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ORIGINAL ARTICLE

The Effect of Mobile Device Usage on SDQ Scores for Children Aged 6–12 in Jordan

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Abstract

Objective: This study aimed to assess the effects of mobile device use on the Strengths and Difficulties Questionnaire (SDQ) scores of children aged 6–12 years in Jordan, and to examine the factors that led the children to experience such effects. Our goal was to provide useful recommendations on how and when to use such devices to minimize harm and maximize benefit.

Methods: An online, anonymous, cross-sectional, observational study was conducted between May and June 2022. It involved a self-administered web-based questionnaire completed by parents of children, using social media platforms for distribution. The inclusion criteria were residency in Jordan and being aged 6–12 years. A total of 829 responses were received from participants; with 553 responses analyzed.

Results: Children who used mobile devices for more than two hours daily had a higher risk of emotional symptoms (p=.002), behavior problems (p=.001), hyperactivity (p=.010), peer problems (p=.000) and prosocial problems (p=.015). Additionally, children who began using mobile devices at or before the age of two years, as well as those who used mobile devices before bedtime, were more likely to have abnormal scores (52.3% and 44.6%, respectively).

Conclusion: Our study demonstrated the negative effects of improper mobile devices use on children's health and psychological development. therefore, it is necessary to investigate these conditions and the extent of the resulting effects more broadly, in order to create a safer environment for the children's growth.

Keywords: SDQ score, Children, Behavior, Smartphones, Jordan

INTRODUCTION

The COVID-19 period and beyond saw an increase in the use of smart devices and e-learning, urging the need to research the effects of this development and its potential impact on children's lives and health. Screen time, which includes watching television or movies, playing video games, and using computers, is a common sedentary behavior among children [1]. According to the latest recommendations from the American Academy of Pediatrics (AAP), children under the age of two should not use electronic

media at all, and children over two should limit their use to less than two hours per day [2]. Emotional, psychological, and social well-being are all included in the concept of mental health [3]. To have a good quality of life and function well at home, school, and in their communities, children must meet normal developmental and emotional milestones during childhood [4].

Mobile devices may affect children's moods in both positive and negative ways. Some of these positive effects lie in creating a type of connectedness with peers, making new friends, and feeling less alone. Recently, mobile devices have become increasingly available for children, anytime and anywhere, as they use them for various purposes, such as playing games, doing schoolwork, chatting with friends, and surfing the internet [5, 6]. However, excessive screen time can lead to several problems, the most significant of which are sleep disorders. These disorders can impair a child's ability to focus and contribute to developmental problems. Using electronic devices before bed increases autonomic activation in children, as bright screens can increase hyperarousal or disrupt melatonin production [7, 8]. Smartphone addiction has become a widespread problem globally [9]. Addiction to smartphones adversely affects users' thoughts, behaviors, feelings and sense of calmness and peacefulness [10]. Smartphone addiction can manifest in various ways, including distraction and preoccupation, tolerance, lack of control, withdrawal, mood changes, struggle, conflict, lies, excessive use and loss of interest [11].

One study reported that high levels of smartphone addiction are associated with low self-esteem, loneliness, a persistent feeling of sadness, a loss of enthusiasm and timidity [12]. Smartphone addiction is also reported to induce focus deficits because more cognitive impairments typically interfere with education, job and family [13]. Addiction is more likely to happen in adolescents rather than older people, with one Turkish study finding that higher levels of smartphone overuse are more common in younger individuals [14]. A study in Austria found that inconvenient mobile device usage had an association with chronic stress, emotional instability, the female gender, young age and depression [14]. In Taiwan, adolescents diagnosed with severe depression were found to exhibit more than three symptoms of problematic cellphone usage [15]. Moreover, the rise of cyberbullying, using digital technologies to harm others, has increased the risk of depression to a greater risk of and low self-esteem among children [16]. The World Health Organization (WHO) has also highlighted the link between excessive screen time and the development of sedentary lifestyle in elementary school children. Therefore, it is crucial to reduce screen time and encourage non-screen-based activities with a caregiver [17].

METHODOLOGY

An online, anonymous, cross-sectional, observational study was conducted between May and June 2022. A self-administered web-based questionnaire was filled in by parents and conducted using social media platforms. Inclusion criteria were residency in Jordan, being 6–12 years of age, and consenting to participate. All children with chronic diseases were excluded. The total responses reached 829 participants; 276 were excluded because they did not fit the inclusion criteria, and 553 responses were analyzed.

