



Problematic Internet use and problematic alcohol use from the cognitive–behavioral model: A longitudinal study among adolescents



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HIGHLIGHTS

- Deficient self-regulation predicts an increase of problematic Internet use over time.
- Negative consequences of problematic Internet use predict problematic alcohol use.
- Longitudinal relations were invariant across genders.

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ABSTRACT

Problematic Internet use (PIU) and problematic alcohol use are two pervasive problems during adolescence that share similar characteristics and predictors. The first objective of this study was to analyze the temporal and reciprocal relationships among the main components of PIU from the cognitive–behavioral model (preference for online social interaction, mood regulation through the Internet, deficient self-regulation, and negative consequences). The second objective was to examine the temporal and reciprocal relationships between PIU components and problematic alcohol use. We also examined whether these relationships differ between males and females. The sample comprised 801 Spanish adolescents (mean age = 14.92, SD = 1.01) who completed the measures both at Time 1 (T1) and Time 2 (T2) six months apart. We used structural equation modeling to analyze the relationship among the variables. Results showed that deficient self-regulation at T1 predicted an increase in preference for online interactions, mood regulation, and negative consequences of the Internet at T2. In turn, the emergence of negative consequences of PIU at T1 predicted a rise in problematic alcohol use at T2. Longitudinal relationships between different components of PIU and between the components of PIU and problematic alcohol use were invariant across genders. Deficient self-regulation, consisting of diminished self-control over cognition and behaviors related to the Internet, plays a central role in the maintenance of PIU, increasing the preference for online interactions, mood regulation, and negative consequences from Internet use over time. In turn, adolescents who present negative consequences of PIU are vulnerable targets for problematic alcohol use.

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1. Introduction

Problematic Internet use (PIU), also called Internet addiction (Young & de Abreu, 2011) or compulsive use of the Internet (Meerkerk, van den Eijnden, Franken, & Garretsen, 2010), has been recognized as a major public health problem and has received increasing empirical attention

in recent years (Davis, 2001; Shapira et al., 2003; Young, 2004). The prevalence of PIU has ranged between 4% and 18% in most studies (Greydanus & Greydanus, 2012; Young, Yue, & Ying, 2011). In addition, PIU has been linked to other behavioral and psychological health problems during adolescence, such as depressive symptoms (Greydanus & Greydanus, 2012), anxiety (Caplan, 2007), cyberbullying (Gámez-Guadix, Orue, Smith, & Calvete, 2013), and alcohol abuse (Ko et al., 2008).

One theoretical model that has received empirical support to explain the etiology, development, and consequences of PIU is the cognitive–behavioral model (Caplan, 2002, 2010; Davis, 2001; Gámez-Guadix, Villa-George, & Calvete, 2012). This model proposes that PIU includes a set of cognitive processes (e.g., obsessive thoughts or cognitive distortions) and dysfunctional behaviors, such as using the Internet to relieve stress or compulsive use, resulting in a range of negative consequences in different areas of an individual's life (Davis, 2001).

Abbreviations: PIU, Problematic Internet use; T1, Time 1; T2, