

Screen Time Exposure and the Development of Internalizing and Externalizing Problems In a Sample of Romanian Urban Highschoolers

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Abstract: *During the last years we have noticed an increase in screen time for adolescents while questions about its effects on the development of psychological and social problems are starting to be addressed. We hypothesized that increased screen time is associated with heightened display of internalizing and externalizing symptoms. We investigated this association on a sample of 2497 highschoolers recruited from one big city in southern Romania. They filled in a series of items focusing on screen time average exposure, display of depression and anxiety symptoms, involvement in aggressive and delinquent behavior, and family context. The linear regression model showed that, after controlling for individual and family variables, more screen time exposure is associated to heighten depression and anxiety symptoms and more involvement into aggressive behavior. These findings contribute to the research in this new area of interest and may inform the development of prevention and supportive programs for adolescents and their families by adding evidence for clarifying the relationship.*

Keywords: *internalizing problems, externalizing problems, screen time, adolescents.*

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1. Introduction

Children and adolescents are now living in a highly digitalized world that, besides its opportunities, also creates a unique set of risks for them. Adolescents are usually seen as frequent users of electronic devices with more than half of Romanians aged 11-15 spending more than 2 hours/day on screen (European Commission, 2021) and during the COVID-19 restrictions, this time increased to 4 hours /day during the week and to 3.5 hours/day during the weekends for 6-18 years old children (Kovacs, et al., 2022). Even without taking into consideration the pandemic impact on screen time exposure, we noticed an increase from 2012, where watching TV, using the telephone and the computer accounted in average for 1.7 hours per weekdays and 2.8 hours per weekends for 13-18 years old (Soos et al., 2012). Considering these numbers, one critical question is whether the duration of navigating on electronic devices is harming youth. Previous studies reveal somewhat conflicting results ranging from minor effects (see Orben & Przybylski, 2019) to either positive (see Przybylski & Weinstein, 2017) or negative effects of excessive screen time for adolescents (Lissak, 2018; Twenge & Campbell, 2018; Paulich et al., 2021). Increased time spent in front of screens has been found to have a small, yet consistent impact on adolescent' mental health (Tang et al., 2021; Wu et al., 2016). Beside the occurrence of internalizing problems such as depression and anxiety, the amount of screen time exposure has also been seen as a trigger for the onset of externalizing behavioral problems like bullying, poor academic performance due to inattention or skipping classes, substance abuse, and unhealthy eating habits (Parent et al., 2016; Busch et al., 2013; Chau et al., 2022).

Nowadays, due to the expansion of the Internet and technology in general, which currently offers both entertainment and socializing activities, there are different types of activities associated with increased screen time exposure. Some of the activities are somewhat familiar, such as watching TV series. This is a familiarity that may be misleading because internet services use different mechanisms, such as, unlike classic television, the option to watch on-demand content, thus bringing new challenges. An example is binge-watching (Matrix, 2015), translated into the consecutive watch of a large amount of media content. Additionally, other forms of media consumption such as video games are also challenging for youth development as they bring more interactivity compared to traditional forms of media consumption. Looking at the time spent on video games, recent reports indicate that boys are spending more time playing games compared to girls (Twenge & Martin, 2020; Leonhardt & Overå, 2021; Barr &

Copeland-Stewart, 2022). Differences are also found in relation to other types of screen time exposure, so one should carefully look at how boys and girls are involved in online activities and be aware that some activities pose more risks to mental health than others.

Previous studies show that some internet related activities have more severe effects on mental health than others (such as gaming) (Tang et al., 2021; Twenge & Farley, 2021), but also it looks like that these effects of screen time on mental health are moderated by variables like gender and involvement in a form of physical activity (Tang et al., 2021; Twenge & Farley, 2021; Nesi & Prinstein, 2015; Forte et al., 2022). Looking at the level and type of engagement while on their screens, Kim et al. (2020) concluded that passive activities (e.g., watching TV, videos or movies) is associated with display of internalizing problems, whereas an active use of electronic devices (e.g., playing video games, chatting, and working on a computer) is not.

