Anxiety and EEG Frontal Theta-Beta Ratio Relationship Analysis Across Personality Traits During HDR Affective Videos Experience

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Abstract: To comprehend the intricate interplay between the frontal regions of the brain, anxiety, and their connection with individual personality traits holds promising potential for developing contemporary, personality-aware interventions in anxiety healthcare design. Traditionally, emotional content with low dynamic range has been employed for anxiety assessment, with personality traits serving as mediators. This paper introduces a novel approach, examining the influence of personality traits on the relationship between anxiety and electroencephalography (EEG) frontal Theta-Beta Ratio (TBR) during high dynamic range (HDR) arousal-valence affective content exposures. Twenty-seven subjects were categorized into five groups based on big five personality scores, further subdivided into high and low personality traits. Correlation analyses were conducted separately for the right and left frontal regions. Across four HDR video clips, each positioned within a distinct valence-arousal plane, it was observed that for High Arousal High Valence (HAHV) and High Arousal Low Valence (HALV), most personality trait groups exhibited a negative correlation between anxiety and frontal TBR, while a positive correlation was noted for Low Arousal Low Valence (LALV) and Low Arousal High Valence (LAHV) HDR emotional content. The findings indicate that the big five personality traits are the pivotal intermediate psychological factors affecting alterations in brain activity and anxiety.

1 INTRODUCTION

In the course of daily living, it often happens with someone to experience anxiety and stress, marked by various emotional states that significantly influence the overall quality of life. Constant anxious feeling can cause the sever depression that ultimately impacts the mental and physical health of an individual(Gavrilescu and Vizireanu, 2019). Difference states of Anxiety and stress are implicated to assess the onset and progressions of various diseases like cardiovascular, neurodegenerative and immunological disorder(Reiche et al., 2004). Social anxiety disorder (SAD) is considered to be one of the major reason for emotional disturbances, cognitive deterioration and brain disorder(Al-Ezzi et al., 2020). Anxiety constitutes internal dimensions within the intricate spectrum of human emotions, intricately connected to both the psychological and physiological characteristics inherent to each individual.

Personality traits are an important but often neglected mediators of emotional well being, physiological responses and anxiety levels. There are different psychological dimensions of human personality but most importance dimensions are those that are described by five factors model (FFM) that denotes the neuroticism (N), extroversion (E), openness (O), agreeableness (A) and conscientiousness (C) (McCrae and John, 1992). These personality traits have been shown to influence the physiological responses, stress and cognitive declines among individuals(Yan et al., 2019). Several researches have been conducted to investigate the relationship between the personality traits and chronic diseases i.e., personality traits and mental disorder(Kotov et al., 2007), personality traits and anxiety about aging and health(Harris and Dollinger, 2003; Nikčević et al., 2021; Bienvenu and Brandes, 2005). While the connection between personality and anxiety has been extensively studied, the underlying mechanism remains unclear. Existing evidence is insufficient to firmly establish how personality might serve as a mediator for anxiety triggered by different audio-visual emotional stimuli.

Physiological signals based anxious levels have been analyzed during various exposures. For example

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in (Šalkevicius et al., 2019), physiological signals like galvanic skin response (GSR), blood volume pulse (BVP), skin temperatures have been recorded during virtual reality therapy exposure to assess the various anxiety levels. Electroencephalography (EEG) signals based major depressive disorder (MDD)(Greco et al., 2021) and human anxiety(Muhammad and Al-Ahmadi, 2022) is analyzed. In(Li et al., 2023), during VR scenes have used to record the physiological signals to assess the anxiety and depression levels. ECG and respiration signals have been recorded whiles subjects were continuously watching the video clips and their anxiety was measured (Elgendi et al., 2022). Numerous cutting-edge studies have demonstrated that analyzing the electrical activity of the brain through EEG offers valuable insights and discernible frequency patterns for understanding anxiety states in human. Among numerous EEG based biomarkers for anxiety assessment, theta-beta ratio can serve as promising neurophyiological bio-indicators to better understand the anxiousness of human.

EEG is accessible and cost effective technology to investigates the neuronal correlates of the theta beta ratio (TBR) and anxiety. TBR specifies the deviations in brainwave frequency patterns and these alteration in neural regions act as indicators of the stress and anxiety. TBR indicates the cortical and sub-cortical interactions and numerous studies have shown its correlation with the anxiety and attention control(Wei et al., 2020). (Poole et al., 2021) states that temperamentally shy children with enhanced theta beta ration are at greater risk of anxiety. In (Chang and Choi, 2023), alpha beta, alpha theta and theta beta ratios have been identified as biomarkers of depression.

Psychological and physical symptoms of the anxiety disorders can be decoded through the variety of audio and video emotional stimuli(Scibelli et al., 2016). As previously mentioned, decoding induced anxiety has utilized facial, audio, and visual cues, yet a comprehensive understanding remains a subject of ongoing exploration. The emergence of High Dynamic Range (HDR) multimedia technology has prompted investigations in healthcare systems within the realms of medical, computer science, and AI-related research communities. Offering immersive and visually captivating content, HDR multimedia stands out for its capability to encompass the complete range of light and color information inherent in real-world scenes(Riaz et al., 2023). In past, very few studies have employed the HDR multimedia for health related emotion recognition using EEG(Riaz et al., 2021a) and emotional experience analysis (Riaz et al., 2021b), quality of experience analysis and perceptual experience analysis using EEG signals(Moon and Lee, 2015b). Likewise, investigations into the connectivity among various brain regions have been conducted to unravel the cognitive processes associated with the tone-mapped HDR visual experience(Moon and Lee, 2015a). To the best of our knowledge there is no such work that have employed EEG responses influenced by HDR emotional stimuli to evaluate the induced anxiety.

While behavioral and physical factors impacting anxiety levels have been extensively explored, the analysis of anxiety levels through the lens of the Big Five personality traits remains underexamined. Previous research has physiologically connected personality traits to the emergence of various diseases by identifying biomarkers. For instance, the role of personality traits such as extroversion and neuroticism in managing stress via biofeedback mechanisms like heart rate has been investigated(Bequet et al., 2022).

The findings of(Olofsson et al., 2008), uncovered that the variation in arousal and valence levels provides crucial insights into the neural underpinnings of anxiety triggered by emotional stimuli. While prior research has explored the relationship between psychological factors and anxiety through the dimensions of valence and arousal emotions, the extent to which specific personality traits serve as stronger mediators in this connection has not been explicitly and clearly delineated.

In this study, we have addressed the challenges given for assessing the anxiety assessment by relating to psychological contributor of human personality through their neural responses. Previous research have not neurologically correlated the personality traits with the anxiety through such strong emotional content. To the best of our knowledge, this study marks the first attempt to utilize affectiv HDR valence and arousal stimuli in investigating the correlation between personality traits and anxiety levels. This exploration involves the analysis of anxiety responses and EEG reactions elicited during exposure to novel visual stimuli.

1.1 Motivation

Anxiety related problems cost the health and overall quality of life of an individual with various demographic details. To investigate the dynamic interplay between the personality traits, microbiological responses during immersive and visually appealing multimedia encounters could be of paramount importance for health related research communities. Although, previous researches have determined the personality and anxiety link separately, but integrat-

ing it with HDR stimuli and brain responses remains largely under-explored area of research. Examining the connection between personality traits, particularly theta-beta EEG frontal correlates, and the expression of anxiety, this research aims to shed light on both affective computing and the practical implications for subjective well-being and mental health. The key discoveries from this study provide valuable insights for crafting personality-aware interventions aimed at controlling anxiety. This involves the creation of interventions that are unassuming, practical, and emotionally engaging in the multimedia context, contributing to the development of customized and effective strategies.

1.2 Contributions

In the present study, we employed personality traits as mediators, serving as intermediary factors that impact the underlying connection between anxiety and the spectrum of brain activity, as indicated by the TBR observed in EEG recordings from both the right and left regions of the brain during exposure to novel HDR emotional content. Our primary contributions are delineated as follows:

1. We introduced the novel application of the HDR valence arousal stimuli to investigate the relationship between personality traits and anxiety level by expanding the scope of experiment i.e., paradigm shift from emotional research to anxiety and personality related research
2. We analyzed the anxiety manifestation and EEG frontal channels bands extracted in response to the HDR visual experience to explore a complex relationship
3. Finally, we introduced a conceptual framework that integrates personality traits with anxiety and TBR derived from frontal EEG recordings on both the right and left sides, collected in response to HDR valence arousal experiences. The statistical analysis revealed a notable role of personality traits as mediators for influencing anxiety.

Remainder of the paper is organized as fallows. Detailed proposed methodology for anxiety and personality traits analysis is discussed in section II. Section III provides a comprehensive analysis of the statistical results while section IV is about the discussion. Final section V concludes the paper and presents futures recommendations.

2 PROPOSED METHODOLOGY

Fig 1 illustrates the step-by-step process employed to investigate the connection between anxiety and personality traits via physiological reactions. The procedure encompasses the assessment of the Big Five personality traits through a questionnaire, followed by stimuli selection, EEG signal acquisition, and the completion of the STAI form. Subsequently, the process involves the extraction of power spectral density bands and statistical analysis. The specifics of each step are delineated below.

2.1 HDR Valence Arousal Stimuli Selection

Total four video clips i.e., one musical clip and 3 from Hollywood movies in HDR10 version with 4K resolution and 10 bits color depth were selected for the experiment. Before finalizing the stimuli, subjective pilot study was conducted in lab to rate the valence and arousal level against each video using 9-point self assessment manikin(SAM) scale(Peacock and Wong, 1990). To validate the valence and arousal ratings, we mapped the ratings given by the viewers to valence arousal (V-A) space and each video was successfully mapped into one of four quadrant of V-A space. Valence scale is between negative(low valence) to positive emotions (High valence) while arousal scale is between calm or relaxation (low arousal)to excitement state (high arousal). In High arousal high valence quadrant (HAHV) a musical clip (LG Jazz Music) while in high arousal low valence (HALV) a horror clip from movie nun version 2018 were mapped. Similarly, in 3rd quadrant of V-A emotional dimension that is low low valence (LALV), a clip from the movie Gladiator version(2000) while in low arousal high valence (LAHV) a clip from john vick version (2014) were mapped. Duration of each clip was 90 seconds.

2.2 Subjective Self Assessment

2.2.1 Subjective Personality Assessment

To measure personalized personality traits, we employed a questionnaire, specifically the Big Five Personality Test, which evaluates the structure of personality(Butt et al., 2020). This questionnaire gauges five personality dimensions based on user responses to each of its 50 questions. Users rate their agreement on a scale of 1 to 5, where 1 signifies disagreement, 2 indicates slight disagreement, 3 represents neutrality, 4 signifies slight agreement, and 5 denotes agreement.

