

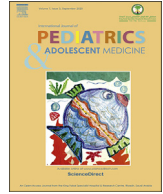
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## Adolescent internet addiction – role of parental control and adolescent behaviours

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## ABSTRACT

**Introduction:** Excessive Internet use can negatively affect academic performance, family relationships and emotional development among the youth. Such issues have been identified as Internet addiction (IA). We aimed to determine the prevalence of IA among Portuguese adolescents and assess how parental control can relate to IA.

**Methods:** An observational cross-sectional study was performed at public schools within a Portuguese region, using Young's Internet Addiction Test survey. General sociodemographic and emotional well-being data were obtained. A descriptive and bivariate analysis was done among Internet-addicted and average users, followed by a logistic regression analysis. Adjusted odds ratios (aORs) were computed with two-sided *P* values < .05 for statistical significance.

**Results:** A total of 1916 eligible responses were obtained. Mean age was 15 ± 1.8 years, with a slight predominance of female (53.3%) participants. In our sample, 16.5% were deemed Internet addicted and less likely to have any parental control over Internet use (aOR 0.74, *P* < .05). Moreover, 28% of the Internet-addicted users were less likely to have control over time spent online (aOR 0.72, *P* < .05), and close to half were unlikely to have online content restrictions (aOR 0.56, *P* < .01).

**Conclusions:** Our findings reported a significant rate of Internet-addicted youth. IA was negatively related to parental control. Whenever any kind of parental control over Internet use was reported, IA was less likely to occur. Healthcare professionals should be aware of the risks of IA in adolescents to improve its prevention and intervention.

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## 1. Introduction

Modern society has been following an exponential technological evolution during the past few decades, witnessing enhanced accessibility to information through Internet use [1]. The Internet has become such an integral part of our social, professional, and academic life, among others, that its excessive consumption has raised concerns about potential harmful health-related

consequences [2]. It is estimated that nearly 75% of European adolescents spend up to 4 h a day on online activities [3,4]. Therefore, adolescents and young adults are at a higher risk of excessive use owing to multiple factors such as peer rejection and alienation [5]. Evidence also suggests that adolescents have not entirely developed their critical thinking skills and sense of boundaries, thus being more susceptible to addiction [6]. Furthermore, excessive Internet use has been reported to negatively affect academic performance, family relationships and emotional development among the youth. Excessive use issues, when associated with other symptoms of tolerance or salience, have been identified as Internet addiction (IA) [6,7].

IA was first mentioned by Kimberly Young in 1996 and has ever since been challenged with regard to its definition. Although

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research on this subject has soared during the last decade, classification of IA remains controversial, with empirical studies providing inconsistent criteria to define IA [8]. More to the point, no gold standard assessment tool has yet emerged [9]. It remains, however, consensual that IA is a problematic behaviour not to be ignored. Different scales have been used to assess IA, of which Young's Internet Addiction Test is one of the most used and accepted [3]. Several studies using this scale have shown the negative impact of IA in adolescents' psychosocial development [10,11]. Many of these adolescents are known to have low self-esteem, be less outgoing and adapt less well socially [12]. It has also been stated that the family environment may present as an important factor for IA [13]. Factors such as permissive parenting, harsh discipline, and parent–child conflicts increase the risk of IA [5]. One important factor, with contradictory findings in the literature, is the role of parental control over Internet use. Giles and Price [14] reported a positive correlation between motherly parental control and IA, whereas a more recent Chinese study showed that behavioural aspects of parental control actually reduce the risk of adolescent IA [15]. With regard to family activities such as mealtimes, one study pointed out that Internet-addicted adolescents are more prone to snack in front of the computer [7], but no other references to being online while having a meal were made.

As these issues are a growing concern among the youth, identification of contributing factors is fundamental to improve mechanisms of prevention and intervention. Hence, the goals of our study were as follows: 1) To determine the prevalence of IA among adolescents from the Cova da Beira region, Portugal; 2) To assess how parental control and other psychosocial factors are related to IA among the same group.

## 2. Methodology

### 2.1. Study design and sample

An observational and analytical cross-sectional survey-based study was performed in Cova da Beira region public schools. Both elementary and secondary school students from grades 7 through 12 were invited to participate. Approval from the Portuguese Ministry of Education and the Portuguese Data Protection Authority was obtained before the beginning of the study. Written consent was obtained from all participants or, where needed, from their legal guardians. Participating students were asked to fill in a questionnaire under their class teacher's supervision. The questionnaire had three different sections. The first section addressed sociodemographic factors, health-related questions and lifestyle habits regarding Internet usage in and out-of-school. The second and third sections consisted of two scales that approached general well-being and IA risk. Students who did not get/return a signed consent form and those older than 18 years and 365 days were excluded from the study. Data were collected between September and October 2017.

