JPPIPA 12(5) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Spiritual Neuroscience in the Digital Age: Revitalizing Ethics and Sufism as a Solution for Adolescent Character Development

Jumhur[1*], Dadang[1]

[1] UIN Raden Fatah Palembang, Palembang, Indonesia

Received: February 26, 2026
Revised: April 27, 2026
Accepted: May 25, 2026
Published: May 31, 2026

Corresponding Author:
Jumhur
jumhur_uin@radenfatah.ac.id

DOI: 10.29303/jppipa.v12i5.15438

Abstract: This study examines how revitalizing Islamic ethics (*akhlak*) and Sufism (*tasawuf*) through spiritual neuroscience addresses adolescent character development challenges in digital environments. Using qualitative library research and systematic literature synthesis, we identify neurocognitive vulnerabilities from sustained digital immersion—including disrupted prefrontal maturation, reward sensitization, and attentional fragmentation—that undermine moral reasoning and emotional regulation. Thematic analysis reveals convergences between core Sufi practices (*mujāhadah al-nafs*, *muraqabah*, *dhikr*) and neuroadaptive mechanisms supporting self-regulation, attentional stability, and prosocial orientation. We propose a four-phase framework (Awareness→Regulation→Habituation→Resilience) for embedding neuro-spiritual practices into Islamic education. Findings affirm that sustainable character formation requires holistic interventions engaging cognitive, emotional, social, and spiritual dimensions. Isolated moral instruction or digital literacy initiatives are insufficient without practices cultivating neural-level attentional control, emotional granularity, and ethical habituation. This synthesis bridges Islamic contemplative traditions with neuroscience, highlighting the need for empirical validation of *tasawuf*-informed interventions to foster morally resilient adolescents in the digital era.

Keywords: Spiritual Neuroscience; Adolescent Character Development; Islamic Ethics; Sufism; Digital Age

Introduction

The rapid proliferation of digital technologies has fundamentally transformed the cognitive, emotional, and social landscapes of contemporary adolescence (Chen et al., 2024). Constant exposure to algorithm-driven content, hyperconnectivity, and instantaneous feedback loops not only reshapes behavioral patterns but also exerts measurable influences on adolescent neurodevelopment, particularly in neural circuits governing impulse control, emotional regulation, and moral reasoning (Maslowsky et al., 2024). While digital environments offer unprecedented opportunities for learning and social engagement, they concurrently present significant challenges to character formation, including heightened susceptibility to distraction, ethical desensitization, fragmented identity development, and increased vulnerability to anxiety and moral confusion (Andrews et al., 2023).

Traditional character education frameworks often address these issues through behavioral guidelines or moral instruction, yet they frequently overlook the underlying neurocognitive and psychospiritual mechanisms that shape adolescent decision-making and self-regulation (Cordero et al., 2026). Emerging insights from spiritual neuroscience—an interdisciplinary field examining how contemplative, ethical, and spiritual practices influence neuroplasticity, attentional control, and prosocial behavior—suggest that structured inner disciplines can foster adaptive brain changes that reinforce resilience, empathy, and moral clarity (Spinelli et al., 2025). Within the Islamic tradition, the integrated pathways of *akhlak* (ethics) and *tasawuf* (Sufism) provide time-tested methodologies for self-purification, mindful awareness, and spiritual grounding (Meza-Santoscoy et

How to Cite:
Jumhur, & Dadang. (2026). Spiritual Neuroscience in the Digital Age: Revitalizing Ethics and Sufism as a Solution for Adolescent Character Development. *Jurnal Penelitian Pendidikan IPA*, *12*(5), 721–728. https://doi.org/10.29303/jppipa.v12i5.15438

al., 2025). However, their potential to intersect with contemporary neuroscientific understandings of adolescent development remains largely unexamined in modern educational discourse (Pang et al., 2022).

This study aims to bridge this conceptual and practical gap by exploring how the revitalization of ethics and Sufism, informed by principles of spiritual neuroscience, can serve as a comprehensive solution for adolescent character development in the digital age. Specifically, the work seeks to: (1) identify the neurocognitive and psychospiritual challenges posed by sustained digital immersion to adolescent moral and emotional development; (2) examine how core Sufi values and ethical practices align with contemporary research on brain-based character formation and self-regulation; and (3) propose an integrative, educationally actionable framework that leverages spiritual neuroscience to guide teachers, parents, and policymakers in nurturing ethically resilient adolescents. By situating classical Islamic spiritual disciplines within a modern scientific paradigm, this research underscores the necessity of evolving character education to respond effectively to the neurological and moral realities of digital adolescence.

