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Bio psycho socio spiritual intervention model for adolescent impulsivity management in digital era

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Abstract: The escalation of impulsive behavior and digital addiction among adolescents in institutional care has become a pressing multidimensional clinical phenomenon in Indonesia. The complex interaction between primary attachment deficits and massive exposure to social media algorithms that exploit the dopaminergic system creates a double vulnerability including delayed maturity of executive functions in the prefrontal cortex and an acute void of spiritual meaning. This study aims to evaluate the effectiveness and explore the dynamics of behavioral change through an integrative Bio Psycho Socio Spiritual intervention model. Utilizing a descriptive case study design with ten adolescent participants at Orphanage X, this research gathered data through intensive participant observation, in-depth clinical interviews, and focus group discussions. The thematic analysis identified four fundamental mechanisms of change including neurobiological literacy, behavioral rehearsal, peer support engineering, and the internalization of God-consciousness. The results indicate that integrating neuroscientific understanding and Islamic spiritual values effectively transforms external compliance into resilient intrinsic self-regulation. This study concludes that a holistic approach addressing biological, psychological, social, and spiritual dimensions is essential for managing adolescent impulsivity in the digital age.

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INTRODUCTION

Adolescence is defined as a turbulent developmental transition period characterized by massive neurobiological restructuring particularly within the brain architecture that regulates emotions and actions (Casey et al., 2008; Crone & Dahl, 2012). Recent neurobiological investigations provide empirical evidence of a functional developmental mismatch between the limbic system which matures early as the center of primitive emotions and the prefrontal cortex which matures much later as the center of executive control (Shulman et al., 2016; Steinberg, 2010). This physiological imbalance creates an inherent vulnerability where adolescents possess a strong biological drive toward risk-taking behaviors, impulsive actions, and a fundamental difficulty in delaying the gratification of immediate desires (Defoe et al., 2015; Vohs & Baumeister, 2018). Scientific understanding confirms that the inability of adolescents to control themselves can no longer be judged as a mere moral failure but must be diagnosed as a deficit in neurocognitive capacity that requires specific intervention to mature the brain's executive functions (Diamond, 2013; Porges, 2011).

The complexity of emotional dysregulation is further amplified in institutional settings such as orphanages where adolescents often face unique psychological challenges (Geldard, 2011; Maclean, 2003). Attachment theory posits that the absence of a consistent and responsive caregiver, a secure base, during childhood inhibits the process of shared emotional regulation which is the absolute foundation for the formation of independent self-soothing abilities (Bowlby, 1999; Schore, 2001). Defisit pengasuhan ini mengakibatkan sistem respons stres pada otak remaja panti asuhan menjadi hipersensitif terhadap ancaman maupun godaan

lingkungan (Geldard, 2011). Consequently, adolescents in these settings are significantly more likely to develop externalizing behaviors such as aggression and impulsivity compared to those raised in stable family environments (Bowlby, 1999).

In the contemporary digital era, these vulnerabilities are exploited by persuasive technology design that affects adolescent public health (Asosiasi Penyelenggara Jasa Internet Indonesia [APJII], 2024; Firth et al., 2019). Excessive use of social media and digital platforms is proven to trigger abnormal dopamine release through variable reward schedules which impairs the executive control systems of the adolescent brain (Brand et al., 2016; Kuss & Griffiths, 2011; Sherman et al., 2016). Online anonymity further facilitates behavioral disinhibition leading to a degradation of communication ethics and an increase in cyberbullying among Indonesian youth (Ardiansyah & Idris, 2025; Tsani et al., 2024). Data from the Indonesia National Adolescent Mental Health Survey confirms that these digital dynamics contribute significantly to the high prevalence of mental health issues among the younger generation (Indonesia National Adolescent Mental Health [I-NAMHS], 2022).

Current intervention landscapes remain fragmented where mainstream clinical psychology approaches often overlook the transcendental dimension that is crucial for religious societies (Haque et al., 2016; Nashori & Mucharram, 2002). Secular behavior modification techniques like cognitive behavioral therapy provide valuable tools but often fail to offer long-term motivational sustainability when disconnected from spiritual meaning (Beck & Beck, 2011; Skinner, 2019). On the other hand, traditional religious education in orphanages frequently relies on dogmatic methods that do not provide concrete self-regulation skills relevant to the digital reality of Generation Z (Irfani & Muhlis, 2025; Niyozov & Memon, 2011). This methodological gap necessitates an intervention model that bridges brain science logic with the depth of spiritual values (Rothman & Coyle, 2018; Yusuf et al., 2022).

