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Study of the Impact of Dzun Nuun Prayer on Brain Wave Patterns of Adolescents with Overthinking Symptoms Through Electroencephalography (EEG) Examination

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ABSTRACT

Overthinking is a psychological disorder characterized by excessive, repetitive thoughts. The Dzun Nuun prayer is believed to be a spiritual approach capable of calming the mind and can be examined through the activity of alpha and beta brain waves. This study aims to determine the normalized intensities of alpha and beta waves before and after the administration of the Dzun Nuun prayer stimulus, and to assess its effect on overthinking among adolescents. The research employed a quantitative, experimental method using an Electroencephalography (EEG) device. The subjects were 20 final-year university students experiencing overthinking, and the data were analyzed using a Paired-Samples T-Test. The results showed increased intensities of alpha waves (0.05–0.30) and beta waves (0.01–0.13) following the Dzun Nuun prayer stimulus. Statistical testing revealed significant effects on both alpha ($p = 0.026$) and beta waves ($p = 0.039$), indicating a meaningful influence. In conclusion, the Dzun Nuun prayer has a positive effect on brain activity, reducing overthinking symptoms by enhancing relaxation and focus-related brain waves.

Keywords:
Brain wave; EEG; Dzun Nuun Prayer; Overthinking Symptoms.

Introduction

Adolescence is a developmental phase laden with confusion and unstable emotional changes. Thought patterns, emotions, and behaviors tend to fluctuate between arrogance and humility, between positive drives and negative temptations, as well as between feelings of happiness and sadness. These conditions make adolescents more vulnerable to psychological disorders, one of which is overthinking symptoms (Diananda, 2019).

Overthinking symptoms are generally related to psychological problems such as anxiety and fear, which have the potential to cause confusion and reduce self-confidence levels (Utami et al., 2022). Overthinking symptoms in final-year students can become serious if left untreated, even posing a risk of triggering suicidal thoughts. Academic pressure, future uncertainty, and demands from family and environment are the main triggering factors. Prevention efforts can be carried out through relaxation techniques such as meditation, increasing worship and prayer, as well as psychological counseling. One prayer believed to be capable of calming the mind is the Dzun Nuun prayer, which was recited by Prophet Yunus A.S when facing a severe trial inside the belly of a whale. This prayer is a form of repentance and plea for help to Allah SWT to escape from difficulties, sadness, and anxiety (Aminah, 2020). The influence of the Dzun Nuun prayer on overthinking symptoms can be analyzed through brain wave activity.

Brain waves are the result of action potential propagation that occurs in certain areas of the brain at certain times. This activity reflects the difference in ionic composition between intracellular and extracellular fluids, which forms a voltage gradient along the nerve cell membrane, known as membrane potential. Brain waves are divided into several types, namely gamma, delta, theta, alpha, and beta waves, each reflecting specific mental conditions and levels of neural activity (Akbar, 2014).

Gamma waves (25–40 Hz, 0.5–2 μV) appear during very high mental activity and full consciousness, but if excessive can have negative impacts on brain health. Beta waves (12–30 Hz) are dominant when individuals are actively thinking, focused, and problem-solving, and are associated with increased stress hormones such as cortisol and norepinephrine. Alpha waves (8–12 Hz, 20–80 μV)

appear in relaxed conditions and produce hormones such as serotonin and endorphins that provide calmness and happiness, as well as strengthen the immune system and stabilize heart rate. Meanwhile, theta waves (4–8 Hz, 5–10 µV) are active during meditation, trance, or light sleep and open access to the subconscious mind, facilitating the entry of suggestions. Lastly, delta waves (0.5–4 Hz, 100–200 µV) dominate during deep sleep, playing a role in cell regeneration and production of growth hormone (HGH) for body recovery and long-term health (Yulianto et al., 2013). One tool used to record and measure brain wave activity is Electroencephalography (EEG).

EEG is a tool used to record brain electrical activity by displaying brain wave patterns. Functionally, EEG works by detecting sudden changes in neuronal electrical charges, which are reflected through the emergence of peaks and interictal waves in the recording results (Rini, 2015). The initial use of EEG in the medical world was focused on diagnosing epilepsy and detecting cerebral function disorders. This is based on the understanding that the brain continuously produces electrical activity that can be recorded and analyzed to identify neurological abnormalities (Khakim, et al. 2021). Power Spectral Density (PSD) is an algorithm for analyzing data from EEG.

