

Neurobiological makeup of Human Personality

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Abstract: The present review article focuses on how brain plays a major in human personality. Human brain is said to most sophisticated organ that other higher-level animals which have got about 100 billion of neurons. The present science developments are leading in a direction under controlled testing and experimentation. It is almost clear that every aspect of our behavioral manifestation is a signal from our brain. The question arises from here, does it applicable to personality as well? To answer, the author has gone through the literatures of past research and collected the relevant data. The data has been analysed, the methods and techniques were identified which were used by the researchers in the past. All the reports and finding were carefully arranged and incorporated in the present review paper. Hopefully, this review paper would help for psychologists to look into scientific perspectives while talking about personality.

Index Terms: Neuroscience, Human Personality, Brain, Image Processing, Big Five Traits.

INTRODUCTION

Human personality is a dynamic and flexible as the situation arises. Allport (1937) defines, personality as the dynamic organization within the individual of those psycho-physical systems that determine unique adjustment with his environment. He analyzed a number of common traits and grouped together in order to came up with the above definition. Among various personality psychologists, Sigmund Freud was the standout to explain personality using psychoanalytical approach thus calling him as father of psychoanalysis. Later some notable people came up to explain personality on the basis body structure, body fluids and other physiological systems and functions, these theories widely known as type theories of personality. On the other hand, some other group of psychologists developed trait theories of personality on the basis of specific behavioral patterns called 'traits' which are consistent for longer times. Traits are regarded as basic units of personality. Traits theorists are as follows Allport, Cattell and Eysenck.

Other humanitarian psychologists developed humanitarian approaches to personality, and they are Maslow and Carl Rogers. Trait theories of personality is the most accepted one among all in particular Big Five Model which came into existence in 1992 by Costa and McCrae, though it was initiated in early 1960s by (Ernest Tupes and Raymond Christal). From then onwards, the field of personality has been predominant and become an emerging interesting field of research in psychology. Gradually, it opened gates to personality neuroscience. Now, the researchers from psychology, biology, neuroscience are actively engaged in exploring neuro-scientific evidence of brain-based personality. This review article is yet another attempt to find out relation between brain and personality.

METHOD

The author has used review method of past research conducted in the field of neuroscience and personality neuroscience. Around 40 research papers including magazines and articles from 2015 were carefully reviewed. Based on the findings and reports that were reviewed, they were discussed under different heads.

DISCUSSION

Big Five personality model, which emerged from lexical analyses eventually led to researches in the field of personality neuroscience. Wängqvist et al., (2015) of the opinion that Big Five personality traits are perhaps relatively stable over time. But age may be one of the variables that that affects brain measures of personality. According to Potvin et al. (2017, 2018) age is key predictor for regional volumes. Yet, Kitamura et al., (2016) negative association between openness and age was observed in relation to GMV. Schutter et al., (2017), concluded no age difference in association between composite neuroticism anxiety and depression facets and CRB GMV. Longitudinal

changes of personality traits were reported by Nickson et al., (2016) and in relation to GMV. Extraversion changes over an average of two-year interval in a mixed sample of patients with major depressive disorder and healthy participants, and no relation existed between AMY GMV changes and neuroticism (Nickson et al. 2016). Yasuno et al. (2017) found associations in opposite directions between openness and PCC GMV. Kunz et al., (2017) observed a positive association with TGMV whereas Yasuno et al., (2017) reported no association between extraversion and regional GMV using a T1w/T2w ratio signal. Schutter et al., (2017); Wei et al., (2015) observed no association with TGMV and TBV with reference to neuroticism (depression, anxiety). Tuerk et al., (2016) found negative associations with TGMV. Yang et al., (2016); Yang, Yin, et al., (2017) found positive associations in frontal, HIP, and INS. Various studies by Boekel et al., (2015); Genon et al., (2017); Marek et al., (2020); Masouleh et al., (2019) focused on other psychological constructs, including, but not limited to, anxiety, internalizing, externalizing, attention, executive function, political orientation, moral aspects. Zhao et al., (2017) that patients with alcohol disorder high scores of neuroticism compared to healthy participants. In a number studies by Castagna, (2019), Hyatt et al., (2019); Owens et al., (2019); Riccelli et al., (2017), Zhu et al., (2020), negative associations were consistently found (in at least two or more studies reporting significant associations for the same region) for the bilateral OFC, SFG and right MFG, left STG. Positive associations were consistently reported for the left AMY. Various studies by Nostro et al., (2017); Owens et al., (2019); Riccelli et al., (2017); Toschi & Passamonti, (2019) that met the meta-analysis revealed no robustly significant regions associated with neuroticism, although they observed a negative trend in the right SFG. With reference to Regional cortical thickness, significant negative associations were consistently reported for the left SFG and MFG in number of studies by Hyatt et al., (2019); Riccelli et al., (2017); Zhu et al. (2020). While talking about Gray Matter Volume meta-analysis, Kunz et al., (2017) examined GMV as a function of APOE genotype and concluded no association between conscientiousness and regional GMV. Most of the studies no association between regional GMV and openness, reported no association between regional GMV and openness. Owens et al.,

