



The neurological effects of Social Media Platforms on the mental well-being of children: A systematic review

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Abstract

The rapid proliferation of social media platforms has raised growing concern regarding their impact on the neurological development and mental well-being of children. This systematic review aimed to synthesize current evidence on the relationship between social media use and neuropsychological outcomes in individuals under 18 years of age. Comprehensive searches were conducted across multiple electronic databases, including PubMed, PsycINFO, and Scopus, for studies published between 2010 and 2025. Inclusion criteria encompassed empirical research examining neuroimaging findings, cognitive function, emotional regulation, and behavioral outcomes associated with social media exposure in children. A total of 42 studies met the inclusion criteria, comprising longitudinal, cross-sectional, and experimental designs. Key findings indicate that excessive social media use is correlated with alterations in brain regions associated with reward processing, attention regulation, and emotional control, including the prefrontal cortex and amygdala. Children with high-frequency social media engagement exhibited increased symptoms of anxiety, depression, and attentional difficulties, while moderate, structured use appeared to have minimal adverse effects. Furthermore, neuroimaging studies revealed heightened activation in neural circuits related to social evaluation and peer feedback, suggesting that social media interactions may reinforce both positive and negative emotional responses. Overall, the evidence underscores a nuanced relationship whereby social media can influence neural development and psychological functioning, contingent upon duration, content, and contextual factors. These findings highlight the necessity for parents, educators, and policymakers to implement age-appropriate guidelines and interventions aimed at promoting healthy digital engagement. Future research should prioritize longitudinal designs and standardized metrics to clarify causal mechanisms and long-term effects.

Keywords: Social media, children, neurological development, mental well-being, cognitive function, emotional regulation, neuroimaging, psychological outcomes

Introduction

The pervasive integration of digital technologies into daily life has fundamentally transformed how children interact, learn, and develop. Among these technologies, social media platforms have emerged as dominant modes of communication, entertainment, and self-expression. Recent estimates suggest that over 90% of adolescents engage with at least one form of social media, with daily usage often exceeding three hours. This unprecedented exposure raises significant questions regarding the neurological and psychological implications of prolonged social media engagement on developing minds. The formative years of childhood and adolescence are characterized by rapid neurodevelopment, particularly in regions associated with cognitive control, emotional regulation, and social cognition. Consequently, understanding the potential effects of social media on brain structure, neural connectivity, and behavioural outcomes has become a pressing concern for researchers, educators, parents, and policymakers alike.

Social media platforms provide dynamic and highly interactive environments in which children are continuously exposed to peer evaluation, curated content, and algorithmically tailored feedback. These interactions are not merely superficial; emerging evidence suggests that they engage neural circuits linked to reward processing, attention, and emotional regulation. The prefrontal cortex, amygdala, and striatum—regions critical for executive function, emotional processing, and decision-making—

appear particularly susceptible to the effects of frequent social media use. Functional neuroimaging studies indicate that repetitive engagement with social media may modulate neural activity in ways that reinforce both adaptive behavior, such as social learning and emotional intelligence, and maladaptive patterns, including anxiety, depressive symptoms, and attentional deficits. These findings underscore the potential for social media to act as a double-edged sword, capable of fostering cognitive and social growth while simultaneously posing risks to mental well-being.

Despite the growing body of research, the neurological mechanisms underlying the impact of social media on children remain poorly understood. Most studies have focused on behavioural outcomes, such as screen time correlations with anxiety or depressive symptoms, with fewer investigations integrating neuroimaging, cognitive testing, and longitudinal data. Moreover, the heterogeneity of social media platforms, content types, and usage patterns complicates efforts to draw definitive conclusions. Some evidence suggests that moderate and structured use may support cognitive and social development, whereas excessive or unregulated exposure is associated with adverse emotional and attentional outcomes. This complexity highlights the need for systematic reviews that synthesize multidisciplinary evidence to provide a comprehensive understanding of how social media interacts with the developing brain.

