



The effects of electronic media on adolescence

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Abstract

Electronic media are a dominant force in adolescents' lives. There is growing concern that rising rates of electronic media might be associated with emotional and behavioural problems. In this study, we examined associations between subsequent symptoms of attention deficit, hyperactivity disorder, and the electronic media use in adolescents. The participants were 99 adolescents (39 boys and 60 girls), aged from 12 to 18 years old. Internet addiction by adolescents was assessed by the Internet Addiction Test (IAT) and the behavioural and emotional problems by using the Achenbach System of Empirically Based Assessment. Parents reported on their adolescent's attention and hyperactivity problems through the Adolescent and Parental assessments of The Attention Deficit Questionnaire. The study showed that the electronic media that are used by adolescents are computers (40.4%), tablets (44.4%), PlayStation (40.4%), Facebook (43.4%). Also, seventy-two (72.7%) of them have an account on social networks. They watch TV 51.5% from 0 to 2 h, while only 1% over 4 h. Most of them (78.8%), use the internet daily, 28.3% use the internet about 6-10 hours and 24.2% use it over 20 hours. Specifically, 20.2% watch videos on YouTube, 14.1% search for school information, 13.1% connect with social media, 12.1% play games, 12.1% look for information on products and services, etc. Eighty respondents (80.8%) were average Internet users, 19 (19.2%) had possible addiction, while no one (0%) had severe addiction. The attention, hyperactivity deficit, and impulsivity were found to have a statistically significant correlation with the social problems. The Positive statistically significant difference was also found between the teens with potential addiction to the internet and the ones with behavioural problems, the increased rule-breaking, the obsession-compulsion, and the post-traumatic stress. Our results suggest that misuse of electronic media may be related to ADHD traits among Greek adolescents. Because of the increasing rates of electronic media use in teens, these results should be taken into account to protect the social and psychological health of adolescents. Future interventions might be more effective if they are targeted at specific types of electronic media use.

Keywords: electronic media use, attention deficit, hyperactivity problems, internet addiction, adolescence

Introduction

Electronic media have become an integral part of adolescent life. Electronic tools, such as televisions, computers, mobile phones, video games, social media (e.g., Facebook, Twitter, Instagram), and other platforms and services are used by them for information, education, and social interaction. According to a recent report, by Anderson and Jiang (2018) almost every adolescent (between 13-17 years old) living in the USA had smartphone and internet access (95%) while 89% of them used the Internet either several times or constantly (45%) during the day and used at least one of the social networking sites (SNS) platforms: YouTube (85% of adolescents), Instagram (72%), Snapchat (69%), Facebook (51%), Twitter (32%), Tumblr (9%) or Reddit (7%)^[1] According to another recent report, by Eurostat (2018), 96% of European individuals aged between 16 and 24 were regular internet users and 88% of them participated in social networking^[2]. The National Sleep Foundation's 2014, Sleep in the Modern Family^[3], polls found that 96% of teenagers between the ages of 15 and 17, take technology into the bedroom and in total, the average adolescent spends up to nine hours of screen time per day^[4].

The use of electronic media can have both positive and negative effects. On the one hand, the important positive and prosocial effects of media use should also be recognized, on the other hand, negative ones should not be ignored. Excessive screen use affects general health, physical activity^[5], cognitive^[6] and social development. In addition, psychopathological features are associated with

prolonged use of electronic media such as anxiety, social anxiety, depression, general psychological distress, and ADHD developmental symptoms^[7]. Many studies have drawn a link between extensive screen time (e.g., watching television, playing video games) and symptoms of attention-deficit hyperactivity disorder (ADHD)^[1, 8, 9], which is the most seen psychiatric disorder in childhood and adolescence. Specifically, the presence of an ADHD diagnosis or related symptoms to this syndrome are linked to compulsive/addiction-driven Internet use^[7], greater rates of social media use and addiction^[10], greater access to video games in the bedroom, and greater preoccupation/lack of control with video game playing^[11]. A meta-analysis of 45 empirical studies investigating the relationship between media use and ADHD-related behaviours in children and adolescents indicated a small significant relationship between media use and ADHD-related behaviours ($r = .12$)^[12].

In a longitudinal cohort survey study of adolescents aged 15 and 16 years at baseline and without symptoms of ADHD, with a follow-up over 2 years, there was a significant association between higher frequency of modern digital media use and subsequent symptoms of ADHD^[8]. Adolescents with ADHD are also reported to have greater access to video content (including video games) and spend more time talking on the phone or video chatting compared to adolescents without ADHD^[13]. ADHD symptoms (attention problems, hyperactivity, and impulsivity) is associated with screen time (TV and video games)^[12].

