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THE ROLE OF EXCESSIVE SOCIAL MEDIA USE IN PREDICTING SPIRITUAL COGNITIVE DECLINE AMONG MUSLIM ADOLESCENTS IN INDONESIA

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ABSTRACT

Social media has become an integral part of daily life for Muslim adolescents globally, raising concerns about "brain rot", caused by excessive exposure to low-quality digital content. While many studies have linked excessive social media use (ESMU) to declines in general cognitive functions, its effect on spiritual cognition remains underexplored. From the perspective of Islamic psychology, overstimulation may weaken essential aspects of spiritual cognition—such as worship focus (khusyū'), Qur'anic memorization, moral regulation, empathy, and ghowzul fikr—collectively framed in this study as Spiritual Brain Rot (SBR). This study aims to analyze the role of ESMU in predicting SBR among Muslim adolescents in Indonesia. A cross-sectional survey was conducted with 171 participants aged 11–19 using two validated instruments: the Excessive Social Media Use Scale (ESMUS) and the Spiritual Cognitive Function Scale (SCFS). Linear regression analysis revealed a significant and moderately strong relationship between ESMU and SBR ($R^2 = 0.358$, $\beta = 0.490$, 95% CI [0.38, 0.63], $p < 0.001$), indicating that ESMU accounts for 35.8% of the variance in SBR. In conclusion, the findings support the study's hypothesis that higher levels of ESMU are associated with a decline in spiritual

cognitive functioning, highlighting a potential disruption to adolescents' spiritual well-being in the digital age.

Keywords: *Excessive social media use, Spiritual brain rot, Spiritual cognitive decline, Muslim adolescents.*

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1. INTRODUCTION

Social media has become an inseparable part of adolescents' daily lives, offering new ways to connect, communicate, and consume information. However, its excessive use—referred to as Excessive Social Media Use (ESMU)—raises growing concerns among researchers, educators, and mental health professionals. ESMU is defined as a behavioral addiction marked by compulsive engagement, mood modification, tolerance, withdrawal, conflict, and relapse (Andreassen & Pallesen, 2014; Kuss & Griffiths, 2015). Adolescents are particularly vulnerable to ESMU due to the developmental imbalance between their emotional and cognitive brain systems. While the limbic system matures earlier, enhancing emotional sensitivity, the prefrontal cortex responsible for self-regulation and long-term thinking develops later, increasing the risk of impulsive behavior and digital overuse (Casey, 2008; Steinberg, 2013).

Recent neuroscience research highlights how ESMU can disrupt brain development by altering both structure and connectivity. Studies have shown reduced gray matter volume in regions responsible for memory and emotional regulation, such as the hippocampus, amygdala, and ventral striatum (He et al., 2023;

Ding et al., 2023; Wadsley & Ihssen, 2023). Functional MRI results also reveal weakened executive network activity and enhanced salience network connectivity, contributing to poor decision-making and compulsive digital behavior (Áfra et al., 2023; Lee et al., 2024). These findings underline the potential long-term cognitive and emotional consequences of ESMU during adolescence.

While existing studies have focused on attention, working memory, and executive function impairments caused by digital overstimulation (Hilman, 2024; Bulut, 2023; Xu, 2022; Rani et al., 2024), few have explored how these cognitive disturbances affect adolescents' spiritual lives. In Islamic psychology, cognition (‘aql) is seen as a holistic interaction between the brain and the heart (qalb). Classical scholars like Imam Al-Ghazali and Ibn Taymiyyah emphasized that spiritual understanding is rooted in the heart, which directs moral judgment and reasoning (Al-Ghazali, 2009; Rassool, 2025). This view is supported by modern neuroscience, which shows that the heart has its own neural network and plays a vital role in emotional and cognitive processes (McCraty, 2015).

To bridge this gap, the current study introduces the concept of the Spiritual Brain Rot (SBR)—a form of cognitive decline in the spiritual domains such as prayer concentration during prayer (khushu’), difficulties in Qur’anic memorization, diminished moral behavior, and decreased empathy. Although the term “brain rot” is popularized in the media (Loh & Kanai, 2016; The Atlantic, 2022), it has not been formally analyzed in spiritual contexts. By integrating classical Islamic concepts with neuroscience, this study aims to investigate how ESMU predicts

SBR in Muslim adolescents, offering a novel perspective that contributes to both psychological science and Islamic studies.

2. REVIEW OF LITERATURE

2.1 Excessive Social Media Use (ESMU) and Adolescent Vulnerability

Excessive Social Media Use (ESMU) refers to compulsive and uncontrolled use of social platforms that leads to negative consequences in daily life. Andreassen et al. (2017) define ESMU as a behavioral addiction with symptoms like being constantly preoccupied with social media (salience), using it to change mood (mood modification), needing to use it more and more (tolerance), feeling nervous or upset without it (withdrawal), having conflicts with others about its use (conflict), and returning to overuse after trying to stop (relapse) (Andreassen & Pallesen, 2014; Kuss & Griffiths, 2015).

