Prevalence of Internet Addiction and Psychological Factors in Adolescents during the COVID-19 Pandemic

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Abstract: Addictive behaviors related to Internet are becoming more common and this tool has been essential once it enables home office, entertainment, homeschooling, and easy access to information. Despite the easiness brought by technology, the exaggerated use has affected users in different ways, including in the development of psychiatric disorders. This study aimed to assess internet addiction, depression, anxiety, attention-deficit/hyperactivity disorder (ADHD), attention, impulsivity, and stress in 48 adolescents (26 young women and 22 young men), aged from 15 to 18 years, with a mean age of 16.74 (0.61), mostly students of public schools, during COVID-19, to investigate correlations between these variables according to sex and sociodemographic aspects. To assess the factors, the Internet Addiction Test (IAT); the Swanson, Nolan, and Pelham Rating Scale (SNAP-IV) Questionnaire ; the Depression, Anxiety, and Stress scale for brazilian adolescents (EDAE-A); the Barratt Impulsiveness Scale (BIS-11); and a sociodemographic questionnaire were applied. The data collection was performed in schools located in southern Brazil. The results indicated that 12 out of 48 adolescents were considered addicted to the Internet. Moreover, Internet addiction was a predictor of depression in regression analysis ($p<0.001$). In addition, participants classified as more addicted to the Internet scored lower averages in general attention ($p<0.035$) and higher averages in behavioral symptoms of inattention and ADHD ($p<0.050$), stress ($p<0.003$), anxiety ($p<0.016$), and depression ($p<0.015$), with effect sizes ranging from moderate to high. Therefore, the intense internet use by adolescents might cause psychological consequences such as depression in adolescents. Family support and professional intervention might help in the reduction of symptoms and consequences of internet addiction as well as in its prevention.

Keywords: Behavioral Addiction, Psychological Disorders, Teenagers.

Prevalência de Dependência da Internet e Fatores Psicológicos em Adolescentes durante a Pandemia de Covid-19

Resumo: A dependência de internet é cada vez mais comum, pois essa ferramenta tem se tornado imprescindível, uma vez que possibilita home office, entretenimento, educação domiciliar e fácil acesso às informações. No entanto, o uso exagerado da tecnologia afeta os usuários de diversas formas, inclusive no desenvolvimento de transtornos psiquiátricos. Este estudo visou avaliar a dependência de internet, depressão, ansiedade, hiperatividade, atenção, impulsividade e estresse em 48 adolescentes (26 meninas e 22 meninos) de 15 a 18 anos, com idade média de 16,74 (0,61), estudantes de escolas públicas do Sul do Brasil durante a covid-19, para investigar correlações entre as variáveis anteriores de acordo com gênero e aspectos sociodemográficos. Para avaliar, aplicou-se o Internet Addiction Test (IAT), um teste de atenção, escala SNAP IV, escala de depressão, ansiedade e estresse para adolescentes (EDAE-A), escala de impulsividade

de Barratt e um questionário sociodemográfico. Os resultados indicaram que 12 adolescentes foram considerados viciados em internet, e que a dependência desta foi preditora da depressão na análise de regressão (p < 0,001). Ainda, os participantes classificados como adictos tiveram médias mais baixas em atenção geral (p < 0,035) e mais altas em sintomas comportamentais de desatenção e hiperatividade (p < 0,050), estresse (p < 0,003), ansiedade (p < 0,016) e depressão (p < 0,015), com efeitos que variaram de moderado a alto. Portanto, o uso intenso da internet por adolescentes pode ter consequências psicológicas, como a depressão. Bom apoio familiar e intervenção profissional podem ajudar na redução dos sintomas e consequências, bem como na prevenção da dependência.

Palavras-chave: Adolescentes, Dependência Comportamental, Transtornos Psicológicos.

