MARMARA
MEDICAL JOURNAL

Original Article

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Problematic social media use, digital gaming addiction and excessive screen time among Turkish adolescents during remote schooling: implications on mental and academic well-being

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Submitted: 07.06.2022 **Accepted:** 14.09.2022

ABSTRACT

Objective: The present study aimed to describe screen use patterns among Turkish adolescents during the coronavirus disease 19 (COVID-19) pandemic with a special emphasis on social media and digital gaming addiction, and explore how these are linked to adolescents' mental and academic well-being.

Materials and Method: The study sample consisted of 9th to 12th grade students from three public high-schools in Istanbul, Turkey (n=201). Participants were required to complete a comprehensive questionnaire which gathered information about various domains including problematic screen use, attitudes towards online education, and mental/academic well-being during the lockdown period.

Results: The overall screen time exhibited a significant increase during the lockdown, with the most common discretionary screen activities being social media use, communication, and watching movies/series ($p<0.001$). The students spent significantly less time on physical activities ($p=0.003$) and face-to-face meetings with their friends ($p<0.001$). Male students presented with higher scores on gaming addiction ($p<0.001$), whereas a significantly higher proportion of the female students (28.57% vs. 14.81%) were classified as at-risk for social media addiction ($p=0.046$). Both gaming addiction and social media addiction were associated with higher depression scores ($p=0.003$ and $p<0.001$ respectively).

Conclusion: Screen use patterns may have diverse consequences for youth's well-being during the pandemic. The addiction risk and other detrimental outcomes are likely to be associated with the qualitative features of screen activities, rather than just the amount of time spent on digital media by the adolescents.

Keywords: Screen time, Social media use, Digital gaming addiction, Adolescents, COVID-19, Well-being.

1. INTRODUCTION

The umbrella term screen dependency disorders (SDD) has been increasingly used by mental health professionals to describe the addictive pattern of engagement with a variety of overlapping screen activities. The well-known examples include internet addiction disorder (IAD), social media addiction (SMA), digital gaming addiction (DGA), and mobile phone addiction (MPA) [1, 2]. Although, prolonged screen use may be problematic at any age, adolescents constitute a particularly vulnerable group for developing SDD. One possible explanation is that, in addition to their natural tendency to use digital media, adolescents have more flexible schedules and freedom from parental control compared to other age groups [3, 4].

Screen dependency disorder has become a topic of increasing interest since the coronavirus disease 19 (COVID-19) pandemic, which brought unprecedented restrictions in youth's life in all aspects. In most countries, the in-person teaching has been suspended, with the decision to organize online education until further notice. The stay-at-home policies mandated most of the daily social interactions to be replaced with digital meetings on online platforms. Although, the scope of the restrictions may have varied between countries, research collectively suggests that most youth have faced the necessity to spend excessive amounts of time in front of screens during this particular period [5-8]. For example, a nationwide survey from China pointed out that 46.8% of the participants presented with internet overuse as a consequence of the pandemic [9]. The daily time spent on video games was found to have increased from 79.2 to 138.6 minutes among German youth after the lockdown

How to cite this article: Carkaxhiu Bulut G, Gokce S. Problematic social media use, digital gaming addiction and excessive screen time among Turkish adolescents during remote schooling: implications on mental and academic well-being. Marmara Med J 2023: 36(1):24-33. doi: 10.5472/marumj.1244628

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ISSN: 1309-9469

http://doi.org/10.5472/marumj.1244628
Marmara Med J 2023;36(1): 24-33

[10]. A two-cohort design study, which investigated screen time during lockdown and one year after school closure among Dutch children, reported that the average screen time increased in both cohorts, with a mean of 35 minutes and one hour per day respectively [11]. Similarly, a cross-sectional survey conducted on children and adolescents from the U.S. during the first year of the pandemic reported excessive amounts of recreational screen time, which also correlated with higher rates of mental health problems [12]. Finally, Nagata et al., reported significantly increased screen times among adolescents from the U.S. during the early period of the pandemic [6]. These and several other reports have sparked the ongoing debate about the detrimental impacts of prolonged screen time on the well-being of children and adolescents during the COVID-19 pandemic. In terms of SDD, the emphasis has been placed particularly on SMA and DGA, which both have been consistently linked by previous research to a variety of adverse mental health outcomes including depression, anxiety, suicide-related behaviours, sleep and attention problems, eating disorder, as well as poor academic performance [13-18].

