

Original Research Article

ASSOCIATION BETWEEN CALMING-BASED MOBILE DEVICE EXPOSURE AND EXECUTIVE FUNCTION & EMOTIONAL REACTIVITY IN PRESCHOOL-AGED CHILDREN

Yunus Nadeemulla Beig Khader¹, Sana Mehek², Shubhanshu Gupta³

¹Specialist Pediatrics, Amana healthcare, Al ain, United Arab Emirates

²Specialist Pediatrics, NMC medical centre, Sharjah, United Arab Emirates

³Assistant Professor, Department of Community Medicine, Government Medical College, Datia, Madhya Pradesh, India.

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Corresponding Author:

Dr. Yunus Nadeemulla Beig Khader,
Specialist Pediatrics,
Amana healthcare, Al ain, United Arab
Emirates
Email: ynb79@yahoo.co.in

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ABSTRACT

Background: The increasing prevalence of mobile device use among preschool-aged children has raised concerns about its potential effects on emotional regulation and cognitive development. Parents frequently use mobile devices to calm children during distress, but such practices may influence executive functioning and emotional reactivity patterns. Understanding this association is essential for informing paediatric behavioural guidelines and developmental interventions. The aim is to evaluate the association between calming-based mobile device use and emotional reactivity and executive functioning in children aged 3 to 5 years.

Materials and Methods: A cross-sectional observational study was conducted over a 12-month period with a sample of 180 typically developing children aged 36–60 months, recruited from urban paediatric clinics. Parental reports were obtained using standardized questionnaires: the Mobile Device Use Questionnaire (MDUQ), the Behaviour Rating Inventory of Executive Function-Preschool Version (BRIEF-P), and the Emotion Regulation Checklist (ERC). Frequency of mobile device use for calming, emotional lability, and executive dysfunction were assessed. Statistical analysis included Pearson's correlation and multivariate regression modelling to evaluate associations, controlling for sociodemographic variables and baseline screen exposure.

Results: Frequent use of mobile devices for calming was significantly associated with higher scores on the emotional reactivity subscale and lower scores on executive functioning domains, including working memory and inhibitory control. Children in the highest quartile of device-calming use had a 2.4-fold increased likelihood of exhibiting poor self-regulation behaviours ($p < 0.01$). These associations remained significant after adjusting for age, gender, parental education, and total screen time.

Conclusion: Regular use of mobile devices as a calming strategy in early childhood is linked to elevated emotional reactivity and reduced executive functioning capacity. These findings underscore the importance of cautious and developmentally informed media use practices in early parenting strategies.

Keywords: Mobile devices, Calming strategies, Executive function, Emotional reactivity, Preschool children, Self-regulation.

INTRODUCTION

The widespread accessibility of smartphones and tablets has led to a dramatic increase in mobile device exposure among young children, especially in early

childhood when neurodevelopmental processes are most sensitive to environmental inputs.^[1] Parents often resort to mobile devices as tools for behavioural management, particularly to soothe or distract children during moments of distress. While such

practices may offer short-term relief in high-demand parenting situations, the long-term implications of calming-based mobile device use on a child's emotional and cognitive development remain insufficiently understood.^[2]

Emotional reactivity and executive functioning are two interrelated developmental domains that mature rapidly during the preschool years. Executive functions—such as inhibitory control, working memory, and cognitive flexibility—are critical for self-regulation and academic readiness.^[3] Similarly, the capacity to modulate emotional responses underlies social competence and behavioural adaptation. Emerging evidence suggests that excessive screen-based stimulation may interfere with the maturation of these skills by displacing opportunities for real-world emotional processing and self-regulatory practice.^[4]

A growing number of studies have begun to link early digital media exposure with delayed executive functioning, language delays, emotional dysregulation, and behavioural problems.^[5] However, specific patterns of device use—such as use for calming during tantrums or emotional arousal—may represent a unique risk factor due to the nature of contingent external soothing, potentially replacing intrinsic emotional coping strategies.^[6] Furthermore, repeated device use as a regulatory tool may disrupt the child's natural ability to tolerate frustration, delay gratification, and manage transitions—all of which are foundational executive functions.

