AN EXPLORATORY STUDY ON INTERNET ADDICTION, SOMATIC SYMPTOMS AND EMOTIONAL AND BEHAVIORAL FUNCTIONING IN SCHOOL-AGED ADOLESCENTS

Rita Cerruti, Valentina Spensieri, Fabio Presaghi, Carmela Valastro, Andrea Fontana, Vincenzo Guidetti

Abstract

Objective: In the last two decades there has been a significant transformation regarding the use of new technologies. Despite growing acknowledgement concerning the different activities and functions of digital technologies, there remains a lack of understanding on how technology overuse may negatively impact both physical and psychosocial well-being. Although researchers have begun to explore the meaning and implications of excessive Internet use in non-clinical populations of children and adolescents, there is still little consistent knowledge on the topic.

This study aimed to extend existing knowledge on the excessive use of the Internet among school-aged adolescents, focusing on its association with recurrent somatic symptoms, depressive risk and behavioral and emotional problems.

Method: Two hundred and forty adolescents (51.9% females) aged between 10 and 15, participated in this study. Data was collected using the Children's Somatization Inventory, the Internet Addiction Test, the Children's Depression Inventory, the Youth Self Report and the Emotion Regulation Questionnaire. Structural Equation Model analysis was used to analyse the data.

Results: Approximately 21.8% of participants reported excessive Internet use based on Young's criteria. Higher levels of Internet use were associated with somatic and depressive symptoms as well as emotional and behavioral problems. Depressive Symptoms predicted both Internet Addiction (b = 0.304, p < 0.001) and Internalizing (b = 0.542, p <0.001) and Externalizing problems (b = 0.484, p < 0.001). Internet Addiction also significantly predicted both Internalizing (b = 0.162, p = 0.02) and Externalizing problems (b = 0.183, p = 0.02). Finally, Structural Equation Modeling showed that the indirect effect of Depressive Symptoms (via Internet Addiction) on Internalizing or Externalizing problems were significant.

Conclusions: Longitudinal studies are needed to confirm these findings and to identify the mechanisms linking Internet use, somatic symptoms and adaptive functioning.

Key words: internet addiction, somatic symptoms, emotional problems, behavioural functioning, adolescents

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Declaration of interest: all of the Authors declare that they have no conflict of interest

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Introduction

Technological progress has led to a radical change in language and interactive modalities, the primary forms of self-expression and the ways in which we relate to our external reality. Today, it is possible to communicate more quickly and with more people.

The Internet has radically transformed and revolutionized communication, modifying how individuals interact in professional, learning and social settings. Consequently, it is an essential element of modern life and human interactions (Campanella et al. 2015). Although the Internet is one of the most accessible forms of media in the world, potential adverse effects are closely linked to its problematic use. Technological advances produce continuous changes in our daily lives with relevant effects on health, redefining the concept of normal and abnormal behavior (Scott et al. 2016). Recent research has shown that the excessive use of Internet technology has a negative impact on physical health, leading to physical symptoms such as headaches, musculoskeletal pain and tiredness (Choi et al. 2009, Thomée et al. 2011, Hinkley et al. 2014, Cerutti et al. 2016a). Additionally, a growing number

of studies on Internet addiction demonstrates that this behavior may be considered a psychopathological disorder with the same features (e.g., excessive and compulsive use, withdrawal phenomena, tolerance and negative repercussions on daily life) of many other substance use disorders (Kuss 2013).

Extensive research has demonstrated that excessive Internet use may be linked to a variety of negative consequences on psychosocial well-being (Cerutti et al. 2016a) and may facilitate the engagement in maladaptive behaviors, including Compulsive Online Gambling, Cybersexual Addiction and MUD's Addiction and Information Overload Addiction (Schimmenti et al. 2014, Callea et al. 2016). In order to confirm previous findings, recent studies have highlighted that gambling behavior has changed over time with implications for health professionals, although these studies have mainly focused on adult populations (Wardle et al. 2012, Calado and Griffiths 2016). Despite being a common activity across several cultures, for some individuals, gambling can develop into a recurrent problematic behavior causing substantial impairment. This psychopathological condition is actually recognized in the DSM-5 as Gambling Disorder (GD) a non-substance related disorder (APA, 2013, Grant et al. 2017) and is considered an important public health concern characterized by persistent, recurrent maladaptive patterns of gambling behaviour (Kuss and Billieux 2017).

Contrary to gambling, the Diagnostic and Statistical Manual of Mental Disorders (5th Ed., APA 2013) does not include internet addiction as a diagnostic category, but does include it as a condition that needs further investigation, recognizing its potential connotation as a mental health issue, but underlining the lack of consensus over its status.