Considering that the pandemic is here to stay for a while and its impacts are likely to last for years, there is a need for better understanding of the problems arising from screen overuse in particular subpopulations. Given the relative lack of data on Turkish population, our motive in this cross-sectional study was to provide a multi-dimensional picture of the screen use patterns among Turkish adolescents within the context of stay-at-home orders during the first year of the pandemic, and assess whether and how these were related to their mental and academic well-being. More specifically, the main research objectives were as follows: 1) examine the students' screen use patterns and the rates of SMA and DGA, 2) explore whether and how their screen time and daily activities were affected by the pandemic, 3) identify their experienced difficulties during online class and their views on different aspects of the stay-at-home measures, 4) examine relationships between participants' demographic characteristics, screen use tendencies and psychological well-being.

2. MATERIALS and METHODS

Participants

The participants were recruited among the 9th to 12th grade students (aged between 14-18) from three public high-schools in the eastern side of Istanbul, Turkey. An invitation e-mail containing a survey link was sent to the students who had priorly expressed willingness to be contacted for research investigations (n=653). Potential participants and their parents (those who replied positively to the study invitation, n=267) were provided more detailed information about the study protocol and required to give online informed consent to move on to the study procedure. Data collection was performed in November 2020 (approximately seven months after the implementation of curfew restrictions and online education), during a three-week period of the lockdown. In line with the methodological design, participants were required to respond to each item in the questionnaire to submit the finalized form (those who left without completing the procedure were excluded from the data analysis). Accordingly, of 215 students who gave consent and started filling out the forms, 201 completed the entire questionnaire and were included in the final sample. The median age of the participants was 16 (14-18), and 73.13% (n=147) were females. The study protocol was approved by the Ethical ommittee of Maltepe University (2021/900/27). The correspondence and the experimental procedure were performed in accordance with the official authorization of the Istanbul Maltepe Provincial Directorate of National Education.

Materials

The questionnaire was prepared by the authors in parallel with the methodology of some previous studies about the impacts of COVID-19 on different populations [19]. The questionnaire consisted of 20 sections (some of them containing several items or scales) which gathered information within various fields of interest including (1) students' sociodemographic characteristics, (2) ownership status for a range of digital devices and accessibility to digital media, (3) the pattern of use of the available devices, 4) time spent on screen and screen-free activities before and during the pandemic, 5) students' attitudes towards online education and experienced difficulties during online class, 6) screen related problems and experienced difficulties, 7) social media addiction, 8) digital gaming addiction, and 9) depressive symptoms. The initial five domains were assessed by specific questions and items developed for the current study while the last three fields were assessed by means of the following scales:

Bergen Social Media Addiction Scale

The Bergen Social Media Addiction Scale (BSMAS) developed by Andreassen and colleagues is based on Griffiths' criteria for addiction (salience, mood modification, tolerance, withdrawal, conflict, and relapse) [20], and is widely used in research [21]. The scale consists of six items rated on a 5-point Likert scale ranging from 1 (very rarely) to 5 (very often). The higher total score reflects stronger addiction to the social media, and the BSMAS score over 19 indicates that an individual is at-risk of developing problematic social media use [22]. The Turkish adaptation and the reliability study of the scale was performed by Demirci et al. [23]. The scale's internal consistency was found acceptable (Cronbach's α=0.83).

