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A NEUROANATOMOPHYSIOLOGICAL APPROACH TO THE "FORMATION & EXPRESSION" OF PERSONALITY & PSYCHOPATOLOGY

KİŞİLİK VE PSİKOPATOLOJİNİN "FORMASYONU & EKSPRESYONU"NA NÖROANATOMOFİZYOLOJİK BİR YAKLAŞIM

Levón Antikacioglu[*1], Nevzat Tarhan[1]

Abstract

Despite the advancements in neurosciences, there are still, only a few Personality Theories, making use of neuropsychology. In the present paper, we tried to propose a NeuroAnatomoPhysiological approach to the "Formation and Expression" of Personality and Pschopatology and discussed the possibility of formation of a new study area.

Keywords: Neuro-Anatomo-Physiological Basis of Personality-Psychopatology, functional connectomes, neuroimaging technologies, personality traits and disorders, cultural background and biases.

Özet

Bu makalede, nörobilimdeki tüm gelişmelere karşın, nöropsikoloji temelli Şahsiyet Teorileri'nin henüz çok az olduğuna dikkat çekilmiştir. Bu durumu dikkate alan yazarlar, yeni bir NöroAnatomoFizyolojik temelli "Şahsiyetin ve Psikopatoloinin oluşumu ve ekspresyonu" ile ilgili bir yaklaşım önermişlerdir. Ayrıca yeni bir çalışma alanının oluşabilme ihtimalini tartışmışlardır.

Anahtar Kelimeler: *Şahsiyetin ve psikopatoloinin Nöro-Anatomo-Fizyolojik Temelleri, fonksiyonel konnektomlar, nörogörüntüleme teknolojileri, Şahsiyet vasıfları ve bozuklukları, kültürel arkaplan ve peşin hükümler.*

[*1]Corresponding author: Faculty of Humanities and Social Sciences, Uskudar University, Turkey E-mail: levon.antikacioglu@uskudar.edu.tr
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1. Introduction

Centuries ago Galenus (Galen, 1938), related the personality, to bodily humors like "sanguine", "choleric", "melancholic" and "phlegmatic".

Since then several others, like Ernest Kretschmer (Kretschmer, E. 1925), linked personality to body forms like, Pyknic – Asthenic – Athletic – Dysplastic.

William Sheldon attempted to connect to Endomorph – Ectomorph – Mesomorph (somatic) types (Sheldon, W. H. 1940).

In modern times emerged more comprehensive Personality Theories based on biology.

Hans Eysenck began to study psychological traits and based them on biology. He based his Personality Theory, on the activation of the limbic system and reticular formation. Gave importance to the level of conditionability, and, distinguished the well-known extroversion-introversion, neuroticism and psychoticism dimensions (Eysenck, H. J. 1952).

Jeffery Alan Gray, based his bio-physiological theory of personality on three hypothetical brain systems: "behavioral inhibition", "behavioral activation" and "fight/flight system" and, emphasized the importance of their sensitivity to reinforcement (Gray, J. A. 2003; Corr, P. 2008).

C. R. Cloninger`s one instead, is a psychobiological theory. It is a "traits'" theory, which he extensively based on genetic, neurobiology, and neuropharmacology (Cloninger, C. R. at al. 1994).

The "Big Five Personality Traits Theory" (FFM: Five Factor Model) instead, partially is based on neurology. To test it, researchers conducted studies by neuroimaging techniques: In a study, they reported; "a personality trait of less openness have an accelerated loss of gray matter volume in the right inferior parietal lobule, compared with subjects with a personality trait of more openness" (Taki, Y. 2013).

In another one, researchers have tried to associate each of the five traits of FFM, with the volume of different brain regions and, they found supporting data, thus outlined the potential of "personality neuroscience" (De Young, C. G. 2010).

Even if they are not related to the FFM theory, there are several similar other studies also. But interestingly, it is remarkably striking that, almost all of the studies done to link MRI findings to personality traits, are connecting the findings, to very specific cerebral locations and/or to their activities.

For instance Davidson and Irwin, "emphasized the importance of PFC, its ventromedial and dorsolateral sector, in negative / positive emotions, and, amygdala in the perception of negative clues"(Davidson, R. J., & Irwin, W. 1999).

