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Growing concern; The relationship between screen time and behavior problems in digital era

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Abstract

Although the physical and psychological effects of digital screens have been shown in studies, its relationship with the behavior of children is still unclear. When, how, and at what ages screen time is associated with behavioral problems continues to be investigated. The study aimed to evaluate the relationship between screen time and behavioral problems. 378 children (preschooler:64, schooler:206, adolescent:108) were included in our study. The Strengths and Difficulties Questionnaire, screen and sociodemographic data were filled in by the mothers. An increase in the SDQ score (except for the social score) indicates an increase in behavioral problems. In each group, <25p screen time was evaluated as low, 25-75p as medium, >75p as high screen time. The median screen time of the preschool, school and adolescent groups was calculated as 3.00hrs.(25p-75p:1.125-5.00), 3.00hrs.(25p-75p:2.00-6.00), 5.00hrs.(25p-75p:3.00-8.00), respectively. The hyperactivity/inattention score of preschoolers who watched screen ≤ 1 hr was significantly lower compared to those with >1hr screen time ($p=0.02$); In the schooler group, the social score was statistically higher and the scores of the other subscales were lower in those who watch screen ≤ 2 hrs. While high screen time was found to be associated with behavioral problems in school and adolescents, it was found to be associated with less hyperactivity problems in preschool period in regression analysis. It was determined that low-screen time was associated with less hyperactivity in preschool period and more behavioral problems in adolescents. While moderate screen time had a positive effect on behaviors in adolescents in paired analyzes, no effect was observed in multiple regressions. Parental screen time was associated with emotional/behavioral problems of preschool and school age children. Child's screen time and parental screen time should be evaluated for intervention of behavioral problems. Large-scale studies are needed to compare the effect of low and medium-screen time on children's well-being.

Keywords: Screen time, parental screen time, behavioral problems

Introduction

Digital media plays a crucial role in the lives of the younger generation. Digital media tools are used for purposes such as entertainment, socialization, education, feeding and care [1]. In recent years, technological developments enable children to access digital devices anytime, anywhere and increase children's

screen time [2, 3].

Restriction of screen time is recommended in the guidelines [4-6] but it is known that parents cannot apply the screen time restrictions [7]. The results of studies that investigate media use and children's well-being are inconsistent [8-10]. Previous studies have shown that high screen time was associated with

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physical and mental health problems [11] and low screen time positively affects the development of children [6, 8]. In recent studies, it has been shown that the relationship between screen time and mental problems is not linear, and moderate screen time has positive psychological effects compared to low screen time [10]. We know that children's screen time has been increasing, so the concerns about children's mental health have been increasing. When and how digital media affect children negatively remains a current public issue. Behavioral problems and factors affecting screen time vary between cultures. The study aimed to evaluate the factors affecting screen time and the relationship between screen time and behavioral problems in children between the ages of 2 and 17.

Material and Methods

Ethics committee approval was obtained from the Ethics Committee Toros University in Mersin, Turkey (23/9/2022 numbered 154). All parents were included in the study voluntarily, using the snowball sampling method. Inclusion criteria; being able to speak Turkish and having children between the ages of 2-17. First of all, the purpose of the study was explained and it was informed that the participation was voluntary. Mothers who agreed to participate in the study were asked to complete the Strengths and Difficulties Questionnaire (SDQ) to assess their children's behavioral problems. The mothers were also asked to fill out a questionnaire made by the researcher for the study that inquired about their children's screen time, parents' screen time, why their children watch screens, how long their children should watch screens per day, the number of books read weekly, and their sociodemographic data. Sociodemographic data; sex and age of children, parent's age, parent's education level, employment status, the number of children, birth order, and family income. Family income was asked by dividing into three groups as below the minimum wage, minimum wage, and above the minimum wage.

The children included in the study were divided into three groups according to their ages as preschoolers (2-4 years), schoolers (5-9 years), and adolescent groups (10-17 years).

In each group, screen times below 25p were classified as low screen time, 25-75p as moderate screen time, and above 75p as high screen time. Also, screen time was categorized as recommended by the guidelines, with a maximum of one hour and more than one hour daily for preschoolers; screen time was categorized as a maximum of two hours and more than two hours daily for schoolers.