Family environment plays an important role in constructing a positive/negative relationship with internet use. Previous studies concluded that parents use different strategies in mediating the internet usage by children (Symons et al., 2016). For example, open communication with teenagers about internet use is associated with a healthier usage of internet (van den Eijnden et al., 2010). Parental engagement alongside children seems to result in more positive online behaviors (Lee & Chae, 2007) while simply restricting access and time does not impact the internet usage of children (Lee & Chae, 2007; Wang et al., 2005). Additionally, the socioeconomic status of the family can also influence the screen time usage of the adolescent. Recent studies found a modest role of socioeconomic adversities (such as family economic difficulties, single-parent families, low parents' education, non-working parents, etc.) on screen time and behavioral problems associations (Chau et al., 2022).

The current study hypothesized a positive linear relationship between the total screen time frequency (regardless of active or passive) and the occurrence of internalizing (depression and anxiety) and externalizing (aggressive and delinquent behavior) problems among adolescents. In testing this assumption, we anticipated a combination of individual (gender, family structure, and environmental changes) and family factors (parent support, parental rules, and monitoring) as significant contributors.

2. Methods

2.1. Data source

Methodological coordination was provided by Icelandic Center for Social Research and Analysis and the local responsible institution, as part of the Planet Youth study. A total of 115 classes were randomly selected from a total of 76 high schools/colleges in Bucharest. A regular school week (between October 2018-February 2019) has been selected by each participant school to distribute the questionnaire among students. Participants filled in the questionnaires in the school environment, and no personal data was required.

2.2. Sample size and participants

2629 highschoolers (10th grade, 15-16 y.o.) from Bucharest filled in the questionnaire. With a response rate close to 90%, the valid sample included 2497 students. As missing data was at random, we opted for removing them from the analysis performed. The sample was almost equally divided between boys and girls, with two thirds belonging to “traditional” family structures where both biological parents were present. Also, students reported few environmental changes during the last year, either for moving to another location (8.6%) or for changing school (10.6%).

2.3. Measures

Internalizing and externalizing problems. The outcome variable is based on 13-items from Symptom Checklist-90 (Derogatis et al., 1973). As a widely used tool for evaluating subjective psychopathology, the scale measures both *symptoms of anxiety* (3 items, $M = 6.84$, $SD = 2.35$, $CA = 0.70$) and *symptoms of depression* (10 items, $M = 21.21$, $SD = 7.20$, $CA = 0.88$) with higher scores reflecting more frequent display of internalizing symptoms.

Externalizing problems included *aggression* (6 items, $M = 11.19$, $SD = 7.66$, $CA = .91$) measuring the frequency on which the adolescent engaged, during the past 12 months, into aggressive behavior such as hitting, slapping, strangling, threatening and *delinquency* (6 items, $M = 6.85$, $SD = 3.18$, $CA = 0.88$) measuring the frequency on which during the past year the respondent engaged into criminal behavior such as stealing, breaking into a car/house, vandalizing. A total score was generated for both dimensions, where higher scores reflecting more frequent display of externalizing problems.

Screen time. The adolescents were asked a series of four questions ($M = 16.00$, $SD = 5.75$, $CA = 0.55$) measuring the amount of daily time spent watching TV, playing video games, navigating social media, and navigating

internet. The response categories ranged from 1 “almost not at all” to 8 “six hours or more” and the mean of responses was then used as a general screen time score, where higher score suggesting more screen time daily exposure.

Control variables. Several individual and family-level characteristics were also measured. The items and the response categories for the variables used in the current paper are provided in Table 1.

Table 1. Survey items used and coding schemes

Measurement	Coding scheme
Individual-level	
Gender	Respondent's gender (1 = “boy”)
Family structure	<i>Who lives in your home?</i> recoded into a dichotomic variable with 1 = “both parents present” and 0 = “other family arrangements” (e.g. living with only mother/father, grandparents, friends, alone, foster parent)
Change in residency	<i>During the last 12 months did you move to another city/neighborhood?</i> with 1 = “yes” and 0 = “no”
Change in school	<i>During the last 12 months did you move to another school?</i> with 1 = “yes” and 0 = “no”
Family-level	
Parent support	Cumulative score based on responses to 5 items (M = 16.93, SD = 3.28, CA = .83) measuring different forms of support (care and warmth, discussing about personal issues, receiving advice about own studies, or receiving help when dealing with different problems), where higher scores indicate a higher level of support.
Parent rule	Cumulative score based on responses to 3 items (M = 8.05, SD = 2.44, CA = .74) including the degree in which parents set strict rules regarding the activities at home, activities performed outside and the time curfew. Items were added into a cumulative measure where higher scores suggesting less strict rules existing in the family setting.
Parent monitoring	Cumulative score based on responses to three items (M = 4.93, SD = 2.04, CA = .69) measuring the degree in which parents know with who and how evenings and free time are spend, where a higher score represents a lower level of parental monitoring.