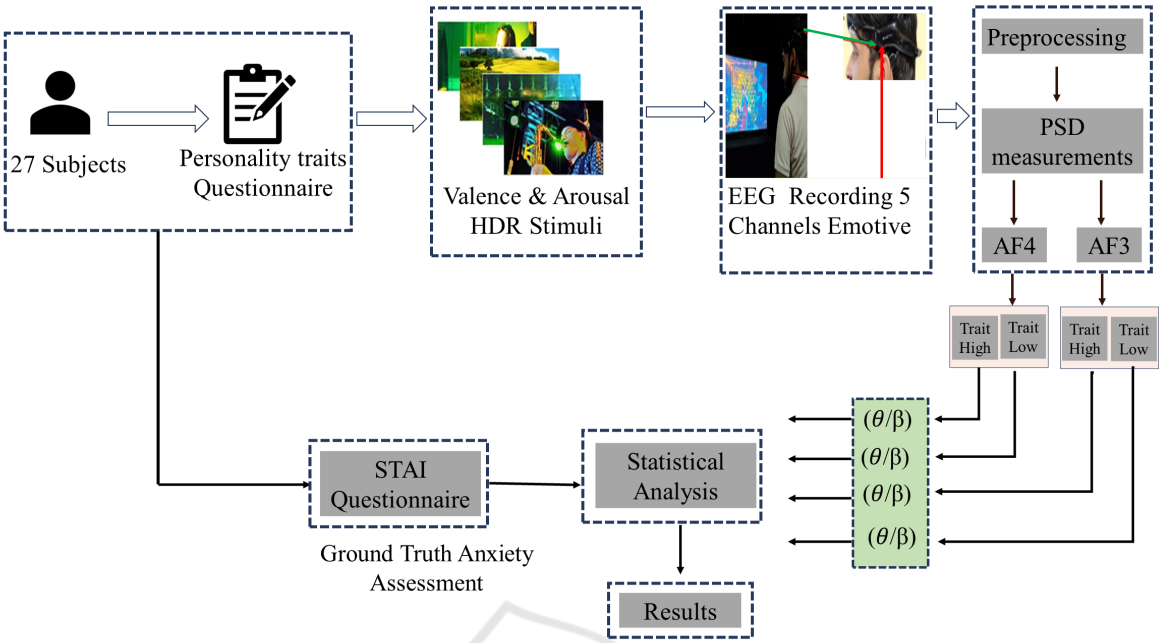

Figure 1: Proposed methodology followed for relationship analysis between personality traits, EEG frontal TBR and anxiety.

The questionnaire's 50 questions are categorized into five groups, aligning with the five personality traits (neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness). Each personality trait's overall score ranges from 0 to 40. To further categorize traits as either low or high, we calculated the mean value for each personality trait score, labeling traits with scores below the mean as low traits and vice versa.

2.2.2 Subjective Anxiety Assessment

To measure the personalized anxiety levels, State-Trait-Anxiety-Inventory (STAI) questionnaire was employed(Mokhtari et al., 2023). STAI tool reflects the anxiety levels aroused in response to various phenomena. This tools comprises 40 questions and users have to mark the anxiety perceived on a scale of 1 to 4 where 1 = almost never, 2 = sometimes,3 = often and 4 = almost always. Finally anxiety scores were calculated for each personality traits based on the rating given by users during visual experience.

2.3 Data Sensing Mechanism

2.3.1 Test Subjects

A total of 27 individuals took part in the research, comprising 17 males and 10 females with ages ranging from 22 to 30 years. All participants were in good health and willingly participated in the experiment. Prior to the commencement of the study, it was ensured that none of the volunteers had previously participated in any anxiety-related studies, and it was their first exposure to videos in HDR format.

2.3.2 Experimental Material

In block 3 of the Fig 1, sensor used for the sensory data acquisition have been shown. EEG signals were captured utilizing the commercially accessible 5-channel Emotive Insight Headset. The Emotive Insight is a wireless headset with five channels (AF4, T7, PZ, T8, AF3) and two reference electrodes designed to capture brain activity and translate it into meaningful information(He et al., 2023). The Emotiv Insight recorded brain waves at a sampling rate of 128 samples per second. It features a 16-bit analog-to-digital converter (ADC) activated during signal transmission. The headset comprises five electrode positions and two reference electrodes situated at the left mastoid bone. EEG signals were recorded from the subjects' scalp using the EMOTIVE Xavier test bench v.3.1.21.

To present the valence and arousal emotional content, a 55-inch TCL 55R16 UHD resolution LED-LCD screen with Full-Array Local Dimming technology was utilized. The display adhered to UHD premium specifications(Association et al., 2013) and had the capability to reach a peak brightness exceeding 1000 cd/m².