Prevalencia de la Adicción a Internet y Factores Psicológicos en Adolescentes durante la Pandemia de la COVID-19

Resumen: La adicción a Internet es cada vez más habitual, puesto que esta herramienta es esencial para el trabajo remoto, el entretenimiento, la educación domiciliar y el fácil acceso a la información. Sin embargo, su uso exagerado afecta a la vida de las personas de diferentes maneras, incluso en el desarrollo de trastornos psiquiátricos. El objetivo de este estudio fue evaluar la adicción a Internet, depresión, ansiedad, hiperactividad, atención, impulsividad y estrés en 48 adolescentes (26 muchachas y 22 muchachos), de entre 15 y 18 años, con una edad promedio de 16,74 (0,61), en su mayoría estudiantes de escuelas públicas del Sur de Brasil, durante la pandemia de la COVID-19, para investigar las correlaciones entre las variables mencionadas según género y aspectos sociodemográficos. Para evaluar los factores, se aplicaron el Test de Adicción a Internet (TAI), un test de atención, la escala SNAP IV, la Escala de Depresión, Ansiedad y Estrés para adolescentes (EDAE-A), la escala de impulsividad de Barratt y un cuestionario sociodemográfico. Los resultados indicaron que 12 adolescentes fueron considerados adictos a Internet, además, la adicción a Internet fue un predictor de la depresión en el análisis de regresión (p<0,001). Igualmente, los participantes clasificados como más adictos a Internet tuvieron promedios más bajos en atención general (p<0,035), y más altos en síntomas conductuales de falta de atención e hiperactividad (p<0,050), estrés (p<0,003), ansiedad (p<0,016) y depresión (p<0,015), con efectos que varían de moderado a alto. Por lo tanto, el uso intenso podría producir consecuencias psicológicas como la depresión en los adolescentes. Tener un buen apoyo familiar e intervención profesional puede ayudar a reducir los síntomas y las consecuencias de la adicción a Internet, así como prevenirla.

Palabras clave: Adicción Conductual, Adolescentes, Transtornos Psicológicos.

Introduction

The widespread use of the Internet has extended ones interactive, informational, entertainment, and labor capacities. However, the exaggerated use might cause individuals to lose control, leading to a behavioral dependency known as Internet addiction (IA) (Jeon, Kim, Chon, & Ha, 2018; Jia, Tong, Zhang, Liu, & Fang, 2021; Munno et al., 2017). The IA is defined as an uncontrollable urge associated with a loss of control, preoccupation and continued use with use which might lead to behavioral consequences (Young, 2004). Currently, there are several scales and tests used worldwide which help to assess IA in different populations, and one of them is the Internet Addiction Test (IAT) (Young, 1998). Difficulties in managing daily tasks to continue online may result in the development of depressive symptoms, impulsivity, anxiety, and inattention

(Dong, Lu, Zhou, & Zhao, 2010; Gholamian, Shahnazi, & Hassanzadeh, 2017; Kahraman & Demirci, 2018; Marin, Nuñez, & Almeida, 2021). Besides that, the COVID-19 pandemic increased the internet use and the prevalence of IA (Li et al., 2021).

Studies conducted during the COVID-19 pandemic presented evidence that the general population overused the internet during this period (Hosen, Al Mamun, & Mamun, 2021; Li et al., 2021; Sun et al., 2020). However, it is known that a controlled use of the Internet had a protective factor during the pandemic, allowing social contact, home office, online learning, and even the development of virtual tools to help people with their physical and psychological health (Gonçalves et al., 2020; Mukhtar, Javed, Arooj, & Sethi, 2020). Moreover, virtual medical and psychological appointments increased, promoting well-being among people (Békés, Aafjes-van Doorn, Zilcha-Mano, Prout, & Hoffman, 2021; Di Carlo et al., 2021). The use of the Internet and other technologies have been increasing even before the pandemic; however, the pandemic isolation period intensified these habits, leading to a higher chance of developing addictions and suffering consequences due to habit changes (Eidi & Delam, 2020).

An online survey conducted in China aimed at addressing the prevalence of IA among the general public during the COVID-19 pandemic and at understanding the risk factors for increases in IA, with a sample size of 20,472 participants with mean age of 33.63 years old, found that 7,517 of the participants were classified as having a moderate or severe IA, with scores ranging from 50 to 100 in the Internet Addiction Test (IAT). Moreover, 20.2% and 13.8% presented depression and anxiety symptoms, respectively (Li et al., 2021). Students, females, having fewer social supporters, and experiencing negative life events were factors associated with increased time spent online during the pandemic (Li et al., 2021).