Source: generated by the authors

2.4. Procedure

Questionnaires were administered to the 10th graders who were present in the classrooms when the survey was distributed. Complying with the national ethical regulations, more than 3500 letters were sent to all the parents / tutors from the selected classes informing them about the study and asking for their consent to allow their children to be surveyed. We opted for a passive consent procedure approved as well by the General Directorate of Social Assistance and Child Protection (DGASPC) - Bucharest and by The Municipal School Inspectorate. Students who were included in the survey returned their questionnaires in sealed envelopes. The entire research protocol is described in detail by Author (2014).

2.5. Data analysis

A set of independent t-tests were run to test for differences according to the individual variables. Then, we run a 3-step multiple hierarchical regression with internalizing and externalizing problems as outcome variable. Gender, family status, and environmental changes were introduced in step 1, controlling respondents' individual characteristics. The three family variables (parent support, parent rules and parent monitoring) were introduced in step 2, and the screen time exposure in step 3. Detailed results are displayed in tabular format and discussed only for the last step.

3. Results

3.1. Adolescents' screen time

On average, among active screen-based activities (e.g., electronic games, social media, computer use navigating), navigating social media sites appeared as the activity with the highest engagement in terms of time (39.1% with more than 4 hours daily) while passive usage such as watching TV was recorded by 1:4 of our respondents for more than 4 hours/day (Table 2).

Table 2. Self-reported daily average screen time exposure

How much time on average/day do you spend for...	Almost never	½h – 1h	1h	2h	3h	4h	5h	> 6h
Watch TV (movies, shows)	7.3	12.9	13	25.7	17.7	8.3	4.1	11
Play video games	40.9	11.2	9.9	11.1	8.3	4.4	3.3	10.9
Spent time on social media sites	7.2	11.8	11.6	16.6	13.8	10.7	7.3	21.1
Use internet for other than social media or games	12.4	22.6	20.9	14.8	10.1	4.4	3.1	11.7

Source: generated by the authors

We performed a series of independent t-tests for screen time exposure to explore means' differences based on gender, family structure and environmental changes. In terms of total screen time exposure, we found a significant difference between boys ($M = 16.65$, $SD = 6.37$) and girls ($M = 15.41$, $SD = 5.05$) in terms of screen time, with boys being more engaged ($t[2166.85] = -5.25$, $p < .001$). As for family structure, respondents living in other family arrangements significantly are exposed to more screen time compared to those living in "traditional" 2-parent families ($t[2376] = 2.43$, $p < .01$), maybe signaling less monitoring from the adults. Changing residency and school did not yield any significant differences for screen time exposure. As for the passive and active screen-based activities, there were no differences accounted for gender and passive, but boys were significantly engaged into active usage of electronic devices ($t[2330.60] = -7.32$, $p < .001$). Adolescents living in other family structures are also significantly engaged into more active screen-based activities ($t[2549] = 2.11$, $p < .01$), while changing residency and school did not yield any significant differences.

3.2. Adolescents' display of internalizing and externalizing problems

In general, adolescents displayed moderate symptoms of anxiety and depression with 1:5 acknowledging feeling often nervousness during the last month. Additionally, sadness, low energy, and enthusiasm were highlighted as the more prevalent depression symptoms.

Table 3. Symptoms of anxiety and depression acknowledged by adolescents

During past week, how often you experienced...	(Almost) never	Seldom	Sometimes	Often
Nervousness	14.7	29.7	34.6	20.9
Sudden fear without a reason	46.2	27.6	17.2	9.1
Tense or keyed-up	21.5	34.1	30	14.5
Sadness	17.7	25.2	34.3	22.8
Poor appetite	36.4	30.3	22	11.3
Loneliness	35.6	24.5	22.7	17.3
Crying easily	42.7	19.7	19.8	17.8
Trouble sleeping	33.5	26	22.5	18.1
Feeling blue	30.1	27.6	25.4	16.9
Low enthusiasm	21.8	32.5	30.3	15.4
Low energy	22.3	33.1	30.5	14.2
Hopeless about future	57.2	22.4	12.6	7.7
Thoughts of ending your life	82	8.3	5.1	4.5

