

Depressive Symptoms and Problematic Internet Use Among Adolescents: Analysis of the Longitudinal Relationships from the Cognitive–Behavioral Model

Manuel Gámez-Guadix, PhD

Abstract

Problematic Internet use—frequently called Internet addiction or compulsive use—represents an increasingly widespread problem among adolescents. The objective of this study was to analyze the temporal and reciprocal relations between the presence of depressive symptoms and various components of problematic Internet use (i.e., the preference for online relationships, use of the Internet for mood regulation, deficient self-regulation, and the manifestation of negative outcomes). Consequently, a longitudinal design was employed with two times separated by a 1 year interval. The sample consisted of 699 adolescents (61.1% girls) between 13 and 17 years of age. The results indicated that depressive symptoms at time 1 predicted an increase in preference for online relationships, mood regulation, and negative outcomes after 1 year. In turn, negative outcomes at time 1 predicted an increase in depressive symptoms at time 2. These results entail several practical implications for the design of prevention programs and the treatment of problematic Internet use.

Introduction

THE SPREAD OF THE INTERNET has resulted in many benefits at an individual and social level.^{1–3} The Internet is a tool that facilitates leisure and entertainment, interpersonal communication, the creation of new social networks, and labor and economic development. The Internet has become a nearly indispensable resource in everyday life and in society. Despite its benefits, the Internet is not without its problems, particularly when its use is excessive or inappropriate and results in loss of control and negative life outcomes.^{4–6}

Problematic Internet use—also referred to in the scientific research as Internet addiction, Internet dependence, or compulsive Internet use^{7–9}—has been recognized in the last decade as a serious health problem, and has received increasing empirical attention.^{8,10–14} Problematic Internet use can be *specific* when it relates to only one concrete activity on the Internet such as sexual behavior, online gaming or gambling, or it can be *generalized* when it implies general overuse of the Internet.^{14,15} Generalized problematic Internet use is assumed to be more strongly associated with interpersonal interactions on the Internet and the need for online social reinforcement and contact.¹⁵ Problematic Internet use increases markedly during adolescence, making this period a critical time to begin prevention efforts.⁶ The prevalence of

this problem among adolescents has fluctuated between 4% and 18% in the majority of studies.^{12,13} One theoretical approach that has received more empirical attention as an explanation of problematic Internet use is the cognitive–behavioral model.^{14–16} On the basis of this model, it has been proposed that problematic Internet use involves a set of cognitive processes (e.g., distortions or ruminative thoughts) and dysfunctional behaviors (such as Internet use to alleviate emotional distress or compulsive use) that result in a series of negative consequences in different aspects of individual life.¹⁵

From the most recent formulations of this model, four main components of problematic Internet use have been identified.^{14,17} First, preference for online social interactions refers to the belief that Internet-based relationships are more secure, comfortable, effective, and less threatening than face-to-face interaction.^{9,18,19} Online social interactions could include chatting, using instant message applications, overusing social networks, or meeting new people through the Internet. Second, mood regulation refers to using the Internet to reduce anxiety, feelings of isolation, or negative feelings.¹¹ Thus, it has been found that individuals who excessively use the Internet more often connect with other users to alleviate feelings of sadness, anxiety, or loneliness than those level of use is considered normal.²⁰ Third, deficient self-regulation refers to the loss of control of cognitions

and behaviors related to the Internet.²¹ This component includes obsessive thought patterns relating to Internet use, such as a compulsive use or the inability to control Internet use.²² Last, the model indicates the importance of the appearance of negative consequences in personal, social, academic, or work settings as a result of dysfunctional Internet use.^{14,20} Several studies have provided empirical support for this basic multidimensional structure of problematic Internet use.^{14,17,23}

Additionally, according to this theoretical model, the presence of prior depressive symptoms constitutes a risk factor that predisposes an individual to develop problematic Internet use.¹⁵ Thus, problematic Internet use is the consequence of more general psychological distress.^{15,24} Individuals with depressive symptoms may use the Internet to alleviate emotional distress or to escape other personal problems, which in turn could increase the likelihood of developing problematic use of this technological resource.¹⁵ Along this line, it has been argued that depressed mood may interfere with cognitions that maintain effective self-regulation, which in turn could increase the probability of developing problematic Internet use.²¹