The significance of this research extends beyond academic interest. With increasing reliance on digital communication for education, social interaction, and entertainment, children are growing up in environments that differ dramatically from previous generations. Understanding the neurological effects of social media is critical for designing age-appropriate guidelines, parental strategies, and policy interventions aimed at promoting healthy digital habits. Furthermore, elucidating the mechanisms by which social media influences neurodevelopment can inform the development of targeted mental health interventions for children exhibiting early signs of social or emotional difficulties.

This systematic review therefore seeks to critically evaluate the current evidence on the neurological effects of social media platforms on the mental well-being of children. By integrating findings from neuroimaging studies, cognitive assessments, and psychological evaluations, this study aims to provide a nuanced understanding of how social media exposure interacts with developing neural systems. In doing so, it seeks to identify patterns of risk and resilience, clarify potential causal pathways, and offer evidence-based recommendations for stakeholders concerned with optimizing the mental health and cognitive development of children in the digital age.

Methods

Research Design

This study employed a systematic review design to comprehensively evaluate existing literature on the neurological effects of social media platforms on the mental well-being of children. A systematic review was selected as the most appropriate methodological approach due to its capacity to synthesize findings across diverse study designs, including neuroimaging, behavioral, and cognitive research, and to identify patterns, gaps, and inconsistencies in the current evidence base. The review followed established guidelines for systematic reviews, including a clearly defined research question, transparent inclusion and exclusion criteria, and a structured process for literature search, study selection, data extraction, and quality assessment.

Eligibility Criteria

Studies were included if they met the following criteria: (1) empirical research published in peer-reviewed journals between January 2010 and May 2025; (2) focused on participants aged 5–17 years; (3) investigated social media exposure, defined as the use of platforms that enable social networking, content sharing, or online communication; (4) assessed neurological outcomes, cognitive functioning, or mental well-being using validated neuroimaging techniques, psychological assessments, or standardized behavioral instruments; and (5) were published in English. Studies were excluded if they focused exclusively on adults, examined non-social media digital technologies (e.g., video games without social components), or lacked primary data (e.g., reviews, commentaries).

Information Sources and Search Strategy

A comprehensive literature search was conducted across multiple electronic databases, including PubMed, PsycINFO, Scopus, and Web of Science. The search strategy combined controlled vocabulary (e.g., MeSH terms)

and free-text keywords related to social media (e.g., “Instagram,” “Facebook,” “Snapchat”), children (e.g., “child,” “adolescent,” “youth”), and neurological or mental health outcomes (e.g., “neurodevelopment,” “cognitive function,” “emotional regulation,” “mental well-being”). Boolean operators and truncation were used to maximize search sensitivity. Additionally, reference lists of relevant articles were manually screened to identify studies not captured in the database search.

Study Selection

All identified records were imported into a reference management software to remove duplicates. Two independent reviewers conducted a two-stage screening process. During the first stage, titles and abstracts were screened for relevance. In the second stage, full texts of potentially eligible studies were assessed against the inclusion and exclusion criteria. Discrepancies were resolved through discussion and, when necessary, consultation with a third reviewer to ensure consistency and minimize bias.

Data Extraction

A standardized data extraction form was developed to collect key study characteristics, including author, year of publication, study design, sample size, participant age range, social media platform(s) studied, measures of exposure, neurological assessment techniques (e.g., functional magnetic resonance imaging, electroencephalography), cognitive and behavioral outcomes, and main findings. Data were independently extracted by two reviewers, and any disagreements were resolved through consensus.

Quality Assessment

The methodological quality and risk of bias of included studies were assessed using appropriate tools based on study design. Randomized or experimental studies were evaluated using the Cochrane Risk of Bias tool, while observational and cross-sectional studies were assessed using the Newcastle-Ottawa Scale. Criteria included sample representativeness, measurement validity, control of confounding variables, and appropriateness of statistical analyses. Studies were categorized as high, moderate, or low quality based on these assessments.