Indeed, various terms appear in the literature to explain the pathological use of digital technologies (Kuss and Billieux 2017). Moreover, when referring to children and adolescents, Internet addiction behavior may be a more serious concern to address (Cao and Su, 2007, Roberts and Pirog 2012, Cerutti et al. 2016b, Scott et al. 2016,). Internet use becomes a pathological risk condition when it is excessive, with a growing amount of time spent online at the expense of human interaction. Problematic Internet use, compulsive Internet use, Internet abuse, pathological Internet use and Internet addiction are the most frequently employed terms to describe Internet overuse (Cash et al. 2012).

Despite the various definitions and a general lack of consensus regarding Internet addiction's conceptualization among researchers (Starcevic and Billieux 2017), the number of epidemiological and cross-sectional studies has increased and provides evidence of a worldwide Internet addiction phenomenon (Huan et al. 2014, Campanella et al. 2015). It is important to note that a clear definition of the clinical criteria is required to appropriately identify the threshold demarcating non-addicted behavior from potentially addicted behavior. The latter appears to be linked to various personality traits (e.g., low emotional stability, low agreeableness, low extroversion) (Charlton and Danforth 2010), as well as to some individual characteristics (e.g., shyness and low self-esteem) (Aydin and Sari 2011). However, the prevalence rates of Internet addiction among adolescents varies among different countries and most likely depends on a number of variables including the age of the sample and the assessment instruments used (Kuss et al. 2014). This makes it difficult to obtain a shared and comparable estimation of prevalence rates of Internet overuse in the adolescent population (Kuss 2013).

Despite numerous studies that have highlighted the discrepancy regarding estimated prevalence rates of Internet users, other studies have registered an increasingly high percentage of youth involved in the excessive use of the Internet (Tzavela et al. 2015). The prevalence of Internet behaviors and addiction in Asian adolescents was examined by Mak and colleagues (2014). Findings from this study registered that across six Asian countries, the highest number of adolescents (68%) with daily or more Internet use were from Hong Kong. A recent nationwide study in 11 European countries reported a prevalence of pathological Internet users ranging from 1.2% in Italy to 11.8% in Israel (Durkee et al. 2012). According to an Italian study, a considerable percentage of high school students (4.7%) reported having a problematic relationship with the web (Taranto et al. 2015). In another recent study using a community adolescent sample, 19.5% of adolescents were considered abusers of both mobile phones and Internet, while 14.9% were classified as Internet only abusers (Cerutti et al. 2016b). Additionally, the hypothesis that Internet use has a negative effect on emotional and psychological well-being has been confirmed in non-clinical Italian adults (Callea et al. 2016).

Research has shown that some demographic features may be associated with or contribute to the excessive use of the Internet, (e.g., gender, family structure and family socioeconomic status) (Mei et al. 2016). However, few studies have examined whether these factors along with the severity of excessive Internet use may be related to a variety of negative psychopathological outcomes. Research has shown that adolescent Internet abusers are at risk for psychological disorders such as depression (Adalier 2012, Wu et al. 2015). Conversely, depressive symptoms in adolescents are more likely to lead to problems related to Internet use (Spada 2014). This finding has also been supported by Brunet's longitudinal study (Brunet et al. 2014, Tan et al. 2016). However, the nature and causal directionality of the relationship between problematic Internet use and depression are unclear. Other negative psychopathological outcomes of excessive Internet use include somatization (Alavi et al. 2011), obsessive-compulsive and other anxiety disorders and dissociation (Bernardi and Pallanti 2009), as well as personality traits and pathology, such as introversion and psychoticism (Xiuqin et al. 2010), and externalizing disorders, including conduct problems, aggression and hostile behavior (Tsitsika et al. 2014). However, the link between Internet addiction and emotional and behavioral problems has not been adequately established yet. To date, the literature suggests both directions of causality, although there has been more evidence for the finding that internalizing problems are an antecedent of Internet addiction (Tsitsika et al. 2014). A cross-sectional study on 15-year old adolescents in three European countries has shown that frequent computer use is associated with shorter sleep duration and higher psychological and somatic symptom loads (Nuutinen et al. 2014). Sleep duration appears to partly mediate the association between computer use and psychological and somatic symptom loads (Zhou et al. 2012, Nuutinen et al. 2014). The severity of excessive Internet use also seems to be related to well-being, self-esteem and self-control. In a Chinese study, Mei and colleagues (2014) showed that problematic or addicted Internet adolescents were less likely to report high subjective well-being, including reductions in positive emotions and life satisfaction than adolescents with adaptive Internet use. These

findings suggest that specific groups of youth may be particularly vulnerable in developing problematic Internet use.

