

Chapter 12

Individual Differences and the Development of Internet Addiction: A Nationally Representative Study

Mirna Macur

National Institute of Public Health, Slovenia

Halley M. Pontes

Nottingham Trent University, UK

ABSTRACT

Internet addiction (IA) has emerged as a universal issue, but its international estimates vary due to different screening instruments and different samples. The present study aims to estimate the risk of IA in a school-based nationally representative sample of Slovenian adolescents and ascertain the interplay between IA, sociodemographic factors, free-time activities, self-control, and perceived satisfaction with life. Overall, the present study found that adolescents at greater risk for developing IA tend to be more passive in their free time, since they watch TV and play video games more than their peers, as well as chat on social media. Adolescents presenting high risk of IA displayed poorer levels of self-control in most cases and reported to be generally less satisfied with their lives in comparison to adolescents presenting low risk of IA.

INTRODUCTION

Background

The Internet is an integral part of modern life that has brought about many advantages and benefits to its users. The Internet plays a key role as an essential tool for education, entertainment, communication, and information-sharing (Poli, 2017) with recent figures showing that the numbers of users are soaring to greater heights. Currently, around 40% of the world population has Internet access (Internet Live Stats

DOI: 10.4018/978-1-5225-3477-8.ch012

[ILS], 2017a), and from 1999 to 2013, the number of Internet users has increased tenfold during that period, with the first billion of users being reached in 2005 and the third billion in 2014 (ILS, 2017a). The use of the Internet varies across different world regions, with Asia (i.e., 48.4%), Americas (North and South) (i.e., 21.8%), and Europe (19%) presenting the largest number of users in the world. Given its ubiquity and wide applicability, alongside its evolving nature as a modern tool of society and issues surrounding its excessive and unhealthy use by a minority of individuals, Internet addiction (IA) has become an increasingly important topic for dedicated research agendas in the field of psychology, psychiatry, neuroscience, and communication studies (Pontes, Kuss, & Griffiths, 2015).

Although IA is currently not officially recognized as a *bona fide* addiction and terminological and conceptual conundrums still exist with regards to its legitimacy (Griffiths, Kuss, Billieux, & Pontes, 2015; Pies, 2009; Starcevic, 2010, 2013; Starcevic & Aboujaoude, 2016), a large body of research suggests that IA can lead to impaired psychosocial and physical health and detrimental interpersonal outcomes (M'hiri et al., 2015; Pontes, Kuss, et al., 2015). Notwithstanding the fact that conceptualization and definition of IA is not entirely consensual, several features have been suggested as being part of the experience related to IA. For instance, Starcevic (2010) suggested that IA is often described as “excessive or compulsive, along with preoccupation with and loss of control over the Internet use” (p. 92), with additional features including adverse consequences due to spending copious amount of time on the Internet, such as neglecting social activities, relationships, health and work or school-related duties, and altering sleep and eating habits in a detrimental way (Starcevic, 2010). Furtherly, Pontes and Kuss (in press) defined IA as “behavioral pattern of Internet use encompassing a dysfunctional craving for the use of the Internet for unregulated and excessive periods of time with accompanying significant psychosocial and functional impairments that are not accounted for by any other disorder.” (p. 2).

The field of IA is rapidly evolving, and the latest developments in research helped shaping the conceptualization landscape of IA and new theoretical insights were provided by emerging empirical research. Accordingly, a recent study by Pontes and Griffiths (2017) on a large sample of Internet users found that the concept of IA could be adequately captured and operationalized using the diagnostic framework for Internet Gaming Disorder (IGD) that was developed by the American Psychiatric Association [APA] in the latest (fifth) edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) (APA, 2013). Based on this, the study by Pontes and Griffiths (2017) found that under these theoretical premises, the phenomenon of IA can be defined by four unique and distinct conceptual dimensions, with these being: (i) *escapism and dysfunctional emotional coping*, (ii) *withdrawal symptoms*, (iii) *impairments and dysfunctional self-regulation*, and (iv) *dysfunctional Internet-related self-control*. Additional empirical research by Pontes and Griffiths (2016) have further corroborated the validity and feasibility for conceptualizing and framing IA in light of the IGD diagnostic criteria, an approach that has been backed up by several scholars in the field (e.g., Rumpf et al., 2015).

Earlier views on the topic defined IA as an ‘umbrella term’ encompassing five specific sub-types of IA. These five sub-types of IA were described by (i) ‘*cybersexual addiction*’ (i.e., compulsive use of adult contents for sexual purposes), (ii) ‘*cyber-relationship addiction*’ (i.e., overinvolvement in online relationships), (iii) ‘*net compulsions*’ (i.e., obsessive online gambling, shopping, or online trading), (iv) ‘*information overload*’ (i.e., compulsive web surfing or database searches), and (v) ‘*computer addiction*’ (i.e., obsessive computer game playing) (Young, Pistner, O’Mara, & Buchanan, 1999). According to recent empirical research (e.g., Griffiths & Szabo, 2014; Pontes, Szabo, & Griffiths, 2015), the concept of IA as an ‘umbrella term’ is problematic as it fails to take into account the focus of the object of ad-

Individual Differences and the Development of Internet Addiction

diction (e.g., gambling, videogaming, social networking, sex, work, shopping, etc.), further supporting early theoretical insights from the late 1990s suggesting that most Internet users spending excessive amounts of time on the Internet are not addicted to the medium itself, but use the Internet to fuel other specific addictions (i.e., most people have addictions *on* the Internet rather *to* it) (Griffiths, 1999, 2000).