Ethical Considerations

This study adhered to the principles of the 1975 Declaration of Helsinki and was

approved by the Institutional Review Board at Al-Balqa Applied University. The first page of the survey provided a brief explanation of the research aim and the types of questions required, requested consent, and clarified the participation was optional. Data was collected and securely stored in a locked file, with access restricted to the research team. No personal information or contact details were collected. For the first part of the online survey, all participants' parents were required to sign an electronic informed consent form. This form provided detailed information on the study goals, objectives, methods, supervisor contact information, and IRB approval.

Participants were informed that participation was voluntary and that they might stop the survey at any stage. Data confidentiality was ensured by stripping all and no identifiable information -related questions such as participant name or city of residence were asked. A study-specific unique identifier was generated for each participant, and the corresponding file was locked, password-protected, and accessible only to the research team for viewing, sharing, and analysis. All subsequent analyses were conducted on this anonymized file. Participants did not receive any compensation or reward for their participation in the study.

Online Sampling Process

According to statistics from the Ministry of Education, the total number of both public and private schools in Jordan is 7,434 and the total number of school children aged 6–12 years is 1,281,935. The authors computed a sample size using the Raosoft calculator with a margin of error set to up to 5% and a confidence value of 95%; 385 respondents or more were considered acceptable. To increase the response rate and reach the target population, the online survey was sent to a list of emails and social media platforms (e.g., Facebook and WhatsApp) using the convenience non-probability sampling method.

Survey Instruments

The survey was constructed based on the Arabic version of the SDQ. It was compiled using Google Forms and took five minutes to complete. The first page dealt with consent and other ethical considerations. Participants who consented to proceed by pressing 'OK' were allowed to answer subsequent questions. The second page focused on the baseline characteristics of participants such as age, gender, order in family, number of siblings, health status of the child and type of his/her school. It also inquired about the governorate where the child lives.

The third section related to using mobile devices and included a list of available electronic devices and their type, ownership, exposure duration, age at first exposure, content watched (videos, applications, social media account, games) and use while in bed. The fourth and fifth sections of the questionnaire covered all the SDQ. Thirty people were asked to fill in a pilot version of the survey before we commenced officially collecting data.

Data Management and Analysis Plan

Children aged 6–12 were assessed using the parent form of the SDQ. The assessment was divided into five subscales: conduct problem, hyperactivity, emotional symptoms, peer problems and pro-social behavior; each has five items [18].

Items were rated on a three-point Likert scale, with 0 representing 'Not true' and 2 representing 'Certainly true'. The internal consistency and construct validity were rated as adequate [19, 20, 21]. We divided participants into normal, borderline, and abnormal groups [21]. The grading system used in the current study is shown in Table 1. The overall score depended on four subscales (emotional, conduct problems, hyperactivity, and peer problems).

Table 1. Categorizing SDQ scores for 4–17-year-olds

SDQ subscales	Original three–band categorization		
	Normal	Borderline	Abnormal
Emotional problems score	0–3	4	5–10
Conduct problems score	0–2	3	4–10
Hyperactivity score	0–5	6	7–10
Peer problems score	0–2	3	4–10
Total difficulties score	0–13	14–16	17–40
Prosocial score	6–10	5	0–4
Impact score	0	1	2–10

An impact score was created by summing the items related to overall distress and impairment. When respondents answered 'No' for item 26 ('Overall, do you think that your child has difficulties in any of the following areas: emotions, concentration, behavior or being able to get along with other people?'), they were not asked to complete the questions on resultant distress or impairment; the impact score was automatically scored zero in these circumstances.

The data were collected using Microsoft Forms and downloaded into Excel for coding and de-identification before being imported into the Statistical Package for Social Science (IBM SPSS Statistics for Windows, version 25, IBM Corp., Armonk, N.Y., USA) for analysis.

RESULTS

Results of the present study are representative of the 553 Jordanian children included in the research. The tables present the demographic characteristics of the participants, their SDQ scores, and the association between the overall SDQ score and variables related to the nature of mobile device use. The demographics of our study sample are summarized in Table 2 and were analyzed based on daily usage duration. Males made up 61.6% of the sample, with 46.3% classified as a greater user compared to 43.4% of females. Most participants had two or more siblings (61.3%), and the largest group were medium mobile users (51.9%).