Despite these concerns, few empirical studies have directly examined the impact of calming-based mobile device exposure on both emotional reactivity and executive function in the same population. Most existing literature has focused either on general screen time or on cognitive outcomes in isolation, failing to account for nuanced patterns of media use. Given the critical developmental trajectory between ages 3 and 5, there is an urgent need to evaluate how device use for behavioural regulation may affect concurrent emotional and cognitive development.

This study was therefore undertaken to assess the association between mobile device use for calming and emotional reactivity and executive functioning in preschool-aged children. The findings aim to inform caregivers and healthcare providers about the potential neurodevelopmental consequences of early digital soothing practices and support more mindful media use in early childhood.

MATERIALS AND METHODS

Study Design and Setting: This was a cross-sectional observational study conducted over a 12-month period across three urban paediatric outpatient clinics. The study was designed to evaluate the relationship between the use of mobile devices for calming purposes and markers of emotional and executive functioning in preschool-aged children.

Ethical approval was obtained from the institutional ethics committee prior to the commencement of data collection.

Participants and Inclusion Criteria

Children aged between 36 and 60 months were eligible for inclusion. Participants were required to be typically developing, as confirmed by parental report and paediatric screening. Only children residing with primary caregivers (parents) and with no diagnosed neurodevelopmental disorders, uncorrected sensory impairments, or major medical illnesses were included. Caregivers needed to be fluent in English or the local language and willing to provide informed consent.

Exclusion Criteria

Children with previously diagnosed conditions such as autism spectrum disorder, ADHD, language delays, or intellectual disability were excluded. Those with significant perinatal complications or known prenatal exposure to substances were also excluded. Families with inconsistent caregiving environments (e.g., frequent relocation or foster care placement) were not eligible for inclusion.

Sample Size and Sampling Method

A total of 180 child-caregiver dyads were recruited using purposive sampling to ensure demographic diversity and adequate representation of varying screen use behaviours. The sample size was calculated to detect medium effect sizes (Cohen's $d = 0.5$) with 80% power at a 5% significance level, accounting for a 10% non-response rate.

Data Collection Tools and Measures

Caregivers completed three standardized, validated instruments:

1. Mobile Device Use Questionnaire (MDUQ) – to quantify frequency, context, and purpose of mobile device use, with emphasis on usage for calming behaviours (e.g., during tantrums, transitions).
2. Behaviour Rating Inventory of Executive Function – Preschool Version (BRIEF-P) – to assess core domains of executive functioning including inhibition, working memory, and emotional control.
3. Emotion Regulation Checklist (ERC) – to evaluate emotional lability/negativity and emotion regulation capabilities.

Sociodemographic information including age, sex, parental education, income, and daily screen time was also collected.

Procedure: Caregivers were approached during well-child visits. After eligibility screening and informed consent, they were asked to complete the assessment tools either in the waiting area or via an online secure survey link within one week. Trained research assistants clarified queries and ensured completeness of responses. Total screen time and device use specifically for calming were recorded separately.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using SPSS version 26. Descriptive statistics were used to summarize

demographic variables and scores from assessment tools. Pearson's correlation coefficient was used to assess bivariate associations between calming-based device use and outcome measures. Multiple linear regression models were constructed to adjust for potential confounders such as age, gender, screen time, and socioeconomic status. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 180 preschool-aged children (aged 36–60 months) were included in the final analysis. Of these, 67 children (37.2%) were categorized as frequent users of calming-based mobile device exposure (defined as ≥ 1 calming use per day), while 113

children (62.8%) were exposed either infrequently or not at all. The groups were statistically comparable in terms of demographic and baseline screen use variables. Emotional reactivity and executive functioning were assessed using standardized caregiver-reported instruments (ERC and BRIEF-P). In addition, behavioural correlates such as tantrum frequency, transition difficulty, and caregiver-reported regulatory strategies were compared. Bivariate, correlational, and adjusted regression analyses were performed to evaluate the impact of calming-based mobile device use.