From all developmental stages, the adolescence is the most vulnerable to addictions since this phase is characterized by a high neurobiological plasticity—which appears to be associated with and predict risk taking behaviors—and sensation seeking (Gerber et al., 2009; Steinberg et al., 2018). Furthermore, during this period, adolescents face numerous physical, emotional, and behavioral changes, including the development of their identity and necessity of belonging (Cerniglia et al., 2017; Reid & Boyer, 2013).

Another factor is the social medias, which has become part of adolescents' daily life, and its overuse may also contribute with potential negative effects on youth metal health, particularly depression (Aalbers, Heeren, McNally, Wit, & Fried, 2019; Ivie, Pettitt, Moses, & Allen, 2020).

It is known that IA in adolescence could interfere in changes to regions of the brain, including the prefrontal cortex and the limbic system, which play a key role in regulating behavior, emotions, higher order cognitive functions, and risk processes (Chun et al., 2018; Comte et al., 2016; Steinberg, 2008; Strathearn et al., 2019). Additionally, research have shown that some structural and functional abnormalities may happen in the amygdala due to IA (Cheng & Liu, 2020; Lee et al., 2017). Changes in the prefrontal cortex suggest that psychological symptoms may be developed. It is known that IA can be considered a predictor of depression, anxiety, stress, sleeping problems, impulsivity, and attention-deficit/hyperactivity disorder (ADHD) in different populations of different age groups (Bazrafshan et al., 2019; Evren, Evren, Dalbudak, Topcu, & Kutlu, 2019; Li, Hou, Yang, Jian, & Wang, 2019; Zhang, Liu, & Zhao, 2021).

Some studies have investigated the psychological symptoms caused by IA such as depression, anxiety, stress, impulsivity, ADHD, and attention bias altogether (Gholamian et al., 2017; Lu, Chou, Hsiao, Hu, & Yen, 2019; Settanni, Marengo, Fabris, & Longobardi 2018). A systematic review that identified empirical studies on IA assessment instruments, variables, and comorbidities related to IA, including executive functions, such as attention, found that most studies do not assess attention itself but attention related to ADHD symptoms (Marin et al., 2021).

Therefore, considering the existing studies, the objectives of this research were to examine: a) the correlations between IA and the different variables such as depression, anxiety, stress, impulsivity, ADHD, and attention in adolescents; b) the presence of gender differences regarding Internet addiction ; and c) to examine if the addicted group has more symptoms of ADHD, depression, anxiety, impulsivity, and inattention than non-addicts. Hence, we hypothesize that IA is correlated with different variables. Our first hypothesis is that a more severe IA is correlated with more symptoms of depression, stress, anxiety, impulsivity, ADHD, and inattention in adolescents (Choi et al., 2019; Kahraman & Demirci, 2018;

Kawabe et al., 2019; Lim et al., 2015; Machado et al., 2018); The second hypothesis is that students of public schools present more IA than students from private schools (Cruz, Scatena, Andrade, & de Micheli, 2018). The third hypothesis is that male adolescents have more IA than girls (Ha & Hwang, 2014).

Methods

Study design

The study was performed in southern Brazil. The COVID-19 pandemic changed the way in which some activities were conducted, including in-person classes and even research collection procedures. A State Decree number 55.118 of March 16th ("Decreto nº 55.118", 2020) established complementary measures to prevent infection by COVID-19 within the State and suspended classes under the Public and Private Education Systems. The collection was conducted from November to December 2020, when students were able to have in-person classes. Nevertheless, the small sample is justified due to the reduced number of students who returned to school in the end of the year.

Sample

This cross-sectional research used a convenience sampling, composed by 48 adolescents aged from 15 to 18 years, with mean age of 16.74 (0.61), from public and private schools of both genders. A total of three schools accepted to participate, and all students within the studied age group were included. Table 1 summarizes participants' sociodemographic data.