Canli, T. at al., trough a study which he conducted by fMRI, concluded that probably emotional experiences involve a complex network of interacting brain regions (Canli, T. 1999).

Canli, T. again, in another study that he made by fMRI, in which he tried to relate extroversion-introversion to cerebral specific locations, concluded that "This study provides direct evidence that personality is associated with brain reactivity to emotional stimuli, and, identifies both common and distinct brain regions, where such modulation takes place" (Canlı at. al. 2001).

Yet in another study Canlı (Canli, T. at al. 2002) by fMRI, measured amygdalas' response to happy faces. They noticed that "the specificity of the relation between extraversion and amygdala activation to happy expressions was supported in three ways: (i) Extraversion did not correlate significantly with activation to other emotional (angry, fearful, and sad) expressions; (ii) neuroticism did not correlate significantly with activation to any expression; and (iii) this correlation was the largest of all possible correlations among the "big 5" major personality traits factors (extraversion, neuroticism, openness, agreeableness, and conscientiousness) and all four facial expressions." (Canli, T. at al. 2002).

Völlm at al. in a study in which they made on Borderline and Antisocial Personality patients, said "active regions in the patient group showed a more bilateral and extended pattern of activation across the medial, superior and inferior frontal gyrus extending to the anterior cingulate" (Völlm, B. et al. 2004).

Again Canlı found that "E (Extraversion) and N (Neuroticism) scores are correlated with individual differences in the activation of the brain during cognitive affective tasks" (Canli, T. 2004).

In another one, the researchers sustained that the human orbitofrontal cortex is important for processing reward and punishment (Kringelbach, M. L., & Rolls, E. T. 2004).

Yang and Raine, " proposed that the emotional deficits are associated with impairments in the orbitofrontal cortex (OFC), anterior cingulate cortex (ACC), amygdala–hippocampus complex, and the insula, whereas antisocial behavior may be linked to deficits in the OFC, ACC, dorsolateral prefrontal cortex, and superior temporal gyrus." (Yang, Y., & Raine, A. 2008)

2. Discussion

As we have seen in the above mentioned ones and, in several other researches, scientists have attempted to relate the personality, or traits, or emotions etc. to specific cerebral locations' activities, and to some extent, also to their interaction.

Nevertheless we would rather assert that our traits or emotions or other personality components, "shouldn't be handled as made of some specific

isolated compartmental neuroanatomical modules only". Because intracerebral associative, short associative, commissural, projection fibers are all, secrets known by everybody (Luria, A.R. 1973). So, if in a given time, a certain personality trait's, attitude's, emotion's expression, is detected to be correlated with any cerebro-electrical discharge, we have to take for granted that, that focal point "must of course have simultaneous and/or consequential, and/or reciprocal interactions with other areas too, even if by our actual devices, they can pass unnoticed".

None of the above mentioned behaviors are reflexes; instead, they are learned expressions. And learning and performing cannot happen independently from the "entire CNS"; every single learning, and its performance, is proposed to be "strictly a systemic CNS issue" (Antikacioglu, L. 2015).

Therefore probably while the Hebbian theory is in action: " When an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased" (Hebb, D.O. 1949), when it is time to detect those metabolically changed and/or grown -bulked up- cells, by our actually used neuroimaging devices, in reality we are capable to detect "just the focuses" of those relatively more active connections. In the while, "the dispersed neurons, which are linked to those easily noticeable focal ones, which have already been established by metabolic changes / connections, are passing unnoticed". For the simple reason that, "their ramifications are too spread over a wide area and, are too tinny". This is perhaps the only simple reason of why, while we are presently detecting the active neural bunches easily and plainly, we are not yet capable of tracing neither the single neurons' activities, nor their endlessly ramified weak connections.