2019; Riccelli et al., 2017) reported positive associations for the PHC, bilateral CAD, and left ITG regions and negative associations for the left MFG and right ACC whereas associations in opposite directions were seen across studies for the right INS, right PCC, left STG, left PSC, and right PCN.

BIG FIVE TRAITS ANALYSIS

In the light of past studies, the Big Five Traits were analysed and discussed in the below section.

Agreeableness: ROI analysis found no association between agreeableness and regional CT. Hyatt et al., (2019); Riccelli et al., (2017); Zhu et al. (2020) observed negative associations for the left SFG and MFG.

Openness: Gray et al. (2018) Observed higher levels of personality measures across all five traits younger females compared to higher levels of extraversion and openness in females in other studies.

Neuroticism: Various authors reported sex-dependent associations between neuroticism and regional GMV for POS, and FSF (Nostro et al., 2017). Yang et al. (2021) observed negative association between neuroticism and frontal activation using an implicit emotional paradigm.

Extraversion: Number researchers reported sex-dependent associations between extraversion and regional GMV for POS, FSF, THA, and CRB (Nostro et al., 2017).

Conscientiousness: Nostro et al., (2017), reported sex-dependent associations between conscientiousness and regional GMV for the left PCN/POS. Ritchie et al., (2018) reported greater regional GMV in the isthmus of the cingulate gyrus in males and greater regional GMV in the superior parietal lobule in females.

LIMITATIONS OF IMAGING TECHNIQUES

Shortcoming Imaging studies while studying neurological perspectives of human personality with reference to Big Five traits are listed below,

- Szucs & Ioannidis (2017) attacked MRI studies due to its underpowered and non-replicable findings
- vertex-based approach more precise, eventually overestimating the statistical effect

- image data analytic approach used
- sex-by-trait interaction analysis.
- non-independent samples overlapping
- meta-analytic software versions
- meta-regression limits
- previous version of SDM,
- Anisotropy Effect-Size Seed-based d Mapping (AES-SDM)

Some researchers used SDM-PSI which is advancing and robust technology. On the other side, few researchers used qualitative techniques of assessment while demonstrating human personality alongside image processing. These have been briefly discussed in the below section

QUALITATIVE ASSESSMENT

Li et al., (2019-20) used checklists in structural imaging studies as it objective indicators and transparency to the study but not by means of standardized tool. It has good reliability (IntraClass Correlation Coefficient) of 0.91. Others like, Hyatt et al., (2019) used combined observation- and interview-based, informant report. To avoid self-bias reporting, Taib et al (2020) used psychological responses and as well as for capturing complex personality better.

CONCLUSION

Montag and Panksepp (2017) listed out seven ANT primary emotional systems that are responsible for Big Five, such neuroticism (Fear, Anger, and Sadness), extraversion (Play), Agreeableness (Care And Anger) and openness (Seeking). On the basis of basis, above discussion it should be understood that Human personality has neurobiological systems and emotional systems. The future work may be carried out in this direction by integrating with genetically driven contributing factors.

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