Table 1
Sociodemographic data, Sleepiness, Sports, and Internet use (*N*=48).

	m(sd)/ *f (%)*
Gender	
Young women	26 (45.8%)
Young men	22 (54.2%)
Age*	16.74 (0.61)
Ethnicity	
White	44 (91.7%)
Black	4 (8.3%)

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	m(sd)/ *f (%)*
Type of school	
Public	39 (81.3%)
Private	9 (18.8%)
Family Income	
1 to 3 minimum wages	8 (16.7%)
3 to 6 minimum wages	16 (33.3%)
6 to 9 minimum wages	10 (20.8%)
More than 9 minimum wages	3 (6.3%)
Do not know	11 (22.9%)
Difficulty in Sleeping	
No	31 (64.6%)
Yes	17 (35.4%)
Sleeping hours	
2 to 4 hours	3 (6.3%)
5 to 6 hours	6 (12,5%)
6 to 8 hours	34 (70.8%)
More than 8 hours	5 (10.4%)
Physical Activity	
No	13 (27.1%)
Yes	35 (72.9%)
Internet Use hours	
Less than 2 hours	1 (2.1%)
2 to 4 hours	10 (20.8%)
5 to 6 hours	11 (22.9%)
More than 6 hours	26 (54.2%)
What is internet used for[+]	
Social Media	45 (93.8%)
Games	22 (45.8%)
Websites	32 (66.7%)
School research	31 (64.6%)
General research	37 (77.1%)
Others	13 (27.1%)
Most Used	
Social Media	29 (60.4%)
Games	6 (12.5%)
Websites	4 (8.3%)
School research	3 (6.3%)
General research	2 (4.2%)
Others	4 (8.3%)

Note: [+]Participants were allowed to choose more than one option.
*Mean age (16.74).

Instruments

Sociodemographic questionnaire

In total, two sociodemographic questionnaires were developed exclusively for this research to collect data from the participants, including age, gender, socioeconomic level, pattern of internet use, physical activity, and sleeping patterns. One of them was filled by the parents and the other by the adolescents.

Internet Addiction Test

The Internet Addiction Test (IAT) was used to measure IA or excessive internet use. The test was developed by Young (1998) and has been applied in several countries. The IAT is a self-administered instrument composed of 20 questions arranged in the form of a Likert scale with points ranging from Rarely (1) to Always (5). Higher scores indicate more severity of addiction, which can vary from 0 to 100 points, categorized as normal (0-30 points), light (31-49 points), moderate (50-79 points), and severe (80-100 points). This study used the cutoff 75 (moderate to severe) of the Brazilian version of IAT-Total scale to classify IA. Some subscales can present different items, such as salience, excessive use, neglect of work, anticipation, lack of control, and neglect of social life. The test that was used in the current study was adapted to Brazilian Portuguese by Conti et al. (2012), and showed satisfactory Cronbach's alpha values very close (0.85) to those of the original study (0.54 to 0.82).

Psychological Battery for Attention Assessment (BPA)

The instrument was developed by Rueda (2013) and mainly aims to perform an assessment of the general capacity of attention, as well as of the three specific sorts of attention, which are Focused Attention, Divided Attention, and Alternating Attention. In order to adapt and validate the test in Brazil, Rueda & Muniz (2012) applied the questionnaire and the results showed positive and significant correlations with values above 0.509 (Rueda & Muniz, 2012). For a better understanding of the instrument, Rueda (2013) describes that the tests are composed of several stimuli and are allocated to be considered target and distracting stimuli. The result of each test is achieved considering the target stimuli that the participant scored, subtracted from the errors and omissions found (Rueda, 2013).

Swanson, Nolan and Pelham - MTA-SNAP-IV

The scale was developed to investigate ADHD and oppositional defiant disorder (ODD) symptoms in children and adolescents, and it is answered by their parents (Mattos, Serra-Pinheiro, Rohde, & Pinto, 2006). The instrument has been validated in different languages and countries. In Brazil, it presented consistency with a Cronbach's alpha above 0.91. The Brazilian version scale contains 26 items that include symptoms of ADHD and ODD. Parents are asked to rate their children's inattentive, hyperactive/impulsive, and defiant behaviors (Costa, de Paula, Malloy-Diniz, Romano-Silva, & Miranda, 2019; Mattos et al., 2006).

Adolescent Depression, Anxiety, and Stress Scale (EDAE-A)

The instrument was validated by a sample of 426 adolescents aged from 12 to 18 years. The Likert scale was adequate in psychometric terms since values indicated reliability of the factorial structure with Cronbach's Alpha values of 0.86, 0.83, and 0.90 for stress, anxiety, and depression, respectively. It consists of 21 items ranging from 0 to 3 and three different subscales that measure stress, anxiety, and depression (Patias, Machado, Bandeira, & Dell'Aglio, 2016).