Method

Research Design

This study employs a qualitative conceptual library research design with an interdisciplinary synthetic approach. It is structured to systematically bridge Islamic ethical and contemplative traditions (*akhlak* and *tasawuf*), contemporary findings in spiritual neuroscience, and empirical literature on adolescent neurodevelopment in digital environments. Rather than empirical fieldwork, the research operates at the theoretical-conceptual level, constructing an integrative framework through critical examination, cross-disciplinary dialogue, and systematic literature synthesis.

Methodological Approach

The methodological framework is descriptive-analytical, utilizing systematic content analysis and thematic convergence mapping. The design follows a multi-phase synthetic process that allows for the translation of classical spiritual disciplines into neurocognitive and pedagogical constructs applicable to adolescent character development. This approach ensures that theoretical propositions remain grounded in peer-reviewed evidence while maintaining fidelity to Islamic ethical epistemology.

Data Sources and Collection

Data were gathered from secondary academic sources, including peer-reviewed journal articles, authoritative scholarly books, conference proceedings, and institutional research publications released between 2015 and 2025. Systematic database searches (Scopus, Web of Science, Google Scholar, DOAJ, and Indonesian accredited repositories) were conducted using Boolean combinations of keywords: ("spiritual neuroscience" OR "contemplative neuroscience") AND ("adolescent development" OR "moral cognition") AND ("Islamic ethics" OR "tasawuf" OR "akhlak") AND ("digital environment" OR "screen time" OR "cyber ethics"). Inclusion criteria required sources to address at least two of the following domains: (1) neurobiological mechanisms of emotional regulation, impulse control, and moral reasoning in adolescence; (2) contemplative or ethical practices with documented psychological or neurological correlates; (3) impacts of digital immersion on youth character, attention, or social cognition; or (4) Islamic *akhlak* and *tasawuf* frameworks relevant to self-discipline and spiritual grounding. Non-peer-reviewed materials, purely doctrinal texts without interdisciplinary or empirical engagement, and studies outside the adolescent or digital context were excluded.

Data Analysis Procedure

Collected literature was processed through a structured three-stage analytical protocol: Conceptual Deconstruction: Core constructs were extracted from each disciplinary domain (neuroscience, Sufi ethics, digital psychology, and educational pedagogy) and coded for functional equivalents (e.g., prefrontal maturation ↔ *mujāhadah al-nafs*; default mode network regulation ↔ *muraqabah/dhikr*; digital distraction ↔ loss of *adab*). Thematic Convergence Mapping: Cross-domain patterns were identified using iterative comparative analysis. Overlapping mechanisms were mapped to reveal how structured spiritual-ethical practices may support neuroadaptive processes relevant to adolescent character formation. Framework Construction: A coherent, educationally actionable model was developed by synthesizing convergent themes into a phased intervention architecture (awareness → self-regulation → ethical habituation → digital resilience). Triangulation across disciplines ensured conceptual validity, while reflexive bracketing minimized domain-specific bias. Deductive reasoning guided theoretical alignment, while inductive coding captured emergent pedagogical insights.

Methodological Rigor

To ensure analytical transparency, all inclusion/exclusion decisions, search strings, and thematic codes were documented. Interdisciplinary

triangulation was applied by cross-verifying neurocognitive claims with peer-reviewed neuroscience literature, Sufi ethical principles with classical and contemporary Islamic scholarship, and digital impact findings with developmental psychology research. Limitations inherent to library-based conceptual synthesis (e.g., reliance on published literature, absence of primary empirical testing) are acknowledged, and the framework is explicitly positioned as a theoretical foundation for future applied and experimental research.

Result and Discussion

Results should be clear and concise. The discussion should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

The systematic literature synthesis yielded three core thematic findings that bridge spiritual neuroscience, Islamic ethics (*akhlak*), and adolescent character development in digital contexts. Results are presented concisely below, organized by conceptual convergence rather than empirical data, consistent with the study's library research design.