Source: generated by the authors

A similar run of t test was performed to test for any significant differences for internalizing and externalizing problems. We noticed a significant difference in the scores for anxiety ($t[2467.58] = -15.91, p < .001$) and for depression ($t[2472.65] = -15.21, p < 0.001$) according to gender, suggesting that girls significantly display more internalizing problems. For externalizing problems, we obtained significant differences for aggression ($t[1819.94] = 12.70, p < .001$) and delinquency ($t[1925.79] = 5.32, p < .001$), but in this case boys were displaying more externalizing problems.

Family structure intervened as an explanatory variable only for displaying internalizing symptoms. Both symptoms of depression ($t[1340.40] = -4.35, p < .001$) and anxiety ($t[1360.09] = -2.38, p < .01$) were significantly heightened in the case of respondents coming from “alternative” family arrangements compared to “traditional” 2-parent structures, but the effect size was weak.

Disruptions in the living environment, such as moving to another city/neighborhood and moving to another school, contributed differently to the development of internalizing and externalizing problems. Therefore, moving to another city significantly contributed to a more frequent display of depressive symptoms ($t[2418] = 3.79, p < .001$), and also to more frequent involvement in aggressive behavior ($t[220.67] = 3.14, p < .001$) and delinquency ($t[214.09] = 3.42, p < .001$). Nonetheless, changing the school in the last year only contributed to heighten depressive mood

($t[2408] = 2.17, p < 0.05$) and to frequent display of delinquent behavior ($t[269.95] = 2.24, p < 0.05$).

3.3. Adolescents and family environment

The family environment is characterized as quite supportive, but no significant differences were noticed according to gender. There is a significant difference in perception of rules ($t[2479] = 9.75, p < 0.001$) setting and the level of parent monitoring ($t[2352.63] = 11.17, p < 0.001$), in both cases, compared to girls, boys perceive their parents as having less strict rules and less monitoring of their behavior. As expected, adolescents living in other family structures ($M = 16.45, SD = 3.58$) received less parent support than those with both parent present ($M = 17.15, SD = 3.11$); ($t[1296.35] = 4.65, p < 0.001$). Parent support was also affected in a negative manner by disruptions in the living environment such as moving to another city ($t[234.45] = -3.53, p < 0.001$) and changing the school ($t[2412] = -2.43, p < 0.01$).

3.4. Results of the multiple regression

The 3-step multiple linear regression analysis identified the combination of factors explaining the display of internalizing and externalizing problems, with the results of the final step included in Table 4. Aside from family structure and changing the school environment, all the other factors have shown to be significant contributors to the model for internalizing problems. Therefore, girls are more depressed and anxious than boys, changing the city leads to more depressive symptoms, while a family environment characterized by low support and less restrictions leads to both heightened depression and anxiety while low monitoring is associated with depression only. Consistent with our assumption, screen time exposure is significantly associated with depression [$F(8, 2332) = 79.83, p < .001$, Cohen's $f^2 = .27$] and anxiety [$F(8, 2332) = 49.78, p < .001$, Cohen's $f^2 = .17$], suggesting that more time spent on electronic devices is associated to more display of internalizing problems, while controlling for individual and family factors.

As for externalizing problems we found similar correlates, but in this model boys, experiencing changes in residency during the last year, low parent support and monitoring are associated with more frequent engagement in aggressive and delinquent behavior. Frequent media use was significant only for aggression, partially supporting our assumption. With a R^2 value of 0.141 [$F(8, 2294) = 46.90, p < .001$, Cohen's $f^2 = .16$] we

concluded that, controlling for all other predictors, more screen time is associated to more engagement into aggressive behavior.