ADHD adolescents have more sleeping problems and poorer academic performance^[13, 14].

The frequent use of electronic media heightens ADHD symptoms, interferes with emotional and social intelligence, sleeping problems, poorer academic performance^[13, 14] increases social isolation and can lead to addictive behaviors^[15]. The addiction in screen use decreases social coping and involves craving behaviour which resembles substance dependence behavior^[19].

Methods and Resources

The sample of this study consisted of 99 adolescents, among which 39 boys and 60 girls, aged between 12 and 18 years old. The study also consisted of 93 parents (12 fathers and 81 mothers). Adolescents with diagnosed psychiatric disorders or other diseases and adolescents under psychological or psychiatric treatment or substance users were excluded. Adolescents participated in the study voluntarily. Participants and their parents were informed about the program’s purposes and signed consent forms before study entry.

The Attention Deficit Hyperactivity Disorder, internet addiction, and the behavioural and emotional problems were assessed, as followings:

A) ADHD Rating Scale-5, Home Version: Adolescent and Parental assessments of Attention Deficit: Signs of Attention Deficit Hyperactivity Disorder of the adolescents were assessed by parents with the ADHD Rating Scale-5, Home Version: Adolescent and Parental assessments of Attention Deficit^[6]. The questionnaire consists of 18 questions concerning the adolescents' attention deficit hyperactivity behaviour noted in the last week, choosing a number from 1 to 4, based on a 4-level Likert type scale [1 = No Attention/No Hyperactive, 2 = Rarely Attention/Rarely Hyperactive, 3 = Sometimes Attention/ Sometimes Hyperactive, 4 = Very often Attention/ Very often Hyperactive]. The scale is standardized and translated into Greek^[17].

B) Internet Addiction Test (IAT): Internet addiction was assessed by adolescents with the Internet Addiction Test (IAT). The 20-item ITA questionnaire measures

characteristics and behaviours associated with compulsive use of the Internet including compulsivity, escapism, and dependency. Examiners respond to each statement with a number from 1 to 6, representing a Likert-scale continuum, indicating the extent to which they endorse that particular behaviour [1 = No Internet Addiction, 2 = Rarely Internet Addiction, 3 = Sometimes Internet Addiction, 4 = frequent internet addiction, 5= very common internet addiction, 6= constant dependence on the internet]. The scale is standardized and translated into Greek. The scores on IAT are 20–39 points for an average user, 40–69 for possible addiction, and 70–100 points for severe addiction. The scale is also standardized and translated into Greek^[18].

C) Achenbach System of Empirically Based Assessment (ASEBA): Behavioural and emotional problems were assessed by adolescents with the Achenbach System of Empirically Based Assessment^[19]. The ASEBA offers a comprehensive approach to assessing adaptive and maladaptive functioning. The 112-point ITA questionnaire measures skills and behaviours of adolescents aged 11-18 years. In particular, it evaluates adolescents’ interests, activities, friendships, school performance, behaviour, etc. Examiners respond to each statement, related to activities, interests, friendships, with a number from 1 to 3 (1=below average, 2=on average, 3= above average), or from 1 to 4 (0=never mind, 1=sometimes, 2= very often), related to the adolescent's personality and behaviour.

The reliability of the measuring instruments, the internal coherence coefficient (Cronbach's alpha) was calculated for each scale/questionnaire (Table 1). The Cronbach's alpha of the scales ranged between $\alpha = 0.792$ and $\alpha = 0.894$.

Table 1. Cronbach α reliability coefficients of the three scales

Scale	Cronbach’s alpha	Questions
ADHD Rating Scale	18	0.892
Attention Deficit Disorder	9	0.867
Hyperactivity / Impulsivity	9	0.792
Internet Addiction Test	20	0.894

The measures of central position and dispersion of the scales of the questionnaires are presented in Table 2.