### 2.2. Data analysis

IA was assessed using a previously validated Portuguese version of Young's Internet Addiction Test (IAT) [2], which consisted of 20 questions with possible answers ranging from '1' (never) to '5' (always), together with the 'not applicable' option of '0' [2]. The maximum possible score was 100, with higher values indicating greater risk from Internet usage. Following an update of the original suggested cut-off criteria [2], it was possible to define four categories of IA risk: normal range (0–30), mild addiction (31–49), moderate addiction (50–79) and severe addiction (80–100). However, as no clinical or empirical cut-off criteria for the IAT have

yet been validated, studies have proposed an alternate categorisation including average Internet users (IAT 0–50) and Internet-addicted users (IAT 51–100) [3,16], which we have also decided to use. Regarding the IAT, the collected data produced a highly consistent internal reliability (Cronbach's  $\alpha = 0.85$ ).

We also assessed emotional individual well-being through the World Health Organization's Five Well-being Index (WHO-5), where we considered a score <13 to indicate a poor well-being [16,17].

General sociodemographic data were obtained alongside specific psychosocial variables (Table 1). Adequate amount of sleeping time during weekdays was classified according to the American Academy of Pediatrics' endorsed guidelines and presented as recommended, or less than recommended [18]. Parental behaviour was assessed by asking participants whether their parents controlled overall Internet use, as well as online time, and online-viewed content. Moreover, as the youth are known to be media multitaskers [16,19] we enquired about which devices they used online. Six answers were considered: computer, console, smartphone, tablet, television and other. Responses were dichotomised into 1 or 2 devices, and more than 2 devices as previously done [16]. Lastly, participants were asked about their own and their relatives' Internet use during family mealtimes.

A descriptive analysis was initially performed, followed by a bivariate analysis comparing 'average users' to 'Internet-addicted users'. Continuous data were assessed with Student *t*-test and presented as means, whereas categorical variables were presented as percentages and compared across groups using Pearson *chi-square* test. Statistical significance was found for *P* value <.05.

Second, we used a logistic regression model with an initial univariate screening of each covariate. Statistically or clinically relevant variables were then included in a multivariate hybrid logistic regression model, using both forward selection and backward elimination of variables whose *P* value <-.25 [20]. Adjusted odds ratios (aORs) with 95% confidence intervals (95% CIs) were computed accordingly, and the model fit was evaluated with the Hosmer–Lemeshow statistic. The predefined 'average users' group was applied as the basis of comparison for all statistical analyses undertaken. Two-sided *P* values <.05 were used for statistical significance. Analyses were conducted using STATA® v14.0.

## 3. Results

### 3.1. General descriptive analysis

A total of 1916 eligible responses were obtained. Mean age was  $15 \pm 1.8$  years, with a slight predominance of female (53.3%) participants. Students' households were mostly constituted by a nuclear family (71.1%), followed by single-parent families (17.6%). Mothers not only were younger (44 vs 47 years) but also had a higher rate of graduate education levels than fathers (39 vs 35%). Most students were at the secondary school level (59%), and nearly 27% had at least one grade retention. Moreover, 46% of students reported not practising any extracurricular sports activities. When asked about their sleeping habits, the majority (91%) self-reported not having problems with sleep, with approximately 45% having any given online activity at bedtime. In the same line, 41% of students were found not to sleep a recommended amount of time.

### 3.2. Internet addiction and psychosocial behaviours

The results showed a 16.5% rate of IA, with a mean average IAT score of  $39 \pm 12$  (results not shown). At the bivariate level, between average users and Internet-addicted users, a higher prevalence of both male (52.8%, *P* < .05) and older adolescents (15.2 years, *P* < .05)

**Table 1**  
Bivariate analysis comparing average users and Internet-addicted users.

	Average users (n = 1600)	Internet-addicted users (n = 316)	p
Sociodemographic variables			
Age (yrs.)	14.9 ± 1.8	15.2 ± 1.7	<.05
Gender (female, %)	54.5	47.2	<.05
Body mass index (%)			NS
Thinness	4	5	
Normal	81	76.7	
Overweight/obesity	15	18.3	
School level (%)			NS
Elementary	41.1	38.9	
Secondary	58.9	61.1	
Parental sociodemographic variables			
Mothers' age (yrs.)	44.3 ± 5.2	44.8 ± 6.2	NS
Mothers with higher degree of education (%)	40.1	34.8	NS
Fathers' age (yrs.)	47.1 ± 5.6	47.7 ± 6.3	NS
Fathers with higher degree of education (%)	35.7	31.3	NS
Psychosocial traits and behaviours			
Single-family structure (%)	16.6	23.1	<.01
Emotional well-being (poor, %)	20.9	29.1	.001
Grade retention (at least 1 year, %)	24.5	37.7	<.001
Befriends easily (%)	14.1	16.7	NS
Practises sport activities (%)	55	51	NS
Problems with sleeping (%)	8.4	12.6	<.05
Sleeps less time than recommended (%)	38.8	53.2	<.001
Internet use behaviours and parental control traits			
Internet use at bedtime (%)			<.001
No	42.5	20.6	
Yes	41.6	59.1	
No answer	15.9	20.3	
Use of Internet-connected devices (>2)	53.1	53.8	NS
Internet use during mealtimes (%)	4.3	18.1	<.001
Internet use by relatives during mealtimes (%)	7.7	15.5	<.001
Parental control over Internet use (%)	51.4	40.1	<.001
Parental control over time spent online (%)	41.5	30	<.001
Parental control over online-viewed content (%)	25.8	16.2	<.001