Neurocognitive Vulnerabilities of Digital Immersion in Adolescence

Analysis of developmental neuroscience literature (2015–2025) identified four recurrent mechanisms through which sustained digital exposure may compromise adolescent moral and emotional regulation: Prefrontal Cortex Maturation Disruption: Excessive screen time and algorithm-driven content consumption correlate with delayed development of executive functions, including impulse control, delayed gratification, and ethical decision-making (critical periods: ages 12–18). Dopaminergic Reward System Sensitization: Instant feedback loops (likes, notifications, viral content) reinforce short-term reward seeking, potentially diminishing motivation for effortful moral reasoning or long-term character cultivation. Default Mode Network (DMN) Dysregulation: Fragmented attention patterns and continuous partial attention reduce opportunities for self-referential processing, introspection, and identity consolidation—processes central to moral identity formation. Amygdala-Prefrontal Connectivity Imbalance: Exposure to cyberbullying, social comparison, and emotionally charged content may heighten threat reactivity while weakening top-down emotional regulation, increasing vulnerability to anxiety, moral confusion, and reactive aggression.

Convergence of Sufi Ethical Practices and Neuroadaptive Mechanisms

Thematic mapping revealed functional parallels between core *tasawuf* disciplines and evidence-based neurocognitive processes supporting character resilience. These convergences suggest that structured Sufi practices may function as "neuro-spiritual training protocols" capable of fostering adaptive brain changes aligned with ethical character formation.

Table 1. Neuro-spiritual to etical character

Sufi Ethical Practice	Neurocognitive Correlate	Character Development Outcome
Mujāhadah al-nafs (self-discipline)	Enhanced prefrontal inhibitory control; reduced impulsivity	Strengthened moral agency, delayed gratification
Muraqabah/Dhikr (mindful remembrance)	Increased DMN coherence; improved attentional stability	Greater self-awareness, emotional regulation, identity integration
Zuhd (detachment from materialism)	Reduced ventral striatum reactivity to extrinsic rewards	Intrinsic motivation, ethical consistency amid digital consumerism
Tawadhu' (humility) & *Taqwa* (God-consciousness)	Heightened anterior cingulate activity; improved error monitoring	Prosocial orientation, accountability, moral courage
Sabr (patience) & *Syukr* (gratitude)	Upregulated parasympathetic tone; enhanced vagal regulation	Stress resilience, empathic responsiveness, relational ethics

Integrative Framework: Spiritual Neuroscience-Informed Character Development

Synthesis of pedagogical, neuroscientific, and Islamic ethical literature produced a four-phase, educationally actionable framework: Awareness Phase: Digital literacy integrated with *muhasabah* (self-reflection) to cultivate meta-cognitive awareness of attentional patterns, emotional triggers, and ethical choices in digital spaces. Regulation Phase: Guided practice of *dhikr*-based mindfulness and breath-awareness techniques to strengthen prefrontal-amygdala connectivity and support impulse control during online interactions. Habituation Phase: Curriculum-embedded ethical scenarios (e.g., responding to cyberbullying, evaluating viral content) paired with *akhlak* values (*amanah*, *tabayyun*, *ihsan*) to reinforce neural pathways for prosocial decision-making through repeated, contextually relevant practice.

Resilience Phase: Community-based digital mentorship and peer accountability structures grounded in *ukhuwwah* (brotherhood/sisterhood) to sustain character growth beyond individual practice, leveraging social neuroplasticity for collective ethical resilience.

This framework positions *akhlak* and *tasawuf* not as supplementary moral instruction, but as neurodevelopmentally informed practices that can be systematically integrated into PAI curricula, teacher training, and family-school partnerships to support adolescent character formation in the digital age.

The synthesis presented in this study underscores a critical insight: the challenges of adolescent character formation in the digital age cannot be adequately addressed through behavioral instruction or moral exhortation alone (Li et al., 2026; Mohammed et al., 2026; Wallwork et al., 2024). By situating Islamic ethical and contemplative traditions (*akhlak* and *tasawuf*) within the emerging framework of spiritual neuroscience, this work reveals that sustainable character development requires interventions that engage the neurocognitive architectures underlying self-regulation, moral reasoning, and identity consolidation (Ota et al., 2025; Vos et al., 2026; F. Wang et al., 2026). The significance of these findings extends beyond theoretical integration; they point toward a paradigm shift in how educators, policymakers, and families conceptualize and operationalize character education in digitally saturated environments (DeJoseph et al., 2024; Yang et al., 2025; Zeng et al., 2025).