Table 2: Central position and dispersion measures of the questionnaire variables

Scale	Mean \bar{x}	Median	Standard deviation (s)	Range (R)	Interquartile range (Q)
Ache Achenbach System of Empirically Based Assessment (ASEBA)					
Anxiety / Depression	53.5	51.0	5.8	28.0	5.0
Withdrawal / Depression	53.4	51.0	5.3	26.0	5.0
Somatic complaints	54.0	51.0	5.4	20.0	6.0
Social problems	52.7	50.0	5.0	23.0	4.0
Thought problems	3.7	51.0	5.1	20.0	5.0
Attention problems	51.7	50.0	3.7	13.0	1.0
Rule-breaking behavior	52.0	50.0	3.6	18.0	3.0
Aggressive behavior	52.9	51.0	4.2	15.0	4.0
Internalization of problems	50.1	52.0	11.3	54.0	16.0
Externalization of problems	47.6	48.0	8.1	38.0	11.0
Activities	39.4	38.0	10.0	45.0	12.0
Social	46.4	47.0	9.2	36.0	13.0
Total Competence	41.5	41.0	10.4	44.0	16.0
Emotional difficulties	53.5	51.0	5.3	28.0	6.0
Stress	53.8	51.0	5.7	20.0	8.0
Physical disabilities	54.4	52.0	5.5	23.0	6.0
Attention Deficit / Hyperactivity Disorder	52.4	50.0	4.0	14.0	2.0
Opposing / Provocative behavior	52.9	50.0	4.6	20.0	6.0
Behavioral problems	52.5	50.0	4.3	17.0	4.0
Obsessive-compulsive problems	54.7	51.0	6.3	24.0	8.0

Post-traumatic stress	53.8	50.0	6.2	29.0	6.0
Total Competence	51.2	51.0	7.8	30.0	11.0
ADHD Rating Scale-5					
Attention Deficit/Hyperactivity Disorder (ADHD)	10.4	9.0	7.8	32.0	9.0
Attention Deficit	5.8	5.0	4.7	22.0	7.0
Hyperactivity / Impulsivity	4.6	4.0	3.9	16.0	5.0
Internet Addiction Test (IAT)					
Internet Addiction Test (IAT)	24.7	22.0	16.1	67.0	23.0

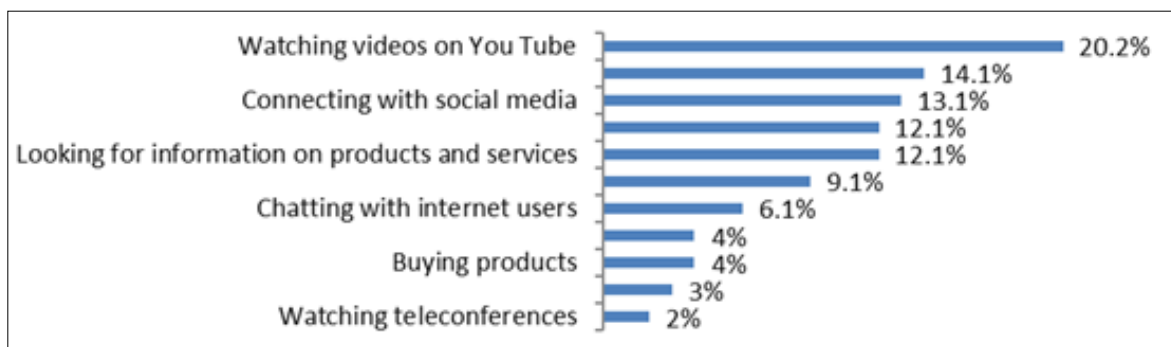
The values refer to Mean (\bar{x}), Medium, Standard deviation (s), Range (R), Interquartile range (Q), and range (minimum - maximum)

Use of electronic media/screen

The present study showed that 22 (22.2 %) teens have a TV in their bedroom, 40 (40.4%) have a personal computer, 29 (29.3%) have a computer in their room, 19 (19.2%) have permanent internet access, 44 (44.4%) have a tablet, 40 (40.4%) have PlayStation and 43 (43.4%) have Facebook. Seventy-two (72.7%) of them have an account on social networks (Instagram, Snapchat, etc.). The last three months, 51.5% watch TV from 0 to 2 h, 26.3% from 1 to 2 h, 15.2% from 2 to 3 h, 5% from 3-4 h and only 1% over 4 h per day. The last three months, 32.3% use a computer every day,

24.2% over one time a weak, 10.1% one time a weak, 13.1% from 2 to 3 times a month, 7% less than one time a month and 12 (12.1%) teens had not used a computer in the last months. Specifically, seventy-eight of them (78.8%) use the internet daily, 15 (15.1%) over than one time a week, 5 (5.1%) one time a week, and only one teen use internet from 2 to 3 times monthly. Twenty-eight teens (28.3%) use internet daily from 6 to 10 hours, 11 (11.1%) from 4 to 5 h, 15 (15.2%) from 2 to 3 h, and 6 (6.1%) less than 1 h daily. The reasons for using are presented in Table 3.