Notwithstanding these inconsistencies and heterogeneity issues present in the conceptualization and assessment of IA, investigating the incidence and prevalence rates of IA in the general population is paramount to assessing the demand for consulting, treatments, and preventive measures as a consistent body of emerging research has shown that IA affects a small minority of Internet users (Griffiths, Pontes, & Kuss, 2016). Additionally, robust epidemiological studies on the prevalence rates of IA are still scarce and this type of research can facilitate further research and promote a better understanding of how IA may impact on societies. Pontes, Kuss, et al. (2015) recently reviewed the prevalence rates of IA across a number of nationwide representative studies and found that prevalence rates of IA can range from 1% to 18.7% according to the age of participants assessed, the cultural background in which studies are conducted, and also the type psychometric instrument and diagnostic approach utilized to assess IA.

Internet-Use and Related Behaviors in Slovenia

According to recent figures, Internet use in Slovenia is steadily increasing. The ILS (2017b) has reported that in 2016, 72% of the total population in Slovenia had Internet access. The Slovenian Statistical Office reported that 97% of individuals with ages between 16 to 24 years used the Internet in the last 12 months in 2016, this average is highly compared to the average in the European Union for this particular age group (Zupan, 2017).

Despite the growth of Internet use in Slovenia, little research on IA has been carried out in Slovenia. Jeriček (2001, 2002) conducted an early study on IA in a large sample ($N = 1.194$) of 3rd year high school adolescents in Ljubljana and found that around 3.7% of the sample exhibited high levels of IA symptoms. Jeriček (2001, 2002) investigated the differences amongst a high-severity IA group (i.e., total scores of 4 and 5, 10% of the total sample) and a low-severity IA group (i.e., total scores of 1 and 2, 10% of the total sample) and found that differences emerged with regards to these two types of users in terms of time spent on the Internet, place of Internet use, and school performance with gender and type of school being found to be key predictors of IA (Jeriček, 2001, 2002). Later in 2004, Šimek (2004) conducted a similar study on a smaller sample of adolescents from Maribor ($N = 622$) and found a prevalence rate of IA of 1.8% in the sample. Although these studies were important in promoting research on IA, the findings reported across these studies are not directly comparable as different approaches in the psychometric assessment (e.g., screening tools and cutoff points) of IA were employed.

Further research on IA was conducted by Primožič (2009) where the author examined the role of IA and emotional instability in a small sample of Internet users ($N = 381$). The findings of Primožič's (2009) study suggested that emotional instability was a risk factor predicting IA, and that individuals exhibiting greater preference for online social interactions were more prone to develop IA. More recently, two nationwide studies on IA in Slovenia were published, and prevalence rates of IA were found to be 3.1% in individuals with at least 18 years in one study (Macur, Király, Maraz, Nagygyörgy, & Demetrovics, 2016) and 3.8% in individuals with at least 15 years old another one (Macur, 2017). In Slovenia, Internet addicts tend to be male, not in a romantic relationship, and being highly educated (i.e., University degrees) and additional risk factors such as young age, unemployment status, and not

being able to work due to health reasons have been identified as potential risk factor for IA in Slovenian samples (Macur et al., 2016).

Since research on IA is still on its infancy in Slovenia and that the field lacks robust findings from epidemiological studies carried out in nationally representative samples, the present study aims to: (i) estimate the risk of IA in a school-based nationally representative sample of Slovenian adolescents and (ii) ascertain the interplay between IA, sociodemographic factors, free-time activities, self-control, and perceived satisfaction with life.

METHOD

Sample and Procedures

This study was part of the project “*Healthy Lifestyle of Children and Youth Through the Empowerment of Youth Workers and the Establishment of Programs on a Local Level*” financed by Norway Grant and conducted by the National Institute of Public Health and NGO No Excuse. A total sample of 1.672 adolescents (Mean age = 18.2 years, SD = 1.3 years; 57% female) was randomly sampled from different schools and educational levels (see Table 1.) across the country representing the population of final year students in Slovenian high schools from various Nomenclature of Territorial Units for Statistics (NUTS3) regions. The sample reflected four high school programmes and 12 statistical regions in Slovenia. Schools were contacted and asked to participate in the study, and students were invited to fill out the study’s questionnaire with the help of research assistants. Data were collected using the schools’ computers (n = 1.130) in addition to paper-and-pencil data collection methods (n = 542). The data was cleaned and cases with severe missing values were excluded from the study, resulting in a total of 76 cases being removed. Weights were added in order to accurately represent the structure of the population (see Table 1.). In Slovenia, secondary schools fall into one of four different programmes: general education is acquired in gymnasium (i.e., four-year programme), technical education is acquired in four-year upper secondary technical education programmes; there is also a three-year vocational training (i.e. upper secondary vocational programme) that does not allow graduates to enter faculty programmes. If they students wish to continue studying at the faculty level, they need to finish a two-year short upper secondary vocational programme (fourth and fifth years of secondary school for them). The sample of the present study consisted of fourth year gymnasium students, fourth year technical education pro-

Table 1. The sample structure (N = 1.595)

<i>Educational Programme</i>	Eastern Slovenia		Western Slovenia		Samples
	n	%	n	%	N
Upper secondary vocational	163	58.0%	118	42.0%	281
Upper secondary technical education	311	55.5%	249	44.5%	560
General education - gimnazija	252	43.4%	329	56.6%	581
Short upper secondary vocational	95	54.9%	78	45.1%	173
<i>Total</i>	821	51.5%	774	48.5%	1595

Individual Differences and the Development of Internet Addiction

grammes, third year upper secondary vocational programmes and fourth year short upper secondary vocational programmes.

In order to analyze the data collected, bivariate statistics with observable variables were used (e.g., chi-square tests and t-tests for independent samples) to investigate IA in the present sample.

Measures

Data on the sample's sociodemographic characteristics (i.e., age, gender, type of a school programme, location of the school) and free-time activities were collected. Participants were asked to specify using a 5-point Likert scale (1: 'Never' to 5: 'Always') how they usually spend their free time by choosing between a series of activities such as: spending time with friends, watching television, playing videogames, using online social networking sites, reading books, musical activities (e.g., choir), and doing sports.

Frequency of Internet use was measured by asking participants about their time spent on the Internet for leisure purposes in weekdays (Monday to Friday) and weekends (Saturdays and Sundays).