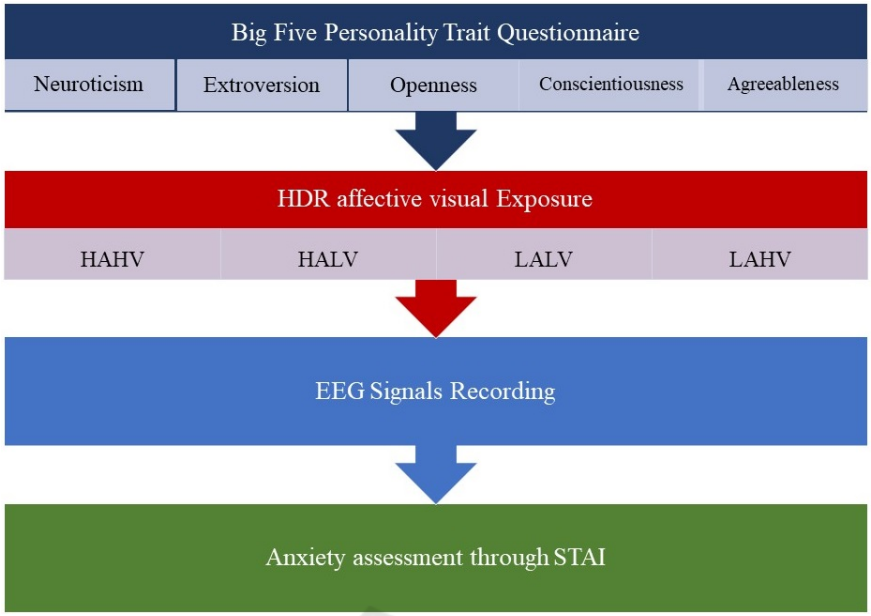

Figure 2: Experimental protocol followed for relationship analysis between personality traits, EEG frontal TBR and anxiety.

2.3.3 Experimental Protocol

Detailed experimental procedure followed for the data acquisition is shown in the Fig 2. First of all, subjects were provided with the Big five personality test questionnaire a day before the subject was subjected to the experiment. Each of the subjects have to watch 4 HDR valence and arousal clips in a sequence i.e., first clip was presented and EEG signals were recorded. after watching the first clip, subject have to rate is anxiety level on the scale printed on the STAI questionnaire. Following the first trial, next clip was played and same procedure was followed. So for one subject there were 4 trials and time consumed for one experiment was almost 30-35 minutes.

2.4 Signals Preprocessing

To analyze the EEG recordings for better anxiety analysis, acquired physiological signals were prepossessed before PSD extraction. EEG signals recorded through electrodes of Emotive have a DC offset in their values which shall be discarded before doing analysis either in time domain or frequency domain(Saeed et al., 2020). For DC offset removal, mean value of data from each channel was subtracted from sample values of that channel. Additionally, sensors used for recording is highly sensitive and have chances to be interfered from external environment resulting into high signal to noise ratio (SNR) which may distort acquired data.

2.5 PSD Extraction

Frequency domain features of EEG signals were extracted by computing power spectrum density (PSD) using Welch's method with window length of 128 samples per seconds and without overlapping. An open source MATLAB toll Brainstorm(Tadel et al., 2011) was used for frequency domain analysis. Changes in the Power of EEG signals were averaged over five frequency bands of Delta (2-4) HZ, Theta (5-9) HZ, Alpha (8-12) HZ, Beta (15-29) HZ, Gamma (30-59) HZ for each channel. Therefore, total of 25 EEG frequency bands (5 electrodes × 5 Bands) were extracted from each EEG signal. In this study we only used the frontal theta beta ratio i.e., theta beta ratio for AF3 and AF4 channels as recently studies have shown that frequency bands specifically theta and beta waves in the frontal regions shows the relationship between the anxiety manifestations and symptoms reported by the individuals.

2.6 Statistical Analysis

A statistical method was employed to investigate the connection between personality traits and anxiety levels triggered by High Dynamic Range (HDR) emotional stimuli related to arousal and valence. Initially, the theta and beta ratio was computed for the AF4 and AF3 channels of the Emotiv Insight headset. Subsequently, the correlation was determined between the Theta/Beta Ratio (TBR) calculated for AF4 channels and anxiety ratings provided by subjects ex-

hibiting varying personality traits in response to affective HDR clips. Subjects were categorized into two groups for each personality trait based on their self-reported ratings, such as low neuroticism (LN) and high neuroticism (HN), introversion and extroversion, low openness (LO) and high openness (HO), low agreeableness (LA) and high agreeableness (HA), and finally, low conscientiousness (LC) and high conscientiousness (HC) for the respective personality traits. The same procedure was replicated for the AF3 channel for the statistical analysis.