[Table 1] compares baseline demographic variables across the two exposure groups. No significant differences were noted, confirming group comparability.

Table 1: Comparison of Demographic Characteristics by Frequency of Calming-Based Device Use

Variable	Low/No Use (n = 113)	Frequent Use (n = 67)	p-value
Age (months, mean \pm SD)	48.1 \pm 6.4	49.4 \pm 6.0	0.12
Gender (Male/Female)	57 / 56	35 / 32	0.91
Primary caregiver (Mother %)	107 (94.7%)	63 (94.0%)	0.85
Parental education \geq Graduate (%)	88 (77.9%)	49 (73.1%)	0.49
Daily screen time (min, mean \pm SD)	74.2 \pm 31.1	77.5 \pm 34.6	0.52

[Table 2] presents scores from the Emotion Regulation Checklist. Frequent device users showed higher emotional lability and lower regulation scores.

Table 2: Emotional Reactivity Scores by Calming-Based Device Use (ERC Subscales)

ERC Subscale	Low/No Use (n = 113)	Frequent Use (n = 67)	p-value
Lability/Negativity	17.6 \pm 3.8	21.2 \pm 4.1	<0.001
Emotion Regulation	27.1 \pm 4.6	23.4 \pm 4.2	<0.001

[Table 3] compares executive functioning across groups. Frequent use correlated with worse inhibition, working memory, and emotional control.

Table 3: Executive Functioning Scores by Calming-Based Device Use (BRIEF-P Subscales)

BRIEF-P Subscale	Low/No Use (n = 113)	Frequent Use (n = 67)	p-value
Inhibition	56.4 \pm 6.8	63.5 \pm 7.1	<0.001
Working Memory	53.1 \pm 5.9	59.6 \pm 6.4	<0.001
Emotional Control	52.9 \pm 5.4	57.3 \pm 5.6	0.002

[Table 4] explores behavioural correlates. Frequent users exhibited higher tantrum frequency and difficulty with transitions.

Table 4: Behavioral Characteristics by Device Use Group

Behaviour	Low/No Use (n = 113)	Frequent Use (n = 67)	p-value
Tantrums/week (mean \pm SD)	1.8 \pm 1.0	3.2 \pm 1.4	<0.001
Difficulty with transitions (%)	26 (23.0%)	31 (46.3%)	0.001
Use of self-regulation strategies (%)	89 (78.8%)	36 (53.7%)	<0.001

[Table 5] stratifies emotional dysregulation scores by total screen time quartiles, confirming that calming-based context—not duration—was most predictive.

Table 5: Emotional Lability by Screen Time Quartile

Screen Time Quartile	Mean Lability Score	p-value
Q1 (<45 min/day)	17.4 \pm 3.5	
Q2 (46–75 min/day)	18.1 \pm 3.6	
Q3 (76–100 min/day)	18.3 \pm 3.7	
Q4 (>100 min/day)	18.9 \pm 3.9	0.17

[Table 6] reports the correlation coefficients between calming-use frequency and key outcome domains. Moderate to strong correlations were found.

Table 6: Pearson Correlation Between Calming-Use Frequency and Outcome Measures

Outcome Variable	Correlation Coefficient (r)	p-value
Emotional Lability	0.48	<0.001
Inhibition Score	0.44	<0.001
Working Memory Score	0.39	<0.001

[Table 7] assesses gender-wise differences in executive functioning within each exposure group. Males in the frequent use group had marginally worse scores.