Adolescent brains are particularly vulnerable to excessive social media use due to the imbalance in the development of emotional and cognitive control systems. During this stage, the limbic system—which processes emotions, rewards, and social feedback—matures earlier and more rapidly than the prefrontal cortex, which is responsible for impulse control, decision-making, and long-term planning (Casey, 2008). This mismatch makes teenagers more sensitive to emotional and rewarding content, such as likes, comments, and shares on social media platforms. As Steinberg (2013) points out, the immature prefrontal cortex limits adolescents' ability to regulate their impulses and assess long-term consequences, increasing the risk of addictive behaviors and poor judgment. Consequently,

the neurological immaturity of adolescents makes them more susceptible to the negative effects of excessive social media use, including distraction, emotional dysregulation, and impaired cognitive control.

2.2 Brain Structural and Neural Connectivity Changes due to ESMU

Excessive social media use (ESMU) during adolescence has been linked to significant changes in brain structure. Studies show that adolescents who engage heavily with social media experience reduced volume in subcortical areas such as the hippocampus, caudate, and thalamus, which are important for memory and reward processing (He et al., 2023; Ding et al., 2023). Furthermore, reductions in gray matter volume have been observed in regions like the ventral striatum, amygdala, and insula, affecting emotional regulation and increasing vulnerability to mental health problems (Wadsley & Ihssen, 2023; Weinstein, 2023). White matter integrity, especially in the corpus callosum, is also impaired, which can disrupt communication between the brain's hemispheres (He et al., 2018). These structural changes highlight the potential long-term risks of ESMU on healthy brain development during adolescence.

In addition to structural alterations, ESMU is associated with changes in neural connectivity that affect brain networks responsible for reward processing, attention, and emotional regulation. Functional MRI studies reveal reduced connectivity in the executive and frontoparietal networks, leading to poorer cognitive control and decision-making abilities (Áfra et al., 2023). Conversely, increased connectivity in the salience

network may heighten sensitivity to social rewards, contributing to compulsive behavior (Lee et al., 2024). Changes in the frontstriatal circuit, which connects the orbitofrontal cortex and nucleus accumbens, have also been observed, resulting in higher impulsivity and withdrawal symptoms (Chun et al., 2018). These findings suggest that ESMU not only changes brain structure but also disrupts how different parts of the brain communicate, impacting adolescents' emotional and cognitive functions over time.

2.3 Previous Studies about ESMU and Cognitive Function Decline

Cognitive functions, including attention, working memory, and executive control, are essential for information processing and daily functioning. Excessive social media use has been associated with impairments across these cognitive domains. Studies show that overstimulation from fast-paced digital content can lead to shortened attention spans and greater distractibility among teenagers (Hilman, 2024; Bulut, 2023), while frequent media multitasking further weakens attentional control (Costanzo, 2024; Stavrinos et al., 2019). Similarly, the fragmented and emotionally charged nature of social media content can overload working memory (Xu, 2022), reducing its capacity to retain and process information effectively (Dikshit & Kiran, 2023; Baumgartner et al., 2024; Rani et al., 2024). Executive control is also affected, with excessive users showing impaired inhibitory control, decreased planning and organizational skills, and increased impulsivity (Wulandari & Hendrawan, 2024; Ma et al., 2022). Neurobiological research further suggests that chronic digital media use may alter the structure and function of brain regions such as the prefrontal

cortex, which plays a central role in cognitive regulation (Marciano et al., 2021; Chun et al., 2024).

The term “brain rot” is commonly used in media to describe cognitive decline caused by social media overexposure. While not formally recognized in academic literature, its implications align with studies on neuroplasticity disruption and shallow thinking (Loh & Kanai, 2016). The Atlantic (2022) described social media as a “brain rot machine” due to its impact on attention span and depth of thought.

2.4 Classical and Contemporary Perspectives on Cognition (‘Aql): The Heart–Brain Connection

In Islamic tradition, the human cognition (‘aql) is not perceived as solely a brain function but as an integrated dynamic between the heart (qalb) and the brain. The Qur'an emphasizes this integration, stating, "Indeed, it is not the eyes that are blind, but the hearts within the breasts that are blind" (Qur'an, 22:46). Imam Al-Shafi'i interpreted this verse as confirmation that true understanding (‘aql) is rooted in the heart (Rassool, 2025). Supporting this, Ibn Abbas explained that acquiring knowledge involves "a questioning tongue and an understanding heart," highlighting the interaction between verbal inquiry and heart-based reflection (Rassool, 2025).

Ibn Taymiyyah further elaborated that ‘aql is not an independent substance but a characteristic residing in both the heart and the brain, varying in strength according to an individual's spiritual state (Rassool, 2025). Imam Al-Ghazali enriched this perspective by portraying the qalb as the "king" and the body, senses, and cognitive faculties as its "soldiers."