This research proposes the Bio Psycho Socio Spiritual model as a holistic solution to the crisis of adolescent impulsivity (Haque et al., 2016; Nashori & Mucharram, 2002). The model is based on the postulate that self-control resilience can only be achieved when biological, psychological, social, and spiritual dimensions are addressed simultaneously. The biological dimension provides rational health-based motivation while the psychological dimension offers technical behavioral skills. Furthermore, the sociological dimension ensures environmental support and the spiritual dimension provides ultimate life meaning. This study aims to investigate the dynamics of behavioral change and validate the interaction of these four dimensions in restoring the self-regulation abilities of orphanage adolescents in the digital world.

METHOD

This research utilized a qualitative approach with a descriptive case study design based on methodological parameters from Yin (2014) and Creswell & Poth (2018). This design allowed for a thorough investigation of internal thought processes and emotional struggles that cannot be fully captured by statistical data (Azwar, 2017). The study involved ten adolescents aged 12 to 17 years at Orphanage X, selected through purposive sampling based on indications of emotional dysregulation and high digital dependency (American Psychiatric Association, 2022).

The intervention was conducted through six weekly structured sessions incorporating principles of cognitive behavior modification, social learning theory, and soul purification (Bandura, 1977; Ghazzali & Karim, 2015; Meichenbaum, 1979). The sessions included neurobiological literacy, psychological coping skills training, peer-support engineering, and spiritual internalisation through God-consciousness (Beck & Beck, 2011; Bronfenbrenner, 2009; Nashori & Mucharram, 2002; Siegel, 2015). Data collection involved intensive participant observation, in-depth clinical interviews, and focus group discussions to ensure information saturation. The verbatim data were processed using thematic analysis to identify patterns of behavioral change (Braun & Clarke, 2006)

Table 1. Detailed Intervention Protocol Schedule

Week	Focus Dimension	Care Activity	Objective

1-2	Biological	Brain mapping and dopamine education	Cognitive restructuring of delinquency labels
3-4	Psychological	Stop-Think-Act and breathing role-plays	Developing behavioral inhibition latency
5	Sociological	Buddy System and peer monitoring	Establishing collective group efficacy
6	Spiritual	Muraqabah contemplation and Hifz therapy	Internalizing transcendental supervision

RESULT

Participant baseline data indicated a high frequency of reactive behaviors where external stimuli were met with immediate aggression without any form of cognitive filtering or intentional inhibition. Observations during the first week recorded numerous physical and verbal conflicts during unstructured orphanage activities, often triggered by minor social friction such as disagreements over communal resources or perceived personal slights. These behaviors were clearly identified as manifestations of a dominant limbic system response coupled with a significant lack of executive control from the prefrontal cortex. Initial interviews revealed that participants felt their behavior was largely uncontrollable and they often attributed this volatility to their identity as troubled or inherently bad children. Furthermore, these reactive episodes frequently resulted in disruptions to the orphanage's daily schedule, necessitating frequent and stressful interventions from the resident staff and caregivers who felt overwhelmed by the constant behavioral management required.

Table 2. Summary of Behavioral Frequency Change (Pre vs Post Intervention)

Indicator of Impulsivity	Pre-Intervention (Avg/Week)	Post-Intervention (Avg/Week)	Reduction
Verbal Aggression (shouting/cursing)	14.2	3.4	76%
Physical Impulse (hitting/pushing)	5.8	0.6	89%
Digital Addiction (Screen time >5h)	10 participants	2 participants	80%
Rule Violation (Orphanage protocol)	8.5	1.2	85%

The introduction of neurobiological literacy triggered a significant and rapid shift in how participants perceived their own internal impulses and emotional triggers. Data from the second week showed that participants began to use terminology such as dopamine and prefrontal cortex to describe their internal states during post-conflict debriefings. For example, Subjek ZA (17 years old) noted that understanding the biological impact of digital use on his brain reduced his persistent feelings of guilt and increased his internal motivation to engage in the healing process. This shift indicated that providing scientific information acted as a non-judgmental framework for self-evaluation, allowing participants to view their brains as valuable assets that needed protection rather than sources of shame. Participants appeared visibly relieved when they realized that their impulsivity was a physiological condition that could be managed rather than a permanent moral failure or character flaw, leading to a more collaborative attitude during therapy sessions.