PSD uses the Welch method from the Python programming language to extract features from signal patterns, including EEG signals, based on their spectral power. One of the main features taken from EEG signals is the frequency spectrum, which is obtained by transforming the signal from the time domain to the frequency domain. This process allows identification of various frequency components contained in the EEG signal (Aji & Tjandrasa, 2017).

Previous research by Syam (2019) analyzed the difference in alpha brain waves before and after treatment in the form of listening to the recitation of the holy verses of the Qur'an QS. Al-Waqi'ah, and the results showed a significant increase in the treatment group. A similar study was conducted by Aminah, (2020), who examined the effect of the Dzun Nuun prayer or Prophet Yunus A.S's prayer in the context of tawhid to overcome anxiety during the pandemic. The results of this study showed that prayer has a relaxation effect capable of relieving tension and bringing inner peace. Nevertheless, to date there has been no research specifically examining the influence of the Dzun Nuun prayer on students experiencing overthinking symptoms in completing their final assignments. Therefore, this research aims to provide a deeper understanding of the potential of the Dzun Nuun prayer as a form of intervention in reducing overthinking symptoms and supporting students' mental well-being during the final assignment preparation process.

Methods

This research was conducted using a quantitative method with an experimental approach. The quantitative method is a research approach based on the positivism philosophy, which views reality as something that can be measured and tested empirically through systematic and structured data collection and analysis, involving the use of statistical tools or other means of quantification (Sugiyono, 2011). Quantitative research is also commonly known as traditional research or positivist research. This approach is based on the principles of positivism, a philosophy that emphasizes empirical observation, objective measurement, and the search for universal laws through systematic testing (Sugiyono, 2011).

The research subjects consisted of 20 female final-year students aged 18–22 years experiencing overthinking symptoms related to their final assignments, selected using purposive sampling technique to ensure the suitability and relevance of the research characteristics. The research location was in the Physics Study Program Laboratory, Tarbiyah and Teacher Training Faculty, Walisongo State Islamic University, Semarang. The primary instrument used in this research was a brain wave measurement device, specifically an Electroencephalography (EEG) device from Neurosky Mindwave Mobile 2, which operates by capturing analog signals and converting them into digital information that can be processed and analyzed further. This study employed a one-group pretest-posttest design, where the same subjects were measured under three different conditions: normal condition without stimulus (pre-test), overthinking symptom condition (treatment 1), and Dzun Nuun prayer condition (treatment 2).

The research procedure began with the preparation stage, namely determining respondents who met the criteria, namely female students aged 18–22 years who experienced overthinking symptoms related to their final assignments, totaling 20 subjects. Next, the EEG device was installed on the subject's head by attaching sensors to the forehead area (Fp1 position) to detect brain wave electrical

activity. After that, the first brain wave recording was taken in a normal condition, where the subject was given 7 minutes to sit in a calm state without specific stimulus. The recording result was displayed in the form of a graph showing the subject's brain wave pattern in a relaxed and normal state.

In the second stage, recording was carried out in the overthinking symptom condition. Subjects were asked to recall stressful experiences or excessive thoughts related to their final assignments for 7 minutes, while their brain wave activity was recorded. This stage aimed to identify brain wave patterns when subjects experienced overthinking. Lastly, brain wave recording was carried out in the Dzun Nuun prayer condition. Subjects were instructed to sit calmly, focus, and listen to the Dzun Nuun prayer recording that had been prepared. The prayer was played for 7 minutes, and brain wave activity was recorded during that process. This stage aimed to assess the effect of the Dzun Nuun prayer on the subject's brain wave patterns. Overall, this research procedure was designed to compare brain wave patterns under three different conditions, namely normal, overthinking, and after the Dzun Nuun prayer stimulus, so that the influence of spiritual approaches on overthinking symptoms could be identified.

Power Spectral Density (PSD) is an analytical method used to estimate the power of frequency components in a random signal. PSD provides information about how signal power is distributed across various frequencies, thus facilitating the identification of signal characteristics that are not clearly visible in the time domain. The Welch method is one of the most common approaches in PSD estimation, designed to overcome some limitations inherent in the periodogram method. This method divides the signal into several segments, calculates the periodogram for each segment, and then averages these periodograms to reduce variability in estimation. The main advantage of the Welch method lies in its ability to produce smoother and more stable estimates compared to the conventional periodogram method, making it very useful for the analysis of random signals such as EEG signals.

