

## MOBILE DEVICE USE FOR CALMING AND EMOTIONAL REACTIVITY AND EXECUTIVE FUNCTIONING IN YOUNG CHILDREN

Vidhu Ashok<sup>1</sup>, Najeeba CM<sup>1</sup>, Shrinath G<sup>2</sup>

<sup>1</sup>Assistant Professor, Malabar Medical College and Research Center, Modakkalur, Kozhikode, Kerala, India

<sup>2</sup>Associate Professor, Department of Paediatrics, Malabar medical college and research centre, Modakkalur, Kozhikode, Kerala, India

Received : 13/12/2022  
Received in revised form : 12/01/2023  
Accepted : 24/01/2023

**Keywords:**

Mobile devices, Executive functioning, emotional reactivity, hyperactivity, learning, correlation.

Corresponding Author:

**Dr. Vidhu Ashok,**

Email: vidhu\_ashok@yahoo.com

ORCID: 0000-0003-1199-1754

DOI: 10.47009/jamp.2023.5.1.149

Source of Support: Nil,

Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2023; 5 (1); 719-723



### Abstract

**Background:** Young children are frequently engaged or soothed by mobile devices, although it is unknown whether this practice affects a child's development. To investigate the long-term, reciprocal relationships between young children's executive functioning (EF) and emotional reactivity and the frequency that parents report utilizing mobile devices to soothe them. **Materials and Methods:** A convenience sample of parents typically developing children between the ages of 3 and 6 was used in this prospective study. The research was conducted between August 2021 and January 2023. Mobile gadgets are frequently used, according to parents, to soothe distressed kids (3-point Likert scale). The Child Behavior Checklist Emotional Reactivity subscale was used to measure the child's emotional reactivity at each wave, and the Behavior Rating Inventory (BRI) of Executive Function-Preschool Version Global Executive Composite was used to measure the child's EF. In order to investigate the cross-lagged relationships between the usage of calming aids, EF, and emotional reactivity, structural equation models were created (Child Behavior Questionnaire-Very Short Form surgency score, median split). **Result:** Among 500 eligible children the crude OR for executive functioning to non-regular users was 1.85 (95% CI [1.25±2.74], p = .002) for regular users (Crude model in Table 5). The IPTW-OR for executive functioning was 1.82 (95% CI [1.15±2.87], p = .009) for regular users. Among the boys, the use of devices to calm was associated with higher emotional reactivity (r [standardized regression coefficient]=0.20; 95% CI, 0.10-0.30), while higher emotional reactivity had a non-significant association with increased device use for calming. Among children with high temperamental surgency, the use of devices to calm was associated with increased emotional reactivity while higher emotional reactivity was associated with increased device use for calming. **Conclusion:** The findings of this study suggest that the frequent use of mobile devices for calming young children may displace their opportunities for learning emotion-regulation strategies over time; therefore, pediatric health care professionals may wish to encourage alternate calming approaches.

## INTRODUCTION

With the emergence of new portable and instantly accessible technologies, such as smartphones and digital tablets, the amount of time that kids spend using digital devices is rising quickly. Additionally, there are more opportunities for using mobile devices, children are using them for longer periods of time, and the age range of the child target users of mobile devices is getting younger due to the dramatically quick development of media games, learning packages, and educational applications for young children.<sup>[1-4]</sup> Mobile devices may be used by

kids anytime, anywhere for a variety of activities, including playing games, doing homework, communicating with friends, and browsing the internet. Media are becoming an ever-more-dominant force in children's life, from classic forms like television and video games to new forms like mobile devices like smartphones and digital tablets in addition to home computers.<sup>[4,5]</sup> Even among young children, media gadgets are predicted to play a larger part in daily life. Concerns about the impact of digital technology use on the health of growing children have been raised due to the growing amount of time that kids spend using mobile

devices. According to many research, depending on the context of use, the effect of computer use on children's development can be either favorable or detrimental. While computer use can be positively related to cognitive and academic skills,<sup>[6,7]</sup> it can be negatively related to social and psychological development. Furthermore, time spent using media (including both traditional and new media), can displace time used for quality parent-child interaction, such as sharing enriching experiences and activities. Thus, increased media exposure is likely to be associated with reduced parent-child interaction, including shared reading and playing together with toys, which reduces opportunities for verbal interaction with parents.

Media use at bedtime has been associated with increased autonomic activation due to hyperarousal, or disrupted melatonin production due to brightly lit screens.<sup>[6,7]</sup> Finally, children with higher levels of media use, including the computer and television, tend to be less physically active due to the sedentary nature of media use, increasing the risk of obesity.