Strengths and difficulties questionnaire (SDQ): Completed by parents to assess the emotional and behavioral problems of children and adolescents. SDQ consists of five subscales consisting of 25 items. The subscales are emotional problems, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. The total difficulties score includes the sum of the emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship. Each item

is evaluated on a 3-point scale from 0 to 2. A higher score on the SDQ subscales score (except for the social score) indicates greater behavioral problems. A higher score on the prosocial behavior score indicates strengths.

Statistical Analysis

Normality control of continuous variables was evaluated with the Shapiro-Wilk test. Since the variables did not conform to the normal distribution, the Mann-Whitney U test was used in the comparison of two independent groups, and the Kruskal-Wallis test was used in the comparison of more than two groups. Spearman Rho correlation coefficients were calculated to examine the linear relationship between the variables. The Chi-square test was used in the analysis of categorical data. Multiple Linear Regression models were created for the variables affecting the Strengths and Difficulties Questionnaire subscales (Total difficulties score, emotional symptoms, hyperactivity/inattention, prosocial behaviors, conduct problems, and peer relationship problems). Data analysis was done in IBM SPSS 21 package program.

Results

As a result, a total of 378 children, 64 in the preschooler group, 206 in the schooler group, and 108 in the adolescent group, were evaluated. The sociodemographic characteristics of the participants in the study were shown in Table 1.

The median screen time for the preschooler, schooler, and adolescent groups was calculated as 3.00hrs (25p-75p: 1.125-5.00), 3.00hrs (25p-75p: 2.00-6.00) and 5.00hrs (25p-75p: 3.00-8.00), respectively. Screen time of the adolescent group was statistically higher than the other groups ($p<0.001$). There was a negative correlation between the number of books read weekly and screen time ($r=-.329$ $p<0.001$), and also parental education and screen time in the schooler group (maternal education: $r=-.217$ $p=.002$, paternal education $r=-.156$ $p=.026$). The numbers of televisions and siblings were positively correlated with screen time in the schooler group ($r=.146$ $p=.036$, $r=.187$ $p=.007$, respectively). According to Kruskal-Wallis analysis, the medium children's screen time was the highest compared to first and last children's screen time in the schooler group ($p<0.001$). By the Mann Whitney-U analysis, the screen time of the children of unemployed mothers was found to be higher than the children of working mothers ($p=0.006$). In the adolescent group, there was an inverse correlation between screen time and the number of books read weekly ($r=-.323$ $p=.001$), and a positive correlation between screen time and maternal age and number of televisions ($r=.20$ $p=.038$; $r=.238$ $p=.013$, respectively).

We asked parents, "How many hours do you think your child should watch screens?". In the preschooler group, 54% of the mothers answered for a maximum of 1 hour, and in the schooler group, 92% of the mothers answered for a maximum of 2 hours. When the children's screen time was examined, it was seen that only 25% of the parents applied the recommended screen time restrictions (≤ 1 hour) in the preschooler group. In the schooler

group, 27% of parents were able to enforce the recommended screen time restrictions (≤ 2 hours).

We asked parents why children use screens. The most common answers in the preschooler group were entertainment (59.4%), caregiving (20.3%), and calming the children (15.6%). The most frequently given answers in the schooler group were entertainment (71.8%), education (12.6%), and caregiving (7.3%). In the adolescent group, the answers given by the parents were entertainment (67.6%), education (21.3%), and socialization (10.2%).

In the bivariate analysis, it was found that screen time was inversely related to prosocial score in the preschooler group ($r = -.255$ $p = 0.042$). In the schooler group, screen time was found to be inversely related to prosocial scores and positively related to other subscales of SDQ. We did not find a relationship between behavioral problems and screen time in the adolescent group.

In the preschooler group, children who watched a screen for ≤ 1 hour daily had a lower hyperactivity/inattention score than those who watched more than one hour ($p = 0.02$). It was observed that children who watched ≤ 2 hours in the schooler group had higher

Table 1. Socio-demographic characteristics and screen parameters of the children included in the study