3 EXPERIMENTAL RESULTS

This section presents the outcomes of a correlation-based statistical analysis examining the relationship between anxiety and personality using EEG frontal TBR. We conduct distinct analyses for both the right (AF4 electrodes) and left (AF3 electrodes) frontal regions of the brain. Among the 27 participants, 15 exhibited high levels of neuroticism, while 12 demonstrated lower neurotic tendencies. Additionally, 13 participants were identified as extroverted, contrasting with 14 who displayed introverted traits. In terms of openness to experience, 18 participants exhibited a higher inclination, while 9 exhibited a lower inclination. For agreeableness, 24 participants displayed higher levels, with 3 displaying lower levels. Regarding conscientiousness, 18 participants exhibited high conscientiousness, whereas 9 displayed lower conscientiousness. The hierarchical distribution depicted in Fig. 3 illustrates how 27 participants were categorized into groups with high and low traits, according to their questionnaire scores.

3.1 Personality Traits-Wise Statistical Analysis for the EEG AF4 TBR and Anxiety

3.1.1 Higher Personality Traits-Wise Results

Anxiety from a personality perspective during exposure to novel valence and arousal-related HDR content is essential, given the influence of personality on both brain function and the expression of anxiety. In this section, we explore the correlation between anxiety and EEG TBR specifically for the AF4 channel. The correlation outcomes for individuals with higher personality traits are presented in Table 1, where correlation coefficients range from -1 to 1. A correlation of -1 indicates a perfect negative linear relationship, signifying reciprocal variation i.e., if one variables increases other variable tends to decrease proportionally. A correlation coefficient of 1 signifies a complete positive linear connection, suggesting that as TBR increases, anxiety aslo tends to increase, and vice versa—a directly proportional relationship. On the other hand, a correlation coefficient of 0 indicates the absence of any correlation. Notably, a robust negative correlation emerged between TBR and anxiety in response to High Arousal High Valence (HAHV) and High Arousal Low Valence (HALV) stimuli for individuals with high-order big five personality traits. This implies that an increase in AF4 TBR corresponds to a relative increase in anxiety levels among individuals with high personality traits exposed to HAHV and HALV HDR stimuli. Conversely, a positive correlation between TBR and anxiety was observed for Low Arousal Low Valence (LALV) and Low Arousal High Valence (LAHV) stimuli across all high-order personality traits, except for the High Conscientiousness (HC) group, which exhibited a negative correlation for the LALV HDR clip. Positive correlations indicate a reciprocal relationship: an increase in AF4 TBR corresponds to a decrease in anxiety, and vice versa.

3.1.2 Lower Personality Traits-Wise Results

With the exception of LA, the remaining personality traits, namely LN, I, LO, LC, demonstrated a negative correlation between TBR and anxiety in response to HAHV stimuli. Conversely, for High HALV affective HDR content, LN and LO exhibited a positive correlation, while the others displayed a negative correlation. Interestingly, all lower personality traits displayed a positive correlation between anxiety and TBR for LALV and LAHV, except for LO, which revealed a negative correlation during the viewing of the LALV HDR video clip. A summarized overview of the relationship between anxiety and TBR is presented in Table 2.

Table 1: Summary of EEG AF4 TBR and anxiety correlation across 15 HN, 13E, 18 HO, 24 HA, 18 HC higher personality traits groups.

