetal sulcus (IPS) and inferior parietal lobule, which are responsible for the manipulation of imagined objects.

Interaction of the frontal and parietal cortex

4.1 Network organization of the brain

During improvisation, the brain functions as a dynamic network, with different areas temporarily coordinated depending on the task context.

Two key network structures:

The default mode network (DMN) is activated during internal thought, fantasy, and self-reflection.

The executive control network (ECN) is responsible for control, attention, and goal-directed action.

During improvisation, simultaneous activation of both networks is often observed, which is unique and suggests coordination between self-expression and control.

4.2 Example: An Artist and a Musician in the Moment of Creativity

A painter painting a portrait from imagination activates the visual areas (occipital cortex), parietal cortex (imagination and motor planning), and medial prefrontal cortex (creative choice).

A musician improvising on the piano activates the auditory cortex, motor areas, parietal areas (spatial coordination and planning of chord sequences), and frontal lobes (composition in real time).

5. Case Studies and Empirical Studies

5.1 Limb & Braun (2008)

A series of fMRI experiments with jazz pianists showed that during improvisation, activity decreases in the dorsolateral prefrontal cortex and increases in the medial prefrontal cortex, corresponding to a decrease in self-criticism and an increase in intuitive spontaneity.

5.2 Studies of artists (Solso, 2001; Zeki, 2011)

During artistic improvisation, the following are activated:

right parietal cortex (object visualization);

prefrontal cortex (thematic selection);

frontoparietal junctions (hand motor program planning).

5.3 Studies of composers (Benedek et al., 2014)

A study of composers showed that when composing "in their heads" without an instrument, strong activity is observed in the parietotemporal areas associated with inner hearing, and in the medial prefrontal cortex - the area of creative choice.

6. Creative Flow and the Neurophysiology of "Inspiration"

The state of "flow," described by Mihaly Csikszentmihalyi, is characterized by complete engagement in the process, a loss of the sense of time, and a decrease in self-awareness. Neurophysiologically, it is associated with:

decreased activity in the dorsolateral prefrontal cortex;

activation of the parietal cortex and motor areas;

enhanced synchronization between the frontal and parietal zones.

This state is especially characteristic of improvisation, where the frontal and parietal areas engage in coordinated activity.

Conclusion. Improvisation in classical art is not a chaotic action, but a finely organized cognitive process involving complex work between the frontal and parietal regions of the brain. The frontal cortex facilitates strategic thinking, planning, and suppression of excess control, while the parietal cortex integrates sensory information, spatial imagination, and motor coordination.

Understanding the neurophysiology of improvisation opens new perspectives in the development of artificial intelligence, creative arts education, and even clinical practice - for example, in neurorehabilitation and cognitive therapy. Improvisation is an organic interaction

between the rational and the intuitive, the structured and the spontaneous. And it is in this interaction between the frontal and parietal cortex that true art is born.

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