Problematic Internet use and risk of IA was measured with the Problematic Internet Use Questionnaire Short-Form (PIUQ-SF-6) (Demetrovics et al., 2016). The PIUQ-SF-6 (Demetrovics et al., 2016) is a shorter version of the Problematic Internet Use Questionnaire (PIUQ) (Demetrovics, Szeredi, & Rózsa, 2008), which is a psychometric tool that has been shown to possess adequate psychometric properties across different samples (Koronczai et al., 2011, Demetrovics et al., 2016). The PIUQ-SF-6 assesses three dimensions of problematic Internet use (i.e., obsession, neglect, and control disorder) and was developed by selecting two items from each of the three PIUQ factors. The six PIUQ-SF-6 items can be responded on a 5-point Likert scale (from 'never' to 'always/almost always') to estimate the severity of problematic Internet use. Scores obtained in this scale can range from 6 to 30, with higher scores indicating increased problematic use. For the present study, a Slovenian translation of the PIUQ-SF-6 was carried out and the scale presented with adequate internal consistency (Cronbach's $\alpha = .82$).

Self-control was measured by seven items reflecting the tendency of low self-control. These items were based on previous studies (Cho, 2010; Rand, Stein, & Rand, 1998) and sample items include: "I wholeheartedly take part in exciting things even if I have to take an examination tomorrow", "I abandon a task once it becomes hard and laborious", "I am apt to enjoy risky activities", "I enjoy teasing and harassing other people", "I feel like I am a ticking time bomb", "I lose my temper whenever I get angry" and "I habitually don't do my homework". Responses were measured on a Likert scale from 1 ('Strongly agree') to 5 ('Strongly disagree'). This scale has been shown to measure self-control in adolescents adequately in recent similar studies (i.e., Kim & Kim, 2015), and the Slovenian version of this measure used in the present study was found to possess adequate levels of internal consistency (Cronbach's $\alpha = .72$).

Perceived life-satisfaction was measured by a single question asking participants to rate on a scale ranging from 1 ('Completely dissatisfied') to 10 ('Totally satisfied') how satisfied they were with their life. Greater scores were indicative of augmented levels of perceived life-satisfaction. This measure was employed in the present due to constraints related to time limits in the study.

RESULTS

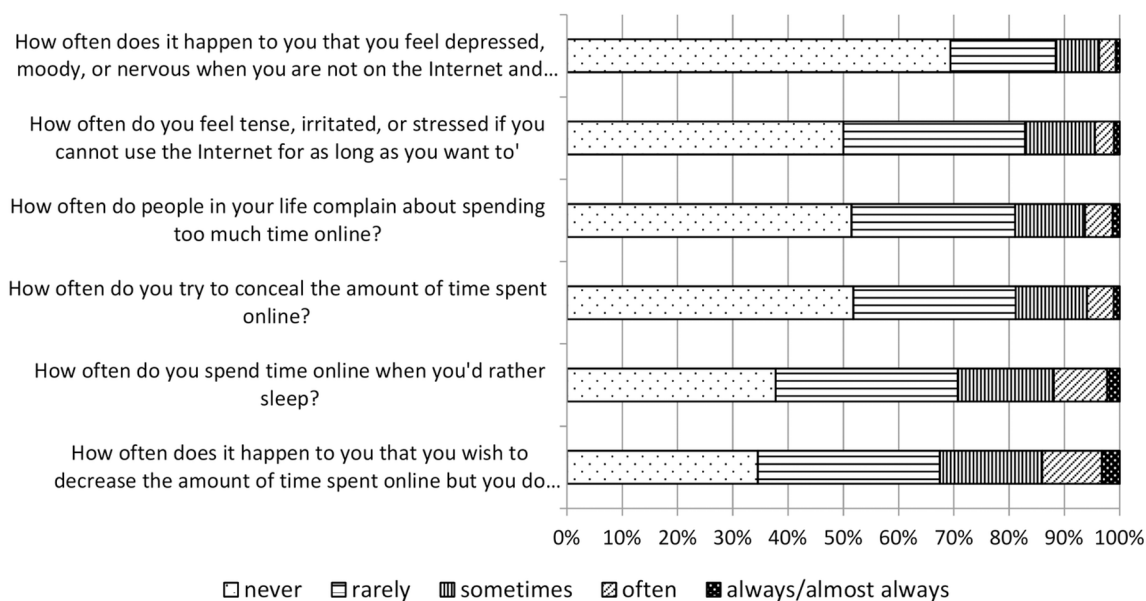
Problematic Internet Use Scale in Adolescent Sample

After having cleaned the data, results from the descriptive statistics analysis revealed that average time spent on the Internet for leisure purposes in the sample during the weekdays was 3.43 hours (SD = 2.74) and 3.94 hours (SD = 2.97) during the weekend. The two most endorsed symptoms of IA as measured by the PIUQ-SF-6 were ‘not being able to decrease the amount of time spent on the Internet’ (answers often & always/almost always combined 29.3%) and ‘spending time online instead of sleeping’ (27% of answers often & always/almost always) (see Figure 1.). The least endorsed symptom of IA was measured by the following PIUQ-SF-6 item: “How often does it happen to you that you feel depressed, moody, or nervous when you are not on the Internet and these feelings stop once you are back online?” with 69.3% of the sample having responded to this item as “never” and 19% “rarely”. In terms of the most endorsed PIUQ-SF-6 factor observed, “obsession” was the least pronounced factor in the sample while “control disorder” was the most salient factor.