Barratt Impulsiveness Scale-Youth (BIS-youth)

In order to assess impulsivity a questionnaire composed of 30 items as Likert scale was used. The instrument assessed three factors of impulsivity, divided into three subscales: inattention, which includes distractibility and cognitive instability; motor, which focuses on agitation when you are asked to stay calm; or financially, which means spending without thinking and non-planning and living in the moment without making careful plans. The scale was adapted for adolescents in the Brazilian context by von Diemen, Szobot, Kessler, & Pechansky (2007) with validity and reliability with values of 0.90 for Intra-class correlation coefficient and alpha of 0.62 for internal consistency.

Ethical and collection procedures

During the first visit to the school, an envelope was sent home so that parents could understand the aim of the research and sign an informed consent form. Then, they were asked to answer the Swanson, Nolan and Pelham Rating Scale (SNAP-IV) Questionnaire, validated in Brazil by Costa et al. (2019), which assess

ADHD and ODD symptoms. Moreover, parents were also asked to fill in a short sociodemographic questionnaire focused on their children's internet use and sleeping patterns. In the same envelope, an assent form was also sent so that students could read about the research and sign their volunteer participation.

The instruments were applied collectively at the schools in November 2020, during schools hours, previously scheduled by the principal and teachers, lasting 50 minutes and following all precautions to protection against COVID-19. The research was previously approved by the Research Ethics Committee of the Federal University of Rio Grande do Sul, in accordance with resolutions 510/2016 and 466/2012 of the Brazilian National Health Council (CONEP) on the norms applicable to research in Human and Social Sciences and regulatory guidelines and standards for research involving human beings.

Data analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) software version 26, in which descriptive statistics (means, standard deviations, frequency, and percentiles) of the study variables were estimated. Pearson's correlations were conducted between the Internet Addiction Scale (total and subscales), attention (focused, divided, alternating, and general), impulsivity, ADHD, depression, anxiety, and stress. Regarding attention tests, age percentile scores were used and, from the presented correlations, a multiple linear regression model (Backward method) was developed in which the total score of addiction to the Internet was a dependent variable, while divided attention, SNAP-IV-inattention, EDAE-A-stress, and EDAE-A-depression were predictive variables (Hair, Black, Babin, & Anderson, 2010).

The number of independent variables did not exceed the sample criteria of at least 10 participants per predictor variable (Hair et al., 2010). The following parameters were inspected in the linear regression model: multicollinearity, independence of residues, homoscedasticity, and error distribution pattern to verify the adequacy of the analysis. For model interpretation, regression weights (β) and percentage of explained variance (R2adj) were reported. In addition, the bootstrap resampling method with 95%CI was used to provide greater reliability for the regression coefficients, correct for deviations from normality and control possible biases due to the sample size (Haukoos & Lewis, 2005).

Finally, comparisons were performed with t-tests by gender and type of school in relation with the means of internet addiction. Furthermore, differences between IA groups regarding the means of all studied variables were investigated. The respective effect sizes were reported (Cohen, 1988) according to the interpretation: ≤0.01 small effect, 0.06 moderate effect, and ≥0.14 large effect. The level of significance used was 5% (p<0,05).

Results

Descriptors and correlations

Table 2 presents means and standard deviations of the variables and the correlations with IA.

Table 2
Mean (SD) and Correlation Matrix between Internet Addiction and the study variables p<05.

	m(SD)	IAT-Salience m(SD)	IAT-Excessive Use m(SD)	IAT-Neglect of Work m(SD)	IAT - Anticipation m(SD)	IAT - Lack of Control m(SD)	IAT-Neglect of Social Life m(SD)	IAT-Total m(SD)
		8.00(4.44)	9.29(3.84)	3.62(2.57)	3.17(1.91)	6.68(3.09)	1.98(1.31)	32.75(12.57)
1. BPA-Focused Attention (FA)	62.27(17.01)	-0.12	-0.01	.01	0.03	-0.09	0.21	-0.04
2. BPA-Divided Attention (DA)	68.52(21.39)	-0.31*	-0.10	-0.22	-0.43**	-0.25	-0.01	-0.31*

