

REVIEW



Analysis of Stress Level Through EEG and Its Management with Special Reference to Unani Principles

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The physical and mental health of the members of society is an important measure of development. With every aspect of life, Stress is a major problem now-a-days which is associated with a large number of mental and physical disorders. It is the need of the hour that the proper stress analysis should be done and the treatment of stress is incorporated. The Mizaj is also an important measure of a healthy living which is also related to psychological conditions like stress relaxation. With emerging technology of Biomedical Engineering, it is now easily possible to regularly analyze, monitor and take care of treatment of stress in a more organized way than earlier. The stress level may be measured with tests such as EEG and the treatment to improve stress levels is adopted with regular monitoring of the stress level by measuring the brain signals. Improvement in stress levels will indicate the correct direction of treatment and no improvement will indicate that the mode of treatment has to be changed.

Key words: Stress, EEG, Unani Tibb

In this modern world where we are approaching towards a better tomorrow with ongoing development and increasing workload, there is immense need of such a healthcare system which would take least time and provide better health assurance. Although conventional systems of treatment are getting advanced day by day, but there is still a gap in the technological advancement of traditional ways of medicine. The traditional ways of medicine like Unani Tibb, Ayurveda, Chinese traditional system of treatment, etc. are the ones practiced from ancient times and these have astonishing effects on human health. With the course of time, we are getting busy day by day having less time for health consideration leading to a variety of diseases and as a result we are bound to get hospitalised or if we are not then getting some sort of disease which would create problem for the entire life not only to the person suffering but also to the nears and dears. Precaution is always better than cure. So, it is better to save us from these diseases from the very beginning than getting medication after having some chronic ailment. The traditional way of treatment we are concentrating upon is the Unani Tibb. The Unani Tibb has infinite boundaries of treatment whether we talk about tadaabeer, mufridaat advia or muraqqabaat. The Unani tibb include the examination of diseases, find its cure from the above methods and ensure the treatment in an effective manner by any of them or a combination of two or more. The Unani methodologies are effective but sometimes take more time and it sometimes become necessary to have a continuous observation on the progress of treatment. This could be easily done if some technological methods along with the normal techniques of tibb are combined. The technology is also getting advanced and this advancement has lead to the development of a new branch of engineering known as Biomedical Engineering which involves the application of engineering principles and problem solving skills to medical field in order to improve healthcare diagnosis, monitoring and therapy.

Along with a variety of physical ailments there are lot of mental disorders that are taking the human being into hands. These mental disorders can even lead to more

problematic physical conditions to one's health. The causes of mental disorders may vary from patient to patient and it can be due to any problem associated with the condition of patient or related with his/her family, society, health, career, etc. Moreover, mental problems such as over-thinking, stress, depression, dizziness, etc. may cause problems associated with respiratory, muscular, skeletal or neural system. There are various bioelectric signals generated as the result of a variety of functions performed by different body organs such as heart, brain and muscles. These bioelectric signals could be easily read and interpretations about a person's health could be easily made. Regular monitoring of these bioelectric potentials can help in regular diagnosis and monitoring of a patient along with the treatment going on. Variation in any figure will indicate the person's condition any depending on the type of variation; the direction of treatment could be modified. In this way we can improve the quality of treatment, that too in less time and confined results of our interest.

METHODOLOGY

This work on the analysis of stress level through EEG and its management with special reference to Unani principles was organized from various databases such as PubMed, Scopus, Google scholar, and Research Gate. The Unani classical texts were search through, mainly "Kamilus Sana" and "Al Qanun fil Tibb" (Canon of Medicine). The information obtained through this search is discussed and presented in this review paper.

Stress Measurement Using EEG

As we all know that the brain EEG signals are the measure of electrical activity of the brain. There are different bands of EEG signals that are associated with different functions performed by us. By analysing these bands of signals we can interpret the situation of one's mind as well as body. Any variation from the standard values will give the measure of the mental as well as the physical problem associated with the person under observation. Below is the description of different signals of brain and the functions they are related with.