Traits	TBR	HDR Affective Clips			
		HAHV	HALV	LALV	LAHV
		Anxiety	Anxiety	Anxiety	Anxiety
HN	θ/β	-0.38	-0.40	0.20	0.42
E	θ/β	-0.57	-0.27	0.02	0.37
HO	θ/β	-0.25	-0.30	0.31	0.15
HA	θ/β	-0.31	-0.20	0.15	0.25
HC	θ/β	-0.43	-0.20	0.00	0.21

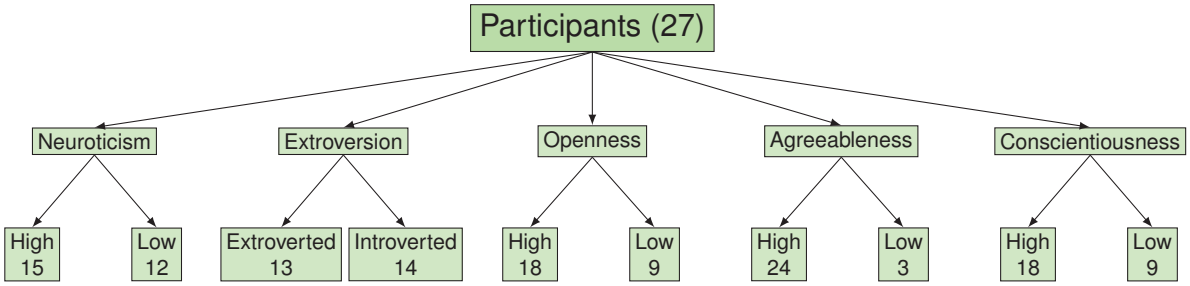

Figure 3: Placement of 27 subjects into Big five personality traits groups.

Table 2: Summary of EEG AF4 TBR and anxiety correlation across 12 LN, 14 I, 9 LO, 3 LA, 9 LC lower personality traits groups.

Traits	TBR	HDR Affective Clips			
		HAHV	HALV	LALV	LAHV
		Anxiety	Anxiety	Anxiety	Anxiety
LN	θ/β	-0.25	0.02	0.07	0.19
I	θ/β	-0.19	-0.17	0.29	0.06
LO	θ/β	-0.55	0.02	-0.56	0.53
LA	θ/β	0.80	-0.30	0.16	0.84
LC	θ/β	-0.10	-0.25	0.45	0.19

Table 3: Summary of EEG AF4 TBR and anxiety correlation across 15 HN, 13E, 18 HO, 24 HA, 18 HC higher personality traits groups.

Traits	TBR	HDR Affective Clips			
		HAHV	HALV	LALV	LAHV
		Anxiety	Anxiety	Anxiety	Anxiety
HN	θ/β	-0.40	-0.48	0.06	0.55
E	θ/β	-0.59	-0.34	-0.23	0.18
HO	θ/β	-0.29	-0.31	0.34	-0.1
HA	θ/β	-0.32	-0.27	0.02	0.34
HC	θ/β	-0.45	-0.29	-0.18	0.26

3.2 Personality Traits-Wise Statistical Analysis for the EEG AF3 TBR and Anxiety

In this section, we present the correlation results between anxiety and the TBR of left prefrontal lobe of the brain that is acquired through AF3 channel of the sensors.

3.2.1 Higher Personality Traits-Wise Results

For AF3, we found some interesting results. All higher-order personality traits exhibited the nevagtive correlations between TBR and anxiety when exposed to the HAHV and HALV. However in case of the LALV, E and HC indicated negative correlation while for LAHV only HO exhibited the negative correlation between the TBR and the anxiety. A summarized overview for the AF3 TBR and anxiety relationship for higher personality traits have been shown in the Table 3.

Table 4: Summary of EEG AF3 TBR and anxiety correlation across 12 LN, 14 I, 9 LO, 3 LA, 9 LC lower personality traits groups.

Traits	TBR	HDR Affective Clips			
		HAHV	HALV	LALV	LAHV
		Anxiety	Anxiety	Anxiety	Anxiety
LN	θ/β	-0.19	0.02	0.13	0.14
I	θ/β	-0.15	-0.01	0.20	0.21
LO	θ/β	-0.55	-0.13	-0.50	0.61
LA	θ/β	0.80	0.11	0.17	0.69
LC	θ/β	-0.02	-0.21	0.32	0.25

3.2.2 Lower Personality Traits-Wise Results

Table 4 provides a condensed overview of the correlation between EEG AF3 TBR and anxiety concerning lower-order personality traits. In the context of HAHV HDR content, there is a positive correlation between TBR and anxiety for LA. Similarly, during HALV exposure, LN and LA exhibited a positive correlation. For LALV, all lower personality trait groups, except LO, displayed a positive correlation, while for LAHV, all lower personality trait groups indicated a positive correlation. Notably, LA consistently showed positive correlations across all four valence and arousal-related HDR content.