Data are reported as mean ± standard deviation, and group comparisons were performed using *Student t-test*. Categorical variables are presented as percentages and compared across groups using *Pearson chi-square* test. Abbreviations: NS, Non-significant.

was seen in the Internet-addicted users group. Adolescents who had a single-parent family structure, who had at least one grade retention and poor well-being were also more prevalent in the IA group (Table 1). Similarly, those who had sleeping problems, as well as those who slept for less time than recommended had a higher prevalence of IA. No significant differences were found with regard to parents' age or level of education, using more than 2 online devices, being thin, overweight, befriending easily or practising sports.

### 3.3. Internet addiction and parental control

Nearly 60% of the study population stated they used the Internet at bedtime. While the number of devices that adolescents used to access the Internet did not differ significantly among both groups, evidence of parental control (overall control, time spent online and online-viewed content) was less seen in the Internet-addicted users group.

In the same line, at the multivariate level, when checking for confounding clinical and statistical variables, Internet-addicted users were 26% less likely to have any kind of parental control over their Internet use (aOR 0.74,  $P < .05$ ). When addressing specific kinds of parental control, 28% of the Internet-addicted users were less likely to have control over time spent online (aOR 0.72,  $P < .05$ ), and nearly half were unlikely to have online-content restrictions (aOR 0.56,  $P < .01$ ), as shown in Table 2.

Adolescents' Internet use during familial mealtimes was significantly higher in the Internet-addicted users group, so much that there was a threefold increased risk of being addicted to the

Internet if this behaviour was reported (aOR 3.3,  $P < .001$ ). Moreover, when family members also used the Internet during mealtimes, the youth were twice as likely to be addicted to the Internet (aOR 1.95,  $P = .001$ ), as shown in Table 3.

## 4. Discussion

Our study assessed the prevalence of IA among adolescents, also reporting associations among personal, family, academic and behavioural patterns. The main findings in our study indicated a significant rate of adolescents addicted to the Internet, i.e. moderate-to-severe addiction (16.5%). This trend was slightly higher than the previously reported rates of IA, when using the same tool [9]. On the other hand, our results concur with a previous Portuguese study, on which IA prevalence was marginally higher (19%) using the same survey and *cut-offs* [3]. IA has more association with male gender [2,9] and poor academic performance [6], which was also perceived in our study. The former has been said to occur because of the nature of Internet use, as males engage more frequently in high-risk online behaviours such as retrieving inappropriate adult content, gambling or role-playing games [6]. However, these were not the subject of our study. On another note, sleeping behaviours have been linked to IA, with excessive use leading to less hours of sleep [3,16]. Our findings also corroborated this, with Internet-addicted adolescents sleeping for less time than average users. As Internet-addicted users have a higher risk of accessing the Internet at any given time or place, even at bedtime, this type of behaviour can lead to less hours of sleep, and, consequently, sleeping problems [16]. The use of several devices to access

**Table 2**Multivariate analysis for each type of parental control individually using average users as the reference group (aOR, 95% CI)<sup>a</sup>.

	Internet-addicted users	P value
Parental control over Internet use	0.74 [0.55–0.99]	<0.05
Parental control over time spent online	0.72 [0.54–0.98]	<0.05
Parental control over online-viewed content	0.56 [0.38–0.82]	<0.01

<sup>a</sup> Controlling for age, gender, school level, grade retention, Internet use at bedtime, sleeps less time than recommended, poor well-being, single-family structure, mothers with a higher education level, fathers with a higher education level, befriends easily, practises sport activities.

**Table 3**Multivariate analysis according to who uses Internet during family-shared activities, individually, using average users as the reference group (aOR, 95% CI)<sup>a</sup>.

	Internet-addicted users	P value
Internet use by adolescents during mealtimes	3.3 [2.12–5.04]	<.001
Internet use by relatives during mealtimes	1.95 [1.29–2.94]	.001

<sup>a</sup> Controlling for age, gender, school level, grade retention, Internet use at bedtime, sleeps less time than recommended, poor well-being, single-family structure, mothers with a higher education level, fathers with a higher education level, befriends easily, overall parental control, parental control over time spent online, parental control over online-viewed content.

the Internet has also been related to sleeping for less time and increasing the risk of addiction [16], but in our study, no difference was found between groups, when using more than 2 online devices.