The Paired Sample T-Test or paired sample t-test is a statistical method used to compare the means of two paired or related groups (Sujarweni, 2022). This test is suitable for use in experimental research involving the same subjects measured at two different time points or under two different treatment conditions. One common application of this test is in research that measures the same variable before and after treatment (pre-test and post-test), such as measuring brain wave patterns before and after the Dzun Nuun prayer stimulus. The main purpose of the Paired Sample T-Test is to determine whether there is a significant difference between the two measurement conditions.

Results and Discussion

Data collection began by preparing all necessary equipment, such as head measuring tape, EEG cap, electrodes, and EEG device. Subsequently, the respondent's head was measured using measuring tape to determine the electrode placement points according to the 10-20 system. After the electrodes were properly attached and the subject was in a comfortable sitting position, the EEG signal recording process could begin.

Alpha Wave Normality Test

Table 2 presents the results of the normality test for alpha waves. Based on the provision that data is declared normally distributed if the significance value > 0.05, the data meets the normality requirement with a significance value of 0.213 in the condition after the Dzun Nuun prayer stimulus and 0.351 in the overthinking symptom condition.

Table 2. Alpha Wave Normality Test

	df	**Sig.**	**Note**
Dzun Nuun	20	0.213	Normal
Overthinking	20	0.351	Normal

Alpha Wave Homogeneity Test

Based on Table 3, the homogeneity test results for alpha waves show that the data has homogeneous distribution. This is in accordance with the homogeneity test criteria, where data is declared homogeneous if the significance value > 0.05; in this case 0.571.

Table 3. Alpha Wave Homogeneity Test

	df	Sig.	Note
Dzun Nuun - Overthinking	40	0.571	Homogeneous

Alpha Wave T-Test

Table 4 presents the test results using the T-test method on alpha waves. Based on the significance criteria < 0.05, the test results show that the data is significant with a p value of 0.026. Thus, hypothesis Ha_1 is accepted, which means there is an influence of the Dzun Nuun prayer on alpha wave activity.

Table 4. Alpha Wave T-Test

	df	Sig.	Note
Dzun Nuun - Overthinking	40	0.026	Significant

Beta Wave Normality Test

Based on Table 5, the normality test results for beta waves show that the data is normally distributed, with a significance value of 0.131 in the condition after the Dzun Nuun prayer stimulus and 0.123 in the overthinking symptom condition. Both values meet the normality requirement because they are above the significance threshold of 0.05.

Table 5. Beta Wave Normality Test

	df	Sig.	Note
Dzun Nuun	20	0.131	Normal
Overthinking	20	0.123	Normal

Beta Wave Homogeneity Test

Table 6 shows that the data distribution is homogeneous with significance > 0.05, namely 0.916.

Table 6 Beta Wave Homogeneity Test df Sig. Note Dzun Nuun Prayer - Overthinking 40 0.916 Homogeneous

Table 6. Beta Wave Homogeneity Test

	df	Sig.	Note
Dzun Nuun - Overthinking	40	0.916	Homogeneous

Beta Wave T-Test

Table 7 shows the results of the Paired Sample T-Test on beta waves with a significance value of 0.039, which is below the threshold of 0.05. Thus, hypothesis Ha_2 is accepted, which indicates that the Dzun Nuun prayer affects beta wave activity.

Table 7. Paired Sample T-Test Beta Waves

	df	Sig.	Note
Dzun Nuun - Overthinking	40	0.039	Significant

Based on the T-test results

- Alpha Waves: The Dzun Nuun prayer significantly affects alpha wave activity ($p = 0.026 < 0.05$)
- Beta Waves: The Dzun Nuun prayer significantly affects beta wave activity ($p = 0.039 < 0.05$)

These results indicate that the Dzun Nuun prayer has a measurable and statistically significant impact on brain wave patterns in adolescents experiencing overthinking symptoms.

Alpha Waves

Figure 1 shows an increase in alpha wave frequency intensity in the normal condition, with an average of 0.18, compared to the overthinking symptom condition which only has an average of 0.13. This increase indicates that subjects in normal conditions without overthinking symptoms are in a more

relaxed and calm state, as reflected in higher alpha wave activity. In normal conditions, subjects were in a relaxed, calm state without significant mental burden, so alpha wave activity was higher. This condition reflects a relaxed mental state, where the brain is not overly active thinking about problems or experiencing high levels of stress.