Another argument that should be taken in consideration is the "non-existing relation, between the variety of our psychological/ psychopathological/psychiatric terminologies, and the neurophysiological functioning principles": In other terms, the only truth is that, "what we describe through psychological, psychopathological and/or similar other concepts, jargons and terminologies, not surprisingly, do not have any corresponding, counterpart in neurophysiology": Because from the standpoint of the CNS, any word / attitude / cultural information / bias / maladaptive habit / emotional state or performance, "are just materials, converted (traduced) into electrical impulses and neurotransmitters, and executed, within the well-known neurophysiological principles". If the information surpasses the excitability threshold, the neurons get excited, neurotransmitters can be released, and, the information can be stored / transmitted / inhibited. Otherwise, the communication between neurons cannot occur. For neurophysiological principles, these are all that count. Thus, any concept in any sub-discipline of psychology, which is related to learning / forgetting / amnesia / symptom / syndrome, psychopathology, and psychiatry or similar, by our CNS, is handled by the "same neurophysiological principles".

So we propose that, if we were able to detect, through a new technology, while our organism is in "full action" oriented to some task or problem solving activity (not simply lied down as actually is done in present neuroimaging or EEG techniques), we would have seen in the skull, a "fabulously sparkling pathways, almost changing direction, speed, intensity and volume, at speeds of lightening". The image of such a continuously changing dynamic view, would be sufficient enough to confirm the fact that our substantial behaviors are part of an "entire CNS" and cannot be originated from, solely limited neuroanatomical regions, like Amygdala or Hypothalamus or Hippocampus or Cingular gyrus. Or perhaps what we need is not a new technology but simply, some better software, to better decode what the actual devices are detecting. In fact, it seems that news of implementing attempts, of different perspectives of analysis, are on the way (Dodero, L. at al. 2015).

By this way probably we would be able to identify endless "patterns of Functional Connectomes" corresponding to different "Psychological, Psychopathological, Psychiatric States, Personalities and Traits etc.". And perhaps it would even be possible, the emergency of a promising new discipline: "Psycho Connectomics or Psycho Connectomology", embracing several sub disciplines.

If the above mentioned hypothesis goes demonstrated, we can arrive to a neat result: "What we call personalities, traits, emotional, psychopathological states etc. are, nothing more than dynamically changing, but at the same time remaining within determined patterns and borders of, functional connectomes made of different intensity, volume, type and directions. This assertion in turn is also a hypothesis that can be verified or falsified, by the more sensitive forms of our present technology.

2.1. How Personality, Traits, Emotional States, Diseases are formed?

For some reason or another, from the very beginning of our conception, our genetic code begins to work. Simultaneously, a nature-nurture combination in a still unknown way to us, shapes our learning and CNS, and then donates "a sui generis" way of operation, to it.

So every individual acquires, either at his preparedness to perceive the external world, or

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in reacting to it, his / her "sui-generis functional connectomal pattern" [These should probably correspond to some extent, what Aaron T. Beck, (Beck, T. A., 1979.) describes, as "automatic thoughts", "main beliefs", dysfunctional thoughts" or all of them, as the targets in CBT.]. And any person, for instance, categorized as introverted, exposes "functional connectomal patterns" common to introverts, or if the person has a Narcissistic Personality disorder, shares common patters with other Narcissist Personalities. The same will be valid for obsessives or histrionics etc. Each individual belonging to a category, of course forms also his / her "proper personal differences".

Thus, we propose to assume that, "the persistence of a personality, and/or formations, manifestations of any psychological, psychopathological state, are no more than the manifestation of the tridimensional expression of its functional connectomes, in a more or less steady way, although varying in integrity, quantity, quality and intensity from each other's".

Thus, perhaps it is time to consider "each personality type or personality treat or personality disorder or psychopathological, emotional state etc., as a merely different functional connectomal pattern", which in turn can entirely be studied, under an embracing discipline, which can be named as "Psycho Connectomics or Psycho Connectomology".

3. Conclusion

It looks that it is time to propose a NeuroAnatomoPhysiological Personality Approach, which merely relies on our "Functional Connectomes": What we call personality, personality traits, attitudes, biases, cultural equipment, psychopathological symptoms, syndromes, by allegedly differentiated disciplines, are nothing more than the, dynamic but consistent, total sum of "functional connectomal (electrical) patterns", differing slightly from each others' in intensity, quality, quantity and volume, either at our preparedness to perceive the external world or, in reacting to it. Therewith it will probably be very handy, the foundation of a discipline called "Psycho Connectomics". And this assertion/s will be proved or disproved by future mapping techniques, or by new softwares, extracting the appropriate information, from the existing ones.