Delta waves: These signal waves have the

frequency ranging from 0 to 4 Hz. These signals are associated with the stages of relaxation and sleeping activity of the brain. Optimum amount of these brain signals will help to maintain better cognitive immune health, better relaxation and sound sleep. High or low level of these brain waves will lead to sleeping disorders, learning problems, disturbance in sleep, etc. Research studies have also focussed that the required amount of these waves will help to improve the functions of cardiovascular and digestive systems.(Kumar & Bhuvanewari, 2012)

Theta waves: These waves are associated when the person is awake but in a state of deep relaxation like in case of a nap or when feeling sleepy. They have a frequency ranging from 4 to 8 Hz. Appropriate amount of these waves incorporate proper emotional balance as well as creativity skills of one's mind. If the levels of these got imbalanced then it can lead to development of stress, anxiety and even depression. Moreover, emotional power of a person is affected along with the laziness of one's mind activity.(Kumar & Bhuvanewari, 2012)

Alpha waves: These EEG signal waves are of the range 9 to 13 Hz and are associated when we are not in sleep but finely relaxed. These waves help us to get calm and relaxed and improved mind's ability to handle anything with mental state of peace. More or less amount of these will cause increased amount of daydreaming, anxiety, disturbance in relaxation and sometimes forgetfulness.(Kumar & Bhuvanewari, 2012)

Beta waves: The beta waves have the frequency from 14 to about 30 Hz and are responsible for attentiveness, good memory, and problem-solving capability. Inaccurate amount of these waves will cause a rift in memory and problem-solving skills. More than this it can lead to reduced or increased secretion of adrenaline, causes anxiety, stress, depression and it would not be wrong if I say that the cognitive strength of patient is affected much and memory loss could be a result.(Kumar & Bhuvanewari, 2012)

Gamma waves: The waves having a frequency more than 30 Hz are called gamma waves. They are related with the high attentive cognitive functions and complex problems which require high level of mental

performance. Reduced or increased level of these signal waves will cause problems and ailments associated with memory, attention, handling a situation, high level of anxiety and depression which can even create a feeling of self-harm such as committing suicide, etc.(Fell et al., 2010)

These all EEG signal waves discussed above are associated with patient's mental as well as physical condition of well-being. These signal waves could be measured easily and attributed to the stress levels in a most confined scientific manner. Any variation in the amplitude, frequency, standard waveform, etc. will indicate the level of stress. Subsequently, after the stress levels are measured these can be categorized according to the patient's condition, the environment in which he/she lives in, the type of work patient does and a number of factors. These can be correlated easily with different physical and mental ailments and hence, the direction of proper treatment is taken into account. (Kumar & Bhuvanewari, 2012)

Effects of Stress and Mizaj

The mental stress is the root cause of a large number of mental as well as physical ailments. If we can control the stress level or in other words if we can reduce the mental stress of the person then he or she could be saved from a large number of diseases. Moreover, the stress is much related to the temperament and humour of any person.

As we all know, the Unani Tibb is one of the oldest forms of medication system. Its sole motive is to provide better health care whether it is curing of ailments or maintaining good health. Mizaj is one of the seven important factors called as *Umoor* which are responsible to ensure a healthy life. If the *Mizaj* of a person is affected then ultimately the health will be affected. The subcategory of *Mizaj* which is responsible for a person's mood is called as *Infalat-e-Nafsania* (the psychic reactions). The *Mizaj* and *Akhlat* i.e., the temperament and humour of a person are much more responsible for a person's healthy when we talk about the stress.

The philosophy of Unani medicine is founded on the humoral idea of four body fluids: *dam* (blood), *balgham* (phlegm), *safra* (yellow bile), and *sauda* (black bile).

According to Unani Medicine stress is a result of unwanted combustion of particular humour.

All changed varieties of humour are collectively referred to as *Sawda Ghayr Tabiyya* (altered black bile), which has a *Barid yabis Mizaj* (cold and dry temperament). (Kausar et al., 2021)

Ihtiraq (Unwanted combustion) of *balgham* (phlegm) results in the production of the aberrant humour *Sawda Balghamiya*, while *Ihtiraq* (Unwanted combustion) of yellow bile, produces *Sawda Safrawiyya*, *Ihtiraq* of normal black bile produces *Sawda Sawdawiyya* and *Ihtiraq* of blood produces *Sawda Damwiyya*. (Al-Shaikh Al- Rais Abo Ali Al-Husain Bin Abdullah Bin Sina, 1993)

The study carried out by Florence Deguire et. al have shown that stress causes the over-activation of the hypothalamo-pituitary-adrenal axis which in turn will have adverse effects on the memory and learning ability of children and young people. (Deguire et al., 2019)