	Preschooler group N=64	Schooler group N=206	Adolescent group N=108
Age, year*	3.0(2-4)	7.0(6-8)	12.0(11-13)
Sex, M/F	33/31	96/110	55/53
Maternal age, year*	30(26-37)	35(31-39)	39(35-42)
Paternal age, year*	36(31-41)	38(34-43)	42(39-46)
Maternal education, year*	11.5(8-13,5)	12(7.5-16)	12(5-16)
Paternal education, year*	11.5(8-12)	12(8-16)	12(8-16)
Unemployed mother**	49(%76)	135(%65)	61(%56)
Family income **			
Below the minimum wage	16(25)	32(15.5)	13(12)
The minimum wage	22(34.3)	65(31.5)	28(25.9)
Above the minimum wage	26(40.6)	108(52.4)	67(62)
The number of children*	2(1-3)	2(2-3)	2.5(2-3)
Birth of the order**			
The first child	31(%48)	110(%53)	58(%54)
Middle child	5(%8)	30(%14)	22(%20)
The last child	28(%44)	65(%33)	28(%26)
The number of books read weekly*	0(0-5)	2(0-5)	0(0-2)
The presence of TV in the bedroom**	9(%14)	32(%15)	57(%53)
The number of TV*	1(1-2)	1(1-2)	1(1-2)
Screen time, h/d*	3(1.12-5.0)	3(2.0-6.0)	5(3.0-8.0)
Maternal screen time, h/d*	2(1.0-3.0)	2(1.0-3.0)	2(1.0-3.0)
Paternal screen time, h/d*	2(1.25-4.0)	2(1.0-4.0)	3(2.0-5.0)
* = median (min-max) ** = N (%)			

prosocial scores ($p=0.045$) and other subscales were lower than children who watched more than 2 hours ($p<0.05$). We used the median screen time as the cut-off value (≤ 5 hours), as there was no recommended hour in the adolescent group. Adolescents with less than five hours of screen time were found to have lower total difficulties scores ($p=0.03$) and lower peer scores than those who watched more than 5 hours ($p=0.01$) (Table 2). The effects of low, moderate, and high screen time on behavioral problems in all three groups are shown in Table 3.

The maternal screen time was positively related to hyperactivity/inattention score in the preschooler group, and also the maternal time was inversely related to the conduct, hyperactivity/inattention, peer, and total difficulties scores in the schooler group. We did not find a significant relationship between parental screen time and SDQ subscales in the adolescent group.

The Multiple Linear Regression model was used to determine the factors related to screen time in all three groups. Sociodemographic factors such as age, sex, age of parent, parental

Table 2. Behavior problems according to the recommended screen time by guidelines

	Total difficulties	Prosocial score	Emotional symptoms	Conduct problems	Hyperactive/Inattention	Peer relationship
Preschooler group						
Screen time ≤ 1 hr (n=16)	8(4.5-17.5)	8(6-10)	2.5(0-4)	2(0.25-3.75)	3(1.25-5.0)	2(1.25-4)
Screen time >1 hr (n=48)	12(9.25-17.75)	7(6-9)	2(1-4)	2(1-3)	5(3.25-7)	3(2-4)
p- value	0.160	0.230	0.688	0.682	0.020	0.770
Schooler group						
Screen time ≤ 2 hrs (n=57)	9(5-13)	9(7-10)	2(0-4)	1(0-2.5)	4(2-5)	2(1-3)
Screen time >2 hrs (n=149)	12(9-17)	8(6-9)	3(1-5)	2(1-3)	5(3-7)	3(2-4)
p- value	<0.001	0.045	0.013	0.018	0.003	0.002
Adolescent group						
Screen time ≤ 5 hr. (n=62)	11(8-14)	9(7.75-10)	4 (2-5)	2(1-3)	4(2-6)	2(1-4)
Screen time >5 hrs (n=46)	15(9.75-19)	8.5(6-10)	4(2-6)	2(1-4)	4(3-6)	3(2-5)
p- value	0.03	0.065	0.288	0.442	0.324	0.010
Median (min-max) of values were given						

Table 3. Children's behavior problems according to low, moderate, and high screen time