Finally, it is well known that by using specific cognitive and emotional regulation strategies, adolescents may be more or less vulnerable to developing Internalizing and Externalizing problems (Garnefski et al. 2005). Data from the existing literature has demonstrated that emotional regulation plays a mediating role in the development of depressive symptoms as well as physical illness, suggesting that adaptive emotional regulation strategies (e.g., reappraisal) permit a reduction in the stress-elicited emotions that lead to physical disorders (Compare et al. 2014). Emotion regulation is also linked to Internet use. In particular, a study conducted by Lee and colleagues (Lee et al. 2015) involving adolescents with internet gaming disorder demonstrated that they may experience more difficulties in emotional regulation during attention-required situations than do an adolescent control group. Moreover, it was found that comorbid depression interfered with emotional regulation in adolescents with internet gaming disorder.

The Current Study

In light of the above, the present study was designed to address the gap with respect to the potential negative effects of excessive Internet use among youth (Griffiths 2012, Roberts et al. 2014) providing information on potential Internet addiction assessed via Young's Internet Addiction Test (1998). Few studies have investigated Internet addiction and its relationship with impaired behavioral and emotional functioning and little has been done to cast light upon its association with somatic symptoms, particularly among adolescents.

Our study aims: (a) to explore the association between excessive Internet use, somatic symptoms and emotional and behavioral functioning, (b) to determine whether potentially Internet addicted adolescents report higher levels of somatic and depressive symptoms than non-addicted adolescents, (c) to test the hypothesis that Internet addiction may predict emotional and behavioral problems, and (d) to evaluate if Emotion Regulation Factors (in particular, Suppression) have an indirect effect on Internalization and/or Externalization problems when both Depressive Symptoms and an Internet Addiction problem are present.

Methods

Participants

Two hundred and fifty Italian students were recruited within two public middle schools in central Italy and involved in the present study. Of these, two hundred and forty students completed the entire questionnaire, resulting in a 96% response rate. The final sample (N = 240) comprised 125 females (51.9%) and 115 males (48.1%) ranging in age from 10 to 15 years (mean age of 11.8; SD = 0.97). This is a convenience sample and the two schools were not randomly sampled from a population of schools.

Consent Procedures

This study was reviewed and approved by the Ethics Committee of the Department of Dynamic and Clinical Psychology, Sapienza University of Rome. Participants

were involved in the study as part of a health promotion project. This was explained to the directors, teachers, and students of each school. Written informed consent was obtained from all students and from their parents before their enrolment in the study.

Students completed all of the self-reports in their classrooms collectively during school hours and were asked to respond anonymously to questions concerning their Internet habits and usage. Subsequently, measures were briefly presented with instructions for their compilation informing participants that responses were anonymous and confidential. The questionnaires took between 60 and 75 minutes to complete.

Measures

Somatic Symptoms

The Children's Somatization Inventory (CSI-24) (Walker et al. 1991, Garber et al. 1991, Walker et al. 2009) was used to assess children's perception of somatic symptoms or complaints. Specifically, the short version of the CSI was used in this study. It was derived from the original CSI-35, a self-report questionnaire comprising 35 items rated on a 5-point scale (0 = not at all, 1 = a little; 2 = somewhat; 3= a lot and 4 = a whole lot), reflecting the extent to which symptoms were experienced in the past 2 weeks. The scale ranges from 0 to 140. Higher scores indicate higher levels of somatic symptoms. The instrument explores the presence and frequency of somatic symptoms among children and adolescents. Recently, Walker and colleagues (2009) examined the dimensionality of the CSI-35, deleting 11 statistically weak items (lump in throat, deafness, double vision, blindness, fainting/passing out, memory loss/amnesia, seizures, convulsion, trouble walking, paralysis/muscle weakness, difficulty urinating, pain-urinating). Given its superior psychometric properties, shorter completion time and inclusion of more appropriate items for children and adolescents, the authors suggested that the CSI-24 is preferable to the CSI-35 (Essau et al. 2013). In the present study, the CSI-24 was administered and used in analyses. Following the forward–backward procedure, the questionnaire was translated into Italian with the approval of the Author. Adequate reliability and validity of the CSI has been established. In healthy pediatric samples, internal consistency (i.e., Cronbach's a) of the CSI-35 was .94 and .92 for the CSI-24 (Lavigne et al. 2012). In the current study, Cronbach's coefficient alpha of the CSI-24 was .89.