Risk of IA and Descriptive Results

Overall, the results suggested that around 18.5% (95% CI:16.5%-20.5%; n = 260) of the sample presented with high risk for developing IA. Those individuals spent significantly more time on the Internet for leisure purposes on weekdays ($Mean_{IA} = 4.12, SD_{IA} = 2.93$) than non-problematic Internet users ($Mean_{non-ia} = 3.20, SD_{non-ia} = 2.62; t[298.9] = -4.16, p < .001$) and also on weekends ($Mean_{IA} = 4.83, SD_{IA} = 3.00; Mean_{non-ia} = 3.61, SD_{non-ia} = 2.80; t[1116] = -5.76, p < .001$). Furthermore, it was found

Figure 1. Distribution of answers in the scale assessing internet addiction



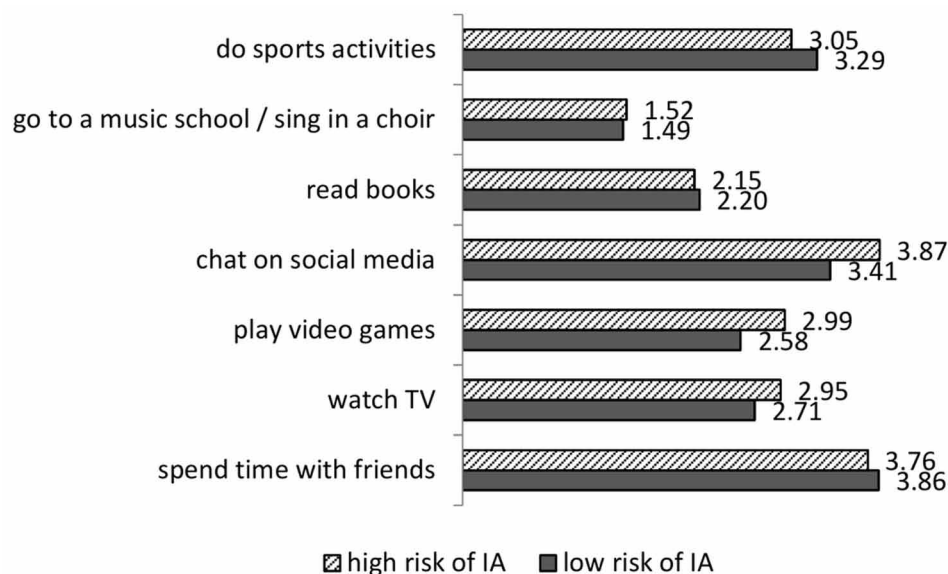
Individual Differences and the Development of Internet Addiction

that risk of IA did not differ across male and females ($\chi^2 = .040$; $df=1$; $p = .84$). The same result was found with regards to the different school programmes students were enrolled ($\chi^2 = 3.204$; $df=3$; $p = .36$). Nevertheless, rates concerning risk of IA were found to be significantly higher among students enrolled in upper secondary vocational programmes (i.e., 20.7%, $n = 50$) in comparison to short upper secondary vocational programmes (13.6%, $n = 20$).

Risk of IA and Free-time Activities

In regards to how IA affects free-time activities, the analysis revealed that key differences between the high risk and low risk of IA groups emerged (see Figure 2.). More specifically, participants in the high risk group devoted significantly more time watching television ($Mean_{IA} = 2.95$, $SD_{IA} = 1.01$) than the low risk group ($Mean_{non-ia} = 2.71$, $SD_{non-ia} = 0.97$; $t[1394] = -3.48$, $p = .001$), playing videogames ($Mean_{IA} = 2.99$, $SD_{IA} = 1.17$; $Mean_{non-ia} = 2.58$, $SD_{non-ia} = 1.13$; $t[1399] = -5.17$, $p < .001$) and using online social networking sites ($Mean_{IA} = 3.87$, $SD_{IA} = 0.96$; $Mean_{non-ia} = 3.41$, $SD_{non-ia} = 1.08$; $t[412.1] = -6.75$, $p < .001$). Additionally, adolescents pertaining to the high risk group reported doing less sports ($Mean_{IA} = 3.05$, $SD_{IA} = 1.13$) than their low risk counterparts ($Mean_{non-ia} = 3.29$, $SD_{non-ia} = 1.18$; $t[397.7] = 3.03$, $p = .003$). Finally, both groups did not differ in terms of how they usually spend time with friends ($Mean_{IA} = 3.76$, $SD_{IA} = 0.98$; $Mean_{non-ia} = 3.86$, $SD_{non-ia} = 0.86$; $t[353.8] = 1.43$, $p = .16$), reading books ($Mean_{IA} = 2.15$, $SD_{IA} = 1.01$; $Mean_{non-ia} = 2.20$, $SD_{non-ia} = 1.10$; $t[402.8] = 0.75$, $p = .45$), and engaging in musical activities ($Mean_{IA} = 1.52$, $SD_{IA} = 1.12$; $Mean_{non-ia} = 1.49$, $SD_{non-ia} = 1.11$; $t[1396] = -0.43$, $p = .67$).

Figure 2. Risk of internet addiction and specific free time activities(from 1 “never” to 5 “almost always/always”)



Risk of IA, Self-Control and Perceived Life-Satisfaction

The summary of the findings related to each aspect of self-control as measured by the seven items employed in this study is presented in Table 2. Overall, the most problematic aspect related to self-control in the sample was measured by the following items: “*I habitually don’t do my homework*” (Mean = 2.66, SD = 1.34) and “*I wholeheartedly take part in exciting things even if I have to take an examination tomorrow*” (Mean = 2.75, SD = 1.14). Table 2 shows that the high risk group displayed overall poorer levels of self-control in comparison to the low risk group, with the exception of one domain of self-control (i.e., ‘*I am apt to enjoy risky activities*’, Mean_{IA} = 2.91, SD_{IA} = 1.14; Mean_{non-ia} = 2.88, SD_{non-ia} = 1.16 $t[1359] = -0.45, p = .65$).

Finally, with regards to perceived general life satisfaction, participants belonging to high risk group (Mean_{IA} = 6.70, SD_{IA} = 2.26) reported to be generally less satisfied with their lives in comparison to adolescents in the low risk group (Mean_{non-ia} = 7.75, SD_{non-ia} = 1.85 group, $t[328.9] = 6.85, p < .001$).

Key Predictors of IA

A multiple linear regression analysis was carried in order to ascertain determine which variables mostly predicted risk of IA (measured by the total scores on the PIUQ-SF-6 score). Predictor variables were (i) watch TV during free-time, (ii) chat on social media during free time, (iii) ‘*to feel like a ticking time bomb*’ (self-control-related variable), (iv) life satisfaction, and (v) time spent on the Internet for leisure purposes on weekends (see Table 3.). Taken together, these predictors explained 14.7% of the total variance in students’ risk of IA ($R^2 = .147; F(2) = 37.52, p < .001$). Further analysis of each predictor’s contribution towards predicting risk of IA revealed that the strongest predictors (i.e., highest standardized beta coefficients) were related to high engagement in social media chats ($\beta = .17, p < .001$), (ii) life dissatisfaction ($\beta = -.16, p < .001$), and (iii) increased time spent on the Internet for leisure purposes on weekends ($\beta = .16, p < .001$).

Table 2. Independent Samples T-Test regarding risk of IA and self-control scores (ranging from 1 = “Strongly Agree” to 5 = “Strongly Disagree”)

	LRIA Mean (SD)	HRIA Mean (SD)	T-Test
I wholeheartedly take part in exciting things even if I have to take an examination tomorrow	2.78 (1.14)	2.63 (1.06)	$t[1370] = 1.98, p = .048$
I abandon a task once it becomes hard and laborious	3.36 (1.08)	2.96 (0.93)	$t[431.1] = 6.07, p < .001$
I am apt to enjoy risky activities	2.88 (1.16)	2.91 (1.14)	$t[1359] = -0.45, p = .654$
I enjoy teasing and harassing other people	3.84 (1.24)	3.54 (1.24)	$t[1366] = 3.48, p = .001$
I feel like I am a ticking time bomb	3.81 (1.23)	3.24 (1.13)	$t[401.8] = 7.18, p < .001$
I lose my temper whenever I get angry	3.36 (1.28)	2.95 (1.14)	$t[417.6] = 5.03, p < .001$
I habitually do not do my homework	2.69 (1.38)	2.47 (1.13)	$t[442.1] = 2.73, p = .007$

Note: LRIA: Low risk of Internet addiction and HRIA: High risk of Internet addiction.

Individual Differences and the Development of Internet Addiction

Table 3. Multiple regression analysis: Potential Internet addiction predictors = “Strongly Disagree”)

Coefficients	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	β		
(Constant)	10.742	0.789		13.61	< .0001
Watch TV in free-time	0.403	0.123	0.094	3.27	.001
Chat on social media in free-time	0.657	0.119	0.166	5.533	< .0001
I feel like I am a ticking time bomb	-0.37	0.104	-0.107	-3.568	< .0001
Satisfaction with life in general	-0.358	0.065	-0.165	-5.489	< .0001
Number of hours on the Internet for leisure purposes on weekends	0.231	0.044	0.158	5.283	< .0001

Note: Dependent Variable: Risk of Internet addiction as a continuous variable.

CONCLUSION

The aim of the present study was to provide new findings regarding IA from a country in which relatively little is known about this phenomenon. More specifically, this study sought to (i) estimate risk of IA in a school-based nationally representative sample of Slovenian adolescents and (ii) ascertain the interplay between IA, sociodemographic factors, free-time activities, self-control, and perceived satisfaction with life.

In terms of risk of IA, it was found that almost one in five (i.e., 18.5%, $n = 260$) participants presented high risk of IA. Participants displaying high risk of IA spent significantly more time on the Internet for leisure purposes in comparison to students classed as low risk of IA, which is in line with previous studies. Demetrovics, Szeredi and Rosa (2008) increased time spent on the Internet related to non-work purposes is more related to IA. The present study has also shown that IA was not affected by gender differences and school programmes in contrast to previous studies in Slovenia (e.g., Jeriček, 2001,2002). Moreover, the present study investigated risk of IA and not IA per se, which might explain the differences observed in comparison to previous research in Slovenia that have investigated IA and its clinical significance (Demetrovics, Szeredi & Rozsa, 2008).

The present findings appear to be in line with previous similar studies. For instance, a study conducted by Evren, Dalbudak, Evren, and Demirci (2014) using a representative sample of 4.957 Turkish 10th graders found that around 16% of the total sample presented with high risk of IA, which is highly comparable to the proportion of high risk IA adolescents found in the present study (i.e., 18.5%). Additionally, in terms of geographical regions, studies from Asia reported rates of IA among adolescents and young people ranging from 2.4 to 37.9% as reported by a review study (Durkee et al., 2012). Previous research on IA in Europe reported prevalence rates of IA ranging from 3.1 to 18.3% (Durkee et al., 2012). As aforementioned, discrepancies in prevalence rates of IA might be the result of different research methodologies, cultural backgrounds, sampling techniques and/or assessment approach.

The findings presented concerning the interplay between IA, sociodemographic factors, free-time activities, self-control, and perceived life satisfaction also add to the broader discussion about the role of individual differences on the potential development of IA. These findings are important as they go beyond traditional personality traits that have been found to be implicated in IA. Recent research on personality characteristics found that neuroticism is positively related to IA while extraversion, agreeableness, conscientiousness, and openness to experience are negatively associated to IA (Kayaş et al., 2016).

Although other studies have reported different results on the role of personality traits in the development of IA (e.g., Aboujaoude, 2017; Zadra et al., 2016), these findings illustrate the intricacies between several personality traits and their contribution to explaining addictive Internet use.