Similarly, another work done by Yoorim Choi et. al. have shown significant effects of the environmental conditions on the stress levels and hence, the health of the person living in that environment. (Choi, Y., Kim, M., & Chun, 2015) There were a number of elements present in that environment such as temperature, humidity, etc. which would affect the stress levels. Climate chambers were set up and these factors were controlled to maintain twelve different types of environments. The subjects i.e., the people under study were kept in these different chambers and their stress levels were measured with the help of paper based and EEG tests. It was found that the beta waves were present in levels in the temporal region of brain when the persons were exposed to the high temperature (30 °C or more), high noise, odour, etc. and as a result the stress levels were also high.

Similarly, one more study was done by Ronald N. Goodman et. al. which focussed on the regulation of cognitive strength and emotional strength of a person. Their work was much more based on the trait and state asymmetry of the alpha band in the frontal regions of brain. The subjects were exposed to various levels of emotional stress and the alpha waves in left and right

frontal lobes were measured. Some important factors such as blood pressure, heart rate, EEG, etc. were measured under three different stress levels. It was found that the participants who were having high levels of asymmetry show considerable amount of emotion regulation during high levels of stress we can say during shocks. (Goodman et al., 2013)

In a work done by S.M. Ahmer et. al, it was concluded that the *Mizaj* is the internal quality of one's health which depend upon the psychological condition of the person along with other conditions such environment and surrounding factors, working conditions, etc. If the *Mizaj* of a person is not normal then it will ultimately affect his mental as well as physical health. (Ahmer et al., 2015)

From the above reviews, we can interpret that the *Mizaj* is the measure of healthy living of a person which along with other factors is also affected by the psychological condition of the person.

Treatment of Stress in Context of Mizaj and Analysis with the of EEG

Depending on the level of stress, many approaches to stress management can be used. At initial level, simply the lifestyle modifications will be able to reverse it; but, if it is chronic conditions, pharmacological therapy will also be needed to correct the hormone level in addition to lifestyle modifications. The practise of Unani is crucial in the management of stress. By managing stress naturally, it aids in achieving optimum health and tranquilly of mind. There are several methods that Unani addresses stress through *Ta'dil-o-Tabdil-e-Mizaj* (temperamental equilibrium / alteration).

Employing *Nafsiyati tadabeer* (psychological measures) and the administration of *muqawwi dimagh* (brain tonics), *Mufarrihaat* (Exhilarants), *Tila* (Head Massage with oils), and *Shumoom* (Inhalation). (Fazil & Khan, 2020)

Sleep plays a crucial and essential role in the management of stress. *Roghan badaam shirin* (sweet almond oil), and compound formulations like *Sharbat Khashkhaash* are useful for promoting sleep due to its sedative and tranquillizing effects, when taken orally. *Roghan kahu* (lettuce oil) for local application on head

may also use for induce sleep.(Al-Shaikh Al- Rais Abo Ali Al-Husain Bin Abdullah Bin Sina, 1993)(Majoosi, 1889)

The best way to prevent constipation is to consume figs or warm milk at bedtime that has been sweetened with honey. In addition, ingesting two teaspoons of sweet almond oil with warm water or milk.(U. et al., 2009)

Ibne Rushd has advocated *Dalk layyn* (gentle massage), *Riyazat* (mild exercise), long sleep, and *har-ratab* foods for relieving the tachycardia, palpitation, and thirst.(Itrat & Zulkifle, 2014)

Riyazat (exercise) is one of the most effective regimenal therapy for relieving stress. Exercise aids in the maintenance of *Akhlat-e-Arba* (humour) equilibrium, which means it keeps the body in a state of homeostasis. It enhances the *hararat-e-ghareeziya* (Innate heat), which is responsible for the metabolic function.(Wang & Xu, 2017)(Majoosi, 1889) *Riyazat* (exercise) is also helpful for the management of *Nisyan* (amnesia).(Anis-ur-Rehman, Saad Usmani, 2007)

According to Ibn Hubal Baghdadi (1121–1213 AD), *faşd* excretes completely all harmful matter lurking in the blood. That is why *Fasd* (venesection) is given extreme importance in the Unani medicine system for disease prevention and health restoration. *Fasd* (venesection) is a general method for body cleaning from abnormal humour.(Eghbalian et al., 2019)

Hijama (Cupping therapy) is one of the oldest medicinal methods that has been documented. It is an ancient approach for treating and curing a wide range of diseases, including, mental and physical relaxation, hypertension, liver diseases and other diseases.(Niasari et al., 2007)

Munzijaat (concoctives), followed by *mushilaat* (purgatives) are the primary methods for *tanqia mawad* (evacuation of affected humour) and *fasd* (phlebotomy) is a secondary method for removing the morbid humour. (Ahmed et al., n.d.)