Internet Addiction

The Internet Addiction Test (IAT; Young 1998) is a self-report questionnaire consisting of 20 items rated on a six-point Likert scale (0 = does not apply, 1 = rarely, 2 = occasionally, 3 = frequently, 4 = often, and 5 = always). The scale ranges from 0 to 100. According to the author, the test measures the extent of a person's involvement with the Internet and classifies addictive behavior in terms of mild, moderate, and severe impairment. Higher scores indicate a greater level of addiction and problems caused by Internet usage. Although several authors have used different cut-off points for diagnosing Internet addiction, a clinical or empirical cut-off for the IAT has yet to be validated (Pontes et al. 2014). In previous studies, the IAT has consistently demonstrated high reliability with adolescent samples (Cronbach's α > .80) (Milani et al. 2009, Wang et al.

2011). According to Lai and colleagues' criteria (Lai et al. 2015), a score ranging from 20 to 49 corresponds to average Internet use, 50 to 79 represents problematic Internet use, and a score of over 79 indicates potential Internet addiction. In this study, we used a cut-off score of 50 to define problematic Internet use. Cronbach's coefficient alpha for this study was .86. Furthermore, at the end of the IAT questionnaire, participants were asked to complete a checklist questionnaire regarding their Internet habits and use (e.g., to specify the average number of hours per week that they used the Internet as well as their main Internet activities).

Depressive Symptoms

The Children's Depression Inventory (CDI; Kovacs 1982) is a 27-item self-report inventory rated on a three-point Likert scale, from 0 (absence of symptoms) to 3 (severe symptoms). The scale ranges from 0 to 54, with a score of over 19 suggesting a depressive state. Higher scores indicate increased severity. The CDI is the most widely used measure of children's depressive symptoms. It has high internal consistency, test-retest reliability and established validity (Twenge and Nolen-Hoeksema 2002), with an alpha coefficient of 0.86. In the current study, Cronbach's coefficient alpha was 0.86.

Externalizing and internalizing symptoms

The Youth Self-Report (Achenbach and Rescorla 2001) is used to measure symptoms of psychosocial problems among adolescents aged 11 to 18 years. The instrument comprises 112 items for which there is a brief description of behavior or symptoms, and adolescents express to what extent the item describes them on a 3-point Likert-type scale (from 0=not true to 2= very true or often true). The youth self-report is based on a dimensional classification system for assessing psychosocial problems that distinguishes between externalizing symptoms (Rule-Breaking Behavior and Aggressive Behavior subscales) and internalizing symptoms (Withdrawn/Depressed, Somatic Complaints and Anxious/Depressed subscales). A high internal reliability was confirmed for both internalizing and externalizing scales (α= .87 and α= .86, respectively). In this study, Cronbach's coefficient alpha was .90 for the internalizing scale and .92 for the externalizing scale.

Emotional Regulation Strategies

The Emotion Regulation Questionnaire (ERQ; Gross and John 2003) is a self-report questionnaire consisting of 10 items rated on a 7-point scale from strongly disagree to strongly agree, used to assess individuals' habitual use of two emotional regulation strategies. Six items comprise the cognitive reappraisal subscale (e.g. "When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm."), while the other four items comprise the expressive suppression subscale (e.g., "I control my emotions by not expressing them"). The ERQ has good internal consistency and a 2 month test-retest reliability of about 0.7 (Gross and John 2003). In this study, Cronbach's coefficient alpha was 0.72.

Data Analytic Plan

The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 22.0 for Windows. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used for socio-demographic features and Internet use characteristics. Pearson correlations were performed to calculate linear relationships between Internet addiction, somatic symptoms, depressive symptoms and emotional and behavioural functioning. Independent samples T-tests and ANOVA were used to compare somatic symptoms between Internet addicted and non-addicted adolescents. A Structural Equation Model (SEM) analysis was implemented to investigate the hypotheses of an indirect effect of Emotion Regulation Factors on Internalization and/or Externalization problems when both Depressive Symptoms and an Internet Addiction problem are present. The SEM analysis was conducted with the Lavaan package within the R statistical software (R Core Team 2017). Completely standardized solution coefficients with robust standard error estimates are presented and discussed.

Results

The majority of youth participants (64%; n = 134) reported excessive Internet use (7 days a week), with a higher prevalence in females than in males (F = 34.2%; M = 29.8%). **Table 1** shows the most frequently stated reasons for Internet connection self-reported by adolescents.