Different studies have provided preliminary empirical support for the relation between depressed mood and problematic Internet use. For example, Caplan²⁵ found that feeling alone and depressed was associated with a preference for online social interactions, which in turn was related to different negative consequences related to Internet use. Likewise, Meerkerk et al.⁹ found that various indicators of psychological well-being contributed to explaining compulsive Internet use. Specifically, low self-esteem was the most important predictor. Tokunaga and Rains²⁶ conducted a meta-analysis on the relation between social anxiety, loneliness, and depression, on the one hand, and problematic Internet use, on the other. Among these variables, only depression was significantly related to problematic use. However, as the authors note, virtually all of the studies were cross-sectional, which prevents the establishment of a temporal order between variables. To our knowledge, only one longitudinal study has examined the relation between problematic Internet use and depressive symptoms among adolescents. In this study, van den Eijnden et al.²⁷ reported that depressive symptoms and “compulsive use” of the Internet did not exhibit significant relations after a period of 6 months. In this study, van Elijnden et al. analyzed a single component of problematic Internet use (i.e., compulsive use), which is a construct similar to deficient self-regulation described above that includes cognitive preoccupation, loss of control, and continued use despite the intention to stop. However, problematic Internet use is a multidimensional construct,²⁸ and the presence of depressive symptoms may show a differential association with the various components of this construct.²⁹

Therefore, considering the scarcity of empirical evidence on the temporal relations between the presence of depressive symptoms and different components of generalized problematic Internet use, this article’s objective was to increase the empirical evidence to include the temporal and reciprocal relationships between these problems during adolescence. As noted, because the cognitive-behavioral model suggests that prior depressive symptoms predispose an individual to generalized problematic Internet use more than the inverse re-

lation,^{15,30} our hypothesis is that the presence of depressive symptoms will increase the probability of reporting problematic Internet use after 1 year. Because some gender differences have been found in problematic Internet use,³¹ we also analyzed whether the relationship between the components of problematic Internet use and depressive symptoms differs between males and females.

Methods

Participants

The initial sample consisted of 957 adolescents between 13 and 17 years of age. The participants came from 49 classrooms of 12 secondary education schools in Bizkaia, a province of Spain. The schools were selected randomly out of 65 schools in the province by means of a cluster sampling procedure stratified by school type (private and public schools). The retention rate in the study between time 1 and 2 was 73.04%. Thus, the final sample included 699 adolescents (61.1% girls; $M_{\text{age}} = 14.77$ years; $SD = 0.96$ years) who completed questionnaires at both time points. There were no significant differences in average scores for any of the variables in the study among those who participated at both time points and those who did not. Most of the adolescents used their personal computers (94.4%) and smartphones (58%) to access to the Internet.

Measures

Problematic Internet use. To measure this variable, the Generalized Problematic Internet Use Scale 2 was employed (GPIUS2¹⁴). This scale evaluates different components of problematic Internet use employing a cognitive-behavioral model. The scale consists of 15 items grouped into four distinct subscales: (a) preference for online social interactions (three items; e.g., “I prefer online social interaction over face-to-face communication”); (b) use of the Internet for mood regulation (three items; e.g., “I have used the Internet to make myself feel better when I was down”); (c) deficient self-regulation (six items; e.g., “I have difficulty controlling the amount of time I spend online”); and (d) negative outcomes (three items; e.g., “My Internet use has created problems for me in my life”). The response format employed was a 6-point Likert scale ranging from 1 = “strongly disagree” to 6 = “strongly agree.” This instrument has demonstrated good construct validity, convergent validity, and adequate reliability in Spanish-speaking samples.^{16,23} The internal consistency of the different subscales in this measurement ranged from $\alpha = 0.76$ (for the negative outcomes subscale) to 0.90 (for the deficient self-regulation subscale).

Depressive symptoms. The depression subscale of the Brief Symptom Inventory (BSI³²) was used to evaluate the presence of depressive symptoms. Participants were required to indicate how frequently they had experienced each symptom (e.g., “feeling sad” or “feeling no interest in things”) during the past 2 weeks. The scale includes six items with a response format that ranged from 1 = “not at all” to 5 = “extremely.” The BSI has demonstrated good psychometric properties in the Spanish population.³³ In this sample, the internal consistency was $\alpha = 0.82$.

Procedure

Participants completed measurements at two time points that were separated by a 1 year interval. The Ethics Committee of the University of Deusto reviewed and approved this research. The responses of the participants were anonymous with the aim of promoting honesty, and participation was voluntary. During both time points of the study, the parents of the participants were informed and had the option of disallowing the participation of their children. None of the parents forbade their child's participation. Similarly, the participants were asked for their informed consent before completing the questionnaires. If any difficulty was experienced understanding the items, the participants were encouraged to ask researchers in charge in the classroom for assistance. To match the questionnaires of time 1 and time 2, each participant used a personal code.

Results

The descriptive statistics of the variables included in the study (means and standard deviation) and the correlations between them are provided in Table 1. As shown Table 1, the highest correlations, in general, were established between the same variable in time 1 and time 2.