➤ Patients should avoid staying in cold and dry environmental conditions for long. Seashore and coastal areas are beneficial for their health.

➤ Patients should avoid old, dry and stale food,

excessive beans, nuts, astringent foods, peanuts, tomatoes, brinjal and rancid fats are harmful for them even in small quantities.

➤ Tea, coffee and artificially flavored drinks should be avoided.

➤ *Har-Ratab* foods should be given to these persons like *Anjeer, Maveez, Chana, Lobiya, Apple, Anar shirin, ginger* etc.

➤ Patients should go to bed early for 6–8 hours night sleep.

➤ Patients should drink at least 2-3 litres of water daily.

➤ Bodily wastes like urine and stool should never be suppressed.

➤ *Sauda* (black bile) should be evacuated from the body. For this purpose, *haleelajat* and *bisfajj* should be used.(Mohammad Zakariya Razi, 1991)

The EEG waves were recorded before starting our treatment procedure. Since we have to measure it daily then we must have proper information about the standard values of the frequency and amplitude of various signal waves. Again, and again the recorded signals are analyzed and rate of improvement is noted. If the rate of improvement is high then the procedure must be continued and if it is too low then some other medicines or methodologies must be adopted. Once a successful result is obtained then it will be improved with combining it with some other methods and medicines.

CONCLUSION

A large number of research articles have shown different effects of stress on different body systems in different ways. From all the studies carried out, it is clear that the increased level of stress from the prescribed limits will cause havoc for human health. Traditional medicinal systems especially Unani Tibb has astonishing effects in improving the stress levels. Recent works have proved that in some cases the Unani tibb has greater curing ability than any other form of medication in cases of high stress levels. It can also be concluded that if the Mizaj (temperament) is controlled by maintaining the stress levels to bearable values then a healthy living with improved cognitive skills can be assured. Moreover, the measurement can be easily

done with the help of modern technology i.e., EEG. So, finally combining both the aspects i.e., Unani medication system with modern biomedical measurement and analysis techniques can make our work easily and give better result than they were in past.

FUTURE WORK

Recent studies have shown that controlling the level of stress can maintain a healthy *Mizaj* (temperament) of a person. Not only this, it will prove to be helpful in the cure of several harsh ailments such as anxiety, depression, loss of memory, daydreaming and a variety of mental disorders and physical health problem associated with respiratory, musculoskeletal, neural, or cardiovascular system. If we talk about the proper direction of our research then we will talk to some participants who are obviously stress patients to participate in our study. No doubt it will help them also. We will measure their stress levels on daily basis and start the stress level management through the traditional way of Unani Tibb keeping in mind about the maintenance of *Mizaj*. The stress will be measured with the help of EEG analysis. Once we will get the EEG signal waves then we will perform quantification of the parameters responsible for stress. Depending on the condition and time frequency based or time-based parameters will be explored, filtering and other data acquisition will be done and classifiers will be used to categorize the stress levels and associate them with the method and medicines due to which the stress level seems to get reduced.

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CONFLICTS OF INTEREST

The authors declare that they have no potential conflicts of interest.

REFERENCES

Ahmed, N. Z., Alam, A., Khalid, M., Sheeraz, M., & Qamri, M. A. (n.d.). An Insight on Malankholia (Melancholia): Unani Perspective ASBAB-E-MARZ

(ETIOLOGY) Buqrat stated that when there is Harart and Yabusat of fawad. 600013, 140–146.

Ahmer, S. M., Ali, F., Jamil, A., Ahmad, H., & Javed, S. (2015). Mizaj: Theory of Greko-Arabic Medicine for Health and Disease. *Asian Journal of Complementary and Alternative Medicine*, 3(6), 1–9.

Al-Shaikh Al- Rais Abo Ali Al-Husain Bin Abdullah Bin Sina. (1993). *Al Qanun Fil Tibb* (English Translation of the Critical Arabic Text (ed.); 1st ed.). Deptt. of Islamic Studies, Jamia Hamdard.

