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The influence of music in general and of rhythm in particular over the human psychic

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Abstract: *The article entitled "Influence of Music in General and of Rhythm in Particular over the Human Psychic" is divided into three chapters. The first chapter focuses on the relation between the human psychic and music, according to the findings of neurologists and cognitive psychology specialists. The various types of rhythm can generate the most diverse feelings and moods; the language people speak influences rhythm, which, in its turn impacts on the various physiological parameters (heart beats, breathing); the second chapter focuses on these aspects. The main idea of the last chapter is that the music we listen to unveils various traits of the human personality. Hence, music does not only influence human thoughts, feelings, and moods, but is also serves to therapeutic purposes.*

Key-words: *rhythm, personality traits, emotional response*

1. Music and brain. The portrait of a musician and of the listener

Quite often, we have wondered why it is that we need music in our lives, what fuels the need to listen to a certain type of rhythm, why it is that some people have a talent for music, while others don't; in order to answer that question, we shall bring into discussion the findings of neurologists, cognitive psychology specialists and other scientists that attempted to understand the relation between music psychic and music. Our brain is made up of 2 cerebral hemispheres, interconnected by the corpus callosum, which ensures the information transfer between the two hemispheres. It has been said that each hemisphere is responsible for certain mental processes: memorizing, speech, logics, spatial orientation, creativity, imagination, musical skills, emotions, and even the full coordination of a part of the body. Thus, the left hemisphere is the home of logics, reasoning, organization and spatial orientation, and it controls the right part of the body, whereas the right hemisphere, responsible for the left part of the body, is the home to intuition, creativity, imagination, and perception of images and symbols.

Musical talent supposes the existence of musical skills: "the musical ear"- developed capacity to distinguish sounds, tonalities, and rhythms - the capacity to differentiate amongst the large number of existing sounds, excellent auditory memory – the capacity to reproduce the sounds heard, as well as high level imagination and creativity that facilitate interpretation or creation; hence, a right

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hemisphere sufficiently developed to encompass all these processes. The left hemisphere is called upon to the same extent to decipher musical scores, to identify the order in which sounds are to be produced. These musical skills people think to be specific, meaning that only certain people have developed them, have been found to be the result of certain changes in the structure of the human brain: researchers have found that "in the professional musician's brain, the grey matter is larger in volume in the premotor and motor cortex, the auditory, the visual and spatial, the somatosensory areas, as compared to an unprofessional musician. Moreover, musicians have a more developed superior parietal lobe and bilateral gyrus in the lower temporal lobe."[2] And the changes are not only due to innate skills, but they are also acquired through the performer's musical exercise.

The idealized image of the artist as a bohemian is starting to fade; studies show that a musician does not only need the right hemisphere, but also the contribution of the left hemisphere in order to achieve a valuable musical performance, which fully goes by the Romanian saying: genius is 1% inspiration and 99% perspiration – the weight of the left hemisphere in the creation process often exceeds 50%.

By generalizing, we would be tempted to say that artists playing various instruments have an intensive neuronal activity in the motor area, and that they use more neurons. "Researchers have found the contrary. Starting from this hypothesis, they established 2 groups: an experimental and a control group; the experimental group was made up of performing artists who played the piano, and the second one was made up of people who understood music, but who had to make an effort to sing. They have found that in the case of the experimental group, the activity is much lower at the level of the motor cortex, as compared to the control group" [3]. The permanent exercise they make has allowed for the development of motor skills, which leads to the conclusion that once skills are acquired the focusing capacity is lowered, the cognitive effort is lower, and a smaller number of neurons are used. To the same extent, musicians also "memorize words more easily"[4].

In a research carried out by the famous scientist Peter Sleight, at Oxford University, it has been found that people with "musical skills (musicians) have faster breathing and heart beat patterns as compared to people without a musical culture. The conclusion of the research was that musicians have a better understanding of the complexity of musical rhythm and that they unconsciously manage to adjust their breathing and heart beat patterns"[5].

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[2] C. Gaser, G. Schlaug, *Brain structures differ between musicians and non-musicians*, in: *The Journal of Neurosciences. Issue* 23, 2003, p. 27.

[3] T. Krings, R. Töpper, H. Foltys, S. Erberich, R. Sparing, K. Willmes, A. Thron, *Cortical activation patterns during complex motor tasks in piano players and control subjects. A functional magnetic resonance imaging study*, in *Neuroscience Letters, issue* 278 (3), p. 189–93.

[4] W.T. Hoyt, Z.E. Imel, F. Chan, *Multiple Regression and Correlation Techniques: Recent controversies and Best Practices. Rehabilitation Psychology*, issue 53, p. 321-339.