To analyze the relation between the variables, the program EQS v6.1 was employed.³⁴ We used the robust maximum likelihood (ML) estimation method with the Satorra–Bentler scaled chi-square (S-B χ^2) because data did not meet the assumption of normality (the normalized Mardia's coefficient=115.21). To study the adequacy of the estimated models, we used a non-normative fit index (NNFI), comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). For the NNFI and the CFI, values of >0.90 indicate an acceptable fit. Values on the SRMR and the RMSEA of <0.08 indicate an acceptable fit.^{35,36}

First, we performed confirmatory factor analysis on the measurement model, which indicated the adequacy of measuring latent variables with the indicators used and confirmed that all of the factor loadings were significantly different from zero. Second, we estimated a model that included the analysis of the relations between depressive

symptoms at time 1 and preference for online social interactions, mood regulation, deficient self-regulation, and negative outcomes at time 2. The model also included an analysis of the relation between the components of problematic Internet use at time 1 and depressive symptoms at time 2. Finally, we included autoregressive paths between a determined variable at time 1 and the same variable at time 2. This strategy enabled us to analyze whether the change of variables at time 2 can be explained by the remaining predictors once the base level in time 1 is controlled.

Certain relationships included in this model were not statistically significant, for example the relationship between depressive symptoms at time 1 and deficient self-regulation at time 2. Nonsignificant relations were excluded from the model, which was re-estimated. The final estimated model is shown in Figure 1. The fit indexes for the estimated final model were adequate: χ^2 (371, $N=699$)=956.41, NNFI=0.92, CFI=0.93, SRMR=0.076, RMSEA=0.048 [90% CI 0.044, 0.051].

As shown in Figure 1, the autoregressive paths between the same variable at time 1 and time 2 were all significant, and displayed a strong relationship (between 0.51 for mood regulation and 0.64 for deficient self-regulation).

Regarding the relation between depressive symptoms and problematic Internet use, depression symptoms at time 1 predicted an increase in preference for online social interaction, mood regulation, and negative outcomes at time 2. However, the relation between depressive symptoms at time 1 and deficient self-regulation at time 2 was not statistically significant.

Moreover, among the components of problematic Internet use at time 1, only the appearance of negative outcomes predicted an increase in depressive symptoms at time 2 after 1 year (Fig. 1).

Finally, we investigated whether the relationship between depressive symptoms and problematic Internet use differed between males and females. To this end, we conducted a multigroup analysis following the steps outlined by Byrne.³⁵ Our analyses revealed three significant differences between males and females: (a) the path between T1 deficient self-regulation and T1 negative outcomes; (b) the path between

TABLE 1. CORRELATIONS AND DESCRIPTIVE STATISTICS OF THE STUDY VARIABLES

	1	2	3	4	5	6	7	8	9	M (SD)
1. Depression T1	1									1.09 (0.80)
2. Preference for online social int. T1	0.20***	1								1.85 (1.03)
3. Mood regulation T1	0.36***	0.42***	1							2.42 (1.37)
4. Deficient self-regulation T1	0.28***	0.34***	0.50***	1						2.37 (1.28)
5. Negative outcomes T1	0.31***	0.35***	0.41***	0.62***	1					0.28 (0.37)
6. Depression T2	0.52***	0.13**	0.28***	0.26***	0.28***	1				1.00 (0.80)
7. Preference for online social int. T2	0.18***	0.50***	0.28***	0.20***	0.34***	0.25***	1			1.69 (0.96)
8. Mood regulation T2	0.25***	0.26***	0.48***	0.49***	0.32***	0.42***	0.36***	1		2.26 (1.25)
9. Deficient self-regulation T2	0.19***	0.26***	0.27***	0.59***	0.34***	0.32***	0.25***	0.69***	1	2.11 (1.19)
10. Negative outcomes T2	0.27***	0.23***	0.22***	0.35***	0.48***	0.35***	0.33***	0.44***	0.57***	0.42 (0.78)

Range of scores: depression=0–4; components of problematic Internet use=1–6.