When the qalb is corrupted by heedlessness (ghaflah) and desires (shahawat), the entire system—cognitive, emotional, and behavioral—becomes compromised (Al-Ghazali, 2009). This holistic view is supported by the Prophet Muhammad's statement: "Truly, in the body there is a piece of flesh which, if sound, the whole body is sound; and if corrupted, the whole body is corrupted. Truly, it is the heart" (Bukhari & Muslim, as cited in Al-Ghazali, 2009). This traditional understanding frames the heart as central to both moral reasoning and cognitive capacities.

Modern neuroscience supports this classical Islamic view. Studies from the HeartMath Institute reveal that the heart possesses its own neural network and sends more information to the brain than it receives, influencing emotional regulation, decision-making, and memory (McCraty, 2015). In the context of excessive social media use (ESMU) among adolescents, overstimulation primarily disrupts not only executive cognitive functions but also impairs the heart's spiritual cognition—manifesting as reduced empathy, weakened moral judgment, and decreased spiritual awareness.

2.5 SBR Framework

Building upon these perspectives, this research proposes a conceptual framework termed Spiritual Brain Rot. Spiritual Brain Rot refers to the deterioration of cognitive functions—attention, memory, and executive functioning—within spiritual domains. It manifests in the weakening of prayer consciousness (khushu'), declining Qur'anic memorization, poor relational ethics toward parents and teachers, loss of empathy for fellow Muslims in crises like Gaza and Rohingya, and vulnerability to

ideological attacks known as ghazwul fikr. This model integrates the classical Islamic view of ‘aql with contemporary neuroscience findings, offering a comprehensive understanding of how ESMU harms both the brain and the heart.

However, a significant gap exists in current scholarship. Most existing studies on social media overstimulation focus on general cognitive impairments, without exploring its specific effects on the spiritual cognition of Muslim adolescents. Moreover, the integration of Islamic theological frameworks with modern neuroscience remains underdeveloped. This research aims to address this gap by synthesizing Islamic psychology with empirical findings, proposing a new model of how ESMU leads to Spiritual Brain Rot, thus contributing uniquely to both Islamic studies and psychological sciences.

3. RESEARCH METHODOLOGY

3.1 Research Design

This study used a quantitative correlational design to examine the relationship between Excessive Social Media Use (ESMU) and Spiritual Cognitive Decline (Spiritual Brain Rot/SBR) among Muslim adolescents in Indonesia. The research focused on measuring how the intensity of social media overuse correlates with deficits in spiritual cognition, including attention, memory, emotional regulation, empathy, and religious consciousness.

3.2 Participants

Participants were selected through convenience sampling from various junior and senior high schools across Indonesia in 2024, including both public schools and Islamic boarding schools. A

total of 171 Muslim adolescents aged 11 to 19 years participated, all of whom were active users of social media.

The sample was dominated by mid-to-late adolescents, with an average age of 15 years, and a majority being female (64%). This age group is particularly relevant to the study, as it coincides with the peak period of social media engagement and neurocognitive sensitivity. Most participants (75%) were high school students, and nearly all (97%) came from regular school settings.

The choice of platforms and content consumption patterns reflected high exposure to fast-paced, entertainment-driven media. TikTok (46%) and Instagram (41%) were the most frequently used platforms, with 76% of respondents reporting that their feeds were filled predominantly with humorous or light content. Such content characteristics are especially relevant to this study, as they align with literature suggesting that short-form, emotionally stimulating media may contribute to cognitive overload and shallow processing (Loh & Kanai, 2016; Firth et al., 2019).

Daily usage patterns further confirmed the intensity of engagement: 40% of participants accessed social media 4–6 times per day, and 44% spent between 1–3 hours daily. These behaviors underscore the relevance of this participant group to the study's objective—to investigate how frequent and emotionally charged media exposure may predict the decline in spiritual cognitive functioning among Muslim adolescents. "Appendix D, Table 5 presents all characteristics of the respondents."

3.3 Instruments

Two self-report questionnaires were used in this study. The first was the ESMU Questionnaire, adapted from the Bergen Social Media Addiction Scale (Andreassen et al., 2017). This instrument consists of six items rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), where higher scores indicate a higher level of excessive social media use. The total score for the ESMU Questionnaire ranges from 6 to 30. An example item is: "I often use social media longer than I planned." Appendix A (Table 1) shows how each questionnaire item matches the key signs of digital addiction based on Andreassen's definition.

The second instrument was the SBR Questionnaire, a newly developed scale containing 14 items organized into three subscales. The first subscale, Relationship with Allah (five items), measures focus in prayer, awareness of divine observation, and coping through worship. An example item is: "I often lose focus or forget the number of prayer units during salah." The second subscale, Relationship with Others (five items), assesses respect toward parents and teachers, emotional control, and task prioritization. An example item is: "I forget tasks requested by my parents because I am busy on social media." The third subscale, Concern for the Ummah (four items), evaluates empathy, critical thinking, and cognitive vigilance related to Islamic values. An example item is: "I rarely care about news regarding oppressed Muslims because I prefer entertainment content." Similar to the ESMU scale, the SBR Questionnaire uses a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), with the total score ranging from 14 to

70, where higher scores indicate greater spiritual cognitive decline.