Gaming Addiction Scale

Developed by Lemmens et al., the 7-item Gaming Addiction Scale (GAS) is a brief instrument based on DSM criteria to assess gaming addiction. The seven items in the GAS are rated using a five-point Likert scale ranging from 1 (never) to 5 (very often). A higher score on the GAS indicates more problematic digital gaming [24]. The Turkish adaptation and the reliability studies of the scale were performed by Irmak et al., and Baysak et al. [25, 26]. The scale's internal consistency was found considerably high (Cronbach's α=0.88).

Kutcher Depression Scale-11

The Kutcher Depression Scale-11 Items (KADS-11) is a self-report, diagnostic instrument measuring depression and suicidal thoughts in adolescents and young adults. The scale was introduced for clinical practice as a sensitive and specific instrument to aid in diagnosis and monitoring the change in severity of symptoms during the course of treatment. It is easily and quickly completed, diagnostically valid and demonstrates reasonable reliability [27, 28] The KADS-11 consists of items with an ordinal and polytomous scoring scale, ranging from 0 *(*hardly ever*)* to 3 *(*all of the time*)* [29]. The Turkish adaptation and the reliability study for the KADS-11 was performed by Balcı Çelik-Uysal Atabay [30]. The scale's internal consistency was found acceptable (Cronbach's α=0.82).

Statistical Analysis

Statistical analyses were performed using SPSS (version 24.0). Descriptive statistics are given as counts, percentages, means, standard deviations, medians, and ranges. Shapiro-Wilk was used to assess normal distribution. Pearson Chi Square was used to compare the distribution of categorical variables between two independent groups (e.g., males and females). Mann–Whitney U test was used to compare non-normally distributed continuous variables (e.g., BSMAS, GAS, KADS-11 scores) between two independent groups. Wilcoxon's signed-rank test was used to compare non-normally distributed continuous variables between two related groups (e.g., before and during the pandemic). Spearman correlation coefficient was used to evaluate bivariate associations between corresponding variables. The statistical significance level was set as α=0.05.

3. RESULTS

The demographic characteristics of the study sample (n=201) are shown in Table I. The vast majority of the students (94.03%) owned a smartphone. 61.69% of the students reported to have constant internet access both at home and outside. The most common intended uses for the digital devices were social media and communication (86.06% for both). Male students were significantly more likely to play digital games and surf the internet compared to females (p<0.001, and p= 0.004 for both) (Table II).

The reported durations for discretionary screen and screen-free activities before and during lockdown are shown in Table III. Notably, screen times for digital gaming, social media use, communication and watching movies/series have all significantly increased during the pandemic period (p=0.005, p<0.001, p=0.012, and p<0.001 respectively) whereas the opposite was true for the screen-free activities. The students spent significantly less time on homework (p<0.001), physical activities (p=0.003) and face-to-face meetings with their friends (p<0.001) during the lockdown period, while their contact with the family members has increased (p=0.022). Our results additionally showed that males spent significantly more time on digital games (p<0.001) whereas the average time spent on social media was significantly higher in females (p=0.003) during this period.

Students' attitudes and subjective experiences in regard with online education are displayed in Table IV. 60.69% of the participants were dissatisfied with not being able to chat with their friends during online class as before. Notably, 24.37% of the students reported being pleased that they did not have to go to school, and 13.93% that they got rid of the bullying.

In terms of the perceived problems with excessive screen activities (Table V), the majority of the students (69.64%) reported significantly increased screen time during the pandemic. 42.28% of the participants stated that their families complained about their excessive screen time, while 26.36% had arguments with family members for this reason. 18.40% reported a decrease in their academic performance due to prolonged screen use.