Notwithstanding this, the results of the individual differences variables in the present study indicated that key differences emerged between the high risk and low risk of IA groups. More specifically, participants presenting high risk for developing IA spent significantly more time watching television, playing videogames, and using online social networking sites in comparison to participants presenting low risk for developing IA. Taken together, these findings could potentially illustrate common clinical course and shared etiology between different types of addictive behaviors. Further, these results lend support to previous studies suggesting some underlying common risk factors between several technological addictions and related behaviors (Andreassen et al., 2016; Grant, Potenza, Weinstein, & Gorelick, 2010; Pontes, 2017; Robbins & Clark, 2015) and provide context to further understand why empirical studies often report positive associations between various addictive technological behaviors (Andreassen et al., 2016; Király et al., 2014; Pontes, 2017).

Another finding encountered in the present study related to the fact that participants in the high risk of IA engaged significantly less in sports in comparison to low risk participants and no significant differences emerged between the two groups in terms of how they usually spent time with their friends, read books, and participated in musical activities. A nationally representative study in Korea conducted by Heo, Oh, Subramanian, Kim, and Kawachi (2014) in a sample of 75,006 school-aged adolescents (13 to 18 years) revealed that IA was inversely associated to physical activity in the sample recruited while a more recent study conducted by Yayan, Arikan, Saban, and Özcan (2016) examining the relationship between IA and physical activities in a sample of 24,260 adolescents (11 to 15 years) found that adolescents engaging in exercise regularly exhibited lower levels of IA and social phobia. These results suggest that there is preliminary evidence indicating that IA can impair engagement in physical activities in adolescents, and that participation in exercise can also be used as a potential preventive strategy to curb levels of IA in the population.

The findings of the present study also suggest that IA may have differential effects across a wide range of social, leisure, and academic activities as no differences emerged between the high and low risk of IA groups in terms of spending time with friends, reading books, and engaging in musical activities. Future studies should investigate how IA may affect specific social, leisure, and academic activities as different effects were found in the present study. Although IA is generally associated with overall poor academic performance and achievement in adolescents (Dhir, Chen, & Nieminen, 2015; Jia, 2012; Kubey, Lavin, & Barrows, 2001; Stavropoulos, Alexandraki, & Motti-Stefanidi, 2013), the fact high risk of IA did not have a statistically significant effect on how often adolescents read books could be related to the fact that both groups of students dedicated significantly less time to read compared to other engagement in activities such as watching TV, playing videogames, chatting on social media, spending time with friends or engaging in sports activities.

Finally, with regards to self-control and overall life satisfaction, it was found that high risk of IA was associated to poor self-control and low levels of life satisfaction. In other words, adolescents exhibiting greater more symptoms of IA exhibited decreased levels of self-control and life satisfaction in comparison to adolescents presenting low risk of IA. These findings support previous small scale studies with non-probability samples that reported similar findings. Given the potential detrimental impact IA can have on adolescents, it is urgent to conduct further research to ascertain preventive factors that could

Individual Differences and the Development of Internet Addiction

boost adolescents' self-control and life satisfaction these factors may provide buffering effects against IA in adolescence.

Although the present study provided important insights on how IA may affect a wide range of experiences in school-aged adolescents, it is not without its limitations. First, the sample recruited had a very specific age range (from 14 to 25 years), thus it is unclear the findings encountered are generalizable to other age groups (e.g., children and elderly). Second, the use of self-report methodologies can be associated with several potential biases, such as social desirability and short-term recall biases which may have impacted on the results of the study. Despite these potential biases, the present study contributes to the ongoing discussion and field of IA by presenting timely and relevant data from a cultural background which relatively little is known, further allowing future studies to compare their findings with the ones reported in this study.

Taken as a whole, the findings of the present study draw attention to the problem of IA in adolescence and provides important insights into how IA may affect several aspects of life during this developmental stage. It is envisaged by the authors of this study that the findings reported will help progress the field towards a better understanding of IA as an emergent and less controversial clinical phenomenon.

ACKNOWLEDGMENT

Present work was funded by Norway Grant (Project nb: SI05-0007): <http://eeagrants.org/project-portal/project/SI05-0007>. The supporting agency had no role in the design and conduct of the study.

REFERENCES

- Aboujaoude, E. (2017). The Internet's effect on personality traits: An important casualty of the "Internet addiction" paradigm. *Journal of Behavioral Addictions, 6*(1), 1–4. doi:10.1556/2006.6.2017.009 PMID:28301969
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Arlington, VA: Author.
- Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Ståle, P. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors, 30*(2), 252–265. doi:10.1037/adb0000160 PMID:26999354
- Cho, Y. J. (2010). A longitudinal study on the Internet delinquency in adolescents: The use of a latent growth model. *Korean Journal of Youth Studies, 17*(6), 171–195.
- Demetrovics, Z., Király, O., Koronczai, B., Griffiths, M. D., Nagygyörgy, K., Elekes, Z., & Urbán, R. et al. (2016). Psychometric properties of the Problematic Internet Use Questionnaire Short-Form (PIUQ-SF-6) in a nationally representative sample of adolescents. *PLoS One, 11*(8), e0159409. doi:10.1371/journal.pone.0159409 PMID:27504915