Table 1. *Distribution of the main Internet activities reported by adolescents*

Activity	Female n(%)	Male n(%)
Music	98(41)	69(28.9)
Research	79(33.1)	58(24.3)
Chat	76(32.1)	64(27)
Play	57(23.8)	78(32.6)
Films	56(23.4)	51(21.3)
Relationship	29(12.1)	17(7.1)
File sharing	15(6.3)	17(7.1)
Shopping	7(2.9)	10(4.2)
Work	2(0.8)	8(3.3)
Sex	0(0)	6(2.5)

With regards to the IAT total score, approximately 78.2% of participants emerged as average Internet users, while 21.8% reported a score above the mean with impacts on daily life. Frequency analysis of the CSI-24 scores indicated that approximately half of the participants (48.8%) reported at least one somatic symptom during the last two weeks. According to previous studies exploring somatic symptoms in paediatric samples (Escobar et al. 1987, Escobar et al. 2002), the threshold for somatization was exceeded by children who endorsed four or more somatic symptoms.

Approximately 27.5% of the total sample reported four or more symptoms with 11.2% of youth declaring eight or more symptoms. **Table 2** presents the frequencies of the most commonly reported somatic symptoms.

Table 2. *Frequency of the most common symptoms reported by adolescents*

Item	To. n(%)	Male n(%)	Female n(%)
6. Sore muscles	57(24.7)	28(12.1)	29(12.6)
16. Pain - stomach	55(23.4)	21(8.9)	34(14.5)
4. Low energy, slowed down	55(23.4)	27(11.4)	28(12)
11. Weakness	48(20.3)	21(8.9)	27(11.4)
8. Hot or cold spells	46(20)	21(9.1)	25(10.9)
1. Headache	39(16.5)	16(6.8)	23(9.7)
13. Nausea, upset stomach	39(16.5)	18(7.6)	21(8.9)
5. Pain - lower back	38(16)	16(6.8)	22(9.3)
9. Numbness or tingling	36(15.3)	16(6.8)	20(8.5)
12. Heavy feelings in arms, legs	35(14.8)	17(7.2)	18(7.6)

There were no statistically significant gender differences (t(237)= 0.15, p= 0.88 , Cohen d = 0.02) between males (M = 3.30, SD= 4.68) and females (M= 3.21, SD= 3.98).

The CSI-24 total score was analyzed as a function of Internet users. Adolescents over and above the average Internet use (>50), reported higher mean scores on the CSI-24 than average or below average Internet users (**table 3**).

Furthermore, the YSR total score and the two subscales of internalizing and externalizing symptoms were analyzed as a function of Internet users. Internet addicted adolescents reported higher mean scores on the YSR total score as well as on the internalizing and externalizing subscales compared to average internet users (**table 3**).

Finally, the CDI total score was examined in order to explore the relationship between Internet overuse and depressive symptoms. Higher CDI mean scores were found among addicted adolescents (M= 11.40, SD= 8.90) compared to non-addicted youth (M= 7.80, SD =6.48). As shown in **table 3**, the difference was statistically significant (F (1,238)= 10.59, p<.01, η^2_P = 0.04).

A positive and significant correlation (**table 4**) emerged between the CSI and IAT total scores (r= .225, p<.01). A positive and significant correlation was also found between the IAT total score and the YSR total score (r=.224, p<.01) as well as the YSR internalizing (r=.207, p<.01) and externalizing subscales (r=.202, p<.01). Finally, a positive and significant correlation emerged between the CDI and the IAT total scores (r=.240, p<.01).

The hypothesized model we fitted for investigating both the direct and indirect effects of emotion regulation, depressive symptoms and internet addiction on internalizing and/or externalizing problems is depicted in **figure 1**.

Gender and age were introduced as observed covariate variables. The fit of the model, obtained with Maximum Likelihood Robust estimation (Satorra and Bentler 1990), was not particularly good (χ²(240) = 652.55, p < 0.01; CFI = 0.888; TLI = 0.873) however the RMSEA and the SRMR (RMSEA = 0.064; RMSEA 90% C.I. = 0.059 – 0.074; SRMR = 0.072) were

Table 3. *Means, standard deviations and p values for each instrument*

	IAT[f] (>50) (n=52)		IAT (<50) (n=188)				
	M	SD	M	SD	F (1, 238)	p	η^2_P
CSI[a]	5.42	4.97	2.66	3.93	17.79	p<0.01	0.07
YSR[b]	58.63	30.55	43.48	29.02	10.85	p<0.01	0.04
YSR In[c].	13.00	9.64	8.89	9.17	7.99	p<0.01	0.03
YSR Ex[d].	12.04	9.26	8.12	8.37	8.50	p<0.01	0.03
CDI[e]	11.40	8.90	7.80	6.48	10.59	p<0.01	0.04

[a] Children's Somatization Inventory; [b] Youth Self Report; [c] Youth Self Report Internalizing Scale; [d] Youth Self Report Externalizing Scale; [e] Children's Depression Inventory; [f] Internet Addiction Test