	Total difficulties	Prosocial score	Emotional symptoms	Conduct problems	Hyperactive/Inattention	Peer relationship
Preschooler group						
Low screen time	8(4.5-17.5)	8(6-10)	2.5(0-4)	2(0.25-3.75)	3(1.25-5.0)	2(1.25-4)
Moderate screen time	12(8.5-18)	7.5(6-9)	2(0-4)	2(1-3)	5.5(3-8)	2.5(2-4)
High screen time	13.5(9.75-15.25)	6(3.75-8.25)	3(1.75-4)	3(1-4)	5(4-6)	3(1.75-4)
p- value	0.370	0.203	0.644	0.814	0.052	0.778
Schooler group						
Low screen time	9(5.5-14) ^a	9(7.25-10)	1(0-4) ^c	2(0-2.75) ^e	4(2.25-5) ^g	2(1-3)
Moderate screen time	11(7-14) ^b	8(7-10)	2(1-4) ^d	2(0-3) ^f	4(2-6) ^h	3(1-4)
High screen time	15(12-21) ^{ab}	8(6-9)	3(2-7) ^{cd}	3(2-5) ^{ef}	6(4-8) ^{gh}	2(3-4)
p- value	<0.001	0.149	0.005	<0.001	0.001	0.170
Adolescent group						
Low screen time	12(11-20.5)	9(6-10)	4(3-6)	2(0.5-5)	4(2-5)	4(2-4.5)
Moderate screen time	11(8-15) ⁱ	9(8-10)	3(2-5)	1 (0.5-3)	4(2-6)	2(1-4) ^j
High screen time	15.5(11-22.25) ⁱ	8(5.75-10)	4(2-6)	2(1-6)	5(3-6)	4(2-6) ^j
p- value	0.040	0.122	0.258	0.064	0.554	0.003

*= median (min-max) values were given

education, working status of a mother, family income, birth order; the presence of a TV in the bedroom; the number of the TV at the home; the number of books read weekly, SDQ subscales; parental screen times were joined the models. In the preschooler group, the presence of a TV in the bedroom ($\beta=0.317$ $p=0.029$), prosocial behavior ($\beta=-0.416$ $p=0.013$); in the schooler group, the number of books read weekly ($\beta=-0.172$ $p=0.018$); in the adolescent group; the presence of a TV in the bedroom ($\beta:0.296$ $p=0.012$) were found to be possible risk factors for screen time.

When the factors associated with behavioral problems were analyzed by Multiple Linear Regression analysis, sociodemographic data, parental screen time, the number of books read weekly, the presence of a TV in the bedroom, low screen time, moderate screen time, and high screen time were included in the models. In the preschool period, maternal screen time was associated with prosocial score and hyperactivity/inattention score ($\beta=-0.273$ $p=0.05$, $\beta=0.245$ $p=0.035$, respectively), presence of a TV in the bedroom was associated with prosocial behavior score ($\beta=0.279$ $p=0.034$). Additionally, low and high screen time were found to be associated with hyperactivity/inattention scores ($\beta=-2.432$ $p=0.019$, $\beta=-2.047$ $p=0.047$).

In the schooler group, high screen time was related to total difficulties score ($\beta=0.227$ $p=0.001$), emotional symptoms ($\beta=0.155$ $p=0.036$), conduct problems ($\beta=0.259$ $p<0.001$), and hyperactivity/inattention scores ($\beta=0.194$ $p=0.008$). Maternal and paternal screen time was related to total difficulties ($\beta=-0.262$ $p<0.001$, $\beta=0.152$ $p=0.023$, respectively). And also, paternal screen time was related to emotional symptoms ($\beta=0.150$ $p=0.038$), maternal screen time was related to conduct problems ($\beta=-0.228$ $p<0.001$), hyperactivity/inattention ($\beta=-0.258$ $p<0.001$), and peer scores ($\beta=-0.193$ $p=0.009$) in the schooler group.

High screen time in the adolescent group was associated with prosocial score ($\beta=-0.227$ $p=0.024$), conduct problems ($\beta=0.259$ $p=0.015$), and peer score ($\beta=0.298$ $p=0.003$). Low screen time was also found to be associated with conduct problems score ($\beta=0.287$ $p=0.013$).

Discussion

Due to the inexorable increasing screen time among the younger generation, when and how screen time causes negative effects children's mental health is one of the health problems that are wondered. In our study, the relationship between preschoolers, schoolers, and adolescent children's screen time, risk factors, and behavioral problems was studied in detail.

The median screen time in the preschooler, schooler, and adolescent groups was 3.00 hrs. and 3.00 hrs., and 5.00 hrs. respectively. This finding was observed to be similar to previous studies [12-14]. In agreement with the literature, the screen time of the adolescent group was found to be statistically higher than the schooler and preschooler groups [13].