Anis-ur-Rehman, Saad Usmani, A. A. (2007). The Role of Riazat-e-Khafeefa in the Management of Nisyan. *Unimed Kulliyat, III(I)*, 33–34.

Choi, Y., Kim, M., & Chun, C. (2015). Measurement of occupants' stress based on electroencephalograms (EEG) in twelve combined environments. *Building and Environment*, 1(88), 65–70. <https://doi.org/https://doi.org/10.1016/j.buildenv.2014.10.003>

Deguire, F., Thébault-Dagher, F., Barlaam, F., Côté, V., Knoth, I. S., Lafontaine, M.-P., Lupien, S., & Lippé, S. (2019). The relationship between acute stress and EEG repetition suppression in infants. *Psychoneuroendocrinology*, 104, 203–209. <https://doi.org/https://doi.org/10.1016/j.psyneuen.2019.03.004>

Eghbalian, F., Mohammadi Kenari, H., Kordafshari, G., Karimi, M., Atyabi, A., & Shirbeigi, L. (2019). The Role of Phlebotomy (Fasd) and Cupping in the Treatment of Epilepsy from Perspective of Persian Medicine. *Iranian Journal of Public Health*, 48(7), 1392–1394. <https://doi.org/10.18502/IJPH.V48I7.2977>

Fazil, M., & Khan, A. A. (2020). Mental Health through Unani Medicine. *ACTA Scientific Neurology*, 3(9), 63–71.

Fell, J., Axmacher, N., & Haupt, S. (2010). From alpha to gamma: Electrophysiological correlates of meditation-related states of consciousness. *Medical Hypotheses*, 75(2), 218–224. <https://doi.org/https://doi.org/10.1016/j.mehy.2010.02.025>

- Goodman, R. N., Rietschel, J. C., Lo, L.-C., Costanzo, M. E., & Hatfield, B. D. (2013). Stress, emotion regulation and cognitive performance: The predictive contributions of trait and state relative frontal EEG alpha asymmetry. *International Journal of Psychophysiology*, 87(2), 115–123. <https://doi.org/https://doi.org/10.1016/j.ijpsycho.2012.09.008>
- Itrat, M., & Zulkifle, M. (2014). A Temperamental Approach in Promotion of Health. *Medical Journal of Islamic World Academy of Sciences*, 22(2), 102–106. <https://doi.org/10.12816/0008179>
- Kausar, F., Yusuf Amin, K. M., Bashir, S., Parvez, A., & Ahmad, P. (2021). Concept of 'Ihtiraq' in Unani Medicine – A correlation with oxidative stress, and future prospects. *Journal of Ethnopharmacology*, 265, 113269. <https://doi.org/https://doi.org/10.1016/j.jep.2020.113269>
- Kumar, J. S., & Bhuvanewari, P. (2012). Analysis of Electroencephalography (EEG) Signals and Its Categorization—A Study. *Procedia Engineering*, 38, 2525–2536. <https://doi.org/https://doi.org/10.1016/j.proeng.2012.06.298>
- Majoosi, A. I. A. (1889). *Kamilus Sana* (U. T. by G. H. K. Part-1 (ed.)). Matba Munshi Naval Kishore, Lukhnow.
- Mohammad Zakariya Razi. (1991). *Kitabul Mansoori* (Urdu Trans). CCRUM, New Delhi.
- Niasari, M., Kosari, F., & Ahmadi, A. (2007). The effect of wet cupping on serum lipid concentrations of clinically healthy young men: a randomized controlled trial. *Journal of Alternative and Complementary Medicine* (New York, N.Y.), 13(1), 79–82. <https://doi.org/10.1089/ACM.2006.4226>
- U., J., S., U., A., S., & M., I. (2009). Chronic stress in Unani prospective. *Internet Journal of Neurology*, 11(2), 1–6. http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L358600564%0Ahttp://www.ispub.com/journal/the_internet_journal_of_neurology/volume_11_number_2_7/article_printable/chronic-stress-in-unani-prospective.html LK - <http://sfx.library.u>
- Wang, Y., & Xu, D. (2017). Effects of aerobic exercise on lipids and lipoproteins. *Lipids in Health and Disease*, 16(1), 1–8. <https://doi.org/10.1186/s12944-017-0515-5>