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	m(SD)	IAT-Salience m(SD)	IAT-Excessive Use m(SD)	IAT-Neglect of Work m(SD)	IAT - Anticipation m(SD)	IAT - Lack of Control m(SD)	IAT-Neglect of Social Life m(SD)	IAT-Total m(SD)
		8.00(4.44)	9.29(3.84)	3.62(2.57)	3.17(1.91)	6.68(3.09)	1.98(1.31)	32.75(12.57)
3. BPA-Alternating Attention (AA)	78.10(14.69)	0.06	0.03	-0.22	0.15	-0.17	0.22	-0.01
4. BPA-General Attention (GA)	79.60(17.57)	-0.26	-0.01	-0.31*	-0.28	-0.28	0.13	-0.26
5. SNAP-inattention	9.10(6.59)	0.30*	0.26	0.45**	0.25	0.40**	-0.16	0.40**
6. SNAP-hyperactivity	7.17(6.49)	0.12	-0.07	0.18	0.20	0.14	-0.08	0.11
7. SNAP-oppositional	7.79(6.51)	0.21	0.05	0.09	-0.10	-0.05	-0.04	0.08
8. SNAP-total	23.27(14.37)	0.30*	0.13	0.33*	0.16	0.22	-0.12	0.28
9. EDAE-A – stress	7.70(4.96)	0.34*	0.18	0.34*	0.22	0.30*	-0.04	0.36*
10. EDAE-A – anxiety	4.72(4.95)	0.21	0.13	0.28	0.23	0.25	0.06	0.27
11. EDAE-A – depression	6.00(4.57)	0.50**	0.26	0.47**	0.24	0.44**	-0.06	0.49**
11. EDAE-A – total	18.43(12.86)	0.39**	0.21	0.40**	0.26	0.37*	0.34*	42**
12. BIS – impulsivity	26.60(3.46)	0.17	0.03	0.01	0.39**	0.04	-0.18	0.17
13. BIS – attentional	19.54(2.33)	-0.41	-0.08	-0.05	0.09	-0.06	0.23	-0.07
14. BIS – planning	26.12(4.09)	0.07	0.03	-0.01	0.26	-0.01	0.52	0.08
15. BIS – total	72.27(7.98)	0.51	0.01	-0.01	0.33*	-0.01	0.15	0.10

Note: *$p<0.05$; **$p<0.01$

As Table 2 shows, the IAT-salience subscale was negatively correlated with the divided attention and positively correlated with the SNAP-IV scale (inattention subscale and total score) and with the EDAE-A scale (subscales of stress, depression, and total score). The IAT neglect of work scale showed a negative correlation with the general attention score, as well as positive correlations with the SNAP-IV (inattention subscale and total score) and the EDAE-A scale (stress, depression, and total score). The subscale IAT-anticipation showed a negative correlation with divided attention and a positive correlation with BIS-impulsivity. Regarding IAT subscale-lack of control, there was a positive correlation with the SNAP-IV-inattention subscale and with the EDAE-A scale (stress, depression,

and total score subscales). A positive correlation was found between IAT-neglect and EDAE-A total. Finally, the IAT-total scale was negatively correlated with divided attention and positively correlated with SNAP-IV-inattention and the EDAE-A scale (stress, depression, and total score subscales). Correlations varied between small and moderate (r=0.30 to r=0.50), with the highest magnitude correlation between IAT-anticipation and EDAE-A-depression

Linear regression

From the presented correlations, a multiple linear regression model (Backward method) was developed in which the total score of IA was a dependent variable,

while divided attention, SNAP-IV-inattention, EDAE-A-stress, and EDAE-A-depression were predictive variables. As a result, only the variable EDAE-A-depression remained as a predictor variable ($F(1, 46)$=14.53, p<0.001; $R^2_{adjusted}$=0.22). The regression coefficients B (B =1.35, Bias=-0.02, SE=.31 [95%CI=.74; 1.96]) indicated that, on average, the increase of one point in the levels of depression reflects the increase of 1.35 points in the levels of IA

Comparisons between groups

No differences were found between genders and type of school in the scores of IA. The analysis of comparisons between groups of addiction were based on the percentile 75 of the IAT-Total scale. Thus, participants who scored below this cutoff point were classified as less addicted. Table 3 shows the averages for each group and the result of the comparisons. In the analysis, it was also found that adolescents from private schools (n=9) had higher mean scores in the tests of attention and BIS-planning and BIS-total. Due to the small sample size, it was not possible to perform more sophisticated analysis controlling the type of school in the comparative analysis between more and less addicts.