- Demetrovics, Z., Szeredi, B., & Rózsa, S. (2008). The three-factor model of Internet addiction: The development of the Problematic Internet Use Questionnaire. *Behavior Research Methods*, *40*(2), 563–574. doi:10.3758/BRM.40.2.563 PMID:18522068
- Dhir, A., Chen, S., & Nieminen, M. (2015). A repeat cross-sectional analysis of the psychometric properties of the Compulsive Internet Use Scale (CIUS) with adolescents from public and private schools. *Computers & Education*, *86*, 172–181. doi:10.1016/j.compedu.2015.03.011
- Durkee, T., Kaess, M., Carli, V., Parzer, P., Wasserman, C., Floderus, B., & Bobes, J. et al. (2012). Prevalence of pathological internet use among adolescents in Europe: Demographic and social factors. *Addiction (Abingdon, England)*, *107*(12), 2210–2222. doi:10.1111/j.1360-0443.2012.03946.x PMID:22621402
- Evren, C., Dalbudak, E., Evren, B., & Demirci, A. C. (2014). High risk of Internet addiction and its relationship with lifetime substance use, psychological and behavioral problems among 10th grade adolescents. *Psichiatria Danubina*, *26*(4), 330–339. PMID:25377367
- Grant, J. E., Potenza, M. N., Weinstein, A., & Gorelick, D. A. (2010). Introduction to Behavioral Addictions. *The American Journal of Drug and Alcohol Abuse*, *36*(5), 233–241. doi:10.3109/00952990.2010.491884 PMID:20560821
- Griffiths, M. D. (1999). Internet addiction: Internet fuels other addictions. *Student BMJ*, *7*, 428–429.
- Griffiths, M. D. (2000). Internet addiction-time to be taken seriously? *Addiction Research*, *8*(5), 413–418. doi:10.3109/16066350009005587
- Griffiths, M. D., Kuss, D. J., Billieux, J., & Pontes, H. M. (2015). The evolution of Internet addiction: A global perspective. *Addictive Behaviors*, *53*, 193–195. doi:10.1016/j.addbeh.2015.11.001 PMID:26562678
- Griffiths, M. D., Pontes, H. M., & Kuss, D. J. (2016). Online addictions: Conceptualizations, debates, and controversies. *Addicta: The Turkish Journal on Addictions*, *3*(2), 1–20. doi:10.15805/addicta.2016.3.0101
- Griffiths, M. D., & Szabo, A. (2014). Is excessive online usage a function of medium or activity? An empirical pilot study. *Journal of Behavioral Addictions*, *3*(1), 74–77. doi:10.1556/JBA.2.2013.016 PMID:25215216
- Heo, J., Oh, J., Subramanian, S. V., Kim, Y., & Kawachi, I. (2014). Addictive Internet use among Korean adolescents: A national survey. *PLoS One*, *9*(2), e87819. doi:10.1371/journal.pone.0087819 PMID:24505318
- Internet Live Stats. (2017a). *Internet users*. Retrieved from: <http://www.internetlivestats.com/internet-users/>
- Internet Live Stats. (2017b). *Slovenia Internet Users*. Retrieved from: <http://www.internetlivestats.com/internet-users/slovenia/>
- Jeriček, H. (2001). Zasvojenost z internetom–sedanjost ali prihodnost. *Socialna Pedagogika*, *5*(2), 141–168.
- Jeriček, H. (2002). Internet i ovisnost o internetu u Sloveniji. *Medijska istraživanja*, *8*(2), 85-101.
- Jia, R. (2012). Computer playfulness, Internet dependency and their relationships with online activity types and student academic performance. *Journal of Behavioral Addictions*, *1*(2), 74–77. doi:10.1556/JBA.1.2012.2.5 PMID:26165309

Individual Differences and the Development of Internet Addiction

- Kayış, A. R., Satıcı, S. A., Yılmaz, M. F., Şimşek, D., Ceyhan, E., & Bakıoğlu, F. (2016). Big five-personality trait and internet addiction: A meta-analytic review. *Computers in Human Behavior*, *63*, 35–40. doi:10.1016/j.chb.2016.05.012
- Kim, J. E., & Kim, J. (2015). International note: Teen users' problematic online behavior: Using panel data from South Korea. *Journal of Adolescence*, *40*, 48–53. doi:10.1016/j.adolescence.2015.01.001 PMID:25621406
- Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., & Demetrovics, Z. et al. (2014). Problematic Internet use and problematic online gaming are not the same: Findings from a large nationally representative adolescent sample. *Cyberpsychology, Behavior, and Social Networking*, *17*(12), 749–754. doi:10.1089/cyber.2014.0475 PMID:25415659
- Koronczai, B., Urban, R., Kökönyei, G., Paksi, B., Papp, K., Kun, B., & Demetrovics, Z. et al. (2011). Confirmation of the Three-Factor Model of Problematic Internet Use on Off-Line Adolescent and Adult Samples. *Cyberpsychology, Behavior, and Social Networking*, *14*(11), 657–664. doi:10.1089/cyber.2010.0345 PMID:21711129
- Kubey, R. W., Lavin, M. J., & Barrows, J. R. (2001). Internet use and collegiate academic performance decrements: Early findings. *Journal of Communication*, *51*(2), 366–382. doi:10.1111/j.1460-2466.2001.tb02885.x
- M'hiri, K., Constanza, A., Khazaal, Y., Khan, R., Zullino, D., & Achab, S. (2015). Problematic Internet use in older adults, a critical review of the literature. *Addiction Research and Theory*, *6*(4), 1000253. doi:10.4172/2155-6105.1000253
- Macur, M. (2017). Can Internet use become problematic?: Presentation of Slovenian data. *International scientific conference Health Online - Book of papers with peer review and abstracts*. Retrieved from: http://www2.zf.uni-lj.si/images/stories/datoteke/Zalozba/Zdravje_na_spletu.pdf
- Macur, M., Király, O., Maraz, A., Nagygyörgy, K., & Demetrovics, Z. (2016). Prevalence of problematic internet use in Slovenia. *Zdravstveno Varstvo*, *55*(3), 202–211. doi:10.1515/sjph-2016-0026 PMID:27703540
- Pies, R. (2009). Should DSM-V designate “Internet addiction” a mental disorder? *Psychiatry (Edgmont)*, *6*(2), 31–37. PMID:19724746
- Poli, R. (2017). Internet addiction update: Diagnostic criteria, assessment and prevalence. *Neuropsychiatry*, *7*(1), 4–8. doi:10.4172/Neuropsychiatry.1000171
- Pontes, H. M. (2017). Investigating the differential effects of social networking site addiction and Internet Gaming Disorder on psychological health. *Cyberpsychology, Behavior, and Social Networking*. (under review)
- Pontes, H. M., & Griffiths, M. D. (2016). The development and psychometric properties of the Internet Disorder Scale-Short Form (IDS9-SF). *Addicta: The Turkish Journal on Addictions*, *3*(2), 1–16. doi:10.15805/addicta.2016.3.0102