Table 4. *Correlations among Internalization, Externalization, Internet Addiction, Reappraisal, Suppression, Depressive symptoms, Sex and Age*

	1	2	3	4	5	6	7	8	9
1. Sex	1.00								
2. Age	0.05	1.00							
3. YSR total score	0.06	0.24	1.00						
4. YSR Internalization	0.09	0.25**	0.90	1.00					
5. Externalization	-0.01	0.22**	0.90	0.74**	1.00				
6. Somatic complaints	-0.01	0.17	0.51	0.53	0.48	1.00			
7. Internet Addiction	0.03	0.21**	0.22**	0.21**	0.20	0.22	1.00		
8. Reappraisal	-0.05	0.00	0.08	0.07	0.02	0.06	0.06	1.00	
9. Suppression	0.04	0.02	0.06	0.08	-0.03	0.00	0.15	0.57	1.00
10. Depressive Symptoms	-0.02	0.22**	0.43**	0.54	0.36	0.38	0.24	-0.01	0.03	1.00

N = 240

below the accepted cut-off (0.08). Parameter estimates (with robust standard error) indicated (**table 5** shows unstandardized parameters and robust standard errors) that Suppression has no significant direct effect on either Internalization (b = -0.033, p = 0.63) or Externalization (b = -0.102, p = 0.159).

Suppression significantly predicted Depressive Symptoms (b = 0.277, p = 0.01) but not Internet Addiction (b = 0.018, p = 0.86). However, Depressive Symptoms, as expected, predicted both Internet Addiction (b = 0.304, p < 0.001) and Internalizing (b = 0.542, p <0.001) and Externalizing problems (b = 0.484, p < 0.001). Internet Addiction also significantly predicted both Internalizing (b = 0.162, p = 0.02) and Externalizing problems (b = 0.183, p = 0.02). Given that all of the indirect paths between Suppression and

Internalizing or Externalizing problems (via Depressive Symptoms and Internet Addiction) were significant, we tested the significance of the total indirect effects. In both cases, the total indirect effect were not significant even if near the threshold (respectively: Suppression → Depressive Symptoms → Internet Addiction → Internalization b = 0.014, p = 0.09; Suppression → Depressive Symptoms → Internet Addiction → Externalization b = 0.015, p = 0.09). Finally, the indirect effect of Depressive Symptoms (via Internet Addiction) on Internalizing and Externalizing problems were both significant (respectively: b = 0.049, p = 0.047; b = 0.056, p = 0.044). Cognitive Reappraisal did not show significant relationships with any of the factors nor was it associated with either gender or age (**table 4** and **figure 1**).

Figure 1. *Path Model depicting the hypothesized relationships between Emotion Regulation Factors, Depressive Symptoms, Internet Addiction and Internalization/Externalization problems. Completely standardized coefficients are presented (* p < 0.05; ** p < 0.01; N = 240)*
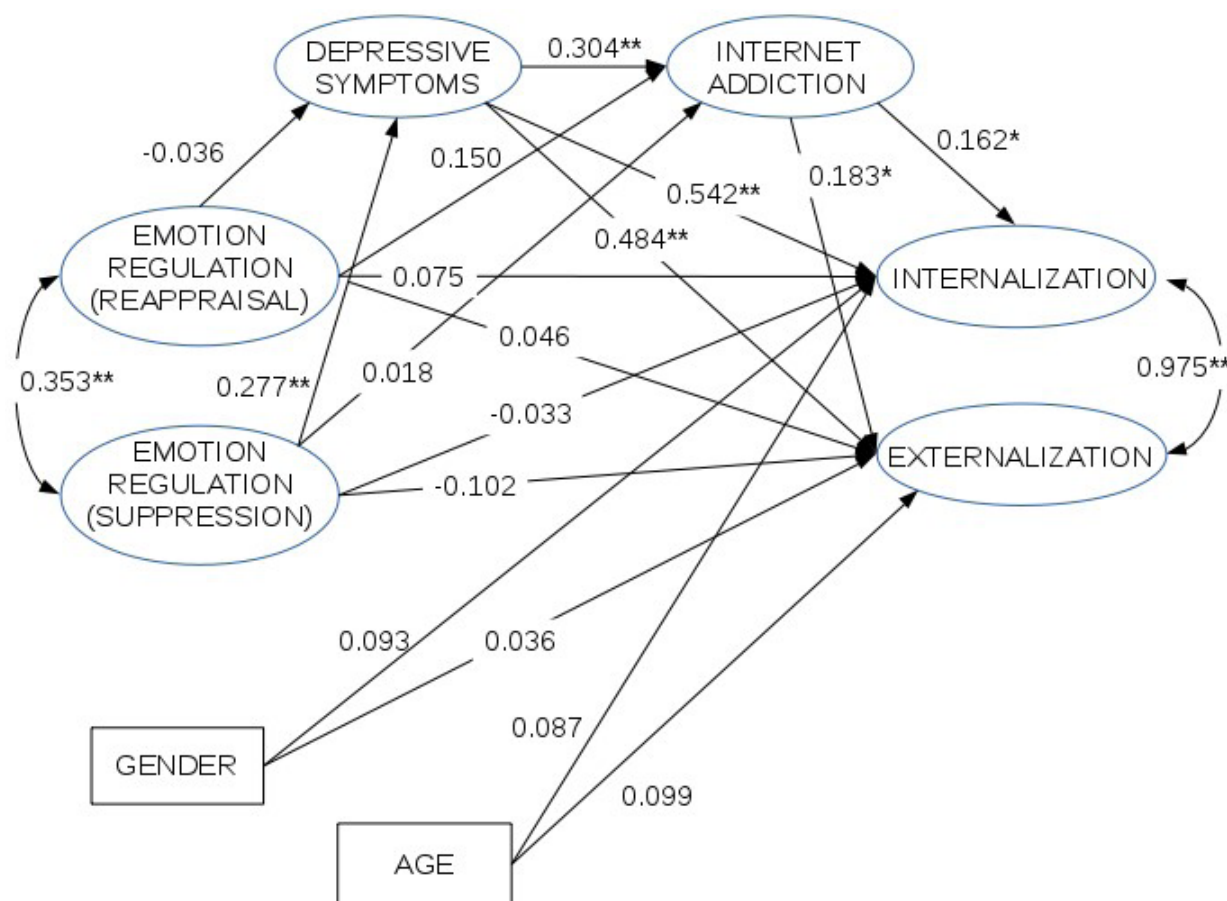