Guidelines recommend limiting screen time to parents to reduce the negative effects of screen time [5, 6]. However, most of the parents of the preschooler and schooler groups stated that their children should watch at or below the recommended hours, it was seen that only %25 of them could apply the recommended screen time. In previous studies, the rate of not applying the screen restrictions recommendation ranged between 20% and 75%, and in our study, the rate was found to be in the upper range [7, 15, 16].

We expected that screen time would be associated with behavioral problems, especially hyperactivity/inattention problems, as younger children are more sensitive to environmental factors, overreact to violent events, and have insufficient self-regulation skills and insufficient skills to distinguish between reality and virtual reality [17]. Consistent with our experience and the literature, in multiple regression analysis, low screen time was found to be associated with lower hyperactivity and inattention problems in preschooler children [18]. An unexpected finding was that high screen time was associated with lower hyperactivity and inattention problems in preschool children too. In the preschooler group, parents stated that they mostly used the screen for caregiving and calming their children. We thought that since the physical activity of the child who stands in front of the screen for a long time may be decreased, therefore the hyperactivity score was found to be low according to maternal reports. In line with previous studies, the study demonstrated that high screen time was associated with emotional, conduct, and hyperactivity/inattention problems in the schooler group [11, 19]. No relationship was found between low and moderate screen time and behavioral problems in the schooler group.

In the literature, according to the Goldilock hypothesis, while high screen time causes behavioral problems in adolescents, moderate screen time does not cause negative effects, and may even have positive effects on behavior compared to low screen time [10]. It has been suggested that moderate digital screen time may positively affect the socialization and creativity of adolescents [10]. It is stated that there is no linear relationship between screen time and behavioral problems [8]. In our study, however, low screen time was associated with higher behavioral problems, moderate screen time did not affect behavior problems in the adolescent group. High screen time had negative effects on behavioral problems in adolescent group agreement with the literature [10, 20]. High screen time was associated with conduct and peer problems in adolescents. In bivariate analyzes, adolescents who watch moderate screen time had lower peer and total difficulties scores compared to those who watch high and low screen time. The effect of moderate screen time was not seen in Multiple Linear Regression. It was thought that the effect of moderate screen time might not have emerged due to the small sample size of the adolescent group.

Several previous studies investigated the effect of children's screen time on children's behavioral problems [10, 12, 13]. A

few studies investigated the effect of parental screen time on the children's behavior problems [21, 22]. The study conducted by Wong et al. [21] was shown that the problematic screen uses of parents affected the behaviors of three-year-old children by increasing the child's screen time and decreasing the interaction between parent and the child. In our study, parental screen time was found to be associated with children's behavioral problems in all groups except the adolescent group. In the preschooler group, it was observed that maternal screen time was associated with lower prosocial behaviors and higher hyperactivity/inattention problems. Also, it was found that paternal screen time was related to higher total difficulties scores and emotional problems in the schooler group. In this study, no relationship was found between the parent's screen time and the children's screen time. It is known that in early childhood, spending quality time with children and interaction between parents and children positively affect the emotional and social development of children [23]. We thought that parental screen time may negatively affect the behavioral problems of younger children by reducing quality time and interaction with the child. It is thought that parental screen time may not affect adolescents' behavior problems since the social environment gains importance in adolescence. Another unexpected finding was maternal screen time was found to be associated with lower behavioral problems in the schooler group. Since the information about screen time was obtained from the mothers, it was thought that it may be related to mothers may tend to see their screen time low.

Evaluating the effects of both parents' and children's screen time on children's behavior problems according to the developmental periods (preschooler, schooler, and adolescent) was the strength of the study. Besides the strengths, the study had some limitations. The limitations were; the study was a cross-sectional study, the sample sizes of preschooler and adolescent groups were small, and co-viewing was not investigated.

Since digital media is an indispensable part of our lives, its positive and/or negative effects on our children's mental health will continue to be investigated. Parental and children's screen time should be evaluated for the intervention of children's behavioral problems. This study showed that recommendations regarding the time spent by children and parents in front of the screen should be given according to the developmental stages of the children. Longitudinal and large-scale studies are needed to evaluate the relationship between low and moderate screen time and behavioral problems.

Conflict of interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical approval

Ethics committee approval was obtained from the Ethics Committee of Toros University in Mersin, Turkey (23/9/2022 numbered 154).

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