Mastery of psychological coping skills progressed significantly as participants consistently practiced the Stop-Think-Act protocol during simulated scenarios designed to mimic high-tension conflicts. Researchers observed that while the physical urge to act aggressively remained present during these simulations, participants were increasingly able to perform deep breathing exercises to create a necessary cognitive pause. By the fourth week, the success rate of performing this intentional pause during role-plays improved substantially, showing a marked reduction in impulsive motoric responses. Participants reported that these technical skills provided them with the necessary tools to navigate high-arousal situations that previously would have led to immediate physical aggression. Additionally, researchers noted that participants displayed more visible physiological calming, such as steadier breathing and less muscle tension, as the sessions progressed toward the end of the month, suggesting an internalization of the relaxation techniques.

The establishment of the peer support system transformed the social interactions within the orphanage into a collective coregulation mechanism. Observations during the fifth week captured numerous instances where participants used the shared neurobiological language to remind one another to stay calm during potential conflict escalations. Instead of escalating conflicts through provocation, peers acted as external monitors by shouting friendly reminders about amygdala activation and the need to protect their prefrontal cortex from further stress. This social engineering effectively lowered the overall level of hostility in common areas and created a more supportive environment where self-control was socially valued rather than being seen as a sign of weakness. The "Buddy System" pairs were observed actively intervening in each other's digital habits, encouraging a reduction in screen time through mutual accountability and the promotion of shared recreational activities that fostered healthier social bonds.

Table 3. Summary of Thematic Findings and Key Verbatim Evidence

Main Theme	Cognitive/Behavioral Shift	Representative Verbatim Evidence
Neuro-Biological	From Moral Failure to Brain Health	My anger is not because I am a devil, but because my dopamine is chaotic
Behavioral Mastery	From Automaticity to Intentional Pause	My chest felt tight holding my hand back, but after 5 seconds, it felt relieved.
Social Engineering	From Provocation to Peer Support	We shout Amygdala Error! as a code to remind each other to stay calm.
Transcendental	From Surveillance to God-Consciousness	God's CCTV is active 24/7; I feel ashamed to sin even when I am alone

Spiritual internalisation through the practice of God-consciousness or Muraqabah provided a deep and persistent sense of accountability that continued even in private or unsupervised moments. Data from interviews during the final week highlighted that participants felt a profound sense of shame toward the Creator when contemplating deviant behaviors that they had previously performed in secret. This internalised monitoring system was reported to be particularly effective when participants were alone with their gadgets at night, which was previously identified as a high-risk period for impulsive digital consumption and isolation. Participants described this spiritual awareness as a more powerful and enduring deterrent than the physical presence of orphanage caregivers or strict institutional rules. One participant specifically mentioned that the feeling of being "seen" by God provided an ontological security that helped quiet the restlessness of the limbic system during moments of profound solitude, making the abstinence from digital temptations feel meaningful rather than punitive.

Increased cognitive endurance was also documented through the holy book memorization sessions, which were used to train sustained attention and executive focus. Participants who initially struggled to focus for short periods without fidgeting or becoming distracted demonstrated an ability to engage in focused memorization for significantly longer durations by the end of the intervention. This improvement in attention span was positively correlated with a reduction in the reported urge for immediate digital gratification and other sensation-seeking behaviors that typically characterize digital addiction. The process of repetition and structured mental effort in memorization appeared to strengthen the participants' capacity for sustained focus and internal discipline. Furthermore, the success in memorizing segments of text provided participants with a sense of intellectual and spiritual competence that boosted their overall self-esteem and commitment to the model's long-term goals.

Finally, feedback from orphanage caregivers confirmed a noticeable and lasting improvement in the general institutional atmosphere and the quality of interpersonal relationships. Caregivers reported a significant decrease in the number of formal disciplinary reports and a marked increase in compliance with orphanage routines and communal duties. They also observed that participants were more mindful of their digital habits, often choosing to self-limit their screen time without being prompted by authority figures. Most importantly, the staff noted that the participants frequently discussed their brain health with one another, showing that the neurobiological literacy had become a permanent part of their social culture. These findings collectively suggest that the integrative Bio Psycho Socio Spiritual model succeeded in fostering a reflective, self-regulated, and more harmonious culture among the participants within the orphanage setting, ultimately reducing the overall burden of behavioral supervision on the staff.