Some 73.8% were the youngest among their siblings, and the highest percentage were greater mobile users (55%). Most mothers were less than 40 years old (68.2%), while most fathers were over 40 years old (59.5%). Some 57.7% of the mothers were homemakers or non-employees; on the other hand, 92.9% of the fathers were employees. Most of the participating mothers and fathers held bachelor's degrees (51.7 and 45.8%, respectively). After studying the relationships between this group of variables with the duration of mobile use, we found a significant association between the duration

of use with the order of the child in the family (p=.00), the age of the mother and the father (p=.00 for both), and the educational degree obtained by the mother and father (p=.007 and .038, respectively). However, we did not find any significant associations between the duration of mobile use and other variables.

Table 2. Participant characteristics (n=553)

	Total		Medium use (2 hours or less)		Long use (> 2 hours)		p-value
	n	%	n	%	n	%	
Sex							
Male	341	61.6	183	53.7	158	46.3	.50
Female	212	38.4	120	56.6	92	43.4	
Presence of siblings							
No	81	14.6	46	56.8	35	43.2	.195
1	133	24.1	81	60.9	52	39.1	
2 or more	339	61.3	176	51.9	163	48.1	
Order of the child in the family							
Youngest	209	37.8	94	45	115	55	.00
Middle	151	27.3	84	55.6	67	44.4	
Oldest	193	34.9	125	64.8	68	35.2	
Mother age							
<40	377	68.2	233	61.8	144	38.2	.00
40 or more	176	31.8	70	39.8	106	60.2	
Father age							
<40	224	40.5	145	64.7	79	35.3	.00
40 or more	329	59.5	158	48	171	52	
Mother's work							
Employed	234	42.3	120	51.3	114	48.7	.155
Unemployed/homemaker	319	57.7	183	57.4	136	42.6	
		Father's work					
Employed	514	92.9	283	55.1	231	44.9	.648
Unemployed/homemaker	39	7.1	20	51.3	19	48.7	
Mother's education							
Compulsory education	64	11.6	29	45.3	35	54.7	
Upper secondary school	162	29.3	75	46.3	87	53.7	.007
Bachelors	286	51.7	175	61.2	111	38.8	
Post-graduate studies	41	7.4	24	58.5	17	41.5	
Father's education							
Compulsory education	76	13.7	37	48.7	39	51.3	
Upper secondary school	181	32.7	87	48	94	52	.038
Bachelors	253	45.8	152	60.1	101	39.9	
Post-graduate studies	43	7.8	27	62.8	16	37.2	

Table 3 presents a summary of the association between the daily time spent using mobile devices and the five subscales of the SDQ. More than half of the participants who

used a mobile for more than two hours a day had abnormal scores regarding conduct problems (52%), while 47.6% suffered from peer problems; in addition, high percentages of greater users recorded abnormal scores in emotional symptoms and hyperactivity (38.8% and 25.2%, respectively). The findings suggest that children who use mobile devices for more than two hours daily have a higher risk of emotional symptoms (p=.002), conduct problems (p=.001), hyperactivity (p=.010), peer problems (p=.000) and prosocial problems (p=.015) compared with those who spent two hours or less.

Most of the participants used smartphones daily (73.1%), and video watching apps were their first choice (48.6%). Most participants started using a mobile device after the age of four years. In addition, 251 of the participants used a mobile before bedtime (45.4%). Statistically, significant effects of the age of starting to use mobiles and use before bedtime on the total difficulties were also identified (p=.000 in both). Children who started using mobile devices during or before the age of two years were more likely to have abnormal scores (52.3%) compared to those who started using mobiles at an older age (Table 4). In addition, those children who used the mobile device before bedtime had a higher percentage of abnormal scores (44.6%). On the other hand, there was no significant relationship between the total score and the most used type of mobile device or the applications for which the mobile device was used (p=.334 and .197, respectively).