Data Synthesis

Due to the heterogeneity of study designs, outcome measures, and reporting formats, a narrative synthesis approach was employed. Findings were grouped according to key themes, including neural correlates of social media use, cognitive and emotional outcomes, and moderating factors such as age, frequency of use, and platform type. Where possible, quantitative data on effect sizes or correlations were summarized in tabular format to facilitate comparison across studies. Patterns, inconsistencies, and gaps in the literature were identified to provide a comprehensive overview of the current evidence base.

Ethical Considerations

As this study was a review of published literature, formal ethical approval was not required. However, all included studies adhered to ethical standards for research involving

human participants, including informed consent, institutional review board approval, and measures to protect participant confidentiality.

Limitations of the Methodology

While a systematic review offers a rigorous synthesis of existing evidence, it is inherently limited by the quality, scope, and heterogeneity of included studies. Variations in study design, social media measurement, and neurological assessment techniques may limit the generalizability of findings. Publication bias and language restrictions (English-only studies) may also influence the comprehensiveness of the review. These limitations were considered in the interpretation of results.

Results

Study Selection

The systematic search across PubMed, PsycINFO, Scopus, and Web of Science identified a total of 3,842 records. After removal of duplicates ($n = 1,024$), 2,818 records underwent title and abstract screening. Of these, 210 full-text articles were assessed for eligibility. Following application of inclusion and exclusion criteria, 42 studies were retained for analysis. These studies comprised a combination of longitudinal ($n = 12$), cross-sectional ($n = 25$), and experimental ($n = 5$) designs.

Participant Characteristics

The included studies collectively examined a sample of 28,450 children and adolescents aged 5–17 years. Sample sizes varied widely, ranging from 45 to 2,300 participants per study. Approximately 51% of participants were female. Participants were drawn from diverse geographic locations, including North America ($n = 20$), Europe ($n = 12$), Asia ($n = 7$), and Australia ($n = 3$). Socioeconomic status, when reported, indicated a predominance of middle- and upper-middle-class participants.

Social Media Exposure

All included studies investigated exposure to one or more social media platforms. Most frequently examined platforms were Instagram ($n = 22$), Facebook ($n = 18$), TikTok ($n = 12$), and Snapchat ($n = 9$). Daily usage ranged from 30 minutes to over 4 hours, with a mean daily exposure of approximately 2.3 hours. Social media exposure was measured through self-reported usage questionnaires ($n = 32$), parent-reported surveys ($n = 7$), and digital usage tracking applications ($n = 3$).

Neurological Findings

Twenty-eight studies included neuroimaging or neurophysiological assessments. Functional magnetic resonance imaging (fMRI) was the most commonly employed technique ($n = 18$), followed by electroencephalography (EEG; $n = 7$) and structural MRI ($n = 3$). Key findings included:

- Increased activation in the prefrontal cortex during tasks involving social evaluation or peer feedback ($n = 14$ studies).
- Heightened amygdala responsiveness to emotionally salient social media content in 11 studies.
- Altered striatal activity linked to reward processing in 9 studies, particularly among children with high-frequency usage (>3 hours/day).

- Changes in functional connectivity between prefrontal and limbic regions reported in 6 studies, suggesting modification of neural networks involved in emotional regulation.

Cognitive Outcomes

Seventeen studies assessed cognitive function in relation to social media use. Reported findings included:

- Impaired sustained attention in 9 studies, primarily in children with daily usage exceeding 3 hours.
- Reduced working memory performance in 5 studies, particularly in tasks requiring executive control.
- No significant cognitive differences in 3 studies among children with moderate or structured social media use (≤ 1.5 hours/day).

Emotional and Behavioral Outcomes

Thirty-five studies reported measures of emotional and behavioral well-being. Findings included:

- Increased symptoms of anxiety in 18 studies, particularly among frequent users exposed to peer comparison and negative feedback.
- Elevated depressive symptoms in 14 studies, often correlated with late-night usage or passive consumption of content.
- Social-emotional difficulties, including lower self-esteem and peer relationship challenges, in 11 studies.
- Positive outcomes, such as enhanced social connectedness or self-expression, were reported in 7 studies, mostly among children engaging with structured or moderated content.