## MATERIALS AND METHODS

It was a prospective cohort study included a community-based convenience sample of parents typically developing children aged 3 to 6 years. The study duration was from August 2021 to January 2023. Participants were all preschool children (N = 500) aged 3 to 6 years, recruited from schools of major urban area. A total of 1114 parents of preschool children provided written informed consent and agreed to participate at baseline in 2021 and self-report questionnaires were provided to the parents of 6-year-old children who were in first grade of elementary school.

In the present study, in order to accurately clarify the association between mobile device use and calm young children and children's executive functioning (EF) and emotional reactivity. Parents did not return complete questionnaires were excluded from the analysis. For inclusion in the study, parents did not need to be the target child's biological parents; however, they did need to reside with the child.

### Methodology

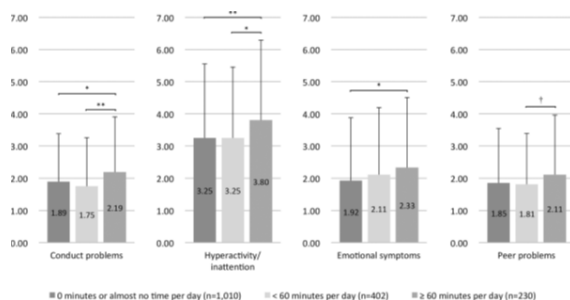
The measure is categorized into three subscales: conduct problems (five items), hyperactivity/inattention (five items), and emotional symptoms (five items). BRI model and The BRIEF-P was developed to capture executive function as manifested in the everyday behavior of preschool-aged children, based on the premise that measurement of executive functions is possible when a developmentally appropriate behavioral repertoire is sample. Examination of everyday behavior is a complementary approach to performance test assessment of executive functions in preschool children. The child's everyday environments, both at home and at school/ or daycare, are important venues for observing routine

manifestations of the executive functions. In the present study calming, emotional symptoms, and executive functioning subscales were used to assess children. Behavior Rating Inventory (BRI) of Executive Function-Preschool Version Global Executive Composite and emotional reactivity with the Child Behavior Checklist Emotional Reactivity subscale. The BRI model is a 63-item parent/teacher completed rating scale for children aged from 2 to 5 years with items composing five executive domains: Inhibit (16 items), Shift (10 items), Emotional Control (10 items), Working Memory (17 items), and Plan/ Organize (10 items). The scales are summarized in three overlapping indexes: Inhibitory Self-Control (Inhibit and Emotional Control), Flexibility (Shift and Emotional Control), and Emergent Metacognition (Working Memory and Plan/Organize).<sup>[5,6]</sup>

### Statistical Analysis

First, mobile device use was evaluated according to children's characteristics. Second, to address potential selection bias attributable to the differential chances of using mobile devices, a propensity score approach was used. The propensity score was calculated using variables supposed to potentially affect the use of mobile devices: sex, family composition (presence of parents and siblings), annual equalized household income, and maternal and paternal educational attainment, and maternal and paternal employment status, maternal and paternal average spending time of talking or playing with children, and children's emotional/behavioral problems at preschool. Inverse probability of treatment weighted (IPTW) logistic regression analysis was then performed; the inverse of the propensity score was incorporated to the weighted logistic regression models to compute odds rate ratios (OR) for emotional/behavioral problems according to use mobile devices.

## RESULTS



**Figure 1: Association of use of Mobile devices with Emotional and Executive functioning**

As per [Figure 1] Children's use of mobile devices was assessed through average use time (in minutes) on a typical day. 55% (270) used devices less than 60 minutes on a typical day, and 230 (45%) used devices 60 minutes or more on a typical day. In terms of emotional reactivity, users spending 60 minutes or more a day had significantly more

problems/symptoms (i.e., conduct problems, hyperactivity/inattention, and emotional symptoms)

compared to non-users or users spending less than 60 minutes a day) and it was statistically significant.

**Table 1: Demographic details of participants**

	Non-regular users (less than 60 minutes a day) n = 270		Regular users (60 minutes or more a day) n = 230		p -value
	n	%	n	%	
Sex					
Girls	210	45	110	50.4	.001
Boys	290	55	142	49.6	50.4
Presence of parents					
Two-parent family	451	92.2	268	92.2	.985
Single-parent family	49	7.8	2	7.8	
Presence of siblings					
Yes	370	83.4	260	83.6	.716
No	130	16.6	10	16.4	
Maternal education level					
Upper secondary school	185	23.7	112	22.3	0.989
Compulsory education	315	2.5	229	2.1	
Paternal education level					
Upper secondary school	381	24.3	323	24.0	0.645
Compulsory education	70	4.9	52	3.9	
Maternal average spending time of talking or playing with children (minutes per day)					
≥ 60	1520	94.5	1306	94.4	.474
< 60	88	5.5	78	5.6	
Paternal average spending time of talking or playing with children (minutes per day)					
≥ 60	858	58.1	731	57.6	.442
< 60	620	41.9	537	42.4	
Emotional/behavioral problems at preschool					
Normal/borderline	493	91.6	301	92.3	.011
Abnormal	07	8.4	7	7.7	