Although the subscales were organized based on relational contexts, each item within the SBR scale was also designed to target specific cognitive functions. These included attention, memory and executive function. For example, items assessing attention include "I often lose focus or forget the number of prayer units during salah," while items related to emotional regulation include "I easily get angry when my parents advise me about social media use." A detailed mapping between each item and the targeted cognitive function is provided in the Appendix A (Table 2).

3.4 Validity and Reliability Testing

The reliability of the questionnaires was evaluated using Cronbach's Alpha to assess internal consistency. Item-total correlations were reviewed to ensure each item contributed meaningfully to the overall construct. These validation processes were conducted separately for the ESMU and SBR questionnaires prior to hypothesis testing.

For the ESMU scale, which consisted of 6 items, the item-total correlation values ranged from 0.518 to 0.725, indicating a strong internal consistency among items. All items exceeded the recommended threshold of 0.30 (Cortina, 1993), suggesting that each item significantly contributes to the overall construct of excessive social media use. The full list of ESMU questionnaire items and their correlations is presented in Tables 2 in Appendix B.

For the SBR scale, which consisted of 14 items, the item-total correlation values ranged from 0.459 to 0.696. These values also showed strong validity, as all items met the accepted minimum correlation level. The items reflected cognitive functions—attention, memory, and executive functioning—within spiritual disengagement, such as distraction in prayer, reduced empathy, and avoidance of spiritual reflection. This confirms that the SBR items are strongly related to the overall construct and support their inclusion in the final instrument. The full list of SBR questionnaire items and their correlations is presented in Table 3 in Appendix B

The reliability of both scales was assessed using Cronbach's alpha. The ESMU scale had an alpha coefficient of 0.72, while the SBR scale had a slightly higher alpha of 0.874, indicating moderate and strong internal consistency (George & Mallery, 2003). This suggests that both scales reliably measure the respective constructs they were designed to assess. (See Table 2)

Table 2. Internal Consistency of ESMU and SBR Scale

Scale	Number of Items	Cronbach's Alpha	Interpretation
ESMU	6	0.72	Moderate Consistency
SBR	14	0.874	Strong Consistency

These results confirm that the questionnaires used in this study are both valid and reliable for measuring excessive social media use and spiritual cognitive decline in Muslim adolescents.

However, some limitations should be acknowledged. First, although the instruments showed strong internal consistency, no confirmatory factor analysis (CFA) was conducted to evaluate the factor structure of the items. Second, the use of self-report questionnaires may introduce bias due to social desirability or lack of self-awareness (Podsakoff et al., 2003). Third, this study used the same sample to validate and test the instruments, which may introduce common-method bias.

3.5 Data Collection Procedures

Data was collected through an online survey platform, with informed consent obtained digitally. Participants completed the demographic form followed by the two questionnaires. The survey duration was approximately 10–15 minutes.

3.6 Data Analysis

Furthermore, to assist in the efficiency and accuracy of the data analysis process, ChatGPT's Analyze Data feature was employed. This AI tool facilitated the computation of instrument validity and reliability measurement, descriptive statistics, linear regression, assumption testing, and Spearman's correlation analysis. To ensure academic rigor, all results were critically reviewed and cross-validated against conventional statistical interpretation standards. This dual approach maintained the validity and reliability of the findings while leveraging AI-based advancements in research methodologies.

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4. RESULTS

4.1 Descriptive Statistics and Classification of ESMU and SBR

The ESMU score was calculated from 6 items on a 5-point Likert scale, resulting in a maximum score of 30. Based on the Interquartile Range (IQR) method and using the full theoretical range, cut-off points were: Low (6–13), Moderate (>13–18), and High (>18–30). Among the respondents, 33.9% were in the low category, 41.5% in the moderate category, and 24.6% in the high category (Figure 1)

SBR was measured using 14 items, with a maximum total score of 70. Using the IQR method and theoretical maximum, the score categories were defined as: Low (14–25), Moderate (>25–35), and High (>35–70). The results showed that 25.7% of respondents were in the low category, 50.3% in the moderate category, and 24.0% in the high category (Figure 2).

ESMU and SBR scores reveals that one in four adolescents faces substantial risks from both excessive media consumption and spiritual cognitive decline. These findings highlight the potential value of using this classification framework as a practical screening tool to identify and support at-risk youth.