DISCUSSION

The effectiveness of the Bio Psycho Sosio Spiritual model in this study emphasizes the importance of addressing the biological foundations of behavior before introducing psychological or spiritual concepts. Adolescent impulsivity is deeply rooted in the functional developmental mismatch between the limbic system and the prefrontal cortex (Casey et al., 2008; Steinberg, 2010). By providing neurobiological literacy, the intervention establishes a rational scientific foundation that reduces cognitive resistance and de-stigmatizes behavioral issues (Crone & Dahl, 2012; Siegel, 2015). This approach transforms the participant's self-perception from a moral failure to a health-oriented recovery process.

Table 4. Integration Matrix of Multi-Dimensional Interactions

Dimension	Primary Mechanism	Synergistic Effect on Other Dimensions
Biological	Neuro-literacy	Reduces Psychological resistance to therapy
Psychological	Stop-Think-Act	Provides technical skill for Social conflict resolution
Sociological	Buddy System	Lowers Biological stress via coregulation
Spiritual	Muraqabah	Sustains Psychological effort via transcendental meaning

Biological literacy acts as a gateway for cognitive restructuring by providing an objective framework for self-observation. Adolescents who are often resistant to moralistic preaching are more receptive to medical facts regarding neurotransmitters and brain atrophy (Lukens & McFarlane, 2004; Shulman et al., 2016). Understanding that impulsivity is a physiological state that can be improved through healthy habits motivates participants to engage more deeply with subsequent therapy stages (Glanz et al., 2008). This scientific rationale serves as a modern validation of religious teachings regarding the preservation of the intellect and the body.

Neural plasticity is actively facilitated through behavioral rehearsals that strengthen the brain's inhibitory pathways. The repetition of the Stop-Think-Act protocol during role-plays is not merely a social exercise but a method for carving new synaptic connections that allow for better executive control (Diamond, 2013; Siegel, 2015). This mastery over physical impulses provides adolescents with a sense of self-efficacy which is crucial for building resilience against external provocations (Bandura, 1977; Logue, 1995). The physical sensation of restraining an impulse represents the active work of the prefrontal cortex over the limbic system.

Despite the high success rate documented in Table 2, several challenges were observed during the six-week implementation. During the first two weeks, three participants exhibited significant resistance to the neurobiological sessions, perceiving the medical explanation as another form of institutional control. Furthermore, a "weekend relapse" phenomenon was identified where participants' self-regulation tended to decrease on Sundays when the structured schedule was more relaxed and access to digital devices was less monitored. These limitations suggest that for long-term sustainability, the Bio Psycho Socio Spiritual model requires a highly consistent environment and a more gradual transition toward unsupervised digital access to prevent neural habituation back to impulsive patterns.

This study highlights the critical limitations of secular psychological models that ignore the transcendental dimension of human existence. While Cognitive Behavioral Therapy provides excellent technical tools, it often fails to offer the existential depth required for long-term behavioral sustainability in religious populations (Beck & Beck, 2011; Haque et al., 2016). Integrating spiritual values provides a persistent motivation that remains active even when external supervision is absent (Nashori & Mucharram, 2002; Rothman & Coyle, 2018). This synthesis ensures that self-regulation is practiced as a matter of personal integrity rather than mere social compliance.

Behavioral habituation in this model finds a strong theoretical parallel in the Islamic concept of soul discipline or Riyadhah. Both frameworks suggest that character is not an innate trait but the result of continuous and purposeful practice (Irfani & Muhlis, 2025; Yusuf et al., 2022). The effort required to perform cognitive pauses is a modern manifestation of the struggle against the lower self or Mujahadah (Ghazzali & Karim, 2015; Nashori & Mucharram, 2002). This alignment between modern psychology and traditional spiritual practice makes the intervention more culturally resonant and personally meaningful for the participants.

Peer support engineering functions as a socioneurobiological regulator that protects against individual ego depletion. According to the theory of self-regulation, the capacity for control is a finite resource that can be exhausted by continuous stress (Goldfried & Merbaum, 1972; Vohs & Baumeister, 2018). In a communal institutional setting, the collective efficacy of the peer group provides an external safety net that compensates for individual failures in self-control (Bandura, 1977). This group dynamic transforms the orphanage environment from a risk factor into a protective factor for adolescent development (Bronfenbrenner, 2009; Schore, 2001).