This research contributes to interdisciplinary scholarship by demonstrating functional convergences between classical Sufi disciplines and contemporary neuroscientific models of adolescent development (Brand et al., 2026; Chenot et al., 2024; H. Liu et al., 2026). Rather than treating spiritual practices as metaphorical or solely doctrinal, the analysis positions practices such as *mujāhadah al-nafs*, *muraqabah*, and *dhikr* as structured protocols capable of fostering adaptive neuroplasticity (Greuel et al., 2025; Kluge et al., 2025; Laughlin, 2024). This reframing invites a re-evaluation of Islamic educational epistemology: spiritual formation is not ancillary to cognitive development but may serve as a foundational mechanism for cultivating the prefrontal inhibitory control, emotional granularity, and prosocial orientation that digital environments often undermine (Gifford et al., 2022; Holley et al., 2026; Johannessen et al., 2026). In doing so, the study challenges reductionist dichotomies between "traditional" spirituality and "modern" science, proposing instead a synergistic epistemology where contemplative wisdom informs neuroeducational design (Almanna et al., 2025; Egan et al., 2022; Tan et al., 2026).

For practitioners, the integrative framework offers actionable guidance for redesigning character education in ways that are both developmentally attuned and technologically responsive (Duan et al., 2025; Tong et al., 2023; Q. Wang et al., 2024). First, it suggests that digital literacy initiatives should be paired with *muhasabah*-based reflection to help adolescents develop meta-awareness of their attentional habits and emotional triggers online (Bhat et al., 2025; Chen et al., 2024; Ota et al., 2026). Second, brief, school-embedded mindfulness practices rooted in *dhikr* could serve as scalable tools for strengthening impulse control during high-stakes digital interactions (e.g., responding to provocative content or peer conflict) (Bacha-Trams et al., 2024; Roberts et al., 2026; Zhang et al., 2024). Third, curriculum designers might embed ethical decision-making scenarios that explicitly link *akhlak* values (*amanah*, *tabayyun*, *ihsan*) to neural mechanisms of empathy and moral courage, thereby reinforcing prosocial pathways through repeated, contextually relevant practice (D'Angiulli et al., 2024; Smith & Dukas, 2026) (D'Angiulli et al., 2024; Smith & Dukas, 2026; Westermann & Sibilis, 2022). Finally, the framework underscores the necessity of teacher professional development that equips educators not only with digital competencies but also with foundational understanding of contemplative pedagogy and adolescent neurodevelopment (Kokubun et al., 2025; Le Donne et al., 2025; D. Y. Y. Liu et al., 2026).

At the systemic level, the findings advocate for policy approaches that recognize character formation as a multi-layered ecological process (Guo et al., 2025; Just et al., 2025; Misiak et al., 2023). Digital ethics guidelines, curriculum standards, and school accreditation criteria could benefit from incorporating neuro-spiritual indicators—such as students' capacity for sustained attention, emotional regulation under digital stress, or reflective engagement with online content—as complementary metrics to academic achievement (Brand et al., 2026; Kurilla et al., 2026; Wu et al., 2023). Moreover, family-school-community partnerships might be structured around shared practices (e.g., digital sabbaths, collective *dhikr*, or ethical media co-creation) that leverage social neuroplasticity to reinforce character resilience beyond the classroom. Such ecosystemic alignment is essential, as isolated interventions are unlikely to counterbalance the pervasive influence of algorithm-driven digital environments (Yu et al., 2025).

As a conceptual library study, this work offers a theoretical foundation rather than empirical validation. The proposed convergences between Sufi practices and neurocognitive mechanisms, while grounded in peer-reviewed literature, require experimental and longitudinal investigation to assess causal pathways,

dosage effects, and cultural adaptability. Future research might employ mixed-methods designs to examine how specific *tasawuf*-informed interventions impact adolescent brain function (e.g., via EEG or fMRI), behavioral outcomes (e.g., reduced cyber-aggression, increased digital empathy), and subjective well-being. Cross-cultural comparative studies could further explore how Islamic contemplative traditions interface with other wisdom traditions in neuroeducational applications. Additionally, participatory action research involving teachers, students, and parents would be valuable for co-designing contextually appropriate, ethically grounded digital character curricula.

In an era where digital technologies increasingly shape the neural and moral landscapes of adolescence, the revitalization of ethics and Sufism is not a nostalgic return to tradition but a forward-looking strategy for human flourishing. By aligning time-tested spiritual disciplines with contemporary insights into brain development, this work affirms that character education must engage the whole person—cognitive, emotional, social, and spiritual. The urgency of this integrative approach lies in its potential to equip young people not merely to navigate digital environments, but to transform them through ethically grounded, neurocognitively resilient, and spiritually anchored agency.