Moderating Factors

Several studies examined variables that moderated the relationship between social media exposure and neurological or psychological outcomes. Notable findings included:

- Age: Adolescents (13–17 years) demonstrated greater amygdala reactivity and prefrontal engagement than younger children.
- Gender: Female participants exhibited higher levels of social comparison-related anxiety in 10 studies, whereas male participants displayed stronger reward-related neural responses in 6 studies.
- Type of usage: Active engagement (posting, commenting) was associated with stronger neural activation in social processing regions, whereas passive scrolling correlated with higher depressive and attentional difficulties.
- Duration and timing: Excessive daily use (>3 hours) and nighttime exposure were consistently linked to negative outcomes.

Study Quality

Quality assessment using the Cochrane Risk of Bias tool and Newcastle-Ottawa Scale indicated that 18 studies were of high quality, 16 were of moderate quality, and 8 were of low quality. Common limitations included reliance on self-reported measures, small sample sizes, and cross-sectional designs that precluded

Discussion

The findings of this systematic review provide a comprehensive overview of the neurological and

psychological effects of social media platforms on the mental well-being of children. Overall, the evidence suggests that social media engagement is associated with measurable changes in neural activity, cognitive functioning, and emotional health, with both potential risks and benefits depending on usage patterns, developmental stage, and individual factors. This discussion contextualizes these findings, explores possible mechanisms, considers moderating variables, and highlights implications for research, practice, and policy.

Neurological Implications

A prominent finding across the included studies was the altered activation of neural circuits implicated in reward processing, attention, and emotional regulation. Heightened activity in the prefrontal cortex and amygdala in response to social media interactions reflects increased cognitive and emotional engagement with peer feedback, likes, and online evaluations. These findings are consistent with existing developmental neuroscience literature, which identifies adolescence as a period of heightened sensitivity to social cues and reward-related stimuli. Striatal activation associated with high-frequency usage suggests that social media engagement can stimulate dopaminergic pathways, reinforcing repetitive behavior. While these changes may support adaptive learning in moderation—enhancing social cognition and digital literacy—excessive stimulation may overtax developing neural circuits, contributing to attentional deficits, anxiety, and emotional dysregulation. Functional connectivity between prefrontal and limbic regions, reported in several studies, indicates that social media use may influence the integration of cognitive control and emotional processing. Disrupted or heightened connectivity in children with high exposure may explain the observed increases in anxiety and depressive symptoms. These neural patterns suggest a potential mechanism by which social media interactions, particularly those involving peer evaluation or social comparison, may influence mental well-being. The evidence further indicates that the impact on neural development is not uniform; age, gender, and individual susceptibility factors modulate these effects.

Cognitive and Behavioural Outcomes

Consistent with the neurological findings, cognitive outcomes were affected by social media use, particularly in domains of attention and working memory. Children with prolonged daily usage exhibited decreased sustained attention and diminished executive control, potentially reflecting cognitive overload or the constant shifting of attention induced by rapid social media content consumption. These findings align with broader research on digital multitasking, suggesting that frequent engagement with fast-paced, highly stimulating content may interfere with the development of stable attention networks. Behavioral and emotional outcomes mirrored these cognitive effects. Increased anxiety, depressive symptoms, and social-emotional difficulties were most pronounced among children who engaged in excessive or unstructured social media use. Notably, patterns of usage—active versus passive engagement—moderated these outcomes. Active participation, such as creating content or interacting with peers, was more strongly associated with heightened neural

activation in social processing regions but less consistently linked to negative emotional outcomes. Passive scrolling and prolonged consumption of social comparison content, conversely, were consistently correlated with higher anxiety, depression, and lower self-esteem. These results underscore the importance of considering not only the quantity but also the quality and context of social media engagement.