The creation of a shared social language based on neuroscience promotes a culture of mutual monitoring and coregulation. When adolescents use terms like amygdala activation to describe their emotional states, they are externalizing the problem and reducing interpersonal friction (Ardiansyah & Idris, 2025; Tsani et al., 2024). This cultural shift within the orphanage ensures that progress

made during clinical sessions is reinforced through daily social interactions (Kuss & Griffiths, 2011; Yusuf et al., 2022). Social identity is thus reconstructed around the goal of holistic health and self-improvement.

God-consciousness or Muraqabah serves as a transcendental inhibition system that transcends the limitations of human observation. Unlike secular mindfulness which primarily focuses on present-moment awareness, Muraqabah introduces a sense of divine accountability that persists in solitude (Deci & Ryan, 2000; Nashori & Mucharram, 2002). This consciousness activates the medial prefrontal cortex which is involved in moral reasoning and self-evaluation (Slamet et al., 2023). The internalization of this spiritual value provides a robust defense against the allure of deviant digital behaviors when adolescents are unsupervised.

Comparing Muraqabah with secular mindfulness reveals that while both techniques calm the nervous system, Muraqabah provides an ontological purpose for self-restraint. Purpose-driven regulation is fundamentally more resilient to the addictive pull of digital algorithms because it is anchored in an eternal reward system (Haque et al., 2016; Keshavarzi & Haque, 2013). In an era of constant digital distraction, having a transcendental anchor is vital for maintaining cognitive and emotional integrity (Abu-Raiya, 2012; Sudarto, 2021). This spiritual dimension completes the holistic defense against impulsivity.

Theoretical implications for holistic health suggest that a reductionist focus on biology or psychology alone is insufficient for addressing adolescent behavioral issues. This research advocates for an integrated model that acknowledges the interdependency of the body, mind, society, and soul (Haque et al., 2016; Nashori & Mucharram, 2002). By treating the adolescent as a holistic being, practitioners can achieve more profound and lasting clinical outcomes. This approach also fosters a positive dialogue between science and spirituality, where each validates and strengthens the other in the pursuit of well-being.

Practical recommendations for social policy include the incorporation of this holistic framework into orphanage management and adolescent counseling services. Caregivers should be trained in neurobiological literacy to replace punitive measures with supportive health-oriented guidance (Firth et al., 2019; Lukens & McFarlane, 2004). Furthermore, digital literacy programs should be expanded to include the neurobiological impact of technology to better equip the next generation for the challenges of the digital age (Brand et al., 2016). This comprehensive strategy will foster a more resilient and self-regulated youth population.

CONCLUSION

This research empirically demonstrates that the Bio Psycho Sosio Spiritual intervention model is highly effective in managing adolescent impulsivity within institutional care settings in the digital era. The model's strength lies in its simultaneous focus on biological health, psychological competence, social coregulation, and spiritual meaning. This integrative approach successfully transforms behavior from external compliance to intrinsic self-regulation. Theoretical contributions of this study highlight the need for a culturally sensitive clinical psychology that incorporates neuroscientific data and transcendental values. Practically, it suggests a shift toward holistic and supportive caregiving in social institutions. Future research should involve longitudinal studies to measure the long-term durability of these behavioral and neural changes across larger populations.

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AUTHOR CONTRIBUTION

Author 1 (ADS): Conceptualization, Methodology, Investigation (conducting research and data collection), Formal Analysis (qualitative interpretation), and Writing – Original Draft. Author 2 (TD): Formal Analysis (data processing and validation), Validation, and Project Administration (management of research activities). Author 3 (MAS): Data Curation (reference management and management activities), Project Administration (administrative support), and Writing – Review & Editing. All authors have reviewed and approved the final manuscript.

ETHICS STATEMENT

This study was conducted in accordance with the ethical standards of the relevant institutional committee and the Declaration of Helsinki. Written informed consent was obtained from the legal guardians of all adolescent participants, and verbal assent was provided by the participants themselves.

DATA AND CODE AVAILABILITY

The qualitative data generated and analyzed during the current study are not publicly available due to participant privacy.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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