Figure 1 displays the gender differences in BSMAS, GAS, and KADS-11 scores. The median value for the BSMAS was 14 (6-30) for the whole sample, 15 (6-30) for the female and 12.50 (6-27) for the male students, with no significant difference between genders (p=0.088). With a cut-off score of 19 and above, 24.87% of the participants were classified as at-risk of problematic social media use. The rate of problematic social media use was %28.57 among females and %14.81 among males, with a statistically significant difference between genders (p=0.046). The median value for the GAS was 11 (7-33) for the whole sample, 15 (7-32) for the males and 8 (7-33) for the females, with the difference being statistically significant (p<0.001). Finally, the median value for the KADS-11 was 14 (0-33) for the whole sample, 14 (0-33) for the females and 11 (0-30) for the males. Again, a statistically significant difference was found between genders (p=0.045).

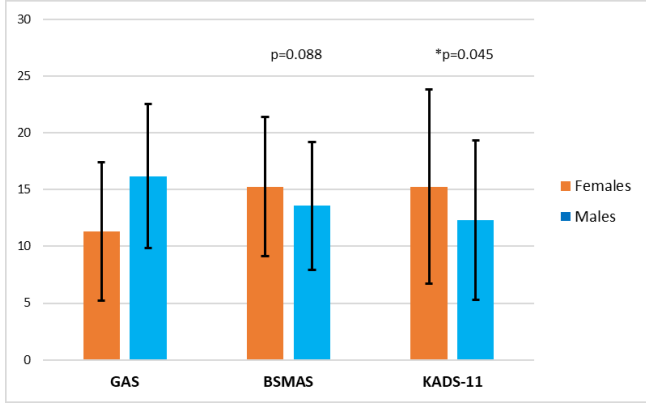

Figure 1. *Gender differences in gaming addiction, social media addiction, and depression scores. GAS: Gaming Addiction Scale, BSMAS: Bergen Social Media Addiction Scale, KADS-11: 11-Item Kutcher Adolescent Depression Scale.*

The SMA, DGA and KADS-11 scores were strongly and positively inter-correlated (p<0.001 for SMA-DGA, p<0.001 for SMA-KADS; p=0.003 for KADS-DGA) (Table VI). The age and the time spent in physical activities were found to negatively correlate with the SMA (p=0.006, and p=0.040), whereas time spent in face-to-face communication with peers negatively correlated with DGA (p=0.038).

http://doi.org/10.5472/marumj.1244628
Marmara Med J 2023;36(1): 24-33

Table 1. *Demographic characteristics of the participants (n = 201)*

		Number (n)	*Percentage (%)*
Gender	*Female*	147	73.13
	Male	54	26.86
Age	*14-15*	86	42.8
	16-18	115	57.2
Grade	*9*	62	30.84
	10	79	39.30
	11	43	21.39
	12	17	8.46
Number of siblings	*Single child*	20	9.95
	2-3	150	74.63
	4-5	28	13.93
	6 and more	3	1.49
Household population	*1-3*	39	19.40
	4-5	138	68.65
	6-7	24	11.94
Maternal employment status	*N/A*	6	2.98
	Unemployed	137	68.16
	Employed	58	28.86
Paternal employment status	*N/A*	7	3.48
	Unemployed	19	9.45
	Employed	175	87.06
Digital devices (ownership)	*Smartphone*	189	94.03
	PC	88	43.78
	Tablet	41	20.39
	Game console	17	8.46
	TV	26	12.93
Digital devices (shared use)	*Smartphone*	10	4.97
	PC	68	33.8
	Tablet	39	19.40
	Game console	23	11.44
	TV	165	82.09
Internet access	*Outside and home-constant*	124	61.69
	Only at home-constant	72	35.82
	Only at home-limited time	2	0.99
	No available connection	3	1.49
Intended use of digital media	*Gaming*	101	50.24
	Social media	173	86.07
	Communication	173	86.07
	Internet surfing	116	57.71
	Watching movies-series	164	81.59