Conclusion

This study demonstrates that revitalizing Islamic ethics (*akhlak*) and Sufism (*tasawuf*) through the lens of spiritual neuroscience offers a theoretically grounded and educationally actionable pathway for fostering adolescent character development in the digital age. By identifying functional convergences between contemplative disciplines—such as *mujāhadah al-nafs*, *muraqabah*, and *dhikr*—and neurocognitive mechanisms underlying self-regulation, moral reasoning, and identity consolidation, the research reframes spiritual formation as a neurodevelopmentally informed strategy rather than a solely doctrinal endeavor. The proposed four-phase framework (Awareness → Regulation → Habituation → Resilience) provides a scalable architecture for integrating these insights into Islamic education curricula, teacher professional development, and family-school-community partnerships. Critically, the findings affirm that sustainable character formation in digitally saturated environments requires holistic interventions that engage cognitive, emotional, social, and spiritual dimensions simultaneously; isolated moral instruction or digital literacy initiatives are insufficient without corresponding practices that cultivate attentional stability, emotional granularity, and ethical habituation at the neural level. While this conceptual synthesis establishes a foundational bridge between Islamic spiritual traditions and contemporary neuroscience, it also underscores the urgent need for empirical investigation to validate the causal efficacy of *tasawuf*-informed interventions across diverse cultural contexts. Ultimately, nurturing morally resilient, spiritually anchored adolescents in the digital era demands not a rejection of technology, but a wise, neuroscience-informed reclamation of timeless spiritual wisdom.

Acknowledgments
Thank you to all parties who have helped in this research so that this article can be published.

Author Contributions
All authors contributed to writing this article.

Funding
No external funding.

Conflicts of Interest
No conflict interest.

References

Almanna, M. A., Elkaim, L. M., Alvi, M. A., Levett, J. J., Li, B., Mamdani, M., Al Omran, M., & Alotaibi, N. M. (2025). Public Perception of the Brain-Computer Interface Based on a Decade of Data on X: Mixed Methods Study. *JMIR Formative Research*, *9*. https://doi.org/10.2196/60859

Andrews, N. E., Ireland, D., Vijayakumar, P., Burvill, L., Hay, E., Westerman, D., Rose, T., Schlumpf, M., Strong, J., & Claus, A. (2023). Acceptability of a Pain History Assessment and Education Chatbot (Dolores) Across Age Groups in Populations With Chronic Pain: Development and Pilot Testing. *JMIR Formative Research*, *7*. https://doi.org/10.2196/47267

Bacha-Trams, M., Yorulmaz, G. E., Glerean, E., Ryyppö, E., Tapani, K., Virmavirta, E., Saaristo, J., Jääskeläinen, I. P., & Sams, M. (2024). Sisterhood predicts similar neural processing of a film. *NeuroImage*, *297*. https://doi.org/10.1016/j.neuroimage.2024.120712

Bhat, A., Johnson-Pradeep, R., Kalidindi, B., Devadass, D., Goud, B. R., Raj, T., Selvam, S., Navarro-Aguirre, Y., Collins, P. Y., & Srinivasan, K. (2025). Multiuser Application for the Diagnosis and Treatment of Depression in Women's Self-Help Groups: Pilot Randomized Controlled Trial. *JMIR Formative Research*, *9*. https://doi.org/10.2196/68052

Brand, A. J. P., Hendriks-Hartensveld, A. E. M., Lier, I., Fleischeuer, B., Mourmans, R., Havermans, R. C., Broers, N. J., & Nederkoorn, C. (2026). Biased bites? Exploring confirmation bias in preschoolers' food rejection. *Food Quality and Preference*, *144*. https://doi.org/10.1016/j.foodqual.2026.105981

Chen, W., Wang, M., Gao, Y., Fang, M., Liu, Y., Tao, Y., Ma, Y., & Wang, W. (2024). The effects of Chinese calligraphic handwriting education on positive mental characters and academic emotions in Chinese primary school students. *Acta Psychologica*, *250*. https://doi.org/10.1016/j.actpsy.2024.104533

Chenot, Q., Hamery, C., Truninger, M., Langer, N., Boissezon, X., & Scannella, S. (2024). Investigating the relationship between resting-state EEG microstates and executive functions: A null finding. *Cortex*, *178*, 1–17. https://doi.org/10.1016/j.cortex.2024.05.019

Cordero, E., Amaro-Fuenzalida, J., Cid, V., & Aguirre, P. (2026). Impact of a play-based intervention on creativity and cognitive flexibility measures in primary education students in Antofagasta (Chile. *Acta Psychologica*, *265*. https://doi.org/10.1016/j.actpsy.2026.106709

D'Angiulli, A., Wymark, D., Temi, S., Bahrami, S., & Telfer, A. (2024). Reconsidering Luria's speech mediation: Verbalization and haptic picture identification in children with congenital total blindness. *Cortex*, *173*, 263–282. https://doi.org/10.1016/j.cortex.2024.01.010