[5] P. Sleight, *Cardiovascular effects of music by entraining cardiovascular autonomic rhythms music therapy update: tailored to each person, or does one size fit all?,* in: Netherlands Heart Journal, vol.21, issue 2, p. 99-100, accessed on October 24, 2011 at: 10.1007/s12471-012-0359-6.

Contrary to idealized image of the artist as a bohemian, studies show that a musician does not only need the right hemisphere, but also the contribution of the left hemisphere in order to achieve a valuable musical performance; this matches the Romanian saying: genius is 1% inspiration and 99% perspiration – the weight of the left hemisphere in the creation process often exceeds 50%.

If the musician needs intensive activity of both brain hemispheres, what happens to music lovers? What is it that we like in the musical creation and why are we passionate about music? Do we like the lyrics or the melody? To a listener, music is relaxation, but also a way to express certain values, believes, or simply emotions and feelings. We quite often say that we find ourselves in a certain song or even musical genre. Our brain is responsible for our feelings and for generating pleasure while listening to a melody – which has rhythm as a backbone. It's not a conscious process, but we often say or find that we "feel" the music.

When listening to music, people mainly use the right hemisphere, which is why they say they can feel the music: "the right hemisphere lingers on the rhythm of music, on words, and rhyme, on poetry, on the images suggested by the song"[6], while the "left hemisphere understands and analyzes the words, the meaning of sentences, the syntax and the message"[7]. However, recent studies have shown that the melody is practically analyzed by both hemispheres, not by the right one only. Research has shown that music with a rhythm that is closer to their heart beat pace seems to be preferred by listeners. We don't consciously realized these things, but we "feel" them. We like a song that we hear for the first time or not depending on a series of factors, such as: mood, preferred musical genre, musical culture; however, minute analysis shows that the "first impression" on a song is related to rhythm and to the tone of voice, if any; which means that the verdict given immediately after a first audition is the result of the interaction of the right, and not left, hemisphere. It is only after we listen to that melody several times that the left hemisphere comes into play and analyzes the information in the words of a song.

Of all parameters one can find in music (rhythm, tonality (frequency), melody, tone) we shall focus on rhythm, tonality, and frequency.

2. Rhythm, tone, frequency of music and human psychic

The music we desire to listen to varies by: our mood, our activity. Let us first take into account the sound of drums when soldiers go to war; we are talking about a rhythm that springs motivation and calls to action, unlike the rhythm in a funeral, when everybody is in mourning for the deceased. Why is it that we do not switch rhythms? Because they generate/influence our feelings. Movie directors best use this information when they establish the soundtrack: the rhythm used in tense scenes is

[6] C. Drapeau, *Fast learning techniques. How to learn fast.* Printing House: Teora, Bucharest, 2007, p. 78-85.

quite different from the one used on love scenes. The answers are first of all to be found in the "theory of cortical stimulation, according to which, background music can have different impacts on cognitive performance, relying on certain personality traits"[8]

Our brain firstly perceives the rhythm and melody of a musical work, and it is only afterwards (after 2 or 3 auditions) that it starts deciphering meaning of words. The meaning of words and their metaphorical interpretation are facilitated by the right hemisphere. The same hemisphere also comes into play when we find ourselves in the streets, humming a song we listened to earlier.

Language influences the frequency of musical and linguistic rhythm; data has been found, according to which "the rhythm in the musical themes differs depending on the composer's origin, more specifically, the language they speak is of essence for their musical composition style, even if they do not include lyrics. The study analyzed a number of 137 English musical themes belonging to 7 English musicians and 181 musical themes created by 11 French composers; the songs had at least 12 notes and contained no breaks. They started from the premises that English and French are completely opposite in terms of musical creations. Below is the analysis of a theme belonging to Claude Debussy - String Quartet in G Minor, first movement, second theme, and another theme belonging to Elgar - Symphony no.1, in A-flat Major, Op. 44, fourth movement, second theme."[9]

Just as language influences rhythm, in its turn, rhythm influences several of our physiological parameters: rhythm is the one that influences our heart beat. Our heart tends to attune to the rhythm of the music we listen to, and that influences the breathing rate, "generating either a relaxed mood (slow rhythm) of up to 64 beats per minute) or an energetic or even agitated mood (rhythms that often exceed 65 beatings per minute)." [10]

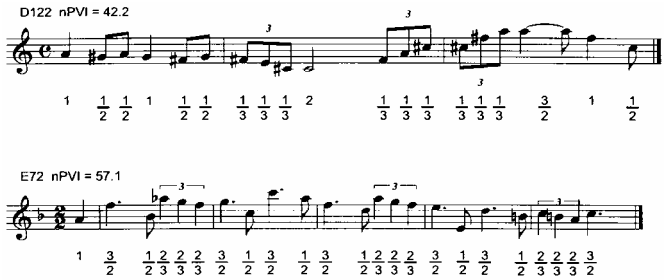

Fig. 1. *Differences obtained pursuant to the analysis of n PVIs of musical themes by composers Debussy and Elgar, according to the description above, taken over from A.D. Patel and J.R. Daniele*