Table II. *Gender differences in digital media usage patterns*

	Rate (%)				
	Males	Females	df	χ2	p value
Intended use of digital media					
• Digital gaming	85.18%	37.41%	1	36.050	<0.001
• Social media use	88.88%	85.03%	1	0.489	0.484
• Internet surfing	74.07%	51.70%	1	8.100	0.004
• Communication	88.88%	85.03%	1	0.489	0.484
• Watching movies/series	75.92%	83.67%	1	1.578	0.209
Being at-risk for social media addiction	14.81%	28.57%	1	3.999	0.046

df: degrees of freedom

http://doi.org/10.5472/marumj.1244628
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Table III. *Daily time spent on screen and screen-free activities before and during COVID-19 (n=201)*

Screen activities						Screen-free activities				
		Before COVID-19	During COVID-19	Test	*p*		Before COVID-19	During COVID-19	Test	*p*
Digital gaming	Almost never	42.28%	39.80%	-2.82[a]	**0.005**	***Face-to-face interaction with friends***	8.95%	28.85%	-7.89[a]	**<0.001**
	Up to one hour	20.89%	18.41%				11.44%	19.40%		
	1 to 2 hours	23.38%	18.90%				29.85%	26.86%		
	2-3 hours	10.44%	15.92%				23.38%	14.43%		
	More than 3 hours	2.98%	6.96%				26.36%	10.45%		
Social media	Almost never	6.96%	6.47%	-4.22[a]	**<0.001**	***Doing homework***	5.97%	28.35%	-7.29[a]	**<0.001**
	Up to one hour	23.38%	14.43%				24.37%	26.86%		
	1 to 2 hours	38.80%	41.79%				46.76%	30.34%		
	2-3 hours	21.89%	20.89%				19.40%	11.44%		
	More than 3 hours	8.95%	16.42%				3.48%	2.98%		
Communication	Almost never	4.97%	3.48%	-2.52[a]	**0.012**	***Hobbies***	19.40%	27.36%	-1.01[a]	0.313
	Up to one hour	28.36%	26.86%				29.85%	22.88%		
	1 to 2 hours	40.29%	35.32%				30.34%	28.85%		
	2-3 hours	19.40%	22.38%				14.92%	14.92%		
	More than 3 hours	6.96%	11.94%				5.47%	5.97%		
Internet surfing	Almost never	18.41%	19.40%	-1.29[a]	0.198	***Interaction with family members***	6.46%	5.97%	-2.29[a]	**0.022**
	Up to one hour	37.31%	33.83%				18.90%	21.39%		
	1 to 2 hours	30.35%	26.86%				37.81%	30.84%		
	2-3 hours	11.44%	16.91%				26.86%	25.37%		
	More than 3 hours	2.49%	2.98%				9.95%	16.42%		
Watching movies/series	Almost never	15.92%	13.93%	-4.64[a]	**<0.001**	***Physical activities***	14.42%	26.86%	-2.97[a]	**0.003**
	Up to one hour	21.39%	13.93%				31.34%	28.36%		
	1 to 2 hours	35.32%	31.34%				29.85%	24.38%		
	2-3 hours	22.39%	29.35%				17.91%	15.42%		
	More than 3 hours	4.97%	11.44%				6.46%	4.97%		

[a] *Wilcoxon signed-rank test. Significant differences are shown in bold font*

Table IV. *Students' attitudes and subjective experiences in regard with online education (n=201)*

	Strongly disagree	Disagree	Nor agree or disagree	Agree	Strongly agree
I am dissatisfied with not being able to chat with friends during online class as before	8.95%	10.94%	19.40%	24.37%	36.31%
I am pleased that I do not have to go to school	22.38%	18.90%	34.32%	10.44%	13.93%
I am content that I got rid of the bullying in school	53.23%	17.41%	15.42%	8.45%	5.47%
I feel more comfortable in expressing my self in front of the screen	45.77%	19.90%	18.90%	7.96%	7.46%
It is more difficult for me to raise hands and speak up during online class	30.34%	17.41%	16.41%	15.92%	19.90%
I prefer to keep my camera off during online class because I feel uncomfortable	27.36%	15.42%	15.42%	16.41%	25.37%
I prefer to keep my camera off during online class because I do not want to be seen doing other thing	51.74%	22.88%	16.91%	3.98%	4.47%

http://doi.org/10.5472/marumj.1244628
Marmara Med J 2023;36(1): 24-33

Table V. *Student's perceived problems regarding the excessive times on screen activities (n=201)*