Table 3. SDQ scores of participants according to the duration of mobile use (n=553)

	Medium use (2 hours or less) n = 303			Long use (>2 hours) n = 250			*p*-value
	Normal n (%)	Borderline n (%)	Abnormal n (%)	Normal n (%)	Borderline n (%)	Abnormal n (%)	
Pro-social	245 (80.9)	28 (9.2)	30 (9.9)	176 (70.4)	33 (13.2)	41 (16.4)	.015
Hyperactivity	219 (72.3)	37 (12.2)	47 (15.5)	153 (61.2)	34 (13.6)	63 (25.2)	.010
Emotional Symptoms	180 (59.4)	47 (15.5)	76 (25.1)	116 (46.4)	37 (14.8)	97 (38.8)	.002
Conduct Problems	134 (44.2)	58 (19.1)	111 (36.6)	81 (32.4)	39 (15.6)	130 (52)	.001
Peer Problems	134 (44.2)	76 (25.1)	93 (30.7)	83 (33.2)	48 (19.2)	119 (47.6)	.000
Total Difficulties Score	164 (54.1)	42 (13.9)	97 (32)	84 (33.6)	56 (22.4)	110 (44)	.000
SDQ Impact Score	190 (62.7)	20 (6.6)	93 (30.7)	131 (52.4)	20 (8)	99 (39.6)	.050

Table 4. The association between overall SDQ score and variables related to the nature of use (n=553)

	Total n (%)	Overall SDQ score			*p*-value
		Normal n (%)	Borderline n (%)	Abnormal n (%)	
Most used device					
Smartphone	404 (73.1)	174 (43.1)	72 (17.8)	158 (39.1)	.334
Tablet/iPad	149 (26.9)	74 (49.7)	26 (17.4)	49 (32.9)	
Age of starting to use devices					
2 years or less	128 (23.1)	41 (32)	20 (15.6)	67 (52.3)	.000
3–4 years	184 (33.3)	82 (44.6)	31 (16.8)	71 (38.6)	
More than 4 years	241 (43.6)	125 (51.9)	47 (19.5)	69 (28.6)	
Applications used most					
video watching apps	269 (48.6)	107 (39.8)	48 (17.8)	114 (42.4)	.197
Games Apps	253 (45.8)	123 (48.6)	44 (17.4)	86 (34)	
Social media	17 (3.1)	9 (53)	4 (23.5)	4 (23.5)	
Others	14 (2.5)	9 (64.3)	2 (14.3)	3 (21.4)	
Use before bedtime					
Yes	251 (45.4)	84 (33.5)	55 (21.9)	112 (44.6)	.000
No	302 (54.6)	164 (54.3)	43 (14.2)	95 (31.5)	

DISCUSSION

This study evaluated the effect of using mobile devices on the SDQ scores of 553 Jordanian children aged 6–12 years in an online cross-sectional survey. It also examined the impact of demographic characteristics on the duration of mobile use and the relationship between various factors related to the nature of mobile use on the SDQ score of the participants. Males constituted 61% of the sample; we found an insignificant relationship between gender and mobile device use, similar to the results found in a previous study [22]. We found that the youngest child in the family used mobiles the longest, which may be explained by what is called 'the youngest child syndrome,' whereby the youngest child is more spoiled by the parents compared to their other children [23]. This opens the way for the child to use a mobile for more extended periods. There were significant associations between the education of the mother and father and the duration of mobile use, consistent with a study conducted in Japan [24]. Similarly, Hinkley et al. identified no association between parental employment, the presence of siblings, and screen time for preschool children. [25]. In our study, we found that using mobiles (smartphones or tablets), was associated with an increased possibility of emotional symptoms, hyperactivity difficulties, conduct and peer problems. These findings are consistent with recent systematic reviews of aggregated electronic screen time in children and adolescents, which reported that the increased use of mobile was associated with attention problems [26], concentration problems [26, 27], conduct problems [28], hyperactivity symptoms [27], and hostility [29], and that frequent mobile use without educational content may be associated with behavioral problems [24]. According to a cohort study, after a year, young children who

reported using mobile devices more frequently had higher scores on the parent-reported SDQ subscales measuring hyperactivity and behavioral problems [30]. For general mobile use, there are proven links between mobile use and depressive symptoms [31].

In line with prior research, we discovered a significant correlation between using a mobile device just before bed and the overall SDQ score. Bedtime use was significantly associated with worse mental health, including higher levels of internalizing symptoms, according to cross-sectional studies [32–34]. However, two of these studies discovered that the link between bedtime use and internalizing symptoms (depression, anxiety, suicidal ideation/ self-harm) persisted even after adjusting for sleep duration [32, 33]. Notably, more prolonged and frequent bedtime use was linked to higher levels of depression [33, 34], anxiety symptoms [33], suicidal thoughts, and self-injury. [32].