** $p < 0.01$; *** $p < 0.001$.

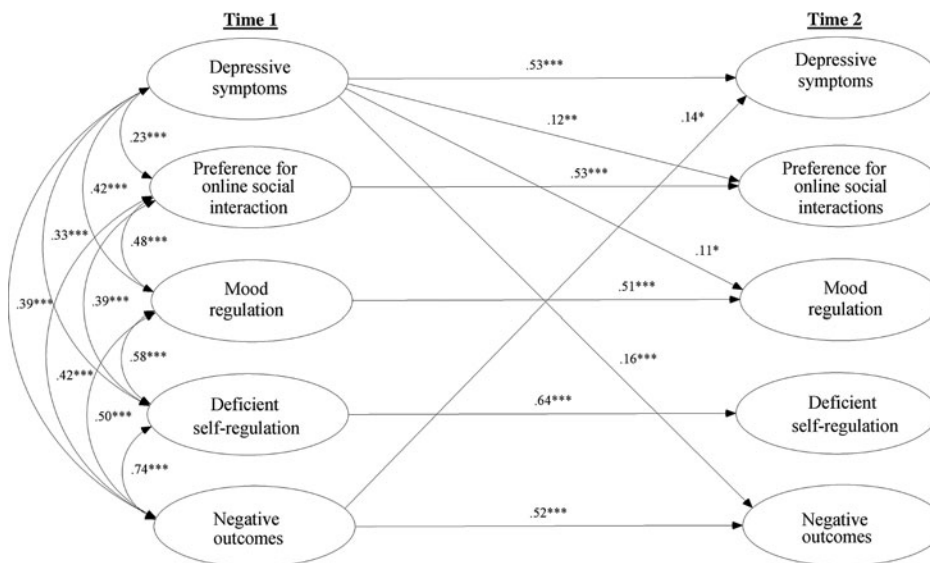


FIG. 1. Final estimated model of the relation between depressive symptoms and problematic Internet use.

T1 deficient self-regulation and T2 deficient self-regulation; and (c) the path between T1 depressive symptoms and T2 depressive symptoms. All of these relationships were stronger for females than for males, although they were statistically significant for both sexes. No significant differences were found in the relationships between depressive symptoms and the components of problematic Internet use as a function of gender.

Discussion

The purpose of this study was to analyze the temporal and bidirectional relationship between the presence of depressive symptoms and the components of problematic Internet use among adolescents. Overall, the results supported the primary hypothesis of the cognitive-behavioral model,^{15,24} which suggests that prior psychological distress is a risk factor for the development of a problematic Internet use. Additionally, the results indicated that the appearance of negative outcomes preceded an increase in depressive symptoms 1 year later. Moreover, the findings suggested that the relationships between depression and the components of problematic Internet use are similar among boys and girls.

First, depressive symptoms are associated with an increase in preference for online social interactions after 1 year. This finding is consistent with the results of prior cross-sectional studies.²⁵ It is likely that certain symptoms of depression, such as the tendency to social isolation and negative self-perception, cause an individual to prefer Internet communication to face-to-face communication upon perceiving online communication to be more secure and less threatening.¹⁸

Second, depression predicted an increase in the use of the Internet for mood regulation. This finding is consistent with the results of prior studies that indicate that in the presence of negative mood, the Internet seems to act as a dysfunctional regulator of emotional distress.^{11,21} Furthermore, these findings suggest that problematic Internet use could be maintained by a negative reinforcement mechanism, such as a means to alleviate distress or sadness.²⁰

Third, depressive symptoms were associated with an increase in negative outcomes of the Internet 1 year later. One possible explanation is that adolescents with higher levels of depression may activate less effective coping strategies (e.g., seeking social support),³⁷ which in turn could increase the likelihood of negative outcomes.

Only the relation between depressive symptoms and deficient self-regulation at the longitudinal level was not significant. This finding agrees with that reported in the longitudinal study of van den Eijnden et al.,²⁷ who found no relation between depression and compulsive use, which is a construct similar to deficient self-regulation in the present study. In this sense, the general inactivity and apathy that characterize depression may explain why there was no increase in compulsive behavior related to the Internet among adolescents with increased depressive symptoms.

In the longitudinal relation between the components of problematic Internet use at time 1 and depressive symptoms after 1 year, only the negative outcomes at time 1 predicted the increase in depressive symptoms at time 2. This result indicates that adolescents who experience impairment at an academic, family, or social level as a result of the Internet are at risk for developing depressive symptoms. Therefore, these results suggest that the relation between depression and negative outcomes is bidirectional in nature. As mentioned, depressive symptoms increased the likelihood of negative outcomes, and these, in turn, increased depressive symptoms 1 year later.

In short, this study is the first to analyze the temporal and reciprocal relations between the presence of depressive symptoms and different components of problematic Internet use among adolescents. The findings suggest that, in general, depressive symptoms predict an increase in components of problematic Internet use, with the exception of deficient self-regulation. Moreover, in the case of negative outcomes, the relation with depressive symptoms was reciprocal. These results have several practical implications. First, programs to prevent problematic Internet use should include specific skills related to depressed mood, for example self-esteem,

social-skills training, or planning leisure activities beyond the use of new technologies. Moreover, professionals in contact with adolescents who present problematic Internet use should explicitly evaluate the presence of depressive symptoms. In this sense, according to the principles of cognitive-behavioral therapy for problematic Internet use,^{38,39} it could be useful to work with different types of cognitive distortions and ruminative thoughts that could be maintaining or exacerbating this problem.

Acknowledgment

This research was supported by Ministerio de Economía y Competitividad (Spanish Government) grant PSI2012-31550.

Author Disclosure Statement

No competing financial interests exist.

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Address correspondence to:

Dr. Manuel Gámez-Guadix

University of Deusto

1 Floor, Avenida de las Universidades 24

48007 Bilbao

Spain

E-mail: mgamezguadix@gmail.com