In concurrence with our findings, adolescents in a single-family structure have been linked to a higher risk of IA [16], which could relate to household conditions being highly influential factors in IA [21]. When addressing a correlation between poor well-being and IA, increased time in online activities has been related to a poorer self-perceived overall health [16], which is in the same line of our results.

In our study, IA has also been found to be negatively related to parental control. In fact, when students reported having any kind of parental control over their Internet use, IA was less likely to occur. Although not many studies specifically address parental control and IA among adolescents, our results are in line with previous studies. In one study [15], which compared two aspects of parental control of Internet use – behavioural (solicitation and restriction) and psychological control (guilt induction, love withdrawal) – a benefit of the behavioural control was seen towards a healthier Internet use. On the other hand, psychological control was shown to increase IA through mediating effects on self-control. In our study, only behavioural aspects were assessed through participants' self-reports, indicating a similar result. However, further studies are needed to clarify the effects of different parental control patterns. Another study that approached parental monitoring and leisure boredom on adolescents' IA concluded that monitoring may deter adolescents from becoming addicted to the Internet [22]. Furthermore, in those who had parental monitoring, leisure boredom was less seen, likely due to an increased motivation to participate in family activities [22]. Although the extent to which activities were motivated, or not, by parents was not explored in our study, we sought to understand the impact of Internet use by family members at gatherings such as mealtimes. As follows, we reported a near-twofold increased risk of being addicted to the Internet should any family member use the Internet at mealtimes, as well as a threefold increase if the adolescent also used it in the same setting, regardless of another family member usage. To the best of our knowledge, no other studies approached the use of the Internet at mealtimes with or without family members. However, one study mentioned that IA caused adolescents more likely to skip meals entirely or eat them in front of the computer, thus neglecting family time [7]. These aspects of IA should be more thoroughly studied to

assess the relationship between family time and a healthier use of the Internet.

The limitations to our study include its cross-sectional design, which means causal inferences cannot be clearly established. Second, as this was a survey-based study with self-reported answers, a response bias needs to be considered. The strengths of our study include the use of a large representative sample of adolescents within our region, the use of a widespread tool to ascertain IA and, finally, control for confounding covariates in the statistical analysis.

In conclusion, all healthcare professionals dealing with adolescents should be aware of the increasing online and social media platforms emerging nowadays, as well as the risk of IA. Physicians can guide parents towards a healthier control of their children's Internet use. Using non-conflictual time and content restriction may help reduce IA. In addition, stimulating social, extracurricular and family activities may also balance a better use of the Internet. Studies similar to ours are lacking in Portugal, especially in non-metropolitan demographic areas of the country. This is an important step to characterize such a population and to raise awareness on prevention actions to decrease IA.

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### Ethical statement

Upon submission of the manuscript entitled “**Adolescent Internet Addiction – Role of parental control and adolescent behaviours**” by Miguel Vieira Martins, Adriana Formiga, Constança Santos, Diana Sousa, Carla Resende, Ricardo Campos, Natália Nogueira, Paula Carvalho and Sofia Ferreira, we confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with regard to intellectual property. In so doing, we confirm that we have followed the regulations of our institutions concerning intellectual property.

We further confirm that any aspect of the work covered in this manuscript that has involved either experimental animals or human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within

the manuscript.

### Author declaration

Upon submission of the manuscript entitled “**Adolescent Internet Addiction – Role of parental control and adolescent behaviours**” by Miguel Vieira Martins, Adriana Formiga, Constança Santos, Diana Sousa, Carla Resende, Ricardo Campos, Natália Nogueira, Paula Carvalho and Sofia Ferreira, we confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of the authors.

We understand that the corresponding author is the sole contact for the editorial process. He is responsible for communicating with the other authors about the progress, submissions of revisions and final approval of proofs. We confirm that we have provided a current, correct email address that is accessible by the corresponding author and that has been configured to accept email from [miguelmartins@campus.ul.pt](mailto:miguelmartins@campus.ul.pt).

### Declaration of competing interest

Upon submission of the manuscript entitled “**Adolescent Internet Addiction – Role of parental control and adolescent behaviours**” by Miguel Vieira Martins, Adriana Formiga, Constança Santos, Diana Sousa, Carla Resende, Ricardo Campos, Natália Nogueira, Paula Carvalho and Sofia Ferreira, we wish to confirm that there are no known conflicts of interest associated with this publication and that there has been no significant financial support for this work that could have influenced its outcome.

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### Supplementary data

Supplementary data to this article can be found online at

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