

Investigation of art and literature in the light of cognitive neuroscience (Neuroaesthetics) and medical anthropology: A qualitative library-based analysis

Seyyed Amir Yasin Ahmadi

Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran
yasin_ahmadi73@yahoo.com

Mohammad Almasian

Department of English Language, Lorestan University of Medical Sciences, Khorramabad, Iran

Jafar Rezaian *

Research Office for the History of Persian Medicine, Lorestan University of Medical Sciences,
Khorramabad, Iran

Corresponding author: jafarrezaian@gmail.com

+989392838309

Abstract

In the days of yore, art and aesthetics were highly regarded in the ancient world. The relation of art and mythology with metaphysics and psychology originated in the ancient Greece with Plato and Aristotle. This famous verse of poem, "With art, thou have lean gem 'n lean reason max / be firm sure with art spirit yours made relax" [in Persian], shows the chronic background of the importance of art and its impact on the psyche and the nervous system in Iran. Iranian philosophers were of the conviction that geometry was a part of mathematics in which the units are connected and fixed. Thus, the visual arts are the harmonized and musical forms and external manifestations of geometry. In the present article, we take it upon ourselves to explain the inter-disciplinary relationship of linguistics, literature, art, mythology and aesthetics with added emphasis on the neuroscientific and psychiatric aspects. Neuroaesthetics is the study of brain-response to art and aesthetic stimuli, and is derived from cognitive neuroscience. Myths play an important role in most parts of neuroscience. The neuroaesthetic perception of art and music is attributed to the mirror neurons. Thus cognitive neuroscience investigates how art works perform their perceptual and aesthetic stimulatory functions in brain. Neurotransmitters connect the software and hardware of the nervous system. Since there is a correlation between these materials and the reward pathways - related to the prefrontal cortex and the limbic structures - it seems that aesthetic stimuli may be dopaminergic. Thereby, further original studies in the future are needed.

Keywords: linguistics, psychiatry, cognitive science, neurosciences, medical anthropology, history of medicine.

Running title: Neuroaesthetics

Introduction

Medical anthropology is an integration between the medical sciences and humanities which consists of anatomical features of individuals in different ethnicities (Nikitiuk, 1980), molecular variations in the immune systems of individuals in different ethnicities (Varzi, Shahsavar, & Tarrahi, 2016), etc that one of them is the ethical, ethnical and religious beliefs of the ethnicities from the viewpoint of neuroscience.

Disagreement and altercation has been common among scientists from the ancient times. In fact, different insights come from different viewpoints. Different viewpoints are necessary in research and they enable us to imagine an outline of the concepts from various dimensions. The only key to achieve this aim is inter-disciplinary studies. Neuroaesthetics is one of the inter-disciplinary sciences that we intend to introduce briefly, because the journal has never before published a paper about this branch of neuroscience.

Research methodology

The present original study is a qualitative library-based analysis. We have used some Persian poems which do not appear in the reference list, because they are not traceable in scientific search engines; but you can search the names of these bards and their poems and find them in traditional (non-electronic) libraries in Persian. All the poems of this paper were originally translated by the authors Ahmadi and Almasian and you can use them in your papers only if you refer to this article correctly.

Results and discussion

The relation of art and mythology with metaphysics and psychology originated in the ancient Greece with Plato and Aristotle (Dutton, 2003). Psychology should not be separated from aesthetics because of its impact on the learning processes in the mind (Morse, 2014). Concepts such as the soul and religion have developed from and been expounded via mythology. Jung counts psychology and mythology as the only ways of representing religion (Drob, 2005). The difference between mythology and science is that if a person can comprehend the philosophy of a subject, he/she approaches science, otherwise he/she approaches mythology (Mitroff & Turoff, 1973). But this thought is not completely correct; because mythology is not pseudoscience. It has been proved that aesthetics, mythology, and art are related to the physiology and anatomy of the nervous system.

Neuroaesthetics is the study of brain-response to art and aesthetic stimuli derived from cognitive neuroscience (Beitmen, 2014). Myths play an important role in most parts of neuroscience. E.g. Freud utilized myths like Oedipus Rex for mental modelling of his ideas (Trubshaw, 2004). Also myths such as left brain / right brain resulted in progression of neuroscience (Waldman, Balthazard, & Peterson, 2011). Neuroaesthetic perception of art and music (SEELEY) is attributed to mirror neurons (Beitmen, 2014). Thus cognitive neuroscience investigates how art works perform their perceptual and aesthetic stimulatory functions in the brain.

PHILOSOPHICAL AND MUSICAL ASPECTS

In the Iranian past philosophy, mathematics falls into four categories; connected and mobile (astronomy), connected and fixed (geometry), disconnected (algebra) and harmonized disconnected (music) (Safvat, 2007). Mystics are of the conviction that mankind's mind innately loves converting entropy into unity. Music also converts dispersion of different sound waves into unity as a melody, etc.