As per [Table 1] Children's average age was 3.88 years (SD = 0.35), and 55% were males (n =290) and 45% females (n = 210). The mean ages of mothers and fathers were 38.29 (SD = 4.63) and 40.32 (SD = 5.46) years, respectively. On average, mothers and fathers had completed comparable years of education. On average, mothers and fathers spent talking or playing with children for 230.41 (SD = 146.67) and 75.39 (SD = 77.54) minutes on typical day, respectively. The proportions of abnormal (or clinical) emotional/behavioural problems at preschool were 8.4% (n = 137). A total of 50% of regular users were male, which was significantly higher than the proportion of males in the non-regular user group. Regarding parental education level, the proportion of lower-education mothers and fathers in the regular user group was significantly higher than in the non-regular user group. Regarding children's emotional/behavioral problems at preschool, the proportion classified as Abnormal in the regular user group was significantly higher than in the non-regular user group.

**Table 2: Use of Mobile devices (N=500)**

	n	%
Viewing videos (YouTube, etc.)	179	77.8
Playing games	165	71.7
Taking and sharing pictures, figures, or photos	67	29.1
Learning/using applications related to education	42	18.3
Talking with friends, family, others	41	17.8
Using internet/searching for information	35	15.2

As per [Table 2] regarding mobile device uses among regular users the main reported purposes were as follows; 77.8% reported viewing videos (YouTube, etc.); 71.7% playing games; 29.1% taking and sharing pictures, figures, or photos; 18.3% learning/using applications related to education; 17.8% talking with friends, family, others; 15.2% using internet/searching for information.

**Table 3: Association between Mobile device and Calming influence**

	Crude model			BRI model		
	OR	95% CI	p-value	OR	95% CI	p-value
Non-regular users	Ref.			Ref.		.038
Regular users	1.99	1.23–3.22	.005	1.77	1.03–3.04	

As per [Table 3] According to the logistic regression analysis, the crude OR for calming influence relative to non-regular users was 1.99 (95% CI [1.23±3.22], p = .005) for regular users. The BRI-OR for calming influence was 1.77 (95% CI [1.03±3.04], p = .038) for regular users.

**Table 4: Association between Calming influence and Executive functioning**

	Crude model			BRI model		
	OR	95% CI	p-value	OR	95% CI	p-value
Non-regular users	Ref.			Ref.		
Regular users	1.85	1.25–2.74	.002	1.82	1.15–2.87	.009

As per [Table 4] the crude OR for executive functioning to non-regular users was 1.85 (95% CI [1.25±2.74],  $p = .002$ ) for regular users (Crude model in Table 5). The BRI-OR for executive functioning was 1.82 (95% CI [1.15±2.87],  $p = .009$ ) for regular users. Among the boys, the use of devices to calm was associated with higher emotional reactivity ( $r$  [standardized regression coefficient] = 0.20; 95% CI, 0.10-0.30), while higher emotional reactivity had a non-significant association with increased device use for calming. Among children with high temperamental surgency, the use of devices to calm was associated with increased emotional reactivity while higher emotional reactivity was associated with increased device use for calming.

## DISCUSSION

In the present study, we discovered a higher risk of conduct issues and hyperactivity/inattention challenges) related with emotional outcomes and executive functioning when using mobile devices, such as smartphones and tablets. The propensity score technique was used to conduct our analysis. The regular and frequent use of mobile devices without instructional content is likely associated with behavioral issues in children, according to our research. Mobile device use and the likelihood of emotional/behavioral issues are likely related through a number of processes, but they have a slight calming effect.

First, excessive mobile device use is likely to make kids feel more socially isolated and limit their options for social engagement with friends and family, which is good for social competence development and can lead to emotional and behavioral issues. More than half of the time youngsters spend using computers at home, according to prior studies on this topic [8], is spent alone. In addition, a survey found that kids and teenagers use various media, such computers, video games, and television, for 7 to 8 hours every day, which is more time than they devote to any other activity.<sup>[9]</sup> Mobile device use by youngsters might become routine and connected with personal space as a result of their freedom to use them whenever and whenever they like, which may further reduce their social contact. Children now have unheard-of access to modern media. Although there are instances where new media can encourage interaction and the creation of online relationships, it is also likely that the growth and adoption of new media tools will have a negative impact on how much time kids spend interacting with others. A key element influencing how children acquire their