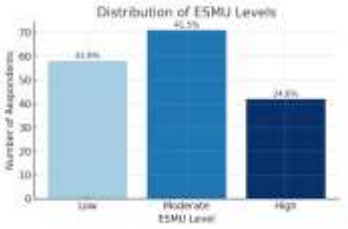

Figure 1. Distribution of ESMU Level

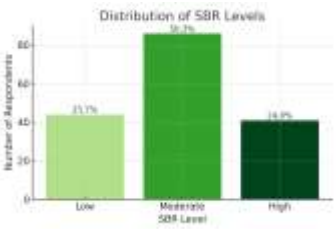

Figure 2. Distribution of SBR levels

4.2 Relationship Between ESMU and SBR Levels

A cross-tabulation analysis was conducted to explore the relationship between ESMU and SBR categories. The findings revealed a clear pattern: 60.4% of adolescents with high ESMU also experienced high SBR, while 53.8% of adolescents with low ESMU maintained low SBR levels. This suggests a proportional increase in spiritual cognitive decline as social media usage becomes excessive.

Table 4. Cross-tabulation of ESMU and SBR Levels (in %)

Tingkat ESMU	SBR ringan	SBR sedang	SBR tinggi	Total
Ringan	53.8%	38.5%	7.7%	100%
Sedang	17.5%	63.9%	18.6%	100%
Tinggi	6.3%	33.3%	60.4%	100%

A Chi-square test of independence confirmed that the relationship between ESMU and SBR is statistically significant, $\chi^2(4, N=171) = 51.02$, $p < .001$. This supports the hypothesis that the two variables are not independent and tend to move together in a predictable pattern.

4.3 Correlation Analysis

To further quantify the strength of association, a Spearman correlation test was conducted due to the non-normal distribution of the variables. The analysis revealed a moderate positive correlation, $\rho = 0.56$, $p < .001$. This result indicates that as ESMU increases, so does SBR. Spearman's method is particularly robust when the assumption of normality is violated (Field, 2018).

4.4 Predictive Role of ESMU on SBR

To examine whether ESMU predicts SBR, a simple linear regression was performed. The model was statistically significant, (R^2 = 0.358, β = 0.490, 95% CI [0.38, 0.63], $p < 0.001$) This means that approximately 35,8% of the variance in SBR scores can be explained by adolescents' excessive social media use. The regression equation is: SBR_avg = 0.75 + 0.49 × ESMU_avg

This indicates that for every one-point increase in ESMU, there is a predicted 0.49-point increase in SBR, controlling for other factors.

Although the residuals of the regression model showed slight deviation from normality (p = .031), the residual vs. fitted plot demonstrated no major violations of linearity or homoscedasticity. In social science research, slight deviations are acceptable, especially with sample sizes over 100 (Hair et al., 2019). Thus, the regression result is considered statistically robust.

5. DISCUSSION

These results align with previous research that connects ESMU to problems in attention, memory, and emotional control. For example, Gerges et al. (2023) and Zhang et al. (2023) found that ESMU often leads to emotional instability and loneliness, which then affects how young people think and behave. Our study adds to this by showing how those same effects may touch deeper areas of life, such as spiritual cognition awareness and moral sensitivity.

Reed (2022) highlighted that people who are too dependent on digital media tend to struggle with self-control and thoughtful decision-making. Petrash et al. (2022) found that long periods of exposure to multimedia content could weaken memory functions. What our study adds is the spiritual dimension: the decline of focus in prayer, weak memory of Qur'anic teachings, loss of moral clarity, and emotional numbness toward others' suffering.

From an Islamic perspective, this kind of decline cannot be seen as just a problem of the brain. Islamic scholars like Al-Ghazali and Ibn Taymiyyah taught that real understanding ('aql) comes from the heart (qalb), not just the mind. When the qalb is overstimulated or distracted, its ability to guide the mind and spirit becomes clouded. This view helps explain our findings: ESMU is not only hurting how adolescents think—it is may also dulling their hearts and weakening their moral compass.

Modern science supports this connection. Research by the HeartMath Institute (McCraty, 2015) shows that the heart sends signals to the brain that influence emotions and decisions. This strengthens the idea that digital overstimulation can upset the balance between brain and heart, leading to both cognitive confusion and spiritual cognition declined—what we describe as Spiritual Brain Rot.

Another study by Oh et al. (2022) found that high exposure to media predicted long-term decline in mental control. Even though our study is cross-sectional, the results point to a worrying pattern: ESMU may slowly erode not just how adolescents think, but also how they feel, remember, and connect spiritually.

By combining insights from data and faith, this study offers a fresh perspective. Most past research focused on Western psychological views. We propose a more culturally and spiritually relevant framework that better reflects the lives of Muslim youth in today's digital world.