	Strongly disagree	Disagree	Nor agree or disagree	Agree	Strongly agree
My screen time has significantly increased during COVID-19	8.95%	8.45%	12.93%	24.37%	45.27%
I spend excessive amounts of time in playing digital games during COVID-19	31.34%	17.91%	16.91%	14.42%	19.40%
I spend excessive amounts of time in social media during COVID-19	12.43%	9.45%	16.91%	33.83%	27.36%
I spend excessive amounts of time in watching movies/series during COVID-19	14.92%	11.44%	17.91%	30.34%	25.37%
Family members and people around me complain that I spend too much time in front of the screen during COVID-19	19.90%	17.91%	19.90%	20.39%	21.89%
I am getting into frequent arguments with my parents due to spending a lot of time in front of the screen	32.83%	22.88%	17.91%	12.43%	13.93%
I cannot find anything else to do when I am away from the screen	19.90%	19.40%	24.37%	13.93%	22.38%
I no longer enjoy the things/activities I used to do	24.37%	20.39%	18.40%	20.39%	16.41%
I cannot help thinking of my phone/computer/tablet even when I'm away from the screen	27.86%	21.89%	23.38%	13.93%	12.93%
My school performance decreased due to spending a lot of time in front of the screen	29.35%	24.37%	27.86%	9.45%	8.95%
My contact with others (family, friends etc.) decreased due to spending a lot of time in front of the screen	41.29%	21.39%	19.40%	7.46%	10.44%

Table VI. *Correlations between screen-free activities, gaming addiction, social media addiction and depression scores*

		1	2	3	4	5	6
1. Age	r_s	-					
	p	-					
2. Time spent in physical activities	r_s	0.050	-				
	p	0.483	-				
3. Time spent in face-to-face communication with peers	r_s	0.044	0.388	-			
	p	0.538	**<0.001**	-			
4. KADS-11	r_s	-0.066	-0.109	0.027	-		
	p	0.351	0.125	0.703	-		
5. GAS	r_s	-0.108	0.001	-0.146	0.206	-	
	p	0.126	0.997	**0.038**	**0.003**	-	
6. BSMAS	r_s	-0.192	-0.145	0.068	0.418	0.280	-
	p	**0.006**	**0.040**	0.335	**<0.001**	**<0.001**	-

Significant correlations are shown in bold font. rs : Spearman's correlation coefficient. KADS-11: 11-Item Kutcher Adolescent Depression Scale, GAS: Gaming Addiction Scale, BSMAS: Bergen Social Media Addiction Scale,

4. DISCUSSION

The findings from this cross-sectional, exploratory study may provide some insight into different aspects of the problematic screen use among Turkish adolescents within the context of the stay-at-home restrictions of the pandemic, and how these may be related to their well-being. Not surprisingly, the students' overall discretionary screen time was found to have increased significantly compared to the pre-pandemic period. Notably, social media use (aside with communication) was reported to be the most common screen activity in our sample with one quarter of the participants additionally being found "at risk" for SMA. This is strikingly high compared to the findings of Bányai et al.'s reference study which reported a prevalence of 4.50% among Hungarian adolescents [22]. Using the same scale with

http://doi.org/10.5472/marumj.1244628
Marmara Med J 2023;36(1): 24-33

a modified cut-off score, the estimated 12-month prevalence of SMA among Chinese adolescents has been reported as 3.50% [31]. Although, the cross-sectional design of our study prevents us from drawing firm conclusions, the observed high rate in our sample may partly be attributed to the ongoing impacts of the COVID-19 restrictions. Indeed, findings from most recent studies similarly point out that the SMA is becoming increasingly prevalent among youth during the pandemic [32, 33].