From the perspective of cognitive neuroscience, musical comprehension of mind is related to mirror neurons (Beitmen, 2014). The positive effects of music therapy in autistic children prove the existence of this relation (Edgerton, 1994) (because autism is associated with impaired mirror neurons (Williams, 2008)).

LITERATURE AND ART IN THE LIGHT OF LINGUISTICS AND NEUROAESTHETICS AS TWO PARTS COGNITIVE SCIENCES

Based on Heidegger's conviction (Nail, 2013), most of the Western bards such as Shakespeare and Goethe are considered as celestial bards as Iranians regard Hafiz and Rumi. Celestial bards are poets who were introduced in the Holy Quran as the defenders of the meekness of the human race.

So we have translated two verses of the sage of Persian bards Ferdowsi into English with emphasis on observing the prosody and rhymes. In English literature, the prosody is based on stress of the syllable; but in Persian literature, duration of the vowel in the syllables makes prosody.

From the days of yore, art has been one of the leitmotifs of poetry in the ancient world. The Iranian art has always been celebrated in history and the bards, sages, and philosophers were aware of its impact on the psyche and the nervous system. Our sage and bard, Ferdowsi has pointed out that:

**At this time, on this thought please testify
On this thought, arts more than gem certify
With art, thou have lean gem 'n lean reason max
Be firm sure with art spirit yours made relax**

We've employed the word "thou" instead of "you", because we wanted to use a stressed syllable. In addition, "reason max" means the peak of reason and wisdom.

**If man wanna go back to the field, don't be freed
Oh please seek the real art and don't eke the greed**

**The art seeker who's pious who's clever chose
You so wanna chance yours divine never loose**

ANATOMY AND PHYSIOLOGY OF NEUROAESTHETICS

Among the cognitive sciences, cognitive neuroscience needs further studies, because its findings are unfortunately just holistic and only a few researchers like Prof. Semir Zeki found the exact anatomy and mechanisms of specific mental phenomena. E.g. these parts of the brain are associated with aesthetics and mythology (Kawabata & Zeki, 2004; Ramachandran & Hirstein, 1999; Zeki, 2001):

- 1- Visual cortex 1 (V1): because of visual and optic perception.

- 2- Limbic structures: because of some emotional messages [and reward pathways].
- 3- Prefrontal cortex: because of the perception of the colors of objects [and reward pathways].
- 4- Orbito-frontal cortex: because of being related to beauty or obscenity judgements.
- 5- All parts of the brain related to musical perception. (SEELEY)
- 6- All parts of the brain related to mirror neurons. (Beitmen, 2014)

Despite the existence of previous studies about the anatomical aspects of neuroaesthetics, we need further investigations and research about the role of neurotransmitters; these chemical substances play a connecting role between the software and hardware of the nervous system. Two famous and effective neurotransmitters are dopamine and serotonin. Since there is a correlation between these materials and reward pathways - related to the prefrontal cortex and the limbic structures (Kawabata & Zeki, 2004; Ramachandran & Hirstein, 1999; Zeki, 2001) - it seems that aesthetic perception may be dopaminergic.

About the serotonergic effect of art and aesthetic stimuli, we should investigate whether mirror neurons are serotonergic or not. We've had a brief systematic review about Autism- related to impaired mirror neurons (Williams, 2008) - to reach the purpose.

Since about 30% of individuals with autism have hyperserotonemia (Veenstra-VanderWeele et al., 2012), apparently serotonin is harmful and can intensify the symptoms of the patients; but it's not all the story and is still controversial. In the cited references, hyperserotonemia is defined as total blood serotonin level. We know that blood serotonin originates from platelet serotonin and it originates from the gut (enterochromaffin cells) serotonin (Donnerer, 2006). On the other hand, in another research, capacity of *cerebral* serotonin synthesis level in children with autism was 1.5 times of adults and in non-autistic children was 2 times of adults (Chugani et al., 1999). So there should be a difference between the effects of blood and brain serotonin. Based on the next reasons and findings, we are of the conviction that individuals with autism have shortage of brain serotonin secondary to impaired mirror neurons only as a hypothesis for future researchers:

- 1- Some symptoms of autism are similar to OCD (Obsessive Compulsive Disorder) symptoms like obsessions, repetitive behaviors, rituals and the desire to hoard old things, and are relieved by SSRIs (Serotonin Selective Reuptake Inhibitors) (Devlin et al., 2005; Nakamura et al., 2010).
- 2- Brain serotonin is independently synthesized by tryptophan and includes less than 10% of the total serotonin of the body (Sholehvar, Takhshid, & Rafiei, 2013).
- 3-

Conclusion

At the end of the paper we say that art is a miracle for our spirits and we need it more than before. The spread of depression and obsession is the result of the short level of the neurotransmitter serotonin and art theoretically seems to be a serotonergic or dopaminergic phenomenon which can heal our psyche's spiritual problems. We should take it upon ourselves to conduct interdisciplinary original studies in the future.