Table 4. Results of regression analysis for occurrence of internalizing and externalizing problems^a

Predictors	Internalizing problems				Externalizing problems			
	Depression		Anxiety		Aggression		Delinquency	
	<i>b</i>	β	<i>b</i>	β	<i>B</i>	β	<i>b</i>	β
Gender (1 = boy)	-4.31	-.29***	-1.43	-	3.25	.21***	.64	.11***
Family structure (1 = both par.)	-.51	-.03	-.07	.30***	.28	.01	.09	.01
Change city (1 = yes)	1.45	.05**	.26	-.01	1.82	.06***	.93	.08***
Change school (1 = yes)	.16	.01	-.03	.03	-.10	-.01	.38	.04*
				-.01				
Parent support	-.66	-.29***	-.14	-	-.14	-.06**	-.07	-
Parental rule	-.24	-.08***	-.04	.19***	-.04	-.01	-.03	.08***
Parental monitoring	.32	.09***	.04	-.04*	.45	.12***	.17	-.02
				.03				.12***
Screen time	.09	.08***	.03	.07***	.28	.21***	.01	.02
	$R^2 = .215$; $F(8, 2332) = 79.83^{***}$		$R^2 = .146$; $F(8, 2332) = 49.78^{***}$		$R^2 = .141$; $F(8, 2294) = 46.90^{***}$		$R^2 = .057$; $F(8, 2316) = 17.42^{***}$	

^a All standardized regression coefficients are from the final step in the analyses

*** $p < .001$, ** $p < .01$, * $p < .05$

Source: generated by the authors

4. Discussion and Conclusion

The rapid technological developments during the last few years have increased adolescents' access and engagement with electronic devices and extended their screen time exposure. Moreover, during the last two years, with the rapid integration of digital technologies into the educational process, screen time is no longer only related to recreational activities. All these have increased the interest in researching this area. Therefore, questions about the impact of prolonged screen time are totally justified. By employing a cross-sectional design, our study examined how individual and family characteristics and amount of screen time exposure contributes to the display of internalizing and externalizing problems among urban highschoolers from Romania. Findings from regression models suggested that upon controlling for individual (e.g., gender, family structure, environmental changes) and family variables (e.g., parent support, rules, and monitoring), more screen time exposure indicates heighten depressive and anxiety symptoms and elevated aggression.

These results advance earlier findings supporting the claim that adolescents' increased time on television, social media and computer predicts the one set of depression and anxiety symptoms (Boers et al, 2019; Boers et al., 2020; Fors & Barch, 2019; Khouja et al., 2019). However, considering that the association between screen time and negative mental health outcomes also depends on device type and specific usage (Tang et al., 2021; Twenge & Farley, 2021). Acknowledging that teenagers today are living in a highly digitalized environment, this conclusion will need further exploration as we did not examine for specific types of devices and the level of interaction, but only accounted for a general screen time exposure. Because adolescents are equally exposed to increased opportunities and risks of the emerging new technologies, additional studies exploring and clarifying the role of active and passive screen time in adolescent mental health outcomes are critical (Kim, et al., 2020; Santos, et al., 2023).

Similar with previous studies showing that higher levels of screen time, especially for video games and television viewing are associated with grater social behavioral problems among youth (Carson et al., 2016; Guerrero et al., 2019), we also found a similar significant relationship for engagement into delinquent behavior. Experiencing environmental changes (e.g., moving to another city) is significantly associated with depression and both externalizing problems, supporting the previous results showing that residential mobility is a disrupting event for adolescents, thus triggering psychological and behavioral problems (Anderson & Leventhal, 2017; Du & Kim, 2021).

Strengths and limitations

We believe the present study has some strengths. First, we employed some valid and standardized measures for depression and anxiety thus making our results comparable with other clinical studies looking at the development of internalizing symptoms in youth. Second, by adding a dimension focusing on family and home environment it highlights the influential role that parents have in regulating the screen time for adolescents.

However, several limitations are worth being noted as well. First, our analysis and conclusions are based only on a one-time measurement, thus being unable to assess for any causality relationship. We can not exclude the assumption that elevated internalizing symptoms might also push youth spending more time in front of screens (Männikkö et al., 2020). As other studies point, longitudinal studies could contribute to a better understanding. Second, no specific information on the use of different devices was collected. There is more to screen time than just a simple count of the hours,

as some specific types of screen time are more likely to be associated with psychological and social problems than others (Twenge & Farley, 2021). Therefore, future studies should include more refined screen time exposure measurements.

Nevertheless, this study contributes to the field by bringing new and contextualized evidence of the association between individual, family environment, screen time exposure and development of emotional and behavioral problems for adolescents. Our results may help to clarify some relationship contributing to negative health outcomes and support formulation targeted prevention or supportive programs for adolescents and their families.

Conflicts of interest

The authors listed above have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

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