Another remarkable finding in our study was the significantly higher rates of problematic social media use among female students compared to males. As also suggested by previous research, one possible reason may be that females are more prone to develop addiction towards activities involving social interaction [34]. Accordingly, Banyai et al. reported that participants who were found to be at-risk for SMA were mostly female [22]. Other studies have reported similar gender differences in problematic social media use [35-37]. Findings from a national survey conducted on Norwegian adults indicated that, aside from low self-esteem and higher narcissism, addictive use of social media was associated with being young, female, and single [34]. Finally, problematic social media use was linked to lower age and female gender among Bangladeshi college students during the pandemic, which was also the case in our study [32].

Our results also revealed that, unlike in the case of SMA, male students were significantly more prone to digital gaming compared to their female counterparts. The gender difference in screen activities was further reflected by the significantly divergent GAS scores. These findings are in line with previous work which suggests two to three folds higher rates of digital gaming among male adolescents [38]. A large population based study from the U.S. additionally showed that male gamers presented with higher rates of addictive gaming behaviours than females [39]. Males have also been reported to be more motivated to play, start playing games earlier in life and spend more time in digital games [40]. Despite the strong evidence underpinning the concept, the underlying reasons for the predominance of males in digital gaming remain elusive. More recent studies underscored the complexity of the phenomenon by pointing out that several gender-sensitive factors might contribute to the observed difference in gaming behaviours among male and female adolescents. These include but are not limited to impulsivity and coping styles [41], bullying victimization and presence of meaning in life [42], game genres, gaming motives, depression [43], and hyperactivity/inattention symptoms [44].

Taken together, our findings support the notion of gender-specific screen use tendencies among adolescents, implying that male and female students may develop SDD through different pathways. However, the design of our study does not allow inferences to be made as to why and how this difference occurs.

The significant increase in screen time, a predictable consequence of the lockdown restrictions, seemed to be associated with several negative outcomes among adolescents including more frequent arguments in the family, feelings of emptiness and boredom, as well as a significant loss of pleasure towards discretionary activities during screen-free time. On the other hand, it should be noted that the lockdown might have affected students' psychological well-being in more direct ways, due to the severe restrictions in their daily activities.

Notably, our findings suggest considerable diversity in the students' attitudes towards online education. The majority were dissatisfied with the lack of peer-interaction and/or reported difficulty expressing themselves during online class. Almost half of them reported keeping their camera off due to the feelings of shame and discomfort. On the other hand, about a quarter of the students were content with not being obliged to go to the school, whereas a considerable proportion (around 14%) were relieved that they were no more exposed to bullying. These latter topics (i.e., students' experienced difficulties during online class and their views on different aspects of online education) remain relatively unexplored by previous research. In line with our findings, a recent study from the U.S. showed that the vast majority of students had their video cameras off at least some of the time during remote class meetings, with the most frequently reported reasons being concerns about appearance or about other people being seen in the background. Not wanting to be seen doing other things was reported by less then 10% of the students, which was in line with our results [45]. Our findings on the exposure to bullying were also partly consistent with the limited evidence from previous research. While a recent study conducted on Canadian adolescents reported lower rates of bullying involvement [46], some evidence indicates that cyberbullying may have become more of a problem during this time period [47].