Acknowledgements

Present study is supported by Research Office for the History of Persian Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran.

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References

- Beitmen, L. R. (2014). Neuroscience and Hindu Aesthetics: A Critical Analysis of VS Ramachandran's "Science of Art".
- Chugani, D. C., Muzik, O., Behen, M., Rothermel, R., Janisse, J. J., Lee, J., & Chugani, H. T. (1999). Developmental changes in brain serotonin synthesis capacity in autistic and nonautistic children. *Annals of neurology*, 45(3), 287-295.
- Devlin, B., Cook, E., Coon, H., Dawson, G., Grigorenko, E., McMahon, W., . . . Spence, M. (2005). Autism and the serotonin transporter: the long and short of it. *Molecular psychiatry*, 10(12), 1110-1116.
- Donnerer, J. (2006). *The chemical languages of the nervous system: history of scientists and substances*: Karger Medical and Scientific Publishers.
- Drob, S. L. (2005). Giegerich and the traditions: Notes on reason, mythology, psychology and religion. *Journal of Jungian Theory and Practice*, 7(2), 61-73.
- Dutton, D. (2003). Aesthetics and evolutionary psychology. *The oxford handbook for aesthetics*, 693-705.
- Edgerton, C. L. (1994). The effect of improvisational music therapy on the communicative behaviors of autistic children. *Journal of music therapy*, 31(1), 31-62.
- Kawabata, H., & Zeki, S. (2004). Neural correlates of beauty. *Journal of neurophysiology*, 91(4), 1699-1705.
- Mitroff, I. I., & Turoff, M. (1973). Technological forecasting and assessment: science and/or mythology? *Technological Forecasting and Social Change*, 5(2), 113-134.
- Morse, D. (2014). Learning Styles: Psychology Shouldn't Condone Mythology. *SOJ Psychol* 1 (2): 2. *Learning Styles: Psychology Shouldn't Condone Mythology*, 32-35.
- Nail, B. W. (2013). Bards of Prayer: Liturgical Reveling and Gift in the Music of Sam Amidon and Alasdair Roberts. *Literature and Theology*, 27(4), 395-413.
- Nakamura, K., Sekine, Y., Ouchi, Y., Tsujii, M., Yoshikawa, E., Futatsubashi, M., . . . Suzuki, K. (2010). Brain serotonin and dopamine transporter bindings in adults with high-functioning autism. *Archives of general psychiatry*, 67(1), 59-68.
- Nikitiuk, B. (1980). [Anatomy and anthropology]. *Arkhiv anatomii, gistologii i embriologii*, 79(9), 5-14.
- Ramachandran, V. S., & Hirstein, W. (1999). The science of art: A neurological theory of aesthetic experience. *Journal of consciousness Studies*, 6(6-7), 15-51.
- Safvat, D. (2007). *Philosophy of music* Tehran: Ketabsarayenik.
- SEELEY, W. P. ART, AESTHETICS, AND COGNITIVE NEUROSCIENCE.
- Sholehvar, F., Takhshid, M. A., & Rafiei, M. (2013). Review of Metabolism, Transport and Role of Serotonin in the Body and the Relation between Serotonin and Diseases. *Journal of Fasa University of Medical Sciences*, 3(1), 9-17.
- Trubshaw, B. (2004). From Psychoanalysis to cognitive linguistics: psychology and the study of folklore and mythology: Retrieved.
- Varzi, A. M., Shahsavari, F., & Tarrahi, M. J. (2016). Distribution of HLA-DRB1 and HLA-DQB1 alleles in Lak population of Iran. *Human immunology*. doi: 10.1016/j.humimm.2016.05.011
- Veenstra-VanderWeele, J., Muller, C. L., Iwamoto, H., Sauer, J. E., Owens, W. A., Shah, C. R., . . . Thompson, B. J. (2012). Autism gene variant causes hyperserotonemia, serotonin receptor hypersensitivity, social impairment and repetitive behavior. *Proceedings of the National Academy of Sciences*, 109(14), 5469-5474.

- Waldman, D. A., Balthazard, P. A., & Peterson, S. J. (2011). Leadership and neuroscience: Can we revolutionize the way that inspirational leaders are identified and developed? *The Academy of Management Perspectives*, 25(1), 60-74.
- Williams, J. H. (2008). Self–other relations in social development and autism: multiple roles for mirror neurons and other brain bases. *Autism Research*, 1(2), 73-90.
- Zeki, S. (2001). Artistic creativity and the brain. *Science*, 293(5527), 51-52.