Table 7: Gender Comparison of Executive Function Scores (BRIEF-P)

Group	Gender	Inhibition	Working Memory	p-value (within group)
Low/No Use	M	56.8 ± 6.9	53.2 ± 5.8	0.74 / 0.82
	F	56.0 ± 6.7	52.9 ± 6.1	
Frequent Use	M	64.1 ± 7.0	60.1 ± 6.2	0.41 / 0.50
	F	62.9 ± 7.3	59.1 ± 6.6	

[Table 8] highlights parental perceptions of calming effectiveness. Frequent users were more likely to view devices as "very effective" in managing outbursts.

Table 8: Parental Rating of Device Effectiveness for Calming

Perceived Effectiveness	Low/No Use (n = 113)	Frequent Use (n = 67)	p-value
Not effective	16 (14.2%)	4 (6.0%)	0.002
Somewhat effective	68 (60.2%)	27 (40.3%)	
Very effective	29 (25.6%)	36 (53.7%)	

[Table 9] presents logistic regression showing the odds of emotional dysregulation with frequent device-calming use, adjusted for covariates.

Table 9: Adjusted Odds Ratio for Emotional Dysregulation

Predictor	Adjusted OR	95% CI	p-value
Frequent calming-device use	2.42	1.39–4.21	0.002
Daily screen time (>90 min)	1.31	0.78–2.21	0.29
Male gender	1.11	0.64–1.95	0.71

[Table 10] examines co-regulation practices at home. Children in the low-use group experienced more verbal and physical emotional coaching.

Table 10: Parental Co-Regulation Strategies Used at Home

Strategy	Low/No Use (n = 113)	Frequent Use (n = 67)	p-value
Verbal reassurance (%)	101 (89.4%)	48 (71.6%)	0.003
Guided breathing or touch (%)	64 (56.6%)	22 (32.8%)	0.002
Distraction with device (%)	31 (27.4%)	61 (91.0%)	<0.001

[Table 11] details the average duration and timing of device use episodes. Most frequent users had device exposure during morning and post-nap transitions.

Table 11: Temporal Pattern of Device Use for Calming

Time of Day	% of Frequent Users Reporting Use
Morning (wake-up)	36 (53.7%)
Before nap time	28 (41.8%)
Post-nap transition	39 (58.2%)
During meals	22 (32.8%)

[Table 12] presents caregiver-reported concerns related to device use, including perceived dependency or withdrawal signs.

Table 12: Caregiver-Reported Concerns Regarding Device Use

Concern Reported	Low/No Use (%)	Frequent Use (%)	p-value
Child upset when device removed	18.6%	64.2%	<0.001
Requesting device repetitively	23.9%	70.1%	<0.001
Sleep disruption post device use	17.7%	39.4%	0.001

This study demonstrates that frequent calming-based mobile device use is significantly associated with greater emotional reactivity [Tables 2, 6], reduced

executive functioning [Tables 3, 7], and poor behavioural regulation including tantrums and transition issues [Table 4]. The relationship remains

significant even after adjusting for gender, screen time, and socioeconomic status [Table 9]. Device use was reported by caregivers as effective for short-term calming [Table 8], but was also associated with reduced co-regulation practices [Table 10] and higher perceived behavioural dependence [Table 12]. These findings indicate a consistent association between calming-based mobile device use and developmental risks in self-regulation and executive function during early childhood.

DISCUSSION

The increasing integration of mobile devices into early childhood routines has raised important questions about their developmental impact, particularly when used for emotional regulation purposes. In this study, we found that preschool-aged children frequently exposed to mobile devices for calming exhibited significantly higher emotional reactivity and impaired executive functioning compared to their peers with low or no such exposure. These findings align with growing evidence that the context of screen use—not just the quantity—plays a critical role in shaping child behavioural and cognitive outcomes.^[7]

The association between calming-based mobile device use and higher emotional lability supports the hypothesis that digital soothing may displace opportunities for children to develop intrinsic self-regulation strategies. Young children depend on co-regulatory interactions with caregivers to learn how to manage arousal, tolerate frustration, and recover from distress. When a device replaces this dyadic process, children may develop an externalized regulation pattern, becoming more reactive in the absence of digital input.^[8,9] This was evidenced in our results by significantly elevated lability scores and lower emotion regulation scores in frequent device users [Table 2], as well as higher tantrum frequency and transition difficulties [Table 4].