Table 5. *Estimated Coefficients (unstandardized, robust standard error, p-value) of the latent structural relationships hypothesized*

	DS			I.A.			Int			Ext		
	b	S.E.	P	b	S.E.	P	b	S.E.	P	b	S.E.	P
Cognitive Reappraisal	-.007	.017	.68	.514	.327	.12	.125	.104	.23	.086	.112	.44
Expressive Suppression	.038	.015	.01	.047	.262	.86	-.041	.085	.63	-.139	.099	.16
Depressive Symptoms	--	--	--	5.555	1.490	.00	4.864	1.010	.00	4.776	1.083	.00
Internet Addiction	--	--	--	--	--	--	.080	.035	.02	.099	.042	.02
Gender	--	--	--	--	--	--	.361	.230	.12	.151	.253	.55
Age	--	--	--	--	--	--	.173	.117	.14	.215	.130	.10

DS = Depressive Symptoms; I.A. = Internet Addiction; Int = Internalization; Ext = Externalization

Discussion

Today youth have new and different communication tools than those used by previous generations, such as social networks (i.e., Facebook, Instagram and Twitter) which, in turn, represent a new way to build their social image, showing selected aspects of their identity. The modern digital world proposes technology 24 hours a day from which it is almost impossible to escape, underlying that many psychological problems can be caused or exacerbated by such technology (Scott et al. 2016). Excessive Internet use and its problematic outcomes have been gaining increasing attention by researchers since the early 1990s given that the sizable time spent on the internet coincides, among other concerns, with increased loneliness and social withdrawal (Koyuncu et al. 2014).

Excessive Internet use is frequently reported among early adolescents and the problems linked with its maladaptive use have been documented worldwide, including Italy where the use of the Internet has increased noticeably (Poli and Agrimi 2012). Findings of the present study highlight that 64% of adolescents spend an excessive amount of time with Internet technologies (i.e., 7 days a week) and 21.9% use the Internet during the day and also at night. In the present study, 21.8% of participants were classified as problematic or addicted Internet users according to the cut off point recommended by Lai and colleagues (Lai et al. 2015) on the IAT self-report.