6. CONCLUSION, STRENGTHS AND LIMITATIONS

This study highlights the significant role of excessive social media use (ESMU) in predicting the decline of spiritual cognitive function among Muslim adolescents. The findings demonstrated that nearly half of the respondents reported moderate to high levels of ESMU, and this behavior significantly accounted for 35.8% of the variance in Spiritual Brain Rot (SBR). Although this study did not perform factor analysis, the SBR scale was conceptually designed to reflect three key dimensions of Islamic spirituality: connection with Allah, interpersonal ethics, and empathy toward the ummah in the face of ideological challenges such as ghazwul fikr. These dimensions align with Islamic psychological concepts such as muraqabah, husn al-khuluq, and spiritual resilience. Overall, the research provides new insight into how digital overstimulation through social media may impair not only cognitive performance but also spiritual awareness, offering a framework that integrates neuroscience and Islamic psychology in addressing adolescent mental and spiritual health.

Future studies should explore longitudinal patterns, apply this framework across diverse Islamic educational settings, and test interventions grounded in Islamic values like tazkiyah, tafakkur, and muraqabah. Protecting the spiritual mind in the digital age

is not only a psychological priority—it is an obligation rooted in the maqasid shariah.

This study presents several notable strengths. First, it introduces an original conceptual framework—Spiritual Brain Rot (SBR)—which integrates Islamic theological concepts with cognitive neuroscience, offering a culturally relevant lens to assess spiritual cognitive decline in Muslim adolescents. Second, the development and validation of the Spiritual Cognitive Function Scale (SCFS) as a multidimensional instrument—covering memory, attention, and executive function in spiritual contexts—demonstrate methodological innovation. Third, the use of robust statistical analyses, including reliability testing, correlation, and regression, strengthens the internal validity of the findings, while the sample size of 171 participants provides adequate statistical power. Fourth, the integration of Islamic psychology perspectives, including classical scholars like Al-Ghazali and Ibn Taymiyyah, with modern brain science supports a novel interdisciplinary contribution.

However, some limitations must be acknowledged. The cross-sectional design restricts causal inference, making it impossible to determine the long-term effects of ESMU on spiritual cognition. Additionally, the use of self-report questionnaires may introduce social desirability bias or inaccuracies due to limited self-awareness among adolescents. Another methodological constraint is that the validation and testing of instruments were conducted within the same sample, increasing the risk of common method variance. Furthermore, the study did not include a confirmatory factor analysis (CFA),

which would have strengthened the structural validation of the instruments.

Despite these limitations, the findings have meaningful implications. Practically, they highlight the need for digital literacy programs rooted in Islamic values, emphasizing emotional regulation, empathy, and worship focus. Theoretically, this study lays the groundwork for future longitudinal research exploring how digital behavior influences spiritual development over time. Moreover, it encourages scholars in Islamic psychology to further integrate classical teachings with empirical methods to address modern challenges in adolescent mental and spiritual health.

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APPENDICES

Appendix A. Conceptual and Functional Analysis of ESMU and SBR Questionnaire Items

Table 1. Item Analysis of the ESMU Questionnaire Based on Behavioral Addiction Criteria

Item Statement	Addiction Dimension (Andreassen et al.)	Behavioral Indicator	Explanation
Saya sering menggunakan media sosial lebih lama daripada yang saya rencanakan.	Salience	A strong need to use social media as a main priority.	This item reflects salience because social media becomes a central focus of the user's attention.
Begitu bangun tidur, saya langsung mengecek media sosial.	Withdrawal	Feeling uncomfortable or worried when disconnected.	This fits the withdrawal symptom in behavioral addiction very well.
Saya kesulitan berhenti scrolling meskipun sudah berniat.	Loss of control / Tolerance	Unable to limit usage duration.	This shows tolerance because users need more time to satisfy their need.
Aktivitas belajar atau ibadah saya terganggu karena asyik di media sosial.	Relapse	Failing to stop the habit despite intentions.	This shows relapse, a key feature of behavioral addiction.
Saya merasa gelisah atau tidak nyaman jika tidak membuka media sosial dalam waktu lama.	Conflict	Skipping responsibilities due to media use.	This item shows conflict between addiction and life roles.
Saya lebih sering berinteraksi di media sosial daripada berbicara langsung dengan keluarga atau teman.	Mood Modification	Using social media to escape emotions.	This reflects mood modification, where users rely on media for emotional relief.