Some parents allow their children to use mobiles to give them time to do housework, to keep the child calm or to put them to sleep [35], without realizing the potential harm of using mobiles at such a young age. Our research revealed a significant correlation between the children's first mobile use age and their overall SDQ scores, with 52% of children under the age of two scoring abnormally compared to those over that age (Table 4). There is general agreement that exposure to screens during infancy (under two years old) negatively impacts executive functions assessed in early childhood. Young children who were regularly exposed to screens as infants perform worse on tests of thinking, problem-solving, and language ability and exhibit greater difficulty in controlling their emotions. They also score higher on measures of demanding behaviors like fussiness [36–39].

Despite studies showing the detrimental effects of gaming applications, we could not detect a statistically significant relationship between the mobile phone application used and the overall SDQ scores. According to one study, children who play violent video games become more aggressive and exhibit less social behavior [40]. The type of game, which our study did not specify, as well as the characteristics of the sample—56.5% of gamers use their mobile devices for less than two hours, and 59% of their mothers and 56% of their fathers have college degrees—are to blame for the discrepancy.

RECOMMENDATIONS

After looking at the results of our study, we recommend that the use of mobile phones for the age group of 6–12 years should be less than two hours per day, which is consistent with Canadian [41], Australian [42], and AAP [43] recommendations. Our results also call for preventing the use of mobiles for children under two years of age, which is consistent with the recommendations of the AAP [44]. The results of our study also support the AAP's recommendation not to use a mobile at least an hour before bedtime [43].

CONCLUSION

Under the recent conditions of the closures resulting from the COVID-19 pandemic, people's lifestyles have changed and dependence on electronic devices and e-learning has increased, which has brought about some psychological and social changes for individuals, especially children, and this has been proven through this study. Thus, it is necessary to focus on studying these

conditions more broadly and the extent of the resulting effect in order to educate parents and provide a safe environment for the growth of children.

Authors' Notes

The manuscript has been seen and approved by all authors and has not been published, or is being considered for publication, elsewhere. The authors transfer all copyright and ownership to the Jordan Medical Journal.

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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تأثير استخدام الأجهزة المحمولة على نتائج استبيان مواطن القوة و الصعوبات عند الأطفال في الفئة العمرية 6 إلى 12 سنة في الأردن

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الملخص

الخلفية والأهداف: هدفت هذه الدراسة إلى تقييم تأثير استخدام أجهزة الموبايل على نتائج استبيان القوى والصعوبات (SDQ) لدى الأطفال الذين تتراوح أعمارهم بين 6 و12 عامًا في الأردن، وإلى تقييم العوامل التي تؤدي لحدوث هذه التأثيرات، للوصول إلى توصيات مفيدة حول كيفية و وقت استخدام هذه الأجهزة بأقل ضرر وأقصى فائدة لصحة الأطفال النفسية و العقلية.

المنهجية: تم اجراء دراسة عبر الإنترنت (cross-sectional study) بين مايو ويونيو 2022. تكونت من استبيان ذاتي التعبئة تم ملؤه من قبل أولياء الأمور للأطفال وتم إجراؤه باستخدام منصات وسائل التواصل الاجتماعي. و شملت معايير الاشتراك الإقامة في الأردن وبلوغ سن 6–12 سنة. بلغ إجمالي الإجابات 829 مشاركًا و تم تحليل 553 إجابة منها.

النتائج: أظهرت النتائج أن الأطفال الذين استخدموا أجهزة الموبايل لأكثر من ساعتين يوميًا كانوا أكثر عرضة للأعراض الانفعالية (P = .002) ومشاكل السلوك (P = .001) وفرط النشاط (P = .010) ومشاكل السلوك الاجتماعي الايجابي (P = .000) ومشاكل العلاقة مع الاقران .(P = .015) . كان الأطفال الذين بدأوا استخدام أجهزة الموبايل أثناء أو قبل سنتين من العمر، والذين استخدموا الجهاز المحمول قبل النوم، أكثر احتمالًا أن يكون لديهم نتائج غير طبيعية (52.3٪ و 44.6٪ على التوالي).

الاستنتاجات: ظهرت التأثيرات السلبية للاستخدام الخاطئ لأجهزة الموبايل على صحة وتطور الأطفال بشكل واضح في دراستنا. وبالتالي، من الضروري دراسة هذه الظروف بشكل أوسع و دراسة مدى التأثير الناتج لتوفير بيئة آمنة لنمو الأطفال.

الكلمات الدالة: استبيان مواطن القوة و الصعوبات، الأطفال، السلوك، الأجهزة الذكية، الأردن.