Not surprisingly, our findings indicate a strong correlation between BSMAS, GAS and KADS-11 scores. Time spent on major non-screen activities (e.g., physical exercises, face-to-face contact with peers) was also inversely associated with addictive social media use and/or digital gaming. The link between excessive screen time and depression among adolescents has been well recognized, with a substantial body of evidence from the last decade. One dramatic example is the nationally representative surveys of the 8-12th graders in the U.S., which pointed out a sudden decrease in the psychological well-being of the students after 2012. The same reports also suggested that adolescents who spent more time on digital communication and less time on screen-free activities presented with lower mental well-being [48]. A meta-analytic review of 19 studies indicated that higher screen time was associated with significantly elevated risk of depression [49]. Furthermore, a limited number of studies conducted during the pandemic underline the fact that both SMA [32, 50] and DGA [51-53] emerge as increasingly common mental health problems among children and adolescents, with potentially distinguishing features inherent to the context of the pandemic.

The link between SDD and depression is likely to be reciprocal. For instance, it has been found that adolescents have a higher chance to develop a greater depressed mood when they browse more often through Instagram, as well as a higher chance to post more on Instagram when they have higher levels of depressed mood [54]. Similarly, Romer at. al reported that while the heavy use of the internet and videogames were associated with

http://doi.org/10.5472/marumj.1244628
Marmara Med J 2023;36(1): 24-33

an increase in depression among youth, increased depression also predicted greater use of these media as well as withdrawal from screen-free activities [55, 56].(50) Some research findings additionally suggest that the nature of this association may largely depend on gender. For example, Liang et al. found that depression predicted subsequent internet addiction among male adolescents whereas the opposite was true for females [57]. Although our results hinder drawing such further implications, it seems plausible that the observed relationship between the adolescents' screen activities and psychological well-being was not straightforward in nature but was mediated through several different mechanisms.

Limitations and Strengths

The present findings should be addressed within the methodological limitations of our study. The categorical data (expressed in ranges) prevented a more precise determination of the students' average screen times. Given that the recruitment was conducted online, voluntary response bias may have negatively affected the representativeness of the sample. The self-report questionnaires might also have been subject to recall-bias as the screen activities were questioned retrospectively regarding the period prior to the pandemic. Due to the cross-sectional design, reported associations cannot be used to infer causal relationship between COVID-19 related problems, screen activities and mental well-being. Finally, the fact that the participants were recruited from three public high-schools located in the eastern site of Istanbul and the relatively small sample size may limit the generalizability of the findings. On the other hand, one substantial strength of the present study was its comprehensive framework which assessed adolescents' screen activities, mental well-being and COVID-19 related problems through a series of standardized measures together with a qualitative perspective of their subjective experiences. These findings may serve as a reference for future research addressing various aspects of the relationship between SDD and the COVID-19 pandemic. These include a wider range of psychological problems (e.g., school refusal, attention problems) as well as physical health outcomes such as obesity, metabolic diseases and sleep disturbances among children and adolescents. Finally, the additional data on the participants' smartphone ownership and/or digital media accessibility may allow more objective comparability with similar studies on this topic.

Conclusion

The COVID-19 pandemic and subsequent public health measures including stay-at-home policies, online education and social distancing have led to an increasing dependence on digital technologies in several substantial domains of the adolescents' lives. Although the restrictions are being gradually lifted, their impacts on the adolescents' screen use habits are likely to last for some time. Research suggests that different screen use patterns may be associated with diverging (positive or negative) outcomes on the youth's well-being during the pandemic. The addiction risk and other detrimental consequences appear to be associated with the qualitative features of screen activities, rather than just the amount of time spent on digital media by the adolescents. It seems thus imperative for mental health professionals and decision makers to adopt multi-dimensional strategies aiming to prevent SDD among children and adolescents, through a balanced view of the risks and benefits of the use of digital technologies in the era of the pandemic.

Compliance with Ethical Standards

Ethical Approval: Approval for the study was obtained from the Ethics Committee of Maltepe University, School of Medicine with the protocol number 2021.900.27.

Financial Support: The authors have no relevant financial information to disclose.

Declaration of Competing Conflict of Interest: The authors declare that there are no conflicts of interest.

Author contributions: Both authors were actively involved in data collection, analysis, and the writing of the manuscript.

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