Table 3
Comparisons between Most Addicted Participants vs. Least Addicted Participants in study variables.

	Least Addicts (*n*=36) m(sd)	Most Addicts (*n*=12) m(sd)	*t*	*p*	*d*
BPA-Focused Attention (FA)	64.17(17.09)	64.58(17.51)	-0.07	0.942	0.02
BPA-Divided Attention (AD)	72.97(16.53)	55.17(28.73)	2.04	0.062	0.88
BPA-Alternating Attention (AA)	78.44(15.02)	77.08(14.22)	0.28	0.780	0.09
BPA-General Attention (AG)	82.67(14.72)	70.41(22.51)	2.17	0.035	0.73
SNAP-inattention	7.61(4.82)	13.58(9.07)	-2.18	0.048	0.98
SNAP-hyperactivity	6.11(4.94)	10.33(9.38)	-2.01	0.050	0.67
SNAP-opposition	7.14(7.13)	9.75(6.94)	-1.21	0.233	0.37
SNAP-total	20.11(11.42)	32.75(18.34)	-2.25	0.041	0.94
EDAE-A – stress	6.53(4.12)	11.25(5.74)	-3.11	0.003	1.04
EDAE-A – anxiety	3.75(4.55)	7.67(5.12)	-2.50	0.016	0.84
EDAE-A – depression	4.75(3.27)	9.75(5.88)	-2.81	0.015	1.24
EDAE-A – total	15.02(10.00)	28.67(15.38)	-2.88	0.012	1.19
BIS – impulsivity	26.28(3.42)	27.58(3.52)	-1.13	0.262	0.38
BIS – attentional	19.58(2.53)	19.42(1.68)	0.21	0.833	0.07
BIS – planning	25.86(4.50)	26.92(2.50)	-1.01	0.445	0.26
BIS – total	71.72(8.60)	73.92(5.74)	-0.82	0.416	0.28

As Table 3 shows, there were statistically significant differences between the groups. When compared with participants classified as less addicted, participants classified as more addicted had lower mean scores in the general attention domain and higher mean scores in the SNAP-IV-total and in subscales of inattention and hyperactivity, as well as in the EDAE-A-total and the EDAE-A subscales of stress, anxiety, and depression. The effect size of the differences varied from moderate to high, with the greatest magnitude seen in the EDAE-A stress and depression subscales.

Discussion

The results of this study corroborate part of our first hypothesis: more severe IA is correlated with more symptoms of depression, stress, anxiety, impulsivity, hyperactivity, and inattention in adolescents. This is highlighted by the correlations and regression analysis, which presents depression, anxiety, stress, and attention. The research found no differences between female and male adolescents, as well as type of school, and this might have happened due to our small sample.

This study used some demographic factors, scales, and an attention battery to identify correlations between IA, attention, stress, depression, anxiety, impulsivity, and hyperactivity in 48 adolescents aged from 15 to 18 years. The primary results of this study revealed that 25% (n=12) of the participants were classified as having IA. Moreover, analyzing sociodemographic collected data, it was found that 54,2% (n=26) consider that they use the internet more than six hours a day and 22.9% (n=11) use the internet from five to six hours a day.

These data corroborate previous research that showed that adolescents adopt technology earlier and access the internet more than other age groups to accomplish academic performance and maintenance of social life (Fomby, Goode, Truong-Vu, & Mollborn, 2019; Sela, Zach, Amichay-Hamburger, Mishali, & Omer, 2020). In a recent study, it was seen that technology use was high in 2002-2003 but increased by 40 minutes per day in 2014-2016, which is a fact that shows an ongoing intensification in its use. (Fomby et al., 2019).