[8] L.M. Patson, L.J. Tippett, *The Efect of Background Music on Cognitive Performance in Musicians and Nonmusicians*, published in the Music Peceception: An Interdisciplinary Journal, vol.29, issue 2, 2011, Printing House: University of California Press, p. 173-183;

[9] A.D. Patel, J.R. Daniele, *An empirical comparison of rhythm in language and music*, published in Cognition Journal, Vol.8, Printing House: Elsevier, 2003, p. B35-B45;

[10] C. Drapeau, *Fast learning techniques. How to learn fast*, Printing House: Teora, Bucharest, 2007, p. 78.

Findings have been made, according to which the tonality also unconsciously influences the human brain. Have we ever wondered how much energy our brain, which is made of 100 billion neurons consumes – "less energy than a 12 watt bulb, less energy than a refrigerator lamp".[11] Electrical impulses we refer to as brain waves cross neurons, representing its electrical manifestations. Practically, the musical frequency is processed by the human brain, 5 primary waves and tens of other secondary waves being thus generated. The brain activity differs in terms of intensity depending on the activity we carry out:

- where Gamma (40 -70 Hz) – is used in intensive mental states, in situations of stress or panick, or even meditation;
- Beta waves (12-30 Hz) are most frequently used in human activity and they correspond to the awake, fully conscious state;
- Alpha waves (8 -10 Hz) are released in reverie or relaxation states, and they originate in the occipital lobe;
- Theta waves (4-7 Hz) are more frequently encountered in animals in the hippocampus area, in children and in adults during meditation, napping or light sleep, but they do not have a specific location;
- Delta waves (0 – 4 Hz) corresponding to deep sleep states (0-2 Hz REM stage, 3-4 Hz non-REM stage), occur in the talamus and cortex, they activate GHRH and prolactine production.

The rhythm and harmonies in baroque music are almost mathematically arranged, managing to generate cerebral waves at the level of the brain. Alfredo Thomatis believes that high frequencies (above 8000 Hz) regenerate and relax the brain and the whole body, whereas low frequencies (up to 2000 Hz) exhaust the body and even generate anxiety. Other researchers, such as Aivenhov state that each tonality influences a certain part of the body: note D influences the intellect, whereas note G influences the heart.

The analysis of baroque music helps determine the type of cerebral waves generated at the level of the brain. For example "in 2006, Mammarella, Fairfield and Cornoldi found that Vivaldi's music increases cognitive performance, especially amongst adults." [12]

Other "musical experiments on music crystals exposed to the various musical genres have shown that when we listen to harmonious music, such as: Vivaldi, Bach, Mozart, Beethoven, or Tchaikovsky harmonious crystals are generated"[13], just as disharmonic music – aggressive rock music styles determine the generation of crystals that seem unstructured. By generalizing and taking into account the human body factor, which is generally made of more than 70% water (approximately 90%

[11] S. Aamodt, S, Wang, *Welcome to your brain. Why you lose your car keys but never forget how to drive and other puzzles of everyday*, Printing House: Litera, Bucharest, 2008, p.44.

[12] A. Jones, *Music and Cognitive Process – Student Perceptions*, accessed online on September 16, 2011 at: http://www.apu.ac.jp/rcaps/uploads/fckeditor/publications/polyglossia/Polyglossia_V19_ Jones.pdf.

[13] E. Masaru, *The hidden massage in water*, Printing House: Beyond worlds, 2004, p.25.

in childhood, 70% during youth, while at elder age, the content of water in the body drops to 50%), it has been assumed that if music is like water, then it will also influence the human body. Hence, a series of studies that concern the information content of water, but these studies concern a different topic.

Starting from a series of findings similar to the previously detailed ones, 3 new concepts have been brought to light: binaural beats, hemi-sync, and metamusic. Each of them has led to a research that helped practitioners improve the quality of life of thousands of people willing to try the new discoveries and technologies.

Binaural beats result from the exposure of two different frequency sounds, placed at each of a person's ear, from the human brain interpretation. It has been concluded that as long as "binaural beats do not exceed 30Hz, they generate a pleasant state"[14]. Why 30Hz? Because they have also been researched by scientist Edwards Sherry, who found that if 2 sound waves placed at an individual's ears are the multiples of a certain number, they will generate similar frequency brain waves.

