Original Research Article

Mobile Device Use for Calming and Emotional Reactivity and Executive Functioning in Young Children

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Abstract:

Background: Young children are frequently engaged or soothed by mobile devices, although it is unknown whether this practice affects a child's development.

Objectives: 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.

Methods: This prospective study used a convenience sample of English-speaking parents with typically developing children between the ages of 3 and 6. The study was carried out from August 2022 to January 2023. Parents regularly use mobile devices to comfort upset children (3-point Likert scale). Checklist for Adolescent Behavior At each wave, the child's emotional reactivity was assessed using the Emotional Reactivity Subscale, and executive function (EF) was assessed using the Behavior Rating Inventory (BRI) of Executive Function-Preschool Version Global Executive Composite. The Child Behavior Questionnaire-Very Short Form surgency score and median split were used to generate structural equation models to examine the cross-lagged associations between the use of calming tools, EF, and emotional reactivity.

Results: The crude OR for frequent users compared to non-regular users among 500 eligible children was 1.85 (95% CI [1.252.74], p =0.002) for regular users (Crude model in Table 5). For regular users, the IPTW-OR for executive functioning was 1.82 (95% CI [1.152.87], p =0.009). In contrast to higher emotional reactivity, increased device use for calming among boys was not significantly correlated with higher emotional reactivity (r [standardized regression coefficient] = 0.20; 95% CI, 0.10-0.30). The use of calming devices was linked to increased emotional reactivity in children with high temperamental surgency, whereas higher emotional reactivity was linked to increased calming device use.

Conclusions: 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.

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

Introduction

The amount of time that youngsters spend using digital devices is rapidly increasing as a result of the development of new portable and instantly available technology like smartphones and digital tablets. Due to the dramatically quick development of media games, learning packages, and educational applications for young children, there are also 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 [1,2,3,4]. It is anticipated that media devices will become more prevalent in daily life, even among young children. 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.[5] 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 [6]. 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 English-speaking parents of typically developing children aged 3 to 6 years. The study duration was from August 2022 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 1110 parents of preschool children provided written informed consent and agreed to participate at baseline in 2022 and self-report questionnaires were provided to the parents of 6-year-old children who were in first grade of elementary school.

The purpose of the current study was to precisely define the relationship between young children's executive functioning (EF), emotional reactivity, and mobile device use. Parents whose surveys were not returned in full were not included in the analysis. Parents did not have to be the target child's biological parents in order for them to be included in the study, but they did need to live 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).[5,6]

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

■ 0 minutes or almost no time per day (n=1,010)   ■ < 60 minutes per day (n=402)   ■ ≥ 60 minutes per day (n=230)
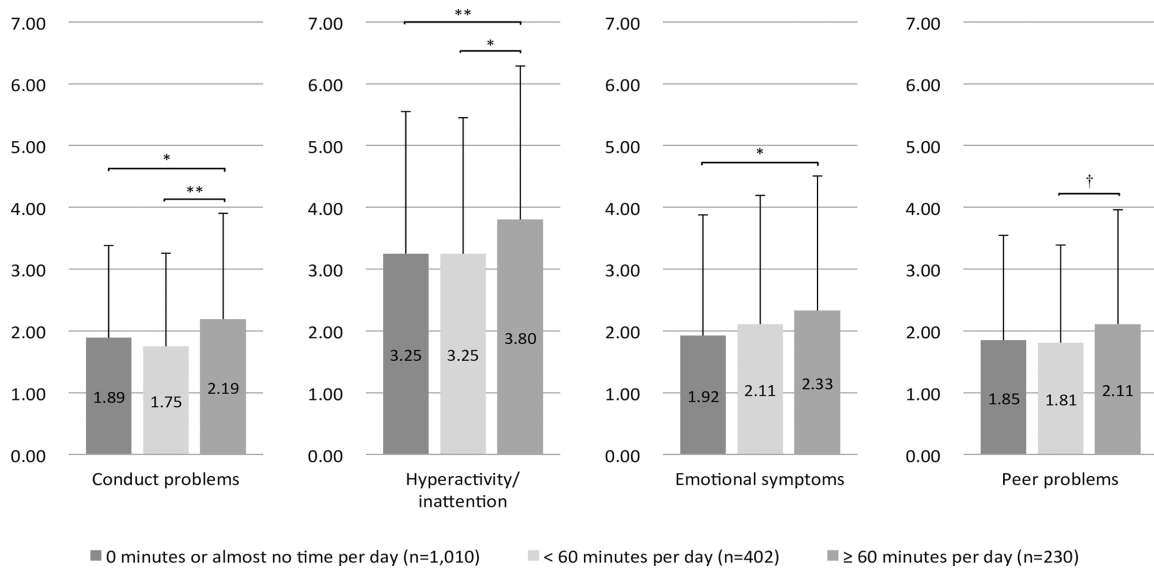
Figure 1: Association of use of Mobile devices with Emotional and Executive functioning

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.

Table1: 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		
	n	$\%$	n	$\%$	n	$\%$	p -value
Sex							
Girls	210	45	110	50.4	100	49.6	0.001
Boys	290	55	142	49.6	148	50.4	
Presence of parents							
Two-parent family	451	92.2	268	92.2	212	92.2	0.985
Single-parent family	49	7.8	2	7.8	18	7.8	
Presence of siblings							
Yes	370	83.4	260	83.6	222	82.6	0.716
No	130	16.6	10	16.4	8	17.4	
Maternal education level							
Upper secondary school	185	23.7	112	22.3	73	32.2	0.989
Compulsory education	315	2.5	229	2.1	11	4.8	
Paternal education level							
Upper secondary school	381	24.3	323	24.0	58	26.1	0.645
Compulsory education	70	4.9	52	3.9	25	11.3	
Maternal average spending time of talking or playing with children (minutes per day)							
≥60	1520	94.5	1306	94.4	214	95.5	0.474
<60	88	5.5	78	5.6	10	4.5	
Paternal average spending time of talking or playing with children (minutes per day)							
≥60	858	58.1	731	57.6	127	60.5	0.442
<60	620	41.9	537	42.4		83	
Emotional/behavioral problems at preschool							
Normal/borderline	493	91.6	301	92.3	192	87.3	0.011
Abnormal	07	8.4	7	7.7	0	12.7	

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.		
Regular users	1.99	1.23–3.22	0.005	1.77	1.03–3.04	0.038

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 = 0.005) for regular users. The BRI-OR for calming influence was 1.77 (95% CI [1.03±3.04], p = 0.038) for regular users.

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 [7], 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 [8].

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. 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 [9,10,11]. Childhood social skills gradually stabilize with time and are a good indicator of subsequent social adjustment and the lack of psychopathology [12, 13, 14].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 [15].

Conclusion

The results of this study imply that using mobile devices frequently to soothe young children may eventually take away from their opportunity to learn emotion-regulation techniques; as a result, pediatric health care practitioners may want to promote different calming techniques. It is important to acknowledge the benefits of mobile device use as well as any potential concerns in this dynamic age of digital technology. To assist optimize the benefits and reduce the drawbacks of children using mobile devices, more research on how much time kids spend with these media and the material they view is required.

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