As IA was found to be a predictor of depression, it is important to understand that it can be classified as a secondary disorder once it is related to other psychopathologies such as social anxiety (Fayazi & Hasani, 2017). In a case-control study conducted by Dieris-Hirche et al. (2017), the authors aimed to explore the tendencies of IA in a group of depressive patients (n=25), comparing them with a control group of healthy participants (n=25). The study found that depressive patients showed significantly higher scores for IA and impulsivity when compared with the control group (Dieris-Hirche et al., 2017).

The maintenance of the online social life could be perceived by sociodemographic data, which identified social media as the most used internet tool, with 93.8% (n=45) of the participants choosing them as the most accessed. A study conducted by Boer, Stevens, Finkenauer, de Looze, & van den Eijnden (2021), which investigated associations between social media use and mental health in adolescents, found that more intense social media use is correlated with more depressive symptoms and decreased life satisfaction one year later (Boer et al., 2021). This study supports our findings since social media was the most used tool and depression was a predictor of IA in correlation and linear regression analysis.

To further contribute to the understanding of these effects, below are the empirical evidence presented in other research. One study performed with 1,715 adolescents in China observed that depression predicts IA in young women, but not in men. This fact suggests that gender is an important variable. In our study, we observed that the ones most addicted were more prone to having depressive symptoms, but we did not differentiate this by gender, perhaps due to the small sample (Liang, Zhou, Yuan, Shao, & Bian, 2016).

Sela et al. (2020), investigated problematic internet use, roles of depression, and fear of missing out—featured to be the cognitive and emotional preoccupation in other's experiences—among adolescents (n=170/mean age 14.04) and their parents with self-administered questionnaires. The results showed that low family expressiveness and high conflicts in problematic internet use and time spent online are mediated by depression. The findings suggest that positive family environment could decrease depressive symptoms, problematic internet use, and time spent online (Sela et al., 2020).

The attention variable was analyzed and the results found supported our previous hypothesis that a more severe IA is correlated with lower mean scores of general attention, as well as higher mean scores in behavioral symptoms of inattention and hyperactivity . Our results were similar to those found in literature since students with ADHD symptoms are more likely to have IA (Chen, Chen, & Gau, 2015; Chou, Liu, Yang, Yen, & Hu, 2015; Romo et al., 2018). In our study, we noted these correlations in SNAP-IV-in the inattention and attention battery, as shown in Figure 1 and Table 3. Our study also suggests that a higher the scores on IA is correlated with higher mean scores in stress and anxiety, which corroborate the literature showing that stressors from interpersonal and school related problems and anxiety symptoms are significantly associated with IA (Tang et al., 2014). Park et al. (2013) also developed a study that aimed to identify the effects of behavioral inhibition and approach system as predictors of IA in adolescents, finding that motivation for escaping from anxiety and feeling free online are reasons why there is an association between IA, anxiety, and stress.

Moreover, in our study, we did not find interaction between impulsivity and IA, fact that could be seen in several other studies (Choi et al., 2014; Choi et al., 2019;

Kahraman & Demirci, 2018). Our hypothesis is that the results were not significative due to the small sample and the great variation of impulsivity among the studied adolescents.

Final considerations

Our study found a high prevalence of depressive symptoms, inattention, stress, hyperactivity, and anxiety in adolescents with IA based on the percentile 75 of the IAT-Total scale. We highlight some study limitations during the development of the research. Firstly, a small sample was adopted due to the pandemic situation. Moreover, since there was an attention test that could not be filled online, we had to keep the in-person format despite adolescents having online classes during the data collection period.

The second limitation was applying the research in private schools due to the difficulty accessing them, which was easier in public schools. The third limitation was that, due to small sample number, it was not possible to investigate the differences in type of school since only nine students studied in private schools.

This study also presents several strengths. The ethics and collection procedures respected the pandemic moment, and even with a small sample, it was possible to achieve significative correlations between the analyzed variables. Our study shows a sophisticated statistics analysis focused on depression and IA. Furthermore, our study has practical implications since it might support professionals in the development of programs aiming prevention and avoidance of IA in adolescents, as well as a encourage better family support, aiding adolescents in reducing and avoiding behaviors that lead to IA.

We conclude our study by highlighting the need for further studies in the area, as it is an important and contemporary topic due to its consequences and growing use during and after COVID-19. Further investigations associating IA and other variables in different populations might contribute and intensify the importance of developing programs to reduce internet use frequency and symptoms.

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