Table 2. Mapping of SBR Questionnaire Items to Cognitive Functions

Subscale	Item Statement	Primary Function	Secondary Functions	Explanations
Subscale 1: Relationship with Allah	Saya sering kehilangan fokus atau lupa rakaat saat sholat.	Attention	Memory, Executive Function	Attention: disrupted concentration during prayer; Memory: forgetting the number of rak'ahs; Executive Function: inability to maintain worship structure
	Saat mendengar adzan, saya menunda sholat karena asyik bermain media sosial.	Executive Function	Attention, Memory	Executive Function: poor prioritization and delay in religious duty; Attention: easily distracted by digital content; Memory: possibly forgetting prayer timing
	Saya jarang memikirkan pengawasan Allah ketika hendak menonton atau membaca konten yang tidak baik.	Executive Function	Attention, Memory	Executive Function: weak moral self-regulation; Attention: lack of moral sensitivity; Memory: diminished recall of muraqabah concepts
	Saya kesulitan menambah atau mengulang hafalan Al-Qur'an karena sering lupa atau tidak fokus.	Memory	Attention, Executive Function	Memory: impaired Qur'an retention; Attention: poor focus during memorization; Executive Function: weak self-discipline in spiritual practices
	Saya lebih sering mencari hiburan online daripada berdoa atau berdzikir saat menghadapi masalah.	Executive Function	Attention, Memory	Executive Function: poor stress coping prioritization; Attention: lack of inclination toward worship; Memory: neglecting spiritual solutions
Subscale 2: Relationship with Others	Saya sering lupa tugas yang diminta orang tua karena lebih sibuk bermain media sosial.	Memory	Executive Function	Memory: forgetting instructions; Executive Function: failure to manage time and responsibility
	Saya mudah terpancing emosi atau berkata kasar saat orang tua menegur saya tentang penggunaan media sosial.	Executive Function	Attention	Executive Function: emotional impulsivity; Attention: defensive response without reflection

Appendix B. Validity of ESMU and SBR Questionnaires

Table 3. Item-Total Correlation – ESMU Questionnaire (6 items)

No.	ESMU Item (English Translation)	Item-Total Correlation
1	I often use social media longer than I planned.	0.585
2	As soon as I wake up, I check social media.	0.711
3	I find it hard to stop scrolling even when I no longer enjoy the content.	0.725
4	My study or worship activities are disturbed by social media.	0.664

5	I feel anxious or uncomfortable if I do not open social media.	0.681
6	I prefer using social media over completing important tasks.	0.518

Table 4. Item-Total Correlation – SBR Questionnaire (14 items)

No.	SBR Item (English Translation)	Item-Total Correlation
1	I often lose focus or forget prayer units during salah.	0.500
2	I postpone prayer after hearing adzan due to social media.	0.683
3	I rarely think about Allah's supervision when viewing inappropriate content.	0.651
4	I struggle in Qur'anc ziyadah or murojaah due to forgetfulness or lack of focus.	0.673
5	I seek online entertainment more often than reflecting on Qur'anic verses during problems	0.663
6	I forget tasks requested by parents due to being busy on social media.	0.641
7	I easily get angry or speak harshly when corrected by parents about social media use.	0.624
8	I rarely pay attention to family needs because my mind is busy with social media.	0.696
9	I cannot focus during teacher's explanation because secretly checking social media..	0.459

10	I feel disturbed or upset when the teacher reprimands me for social media use..	0.522
11	I rarely care about news about oppressed Muslims because I prefer entertainment content.	0.563
12	I am lazy to verify Islamic information or news found on social media.	0.643
13	I am unaware of content weakening Islamic faith (ghazwul fikri) because I find it troublesome to learn.	0.692
14	I rarely pray for oppressed Muslims because I think it is not important.	0.648

Appendix C. Questionnaires (Indonesian Version)

Assalamu'alaikum warahmatullahi wabarakatuh,

Terima kasih telah bersedia meluangkan waktu untuk berpartisipasi dalam penelitian ini. Penelitian ini bertujuan untuk mengetahui hubungan antara penggunaan media sosial secara berlebihan (Excessive Social Media Use) dengan penurunan fungsi kognitif (Spiritual Brain Rot) pada remaja Muslim. Data yang Anda berikan akan membantu kami memahami dampak penggunaan media sosial terhadap spiritualitas dan hubungan sosial Anda.

Informed Consent
Kerahasiaan: Semua jawaban Anda bersifat rahasia dan hanya digunakan untuk tujuan penelitian.
Kesukarelaan: Partisipasi Anda bersifat sukarela. Anda bebas menghentikan partisipasi kapan saja tanpa konsekuensi.
Durasi Pengisian: Kuesioner ini memerlukan waktu sekitar 10–15 menit.
Jika Anda bersedia melanjutkan, silakan klik "Lanjutkan" atau isi kuesioner berikut ini. Terima kasih atas partisipasi Anda.
Wassalamu'alaikum warahmatullahi wabarakatuh.
Hormat kami,
dr. Fitri Mulya Verakadita, Sp. A
International Open University/Magister Psikologi Islam
DATA DEMOGRAFI

1. Jenis Kelamin
   - Laki-laki
   - Perempuan
2. Usia (isi dengan angka, misalnya: 12, 13, dst.)
3. Tingkat Pendidikan
   - SMP/MTs Kelas VII
   - SMP/MTs Kelas VIII
   - SMP/MTs Kelas IX
   - SMA/MA Kelas X
   - SMA/MA Kelas XI
   - SMA/MA Kelas XII
4. Apakah Anda memiliki akun media sosial?
   - Ya
   - Tidak

(Jika "Tidak," kuesioner mungkin tidak relevan.)