Hemi-sync represents the use of nervous centers where neurons of both brain hemispheres are simultaneously activated. Cognitive psychology specialists have discovered that we are much more efficient if we use both brain hemispheres when we do certain things. The best example is maybe learning. We learn easier if we visualize, hear, and create a mental movie of what is going on, and in order to carry out these activities that are subordinated to the learning process, we need both brain hemispheres. Hemi–Sync was developed by Robert Monroe and it became an American registered trademark that helps produce binaural beats through metamusic, which has been used for life quality enhancement purposes: better sleep quality, emotional balance, and onset of various desired consciousness states, specific to the various activities: sleeping, meditation/reverie, learning, etc, for more than 40 years. Apart from this patent, variants using the same discoveries were generated: Brain-Sync is another, more recent patent, created by Kelly Howell and Michel J. Gelb. A special category of the discoveries focuses on the way in which music influences a child's life.

3. Music, emotions, and personality traits

Television industry uses all available information on the brain. It should be noted that our brain is not only influenced by music, but also by images. "The right brain hemisphere is twice more active while we are watching TV, which generates high endorphin release rates, and turns us into television addicts. In addition, the neocortex activity is inhibited and the activity of the primitive brain formations

[14] R.C. Filimon, *Beneficial Subliminal Music: Binaural Beats, Hem-Sync and Metamusic*., published in the vol. of the International WSEEAS Conference: Recent Advances in Acoustics & Music, accessed on December 15, 2011, at http://www.wseas.us/e-library/conferences/2010/Iasi/_AMTA/AMTA-18.pdf.

responsible for the survival and reproduction process is stimulated. In front of the television set, our brain is not capable to distinguish fiction from reality, and it will thus produce pleasure or stress hormones depending on the action on TV. This probably is the reason why soap operas are so successful, but there are repercussions - the excessive stimulation of the limbic system to the detriment of the neocortex leads to the atrophy of the latter" [15]. And because the right hemisphere is not very attentive to content, when we watch television, we retain very little information: let us think about certain movies we watch and if we were to watch them again after a certain period of time, we would be surprised to find the little we remember of them. Let us think about what happens when the image is doubled by the sound? It becomes even more significant for the right hemisphere and leads to the intensive generation of various types of pleasure or stress hormones that determine certain moods. We sometimes pick the music we want to listen to depending on our momentary mood, just like other times, music is the one to influence our mood.

Music practically activates the front part of the brain, and generates incredibly pleasant emotions described as "thrills". As the "emotional response when we listen to music is generated, the pressure of the brain blood in the following formations: amygdala nucleus, orbitofrontal cortex, ventral striatum, midbrain, and prefrontal cortex also changes. All these areas are activated when we talk about emotions, compensation or emotions, whether we listen to music or do other pleasant activities"[16] and they determine an intensive activity at the level of the right hemisphere. "Unpleasant music, on the other hand, stimulates the cingulate gyrus that is activates whenever a conflict or emotional disappointment is envisaged"[17] such as disappointing love story, or even the feeling generated in the case of all forms of social rejection.

Jan Rentfrow and Sam Gosling, alongside other researchers, draw attention on the fact that the music we listen to offers information on our personality. "Country music fans are more emotionally stable, more outgoing, and assertive, whereas pop music fans are very likely to be extrovert, conventional, honest, hardworking, and with high self-esteem, but low creativity and some level of inflexibility. Rap fans and rockers are more aggressive and violent?? By no means! Rappers have a high level of self-esteem, and they are outgoing, while rock fans are delicate, creative natures, but often introvert and, unfortunately, with a quite low level of self-esteem. Indie music fans are introverts, with a tendency to passiveness, educated, and

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[15] I.Alexe, *What does TV make out of us*,, in the magazine: Psychologies, issue 46, Printing House: Ringer Magazines, March 2013, p. 38-42;

[16] A. Blood, R.J. Zatorre, *Intensely pleasurable responses to music correlated with activity in brain regions implicated in reward and emotion*, published in: Proceedings of the National Academy of Sciences of the United States of America, vol. 98, issue 20, Washington, 2001, p. 11818-11823, accessed on October 23, 2011 at: http://www.pnas.org/content/98/20/11818;

[17] M.J. Tramo, *Biology and Music. Music of the Hemispheres*, published in Sciences Magazine, vol. 291, issue 5501, published by Science Magazine Organization, 2001, pp. 54-56, accessed online on November 25, 2011 at: http://www.sciencemag.org/content/291/5501/54.

creative, but not as hardworking and delicate, and with a low self-esteem. Classical music seems to be listened to by introverts, empathic to self and others, with a high level of creativity and good self-esteem"[18].

Pursuant to a survey on "77 de extrovert and introvert student, it has been found that the first more easily solve creative tasks when they listen to music, unlike the introverts"[19]. Langmeyer, Guilhor-Rudan, Tarnai concluded that "people open to novelty prefer complex and reflexive music, such as classical, intensive, and rebel music, and dislike conventional, high frequency music (such as rap or hip-hop); contrary to the previously described personalities, while extroverts prefer alert, conventional, and energetic music"[20]. The described survey was carried out on a sample of 422 young German people aged 21 to 26.

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