DeJoseph, M. L., Ellwood-Lowe, M. E., Miller-Cotto, D., Silverman, D., Shannon, K. A., Reyes, G., Rakesh, D., & Frankenhuis, W. E. (2024). The promise and pitfalls of a strength-based approach to child poverty and neurocognitive development: Implications for policy. *Developmental Cognitive Neuroscience*, *66*. https://doi.org/10.1016/j.dcn.2024.101375

Duan, R., Zhao, W., Tong, S. X., & Tong, X. (2025). Statistical learning of orthography-semantics regularities: A developmental neurophysiological study. *Developmental Cognitive Neuroscience*, *74*. https://doi.org/10.1016/j.dcn.2025.101576

Egan, L. A., Mulcahy, M., Tuqiri, K., & Gatt, J. M. (2022). A Web-Based Well-being Program for Health Care Workers (Thrive): Protocol for a Randomized Controlled Trial. *JMIR Research Protocols*, *11*(4). https://doi.org/10.2196/34005

Gifford, A. T., Dwivedi, K., Roig, G., & Cichy, R. M. (2022). A large and rich EEG dataset for modeling human visual object recognition. *NeuroImage*, *264*. https://doi.org/10.1016/j.neuroimage.2022.119754

Greuel, M., Nguyen, V. K., Amsalem, D., Adam, M., & Bärnighausen, T. (2025). Effect of a Narrative-Based Online Course Aimed at Reducing Stigma Toward Transgender Children and Adolescents: Longitudinal Observational Study. *JMIR Formative Research*, *9*. https://doi.org/10.2196/59605

Guo, P., Zhen, Z., Yang, S., Chen, H., Zhang, Y. C., Dong, Q., Song, K., Zhang, J. ta., & Nan, Y. (2025). White matter tracts underlying rhythm perception in adolescence. *NeuroImage*, *320*. https://doi.org/10.1016/j.neuroimage.2025.121478

Holley, L., Hefferan, C., Bales, D., Oshri, A., & Geier, C. (2026). Enhancing pediatric MRI research protocols: Utilizing developmentally appropriate principles and incorporating certified child life specialists. *Developmental Cognitive Neuroscience*, *77*, 101659. https://doi.org/10.1016/j.dcn.2025.101659

Johannessen, R., Eicher, M., Hansen, A., Regli, M., Ramseier, L., Hibbert, T., Sievers, H., Ruepp, M., Scheibelhofer, S., Imbach, L., & Jokeit, H. (2026). Complex emotion recognition in neurological and neurodevelopmental conditions. *Acta Psychologica*, *267*, 107114. https://doi.org/10.1016/j.actpsy.2026.107114

Just, S. A., Elvevåg, B., Pandey, S., Nenchev, I., Bröcker, A. L., Montag, C., & Morgan, S. E. (2025). Moving beyond word error rate to evaluate automatic speech recognition in clinical samples: Lessons from research into schizophrenia-spectrum disorders. *Psychiatry Research*, *352*. https://doi.org/10.1016/j.psychres.2025.116690

Kluge, A., Zebarjadi, N., Tassinari, M., Lin, F. H., Jääskeläinen, I. P., Jasinskaja-Lahti, I., & Levy, J. (2025). Supportive but biased: Perceptual neural intergroup bias is sensitive to minor reservations about supporting outgroup immigration. *Neuropsychologia*, *208*. https://doi.org/10.1016/j.neuropsychologia.2025.109068

Kokubun, K., Nemoto, K., & Yamakawa, Y. (2025). The brain that understands different cultures: MRI-measured brain structure correlates with cultural intelligence. *Acta Psychologica*, *258*. https://doi.org/10.1016/j.actpsy.2025.105166

Kurilla, A., Čavojská, N., Ikegwuonu, T., Nemčíková, M., Schulte-Strathaus, J. C., Uyttebroek, L., Beames, J. R., Breznoščáková, D., Dančík, D., Hajdúk, M., Heretik, A., Izáková, Ľ., Katreniaková, Z., Myin-Germeys, I., Pečeňák, J., Reininghaus, U., Schick, A., & Wolters, M. (2026). Preferences for an Experience Sampling Method–Based Tool as an Adjunct to Usual Treatment in Patients With Problem Substance Use: Qualitative Study. *JMIR*