social skills is face-to-face social engagement throughout childhood.<sup>[10]</sup> A key accomplishment in childhood is the establishment of social relationships with peers at home, school, and in other contexts; these interactions lay the groundwork for the development of social competence in children.<sup>[10-12]</sup> Childhood social skills gradually stabilize with time and are a good indicator of subsequent social adjustment and the lack of psychopathology.<sup>[13-15]</sup> Therefore, frequent use of mobile devices as well as computers might exacerbate children's social deficits. However, research on the social effects of media technology use has produced mixed results including advantages and disadvantages. Some research on computer use indicates that moderate use does not significantly impact children's social development or relationships with peers and family.<sup>[16]</sup> Furthermore, one study found that frequent computer game users interacted with peers outside school more often than did less frequent users.<sup>[17]</sup> In addition, internet use has been found to contribute to social well-being though the expansion of social networks.<sup>[18]</sup>

## CONCLUSION

The findings of this study suggest that the frequent use of mobile devices for calming young children may displace their opportunities for learning emotion-regulation strategies over time; therefore, pediatric health care professionals may wish to encourage alternate calming approaches. In this dynamic era of digital technology, both positive effects and potential harmful risks of mobile device use need to be recognized. Further research on the amount of time spent by children using these media and the viewed content is needed to help to maximize the positive effects and minimize the negative effects of mobile device use in children's lives.

## REFERENCES

1. Strasburger VC, Hogan MJ. Policy statement: children, adolescents, and the media. *Pediatrics*. 2018; 132: 958±961.
2. Nielsen Company. Television, Internet and mobile usage in the U.S.: A2/M2 Three Screen Report. New York: Nielsen Company; 2019.
3. Strasburger VC, Jordan AB, Donnerstein E. Health effects of media on children and adolescents. *Pediatrics*. 2016; 125: 756±767.
4. Vandewater EA, Rideout VJ, Wartella EA, Huang X, Lee JH, Shim MS. Digital childhood: electronic media and technology use among infants, toddlers, and preschoolers. *Pediatrics*. 2017; 119: e1006± e1015.
5. National Institute for Educational Policy Research. Zenkoku Gakuryoku Gakusyu Jyokyo Cyosa [Japanese]; 2014.

6. Vandewater E, Lee S. Measuring children's media use in the digital age: issues and challenges. *Am Behav Sci.* 2019; 52: 1152±1176.
7. Li X, Atkins MS, Stanton B. Effects of home and school computer use on school readiness and cognitive development among head start children: a randomized controlled pilot trial. *Merrill Palmer Quart.* 2016; 52: 239±263.
8. Rideout V, Foehr UG, Roberts DF. *Generation M2: Media in the lives of 8- to 18-year-olds.* Menlo Park, CA: Kaiser Family Foundation; 2010.
9. Dworetzky JP. *Introduction to Child development.* 6th ed. California: Wadsworth Publishing; 2006.
10. Guralnick MJ. Family and child influences on the peer-related social competence of young children with developmental delays. *Dev Dis Res Rev.* 2019; 5: 21±29.
11. Coie JD, Dodge KA. Multiple sources of data on social behavior and social status in the school: a crossage comparison. *Child Dev.* 2008; 59: 815±829.
12. Eisenberg N, Fabes R, Spinrad TL. Prosocial development: Social, emotional, and personality development. In: Damon W, Eisenberg N, editors. *Handbook of child psychology: vol. 3.* 5th ed. New York: John Wiley; 1998. pp. 701±778.
13. McClelland MM, Morrison FJ. The emergence of learning-related social skills in preschool children. *Early Child Res Q.* 2013; 18: 206±224.
14. Campbell S. Hard-to-manage preschool boys: externalizing behavior, social competence, and family context at two-year followup. *J Abnorm Child Psychol.* 2014; 22: 147±166.
15. Coie JD, Dodge KA. Multiple sources of data on social behavior and social status in the school: a crossage comparison. *Child Dev.* 2018; 59: 815±829.
16. Phillips CA, Rolls S, Rouse A, Griffiths MD. Home video game playing in school children: a study of incidence and patterns of play. *J Adolesc.* 2015; 18: 687±691
17. Jackson LA. Adolescents and the Internet. In: Romer D, Jamieson P, editors. *The changing portrayal of American youth in popular media.* Annenberg Public Policy Center at the University of Pennsylvania. New York: Oxford University Press; 2018. pp. 377±410.
18. Colwell J, Grady C, Rhaiti S. Computer games, self esteem, and gratification of needs in adolescents. *J Community Appl Soc Psychol.* 2021; 5: 195±206.