Our results are valuable given the ever-increasing amount of time youth spend on new technologies and the impact this may have on their psychosocial well-being. As demonstrated by previous research, excessive Internet use is related to poorer perceived overall health status and physical complaints (Kim 2012, Do et al. 2013). This study adds important information to the expanding field of problematic Internet use. Particularly, it examined prevalence rates and correlates while at the same time exploring the risk for somatization among Internet addicted adolescents. Although many studies have focused on the relationship between Internet addiction and psychiatric symptoms and disorders, little research has been done on the association between Internet addiction and somatic symptoms (e.g., sore muscles, stomach pain, low energy, slowed down) but rather past studies have mainly focused on the Internet's potential effect on adolescent's physical and mental well-being (Cao et al. 2011). There is evidence that recurrent somatic symptoms may be important signals of mental health problems that can lead to considerable impairment in an adolescent's life, influencing development, school attendance and achievement as well as social adjustment (Cerutti et al. 2017). According to Escobar's definition of somatization (2002), we explored the impact of somatic symptoms among adolescents who are potentially addicted to the Internet. The link between Internet addiction and recurrent somatic symptoms as evaluated on the CSI-24 has been recognized. Studies among non-clinical adolescent populations have shown conflicting findings with regards to self-reported somatic symptoms and gender differences (Walker et al. 1991, Meesters et al. 2003). Specifically, an interesting finding is that adolescents classified as problematic and/or addicted Internet users presented a higher risk for somatization on the CSI than average Internet users, with gastrointestinal symptoms being the most commonly reported. This is not comparable with findings from previous research since this is the first study to focus on the relationship between Internet addiction and somatic symptoms among a non-clinical adolescent population.

Furthermore, adolescents with a IAT score above the cut off of 50 reported higher levels of emotional and behavioral impairment, confirming our hypothesis regarding the impact of high online engagement on quality of life. Our results also clearly demonstrated that high levels of internalizing (e.g., anxiety and depressive symptoms) and externalizing problems (e.g., rule-breaking behavior and aggressive behavior) are related to Internet addiction. Our findings are in accordance with earlier studies in which externalizing problems were predicted by adolescents' Internet addiction score. Consistent with Tsitsika and colleagues' study (2014), indicating that adolescents with dysfunctional Internet behavior (DIB) engage in more behavioral actions (e.g., aggressive behavior), our findings demonstrated that externalizing problems were also predicted by high Internet addiction scores in a non-clinical population of adolescents. Adolescents above the cut off for addiction showed higher mean scores on the YSR total score as well as on both the YSR internalizing and externalizing subscales when the YSR was analyzed as a function of Internet users. Additionally, consistent with previous studies (Yang et al. 2014, Tang et al. 2014), our data indicated a positive correlation between Internet addiction and emotional and behavioral problems, providing evidence of greater functional impairment among problematic and addicted Internet users in comparison to average Internet users. The hypothesis of an association between Internet addiction and the risk for somatization was also confirmed by the positive correlation between the IAT total score and the "Somatic Complaints" subscale of the YSR.

Past studies have suggested that addicted Internet users are also at greater risk for mental health disorders such as depression. Although much research has been done to understand whether depression is a cause of overuse or addiction to technologies (Błachnio et al. 2015), there are few studies investigating Internet addiction as the cause of depressive symptoms among non-clinical adolescent populations. In the present study, higher mean scores on the CDI were found among addicted adolescents. Furthermore, a correlation between the CDI total score and the IAT was observed. These later results support our hypothesis that Internet addiction is linked to depressive risk in adolescent populations. Furthermore, the present study draws attention to the significance of the indirect effect of Depressive Symptoms (via Internet Addiction) on Internalizing and Externalizing problems.

Finally, given that expressive suppression is an emotional regulation strategy that requires emotional awareness, our study focused on its relationship with depression, internet addiction and internalizing and/or externalizing problems. Findings highlighted that expressive suppression is an aggravating factor of depressive symptoms linked to internet addiction that may lead to internalizing problems, but not externalizing problems.

Nonetheless, these findings should be interpreted cautiously in light of several limitations. First, given the increasing interest on Internet addiction within non-clinical settings (especially schools and colleges), this study examined the association between Internet addiction and somatic symptoms, as well as the psychological correlates of Internet addiction among healthy adolescents. Thus, the extent to which these findings are applicable to clinical samples remains unclear. Future research should aim to replicate these findings within clinical samples. Second, all of the

data was based on self-report measures rather than objective assessment, which may be less affected by respondent bias. Finally, our study was cross-sectional and, consequently, all of the conclusions that we draw should be considered within the limits of correlational studies.

In conclusion, the lack of agreement on an unambiguous and shared definition of Internet overuse reflects the difficulties in classifying this problematic condition, limiting our understanding about Internet use within a framework of adolescent developmental tasks. In addition to the different descriptions of Internet usage, there is also a debate regarding the question of whether Internet overuse represents a primary disorder or rather, should be viewed as a vehicle for expressing emotional problems or maladaptive behavior.

Compliance with Ethical Standards

Disclosure of potential conflicts of interest:
Ethical approval: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2005.

Informed consent: Informed consent was obtained from all participants included in the study.

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