- Pontes, H. M., & Griffiths, M. D. (2017). The development and psychometric evaluation of the Internet Disorder Scale (IDS-15). *Addictive Behaviors*, *64*, 261–268. doi:10.1016/j.addbeh.2015.09.003 PMID:26410796
- Pontes, H. M., & Kuss, D. J. (in press). *Internet addiction*. Göttingen, Germany: Hogrefe Publishing.
- Pontes, H. M., Kuss, D. J., & Griffiths, M. D. (2015). Clinical psychology of Internet addiction: A review of its conceptualization, prevalence, neuronal processes, and implications for treatment. *Neuroscience and Neuroeconomics*, *4*, 11–23. doi:10.2147/NAN.S60982
- Pontes, H. M., Szabo, A., & Griffiths, M. D. (2015). The impact of Internet-based specific activities on the perceptions of Internet addiction, quality of life, and excessive usage: A cross-sectional study. *Addictive Behaviors Reports*, *1*, 19–25. doi:10.1016/j.abrep.2015.03.002
- Primožič, A. (2009). *Zasvojenost z internetom (Bachelor thesis)*. University of Ljubljana. Retrieved from <http://dk.fdv.uni-lj.si/diplomska/pdfs/primozic-anze.pdf>
- Rand, D. L., Stein, J. A., & Rand, S. T. (1998). Reliability and validity of a self-control measure: Rejoinder. *Criminology*, *36*(1), 175–182. doi:10.1111/j.1745-9125.1998.tb01245.x
- Robbins, T. W., & Clark, L. (2015). Behavioral addictions. *Current Opinion in Neurobiology*, *30*, 66–72. doi:10.1016/j.conb.2014.09.005 PMID:25262209
- Rumpf, H.-J., Bischof, G., Bischof, A., Besser, B., Meyer, C., & John, U. (2015). *Applying DSM-5 criteria for Internet Gaming Disorder for the broader concept of Internet addiction*. Paper presented at the 2nd International Conference on Behavioral Addictions, Budapest, Hungary.
- Šimek, D. (2004). Odvisnost od interneta. In *Vzgoja in izobraževanje v informacijski družbi: zbornik referatov* [Education in information society: conference proceedings]. Ljubljana: Ministrstvo za šolstvo, znanost in šport.
- Starcevic, V. (2010). Problematic Internet use: A distinct disorder, a manifestation of an underlying psychopathology, or a troublesome behaviour? *World Psychiatry; Official Journal of the World Psychiatric Association (WPA)*, *9*(2), 92–93. doi:10.1002/j.2051-5545.2010.tb00280.x PMID:20671892
- Starcevic, V. (2013). Is Internet addiction a useful concept? *The Australian and New Zealand Journal of Psychiatry*, *47*(1), 16–19. doi:10.1177/0004867412461693 PMID:23293309
- Starcevic, V., & Aboujaoude, E. (2016). Internet addiction: Reappraisal of an increasingly inadequate concept. *CNS Spectrums*, 1–7. doi:10.1017/S1092852915000863 PMID:26831456
- Stavropoulos, V., Alexandraki, K., & Motti-Stefanidi, F. (2013). Recognizing internet addiction: Prevalence and relationship to academic achievement in adolescents enrolled in urban and rural Greek high schools. *Journal of Adolescence*, *36*(3), 565–576. doi:10.1016/j.adolescence.2013.03.008 PMID:23608781
- Yayan, E. H., Arikan, D., & Saban, F., N. G. B., & Özcan, Ö. (2016). Examination of the correlation between Internet addiction and social phobia in adolescents. *Western Journal of Nursing Research*, 1–15. doi:10.1177/0193945916665820 PMID:27561297

Individual Differences and the Development of Internet Addiction

Young, K. S., Pistner, M., O'Mara, J., & Buchanan, J. (1999). Cyber disorders: The mental health concern for the new millennium. *Cyberpsychology & Behavior*, 2(5), 475–479. doi:10.1089/cpb.1999.2.475 PMID:19178220

Zadra, S., Bischof, G., Besser, B., Bischof, A., Meyer, C., John, U., & Rumpf, H.-J. (2016). The association between Internet addiction and personality disorders in a general population-based sample. *Journal of Behavioral Addictions*, 5(4), 691–699. doi:10.1556/2006.5.2016.086 PMID:28005417

Zupan, G. (2017). *16-24-year-olds and Safer Internet Day*. Statistical Office of the Republic of Slovenia. Retrieved from <http://www.stat.si/StatWeb/en/News/Index/6478>

KEY TERMS AND DEFINITIONS

Addiction: Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry that leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors.

Behavioral Addictions: Any non-chemical behavior (e.g., gambling, work, sex, videogame playing, etc.) that contains all following six specific addictive features: salience, mood modification, tolerance, withdraw, conflict and relapse and causes several significant impairments in various domains of a person's life.

Internet Addiction: A behavioural addiction and umbrella term used to characterized generalized excessive or poorly controlled preoccupation, urges, and/or behaviors regarding Internet use that lead to significant psychosocial impairment or distress in several life domains.

Problematic Internet Use: A construct usually situated by cognitive-behavioral researchers in the middle range of the continuum of problem severity and emphasizes the mild, benign nature of related negative outcomes (e.g., truancy, foregoing a social event). Problematic Internet Use comprises a distinct pattern of Internet-related cognitions and behaviors related to Internet use that are not linked to any specific content as individuals may develop problems due to the unique communicative context of the Internet.

Satisfaction With Life: refers to a cognitive judgment and a global assessment of a person's quality of life according to his/her chosen criteria. Judgements of satisfaction are usually dependent upon a comparison of one's circumstances with what is thought to be an appropriate standard.

Self-Control: A construct that reflects a person's ability to exert control over the self by the self. That is, self-control is said to occur when a person attempts to change the way he or she would otherwise think, feel, or behave.