Table 3: Reasons for using the internet



In the present study, we classified the level of internet addiction according to the cutoff points previously reported by Young (1998) [20]. The total IAT scores for each group were less than 40 points for the average online user, 40 to 69 for possibly addicted to the internet, 70 to 100 points for severe internet addiction. Eighty respondents (80.8%) were average Internet users (IAT < 40), 19 (19.2%) had possible addiction (IAT 40–69), and no one (0%) had severe addiction (IAT ≥ 70).

Analysis of linear correlations

The evolution of the linear correlation between the questionnaires demonstrated the statistically significant correlations between their subscales (Table 4). The Attention-Deficit/Hyperactivity Disorder (ADHD) scale was

found to have a statistically significant correlation with the "social problems" of the Achenbach questionnaire (rs =0.434, n = 86, p <0.001). The attention-deficit subscale of the ADHD questionnaire was found to be statistically significant with subscales of ASEBA and social problems (rs = 0.490, n = 86, p <.001), thought problems (rs = 0.237, n = 86, p =.028), attention problems (rs = 0.306, n = 86, p =.004) and stress (rs =.217, n = 86, p =.045). The hyperactivity/impulsivity subscale of the ADHD questionnaire was found a statistically significant correlation with social problems of the Achenbach questionnaire. The Internet Addiction scale was found to have statistically significant correlations with many of the subscales of the Achenbach questionnaire and the attention deficit subscale of the ADHD questionnaire, (Table 4).

Table 4: Correlation among ASEBA, ADHD, IAT

	Attention Deficit / Hyperactivity Disorder (ADHD)	Attention Deficit	Hyperactivity / Impulsivity	Internet Addiction
Anxiety / Depression	0.107	0,183	-0.011	0.270*
Withdrawal / Depression	-0.066	-0,026	-0.130	0.226*
Somatic complaints	0.013	0,139	-0.116	0.266*
Social problems	0.434***	0.490***	0.289**	0.256*
Thought problems	0.168	0.237*	0.050	0.326**
Attention problems	0.153	0.306**	-0.062	0.236*
Rule-breaking behavior	-0.030	0.019	-0.105	0.371***
Aggressive behavior	0.027	0.026	0.038	0.185
Internalization of problems	0.025	0.097	-0.071	0.315**
Externalization of problems	0.032	0.055	-0.024	0.339***
Activities	0.003	0.066	-0.008	0.235*

Social	-0.017	0.009	-0.018	0.202
Total Competence	-0.009	0.039	-0.008	0.250*
Emotional difficulties	0.004	0,062	-0.069	0.252*
Stress	0.173	0.217*	0.038	0.210
Physical disabilities	-0.024	0.110	-0.155	0.333**
Attention Deficit / Hyperactivity Disorder	0.132	0.299**	-0.092	0.206
Opposing / Provocative behavior	-0.006	0.015	-0.030	0.151
Behavioral problems	-0.004	0.084	-0.082	0.357***
Obsessive-compulsive problems	0.007	0.083	-0.073	0.271*
Post-traumatic stress	0.049	0.150	-0.076	0.287**
Total Competence	-0.164	-0.084	-0.151	-0.089
Attention Deficit / Hyperactivity Disorder (ADHD)		0.902***	0.867***	0.150
Attention Deficit			0.599***	0.212*
Hyperactivity / Impulsivity				0.050

Values refer to Spearman rho correlations.

***P <.001, **P <.01, *P <.05.

Internet addiction

A positive statistically significant correlation was found between the teens, probably addicted to the internet, with rule-breaking behavior, problems like thought, externalization, behavioral, obsessive-compulsive, and post-

traumatic stress (Table 5). The internal problems are anxiety/depression, withdrawal/ depression, and somatic complaints, while the external are attention problems, thinking problems, aggressive behavior, and social problems.

Table 5: Correlation among scales/subscales and internet addiction of the participants