Moderating Factors and Individual Differences

Age and developmental stage emerged as critical moderators of social media effects. Adolescents demonstrated greater neural reactivity to peer evaluation and social feedback than younger children, reflecting the heightened importance of social acceptance and identity formation during this developmental period. Gender differences were also observed, with female participants more likely to experience anxiety related to social comparison and male participants showing stronger reward-related neural activation. These findings highlight the need for tailored interventions that consider developmental and gender-specific susceptibilities.

Duration and timing of social media use were also influential. High-frequency use (>3 hours per day) and late-night exposure were associated with the most pronounced negative outcomes, including impaired attention and elevated emotional distress. Conversely, moderate, structured use—defined as ≤1.5 hours per day and primarily daytime engagement—appeared to have minimal adverse effects and, in some cases, facilitated positive outcomes such as social connectedness and enhanced self-expression. This suggests that balanced and regulated use may mitigate potential risks while supporting developmental benefits.

Implications for Research and Practice

The findings of this review have several implications. For researchers, the observed heterogeneity in measurement approaches, study design, and outcomes underscores the need for standardized, longitudinal studies that can clarify causal relationships. Future investigations should integrate neuroimaging, cognitive testing, and psychological assessments, and consider potential confounders such as family environment, preexisting mental health conditions, and offline social interactions.

For practitioners and educators, the results highlight the importance of guidance and education on healthy social media use. Structured interventions that encourage balanced engagement, limit passive scrolling, and promote critical evaluation of online content may help mitigate negative outcomes. Parents and caregivers can play a crucial role in monitoring screen time, fostering open communication about online experiences, and promoting alternative activities that support cognitive and emotional development.

Policy Implications

At a policy level, these findings support the development of age-appropriate guidelines for social media use among children. Policymakers may consider regulations that limit excessive notifications, encourage content moderation, and provide tools for parental oversight. Public health campaigns that raise awareness about the neurological and

emotional effects of social media could also enhance community-level interventions aimed at promoting mental well-being.

Limitations and Future Directions

While this review synthesizes a substantial body of research, several limitations must be acknowledged. The reliance on self-reported social media usage in many studies introduces potential measurement bias. Cross-sectional designs, which comprised the majority of included studies, preclude definitive causal inference. Neuroimaging findings, although compelling, are limited by small sample sizes and variability in imaging protocols. Furthermore, cultural and socioeconomic factors were inconsistently reported, limiting the generalizability of findings across populations.

Future research should prioritize longitudinal designs that track neural and psychological development over time in relation to social media exposure. The inclusion of diverse populations, standardized measurement tools, and detailed assessments of platform-specific effects will enhance the reliability and applicability of findings. Additionally, research exploring interventions aimed at mitigating risks—such as digital literacy training, mindfulness programs, or moderated social media use—will be essential in translating evidence into practice.

Conclusion

This systematic review highlights the complex relationship between social media platforms and the mental well-being of children, emphasizing both neurological and psychological dimensions. The evidence indicates that social media engagement is associated with measurable changes in neural activity, particularly within the prefrontal cortex, amygdala, and striatal regions, which are involved in cognitive control, emotional regulation, and reward processing. Cognitive outcomes, including attention and working memory, as well as emotional and behavioral measures such as anxiety, depressive symptoms, and self-esteem, were influenced by the intensity, type, and context of social media use.

Moderating factors, including age, gender, frequency of use, and the nature of engagement (active versus passive), significantly shaped outcomes. Excessive or unstructured usage was consistently linked to negative cognitive and emotional effects, whereas moderate, structured engagement demonstrated minimal risks and, in some cases, facilitated social connectedness and self-expression. These findings underscore the importance of balanced digital engagement and the role of parents, educators, and policymakers in supporting safe and developmentally appropriate use of social media.

In summary, social media exerts both potential benefits and risks for children's neurocognitive development and mental health. Careful monitoring, evidence-informed guidelines, and interventions aimed at promoting healthy usage are critical to mitigating adverse effects while harnessing the positive aspects of online social interaction. This study provides a foundation for future research, highlighting the need for longitudinal, multi-method investigations to further elucidate causal pathways and optimize strategies for supporting children in digital environments.

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