References

Antikacioglu, L. (2015). The More Brain Parts Are Involved The Better Is Learned and Performed. The Journal of Neurobehavioral Sciences, 2(3), 114-116.

Beck, T. A. (1979). Cognitive Therapy and the Emotional Disorders. Meridian Plume.

Canli, T. (2004). Functional brain mapping of extraversion and neuroticism: learning from individual differences in emotion processing. Journal of personality, 72(6), 1105-1132.

Canli, T., Sivers, H., Whitfield, S. L., Gotlib, I. H., &Gabrieli, J. D. (2002). Amygdala response to happy faces as a function of extraversion. Science, 296(5576), 2191-2191.

Canli, T., Zhao, Z., Desmond, J. E., Glover, G., &Gabrieli, J. D. (1999). fMRI identifies a network of structures correlated with retention of positive and negative emotional memory. Psychobiology, 27(4), 441-452.

Canli, T., Zhao, Z., Desmond, J. E., Kang, E., Gross, J., &Gabrieli, J. D. (2001). An fMRI study of personality influences on brain reactivity to emotional stimuli. Behavioral neuroscience, 115(1), 33.

Cloninger, C. R., Svrakic, D. M., & Przybeck, T. R. (1993). A psychobiological model of temperament and character. Archives of general psychiatry, 50(12), 975-990.

Corr, P. (2008). The Reinforcement Sensitivity Theory of Personality. Cambridge University Press. pp. 1–5, 8–11, 51–55.

Davidson, R. J., & Irwin, W. (1999). The functional neuroanatomy of emotion and affective style. Trends in cognitive sciences, 3(1), 11-21.

DeYoung, C. G., Hirsh, J. B., Shane, M. S., Papademetris, X., Rajeevan, N., & Gray, J. R. (2010). Testing predictions from personality neuroscience brain structure and the big five. Psychological science.

Dodero, L., Sambataro, F., Murino, V., & Sona, D. (2015). Kernel-Based Analysis of Functional Brain Connectivity on Grassmann Manifold. InMedical Image Computing and Computer-Assisted Intervention–MICCAI 2015 (pp. 604-611). Springer International Publishing.

Eysenck, H. J. (1952). The Scientific Study of Personality. Routledge & Kegan Paul Ltd. London.

Galen. (1938). Peri Kraseon (On Temperaments). (Lamera, K., Trans. Ancient to modern Greek). Papyros Library: The collected works of ancient Greek writers (Vol. 24). Athens: Papyros (original work written ca 170 AD).

Gray, J.A. and McNaughton, N. (July 2003). The Neuropsychology of Anxiety: An Enquiry into the Functions of the Septo-Hippocampal System. Oxford: Oxford University Press. ISBN 978-0-19-852271-3 and ISBN 0-19-852271-1

Hebb, D.O. (1949). The Organization of Behavior. New York: Wiley & Sons.

Kretschmer, E. (1925). Physique and Character. An Investigation of the Nature of Constitution and of the Theory of Temperament (Translated from the Second by W. J. H. Sprott, B.A.). Kegan Paul. London.

Kringelbach, M. L., & Rolls, E. T. (2004). The functional neuroanatomy of the human orbitofrontal cortex: evidence from neuroimaging and neuropsychology. Progress in neurobiology, 72(5), 341-372.

Luria, A.R. (1973). An Introduction to Neuropsychology. The Working Brain. New York: Basic Books.

Sheldon, W. H. The Varieties of Human Physique (An Introduction to Constitutional Psychology). Harper & Brothers. 1940.

Taki, Y., Thyreau, B., Kinomura, S., Sato, K., Goto, R., Wu, K., ... & Fukuda, H. (2013). A longitudinal study of the relationship between personality traits and the annual rate of volume changes in regional gray matter in healthy adults. Human brain mapping, 34(12), 3347-3353.

Völlm, B., Richardson, P., Stirling, J., Elliott, R., Dolan, M., Chaudhry, I., ... &Deakin, B. (2004). Neurobiological substrates of antisocial and borderline personality disorder: preliminary results of a functional fMRI study. Criminal Behavior and Mental Health, 14(1), 39-54.

Yang, Y., &Raine, A. (2008). Functional neuroanatomy of psychopathy. Psychiatry, 7(3), 133-136.