Meanwhile, in the overthinking symptom condition, subjects experienced excessive thinking pressure related to academic problems or their final assignments, causing a decrease in alpha wave intensity. This is consistent with research by Yulianto et al. (2013), which states that alpha waves are associated with relaxation and rest conditions without high mental stress. When individuals overthink, the brain is busier with active thought processes, reflected in the decrease in alpha waves and the potential increase in beta waves, which are more associated with focus and concentration. The difference in alpha wave intensity between these two conditions indicates that normal states are more supportive of mental calm and relaxation, while overthinking symptoms cause the brain to be in a more tense and active condition, with the involvement of spiritual and emotional aspects in the thinking process.

Figure 2 shows that the average alpha wave frequency intensity in the normal condition is 0.18, higher than after the Dzun Nuun prayer stimulus which has an average of 0.20. The alpha wave increase after the Dzun Nuun prayer stimulus indicates that the Dzun Nuun prayer can strengthen the relaxation state.

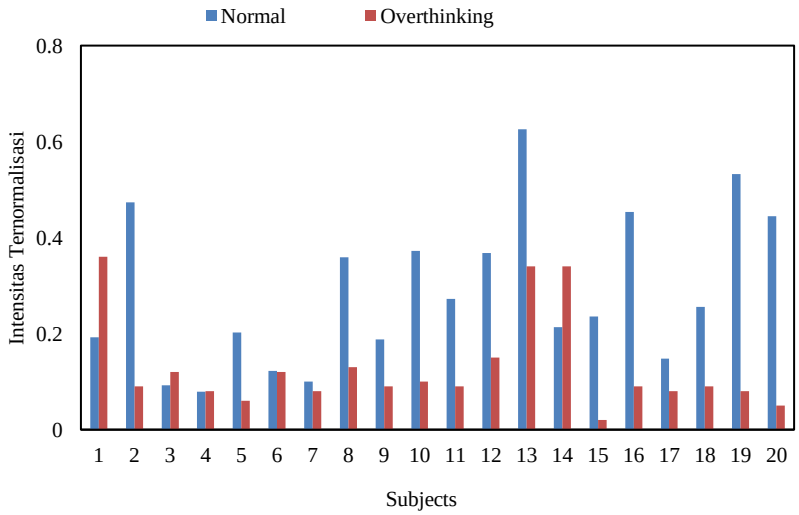

Figure 1. Difference in Normalized Intensity of Normal Condition and Overthinking Symptoms

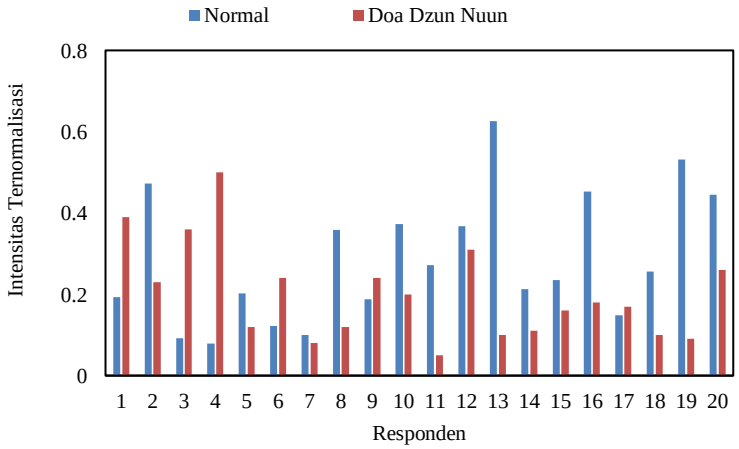

Figure 2. Difference in Normalized Intensity of Normal Condition and Dzun Nuun Prayer

Research by Julianto & Etsem (2015) found an increase in alpha waves when subjects received the Qur'an recitation stimulus, which also had a relaxation and calming effect on the mind. Similarly, the Dzun Nuun prayer is believed to provide inner peace through spiritual reflection, which is reflected in the increase in alpha waves. In short, the increase in alpha waves after the Dzun Nuun prayer stimulus indicates that this prayer has a calming effect on the mind and can strengthen the relaxation state, especially for individuals experiencing overthinking symptoms. This finding reinforces the idea that spiritual approaches such as prayer can have a positive impact on brain activity, particularly in creating mental calm and balance, with the involvement of spiritual and emotional aspects in the thinking process.