5. Media sosial apa yang paling sering Anda gunakan? (pilih satu)
   - Instagram
   - TikTok
   - YouTube
   - Twitter
   - Facebook
   - Lainnya: _____
6. Jenis konten apa yang paling sering Anda konsumsi di media sosial?
   - Edukasi (sains, agama, tutorial, dsb.)
   - Hiburan (video lucu, musik, meme, dsb.)
   - Informasi (berita, tren terkini, tips, dsb.)
   - Konten ringan/santai (meme, konten iseng)
   - Motivasi/inspirasi
   - Agama (kajian, cerita Nabi, dsb.)
   - Lainnya: _____
7. Berapa kali Anda membuka media sosial dalam sehari?
   - 1–3 kali
   - 4–6 kali
   - 7–10 kali
   - Lebih dari 10 kali
8. Berapa lama rata-rata Anda menggunakan media sosial setiap hari?
   - < 30 menit
   - 30 menit – 1 jam
   - 1–2 jam
   - 2–3 jam
   - Lebih dari 3 jam

KUISEONER ESMU

Instruksi: Pilih jawaban yang paling sesuai dengan kebiasaan Anda menggunakan media sosial. Gunakan skala:

1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Ragu-ragu, 4 = Setuju, 5 = Sangat Setuju.

1. Saya sering menggunakan media sosial lebih lama daripada yang saya rencanakan.
2. Begitu bangun tidur, saya langsung mengecek media sosial.
3. Saya kesulitan berhenti scrolling meskipun sudah berniat.
4. Aktivitas belajar atau ibadah saya terganggu karena asyik di media sosial.
5. Saya merasa gelisah atau tidak nyaman jika tidak membuka media sosial dalam waktu lama.
6. Saya lebih sering berinteraksi di media sosial daripada berbicara langsung dengan keluarga atau teman.

KUSIONER SBR

Instruksi: Pilih jawaban yang paling sesuai dengan kondisi Anda. Gunakan skala: 1 = Sangat Tidak Setuju, 2 = Tidak Setuju, 3 = Ragu-ragu, 4 = Setuju, 5 = Sangat Setuju.

Subskala 1: Hubungan dengan Allah (Spiritualitas dan Kesadaran Ibadah)

1. Saya sering kehilangan fokus atau lupa rakaat saat sholat.
2. Saat mendengar adzan, saya menunda sholat karena asyik bermain media sosial.
3. Saya jarang memikirkan pengawasan Allah ketika hendak menonton atau membaca konten yang tidak baik.
4. Saya kesulitan menambah atau mengulang hafalan Al-Qur'an karena sering lupa atau tidak fokus.
5. Saya lebih sering mencari hiburan online daripada berdoa atau berdzikir saat menghadapi masalah.

Subskala 2: Hubungan dengan Manusia (Adab terhadap Guru dan Orang Tua)

6. Saya sering lupa tugas yang diminta orang tua karena lebih sibuk bermain media sosial.
7. Saya mudah terpancing emosi atau berkata kasar saat orang tua menegur saya tentang penggunaan media sosial.
8. Saya jarang memperhatikan kebutuhan keluarga karena pikiran saya sibuk dengan media sosial.
9. Saya tidak fokus saat guru menjelaskan karena sering membuka media sosial secara diam-diam.
10. Saya merasa terganggu atau kesal saat guru menegur saya karena penggunaan media sosial.

Subskala 3: Kepedulian terhadap Umat dan Ghazwul Fikri

11. Saya jarang peduli dengan berita tentang penderitaan umat Islam (misalnya di Gaza atau Rohingya) karena lebih tertarik pada konten hiburan.
12. Saya malas memverifikasi informasi agama atau berita keislaman yang saya temukan di media sosial.
13. Saya tidak menyadari adanya konten yang melemahkan akidah (ghazwul fikri) karena tidak ingin repot mempelajarinya.

14. Saya jarang mendoakan umat Islam yang sedang tertindas karena merasa itu bukan hal yang penting bagi saya.

Appendix D. Demographic Characteristics

Table 5. Demographic Characteristics of Respondents (N = 171)

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	61	36.0
Female	110	64.0
Mean Age (years)	15	
School Type		
Regular	166	97.0
Boarding	5	3.0
School Level		
Elementary	5	3.0
Junior High	33	20.0
Senior High	129	75.0
College	4	2.0
Most Used Social Media		
TikTok	78	46.0
Instagram	70	41.0
YouTube	13	8.0
Others	10	5.0
Most Viewed Content		
Entertainment	103	60.0
Light	27	16.0
Information	16	9.0
Motivation	8	5.0
Religious	8	5.0
Educational	7	4.0
Sports	2	1.0

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Daily Social Media Access Frequency		
1-3x	35	20.5
4-6x	69	40.0
7-10x	35	20.5
>10x	32	19.0
Daily Duration		
<30 mins	10	6.0
30-60 mins	47	28.0
1-2 hrs	37	21.0
2-3 hrs	38	22.0
>3 hrs	39	23.0