Moreover, impairments in core domains of executive functioning—such as inhibition, working memory, and emotional control—were consistently observed in children with frequent calming-based exposure. Executive functions develop rapidly during the preschool years and are foundational for later academic and behavioural competence.^[10] Our findings correspond with those of McHarg et al., who reported that early screen use may negatively impact self-regulatory neurocognitive systems.^[11] The regression analyses further supported that these associations were independent of total screen time, gender, or parental education, highlighting that the purpose and emotional context of device use are more critical predictors than screen time duration alone [Table 5, 9].

An interesting insight from this study was the strong caregiver perception of mobile devices as effective calming tools [Table 8], despite clear associations with adverse regulatory outcomes. This points to a

possible mismatch between short-term behavioural convenience and long-term developmental cost. Caregivers from the frequent-use group reported significantly less engagement in verbal and tactile co-regulation strategies [Table 10], suggesting that reliance on devices may reduce interactive opportunities that are essential for socio-emotional learning.^[12]

The concept of “digital pacification” during early years must therefore be carefully reconsidered. Repeated use of mobile devices to manage emotional distress could function similarly to externalized coping, bypassing the developmental need for internal emotional mastery. Several researchers have cautioned against overuse of digital media in emotionally charged contexts, citing possible reinforcement of dependency and avoidance behaviours.^[13] This study adds to that literature by quantifying these patterns and linking them to specific deficits in executive function.

While the study was cross-sectional in nature, the strength and consistency of associations across emotional, cognitive, and behavioural domains underscore a potential causal pathway that warrants longitudinal exploration. Furthermore, the use of validated, standardized tools such as the BRIEF-P and ERC adds reliability to the findings. Nevertheless, the limitations must be acknowledged. Data were based on caregiver reports, which may be subject to social desirability or recall bias. Additionally, the sample was urban and clinic-based, which may limit generalizability to other settings.

Despite these limitations, the implications are clear: routine use of mobile devices to calm young children may contribute to elevated emotional reactivity and hindered development of critical executive functions. Paediatricians, early childhood educators, and caregivers should be made aware of these risks and encouraged to prioritize interactive, co-regulatory methods over screen-based calming. Future research should aim to replicate these findings in diverse populations and investigate whether interventions targeting media literacy and parent-child engagement can buffer the observed effects.

CONCLUSION

This study demonstrates a significant association between frequent calming-based mobile device use and poorer emotional and cognitive regulation in preschool-aged children. Children exposed to such practices exhibited heightened emotional reactivity, as reflected by elevated lability scores and greater behavioural dysregulation. Furthermore, executive function domains including inhibition, working memory, and emotional control were markedly impaired among frequent users, even after controlling for sociodemographic variables and total screen time. The findings suggest that while mobile devices may provide immediate calming, their habitual use as emotional regulation tools may displace essential

opportunities for internal coping development and co-regulation with caregivers. Caregivers who relied on devices were also less likely to engage in interactive strategies such as verbal reassurance and physical comfort, further limiting the child's capacity for self-regulation. These patterns underscore the importance of intentional and developmentally informed screen use practices during early childhood. While short-term convenience may tempt caregivers to resort to digital calming, the long-term impact on executive functioning and emotional resilience should not be overlooked. These findings add to the growing body of literature urging moderation and context-awareness in early media exposure. Paediatricians and child development professionals should provide anticipatory guidance to families around healthy screen use, especially in emotionally charged settings. Longitudinal research is warranted to explore whether targeted interventions and co-regulatory education can reverse or buffer the developmental risks associated with early calming-based mobile device exposure.

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