Figure 3 shows that the average alpha wave frequency intensity after the Dzun Nuun prayer stimulus is 0.20, higher than the overthinking symptom condition which is only 0.13. This increase reflects that after receiving the Dzun Nuun prayer stimulus, subjects are in a calmer and more relaxed state, as shown by the increase in alpha wave activity. Research conducted by Syam (2019) analyzed the comparison of alpha brain waves before and after treatment in the form of listening to the recitation of Al-Qur'an surah Al-Waqi'ah. The research results showed an increase in alpha waves post-intervention, with significance values showing a meaningful effect. This is similar to the increase in alpha waves in the Dzun Nuun prayer condition.

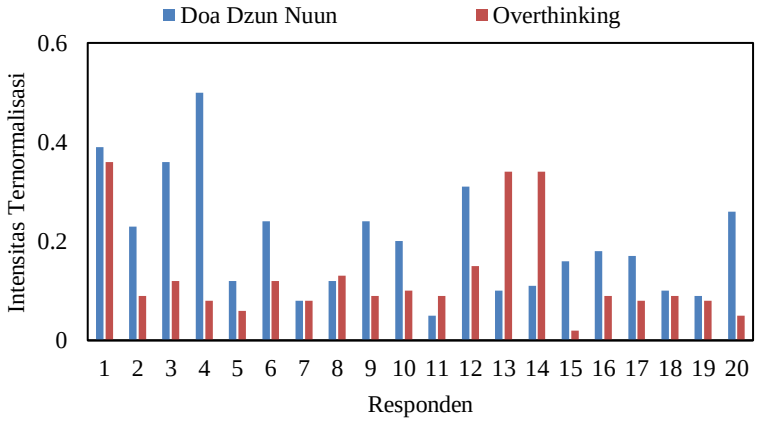

Figure 3. Difference in Normalized Intensity of Dzun Nuun Prayer Condition and Overthinking Symptoms

Beta Waves

Figure 4 shows an increase in beta wave frequency intensity in the overthinking symptom condition, with an average of 0.04, compared to the normal condition which has an average of 0.03. This increase reflects higher cognitive activity, indicating mental burden, although still in the mild to moderate category for most respondents. Overthinking symptoms have not yet triggered a significant spike in beta activity, but still show a tendency for increased mental pressure. The similarity in values between the two conditions can also be caused by the absence of external stimuli that directly cause stress or anxiety in respondents.

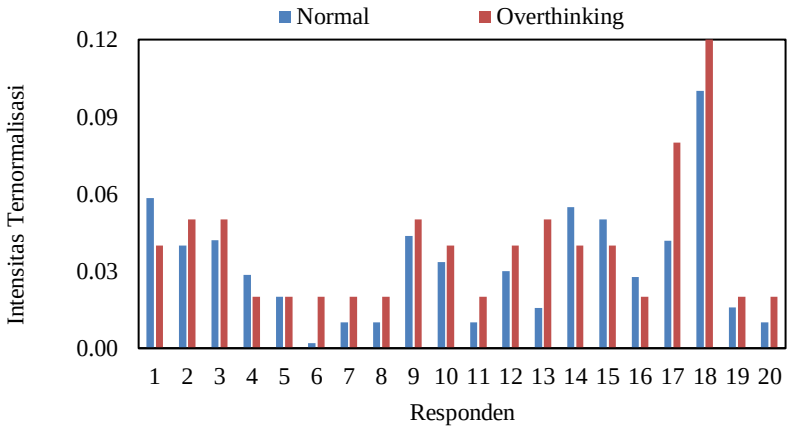

Figure 4. Difference in Normalized Intensity of Normal Condition and Overthinking Symptoms

Figure 5 shows that the beta wave frequency intensity in the condition after the Dzun Nuun prayer stimulus increased with an average of 0.05, compared to the normal condition which has an average of 0.03. Although this increase is not very significant, it can be interpreted as a mild cognitive response that is possibly triggered by the reflection process or increased concentration during listening to the prayer.

These findings are in line with research by Aziz Hayati, (2022), which shows that beta waves increase when individuals are in an actively thinking and focused condition, thus encouraging cognitive involvement in understanding the verses being heard. Thus, the increase in beta waves in the Dzun Nuun prayer stimulus can be understood as a cognitive response to the contemplation process and focus of attention during listening to the prayer.