4 DISCUSSION

With the exception of uncovering the connection between anxiety and TBR in response to HDR valence-arousal emotional content from the right and left prefrontal lobes of the brain, this study made notable observations in this context. We provided separate results for each personality trait while considering both frontal regions of the brain. The following section offers a comprehensive discussion of the statistical analysis First of all, subjects were divided into five groups

based on the big five personality traits. Each group was further subdivided into low/high trait group based on the big five personality scores. In order to assess the impacts of personality traits on brain activities and anxiety either for low of high group, we check the correlation for right and right prefrontal region of brain separately. As recent studies have proved that these cortex of human brain are crucial regions and contain neurophysiological markers of anxiety and depressive disorder(Shanok and Jones, 2023). Right prefrontal activity is covered through the AF4 channel while left prefrontal lobe of the brain is captured through the AF3 channels of the 5-channel EMOTIV Insight headset. From each channels we calculated the PSD and frequency spectrum. It is important to note that both anxiety and EEG waves were measured while subjects were watching a novel valence and arousal related content in HDR version.

The correlation outcomes indicated that both high and low personality traits impact the association between anxiety and EEG TBR differently in both brain regions. Among the high personality traits group, HAHV and HALV HDR clips elicited anxiety and brain activity in a similar manner, with TBR and anxiety showing a negative correlation. Conversely, for LALV and LAHV, there is a positive correlation, except for the HC group, which demonstrated a negative correlation for LALV, indicating almost no correlation (correlation coefficient = -0.005). For the low personality traits group, exposure to HAHV triggered anxiety and brain activity in opposite direction as indicated by the negative correlation, except for the LA group (correlation coefficient = 0.802). During LALV and LAHV emotional experiences, anxiety and TBR exhibited an direct relationship, except for LO, where the correlation coefficient was -0.56. In summary, it can be inferred that the right and left EEG frontal TBR and anxiety during LALV and LAHV emotional experiences showed positive correlation for both personality traits groups, except for the HC group during LALV and the LO group during LALV.

We delved into the detailed effects of higher and lower personality trait groups on the left prefrontal region and anxiety in response to the same emotional content. The high personality traits group experienced negative correlations between TBR and anxiety while viewing HAHV and HALV HDR emotional content. During LALV, only E and HC showed a inverse direction of relationship, while during LAHV, only the HO group experienced a negative direction of relationship between the left frontal TBR and anxiety. Lastly, we investigated how lower personality traits influence the left prefrontal cortex of the brain and anxiety during valence-arousal related HDR multimedia content. Some noteworthy and intriguing outcomes emerged, indicating that the LA personality traits groups exhibited the direct relationship between the left front TBR and anxiety during all four trials. While duirng HAHV and HALV exposures, inverser relationship was notices across all lower personality traits groups except LN during HALV (correlation coefficient = 0.02). Similarly, for the LALV and LAHV HDR experiences, all groups showed an direct relationship between the left frontal TBR and anxiety, except for LO (correlation coefficient = -0.50).

5 CONCLUSION

In this investigation, we explored the impact of different big five personality traits groups on EEG frontal Theta-Beta Ratio (TBR) and anxiety responses to novel HDR valence and arousal affective content. Key findings unveiled distinct correlation patterns for both higher and lower personality traits groups, shedding light on how various dimensions of an individual's personality influence emotional and neural responses. These preliminary outcomes offer valuable insights for developing personalized interventions for anxiety control that consider the interplay between personality and brain activity. Furthermore, this study contributes to fields like affective computing for mental health, providing a nuanced understanding of the intricate relationships between personality traits, anxiety, and neural activity. Overall, this research lays the groundwork for future investigations that can be enhanced by incorporating additional demographic, psychological, and physiological details.

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