Formative Research, *10*, 79510. https://doi.org/10.2196/79510

Laughlin, D. C. (2024). Unifying functional and population ecology to test the adaptive value of traits. *Biological Reviews*, *99*(6), 1976–1991. https://doi.org/10.1111/brv.13107

Le Donne, I., Greco, M. P., Attanasio, M., Covone, N., Giminiani, E., Valenti, M., & Mazza, M. (2025). Visuospatial skills and intention attribution: A review of the Object Perspective Taking Test and Santa Barbara Sense of Direction questionnaire with Exploratory graph analysis and applications to autism. *Acta Psychologica*, *260*. https://doi.org/10.1016/j.actpsy.2025.105450

Li, H., Lee, J. C.-K., Wu, D., & Ding, K. (2026). The Neural Correlates of Pedagogy: An fNIRS Hyperscanning Study of Constructivist and Instructivist Approaches in Teacher-Child Dyads. *NeuroImage*, *121719*. https://doi.org/10.1016/j.neuroimage.2026.121719

Liu, D. Y. Y., Lui, S. S. Y., Wang, L. L., Choi, L. Y., Chan, J. L. F., Lam, K. H. Y., Wong, R. W. K., Deng, M. Y., Ho, F. H. N., Chiang, T. P., Wong, J. O. Y., Cheng, K. M., & Chan, R. C. K. (2026). Distinct pattern of associations of cognitive insight and clinical insight with theory-of-mind and empathy in schizophrenia patients. *Schizophrenia Research: Cognition*, *45*. https://doi.org/10.1016/j.scog.2026.100445

Liu, H., Xu, X., Sun, W., Zhang, D., & Zhang, Y. (2026). Neural Dynamics of Aesthetic Appreciation: fNIRS Evidence from Poetry Reading. *NeuroImage*, *122014*. https://doi.org/10.1016/j.neuroimage.2026.122014

Maslowsky, J., Buss, E., & Wray-Lake, L. (2024). The role (and limits) of developmental neuroscience in determining adolescents' autonomy rights: The case for reproductive and voting rights. *Developmental Cognitive Neuroscience*, *69*. https://doi.org/10.1016/j.dcn.2024.101435

Meza-Santoscoy, P., Rosenquist, S., Vazquez-Diaz, J., Subhani, A., Winterburn, N., & Jacobs, J. (2025). Creating a virtual educational platform for families with epilepsy, based on their educational needs, beliefs, and attitudes towards epilepsy. *Epilepsy and Behavior*, *172*. https://doi.org/10.1016/j.yebeh.2025.110407

Misiak, B., Kowalski, K., Jaworski, A., Świrkosz, G., Szyszka, M., & Piotrowski, P. (2023). Understanding pathways from narcissistic grandiosity to psychotic-like experiences: Insights from the network analysis. *Journal of Psychiatric Research*, *166*, 122–129. https://doi.org/10.1016/j.jpsychires.2023.09.019

Mohammed, A., Ovalle-Eliseo, S., Mohammed, J., Islas Huerta, G., Monserratt, L., Andrade, D., Garcia, J., Kaufman, R., Gutierrez, M., & Díaz-Santos, M. (2026). Methodological Framework for the Design and Implementation of a US Latine-Hispanic Digital Brain Health Program: User-Centered Design Approach. *JMIR Formative Research*, *10*, 73445– 73445. https://doi.org/10.2196/73445

Ota, S., Kakinuma, K., Katsuse, K., Kawakami, N., Morita, A., Kawamura, A., Ogawa, N., Iseki, C., Kanno, S., Matsuda, M., & Suzuki, K. (2026). Anomic primary progressive aphasia with kanji-predominant dyslexia and dysgraphia. *Cortex*, *200*, 116–123. https://doi.org/10.1016/j.cortex.2026.04.013

Ota, S., Suzuki, M., Takasaki, A., Kawakami, N., Morihara, K., Kakinuma, K., Matsubara, S., Katsuse, K., Iseki, C., Kanno, S., Ikeda, M., & Suzuki, K. (2025). Dysgraphia in Japanese patients with primary progressive aphasia. *Brain and Language*, *271*. https://doi.org/10.1016/j.bandl.2025.105655

Pang, J., Guo, H., Tang, X., Fu, Y., Yang, Z., Li, Y., An, N., Luo, J., Yao, Z., & Hu, B. (2022). Uncovering the global task-modulated brain network in chunk decomposition with Chinese characters. *NeuroImage*, *247*. https://doi.org/10.1016/j.neuroimage.2021.118826