Anxiety / Depression §	50.0 (3.0)	52.5 (7.0)	445.500	0.051
Withdrawal / Depression §	50.0 (5.0)	53.5 (9.3)	449.000	0.053
Somatic complaints §	51,0 (5.0)	54.0 (12.8)	483.000	0.135
Social problems §	50.0 (3.0)	51.0 (6.5)	463.000	0.065
Thought problems §	50.0 (4.5)	54.0 (9.5)	396.000	0.014
Attention problems §	50.0 (0.5)	50.0 (1.8)	515.000	0,164
Rule-breaking behavior §	50.0 (1.0)	53.0 (6.5)	372.500	0.005
Aggressive behavior §	50.0 (4.0)	52.0 (8.3)	513.500	0.224
Internalization of problems	49.0 ± 11.6	54.3 ± 9.7	-1.884	0.063
Externalization of problems	46.5 ± 8.1	51.8 ± 7.2	-2.627	0.010
Activities §	37.0 (10.0)	40.0 (10.3)	508.000	0.104
Social	45.5 ± 9.3	49.8 ± 8.0	-1.878	0.064
Total Competence	40.5 ± 10.7	45.2 ± 8.4	-1.860	0.066
Emotional difficulties §	51.0 (4.0)	55.0 (10.0)	446.500	0.054
Stress §	50.0 (6.0)	53.0 (7.3)	461.500	0.079
Physical disabilities §	51.0 (6.0)	56.0 (12.3)	417.500	0.026
Attention Deficit / Hyperactivity Disorder §	50.0 (2.0)	51.0 (2.8)	548.500	0.407
Opposing / Provocative behavior §	50.0 (4.0)	51.0 (8.0)	490.500	0.135
Behavioral problems §	50.0 (2.0)	52.5 (9.0)	424.000	0.019
Obsessive-compulsive problems §	51.0 (7.0)	54.5 (13.3)	437.500	0.045
Post-traumatic stress §	50.0 (4.0)	56.0 (10.0)	446.500	0.046
Total Competence	51.4 ± 7.3	50.4 ± 9.4	0.388	0.699
Attention Deficit / Hyperactivity Disorder §	9.0 (9.0)	7.5 (13.3)	700.000	0.772
Attention Deficit §	5.0 (6.5)	5.5 (6.3)	649.000	0.447
Hyperactivity / Impulsivity §	4.0 (4.5)	3.5 (6.8)	727.000	0.967

Values refer to Mean values (MT), standard deviation (TA), t-test and corresponding p-value

§Values refer to median (D), intra-quadratic range, Mann-Whitney U controls and p-value.

The statistically significant differences are marked in bold at the significance level of 5%.

Discussion

This research aimed to examine the association between the use of electronic media and the symptoms of attention deficit hyperactivity disorder in adolescents. The adolescents use mobile phone (81.8), internet (80.8%), tablet (40.4%), PlayStation (43.4%). Seventy-two (72.7%) have an account on social networks (Instagram, Snapchat, etc) of which the most popular seems to be Facebook (43, 43.4%) and this finding is related to the results of other studies [1].

Most teens (51.5%) watch TV from 0-1 h daily, while 94 (94.5%) use the internet more than 1 h a day, 54 (54,5%) from 6 to 3 h. Researches show that teens use the internet

daily from 7 to 3 h/day [21, 22]. Teens of our study use the internet to watch videos on YouTube (20,2%), look for school information (14,1%), connect with social media (13,1%), playing games (12,1%), looking for information on products and services (12,1%), receiving/sending emails (9,1%), chatting with internet users (6,1%), reading newspapers and magazines (4%), buying products (4%), looking for new databases (3%) and watching teleconferences (2%).

The present study showed that most teens (80.8%) seemed to have complete control of internet use while the rest (19.2%) are possibly addicted. A previous Japanese study indicated that 36.7% of the teens (aged 17.2 to 19.6) were

average Internet users (IAT < 40), 59.6% had possible addiction (IAT 40-69), and 3.7% had severe addiction (IAT ≥ 70)²¹. Probably the older the teen gets, the more likely he/she is to become addicted to internet use. One optimistic finding of our research is that most Greek adolescents had complete control over internet use in spite of the long hours spent on it and only 19 (19.2%) had possible addiction. Probably the older the teen gets, the more likely he/she is to become addicted to internet use. Twenty-eight out of them (28.3%) use the internet from 6 to 10 hours and twenty-four (24.2%) over 20 hours daily for 3 months. The group which had possible addiction appears to have externalizing symptoms of ADHD (attention, thinking, aggressive behaviour, and social problems). Recent research has raised the concern that interactivity and reflexive reactivity on mobile media may contribute to the development of ADHD symptoms among adolescents^[8].

Besides numerous benefits of Internet use, the virtual environment arise various risks for teens. The intense exposure to the screens can have long-lasting and intense negative effects, emotional, social, and behavioural problems. Our study showed that the teens who were probably addicted to internet use had more problems with rule-breaking behaviour, thinking problems, externalization, obsessive-compulsive and post-traumatic stress. We speculate that ADHD traits, such as impulsivity, could be related to a difficulty in controlling Internet use.

This study has several limitations; for example, the sample size was limited. Furthermore, ADHD was screened by parents' reports of the ADHD Rating Scale, and none of our subjects underwent further evaluations for clinical diagnosis according to the DSM-5. Future interventions might be more beneficial if they are targeted at specific types of electronic media use.

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