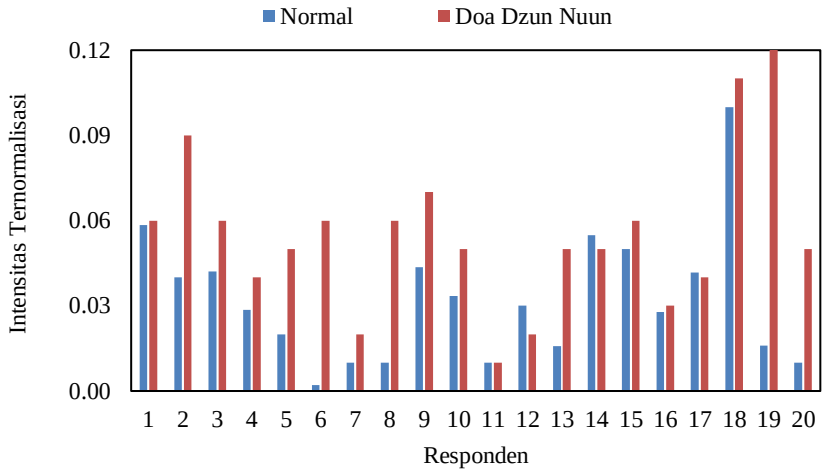

Figure 5. Difference in Normalized Intensity of Normal Condition and Dzun Nuun Prayer

Figure 6 shows that the beta wave intensity in the condition after the Dzun Nuun prayer stimulus has an average of 0.05, higher than the overthinking symptom condition with an average of 0.04. This indicates that the Dzun Nuun prayer affects the increase in beta wave activity.

According to Ma et al. (2024), beta waves are related to active thinking, focus, and mild cognitive activity, and involve activation of the brain's frontal area. When individuals actively listen to and understand the meaning of the Dzun Nuun prayer, the increase in beta waves reflects the neuronal response to fast and directed information processing.

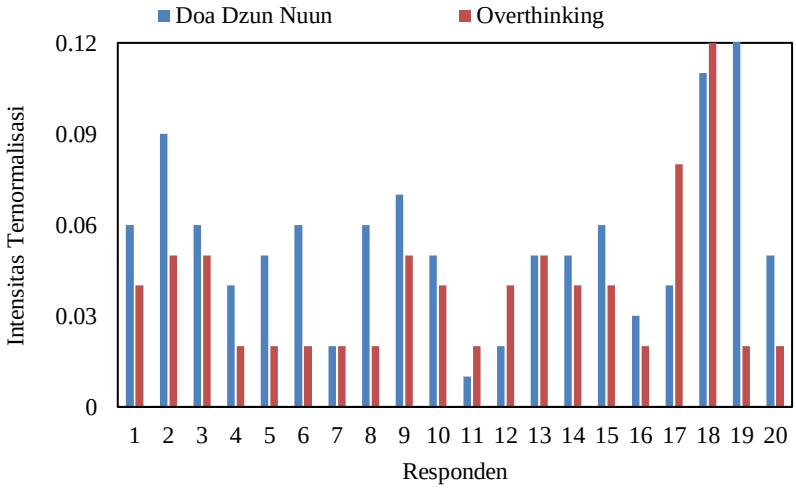

Figure 6. Difference in Normalized Intensity of Dzun Nuun Prayer Condition and Overthinking Symptoms

This comparison shows that although alpha wave intensity remains high, there is a decrease accompanied by an increase in beta waves, in accordance with neurophysiological characteristics in individuals experiencing overthinking symptoms. Thus, it can be concluded that respondents objectively show brain activity patterns that indicate the presence of overthinking symptoms.

Conclusion

The normalized intensity values of alpha and beta waves show a higher range after the administration of the Dzun Nuun prayer stimulus compared to the overthinking symptom condition. In the overthinking symptom condition, the alpha wave intensity range was between 0.02–0.34, while beta waves were in the range of 0.004–0.12. After being given the Dzun Nuun prayer stimulus, there was an increase in intensity range, namely alpha waves were at 0.05–0.30, and beta waves increased to 0.01–0.13. This data indicates changes in brain activity as a response to spiritual stimuli. Statistical analysis results show that the Dzun Nuun prayer affects alpha and beta wave activity in adolescents experiencing overthinking symptoms. This is evidenced by the alpha wave significance value of 0.026 ($p < 0.05$), which shows a significant influence. Similarly, beta waves show a significance of 0.039 ($p < 0.05$), which also indicates the influence of the Dzun Nuun prayer on the increase in beta wave activity.

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