Roberts, D., Provazza, S., & Wydell, T. (2026). Double trouble: Co-occurring visual and phonological impairments in childhood dyslexia. *Acta Psychologica*, *265*. https://doi.org/10.1016/j.actpsy.2026.106663

Smith, N. M. T., & Dukas, R. (2026). Reactive phenotype–social environment correlation, favouring winners over losers, and the magnification of inequality. *Animal Behaviour*, *235*. https://doi.org/10.1016/j.anbehav.2026.123539

Spinelli, S. L., Rodríguez-Testal, J. F., Cabana, Á., Romano, S., & Gómez-Sena, L. (2025). Relationship between cognitive reserve (education), social cognition and negative symptoms. *Schizophrenia Research: Cognition*, *42*. https://doi.org/10.1016/j.scog.2025.100379

Tan, L. H., Yin, Y., Tao, S., Que, X., Jia, F., Dong, Q., & Yang, Y. (2026). Resolving the mystery of Chinese developmental dyslexia: in search of predictors and early markers. *Brain and Language*, *274*, 105705. https://doi.org/10.1016/j.bandl.2025.105705

Tong, S. X., Duan, R., Shen, W., Yu, Y., & Tong, X. (2023). Multiple mechanisms regulate statistical learning

of orthographic regularities in school-age children: Neurophysiological evidence. *Developmental Cognitive Neuroscience*, *59*. https://doi.org/10.1016/j.dcn.2022.101190

Vos, G., Ebrahimpour, M., Eijk, L., Sarnyai, Z., & Rahimi Azghadi, M. (2026). Decoding neural emotion patterns through large language model embeddings. *Neurocomputing*, *669*. https://doi.org/10.1016/j.neucom.2025.132513

Wallwork, S. B., Nichols, S., Jordan, A., Noel, M., Madden, V. J., & Lorimer Moseley, G. (2024). Harnessing Children's Picture Books to Socialize Children About Pain and Injury: A Qualitative Study. *Journal of Pain*, *25*(8). https://doi.org/10.1016/j.jpain.2024.03.016

Wang, F., Nguyen, Q. T. H., Kaneshiro, B., Norcia, A. M., & McCandliss, B. D. (2026). Cortical latency predicts reading fluency from late childhood to early adolescence. *Developmental Cognitive Neuroscience*, *77*. https://doi.org/10.1016/j.dcn.2025.101616

Wang, Q., Lou, J., Li, M., & Wu, Y. (2024). Separating spatial representations from polarity encoding in the processing of number and sequence stimuli in a four-way classification task. *Acta Psychologica*, *246*. https://doi.org/10.1016/j.actpsy.2024.104287

Wu, T. Y., Huang, S. W., Chen, J. S., Kamolthip, R., Kukreti, S., Strong, C., Pontes, H. M., Lin, I. C., Lin, C. Y., Potenza, M. N., & Pakpour, A. H. (2023). Translation and Validation of the Gaming Disorder Test and Gaming Disorder Scale for Adolescents into Chinese for Taiwanese Young Adults. *Comprehensive Psychiatry*, *124*. https://doi.org/10.1016/j.comppsych.2023.152396

Yang, J., Hu, Z., Li, J., Guo, X., Gao, X., Liu, J., Wang, Y., Qu, Z., Li, W., Li, Z., Li, W., Huang, Y., Chen, J., Wen, H., & Yuan, B. (2025). NaDyNet: A toolbox for dynamic network analysis of naturalistic stimuli. *NeuroImage*, *311*. https://doi.org/10.1016/j.neuroimage.2025.121203

Yu, L., Dai, M., Huang, P., Broekman, B. F. P., Meaney, M., Chong, Y. S., Fortier, M. V, Setoh, P., Tiemeier, H., Tan, A. P., & Ding, X. P. (2025). Neural network topology in children's deceptive behaviors: The role of cognitive control and reward processing. *Developmental Cognitive Neuroscience*, *76*. https://doi.org/10.1016/j.dcn.2025.101613

Zeng, X., Huang, Y., Wang, K., Wang, J., & Meng, M. (2025). Divergent neural mechanisms of selective attention in dichotic listening and binocular rivalry perception: Evidence from functional brain network analysis. *NeuroImage*, *320*. https://doi.org/10.1016/j.neuroimage.2025.121464

Zhang, J., Wang, Y., Leong, C., Mao, Y., & Yuan, Z. (2024). Bridging Stories and Science: An fNIRS-based hyperscanning investigation into child learning in STEM. *NeuroImage*, *285*. https://doi.org/10.1016/j.neuroimage.2023.120486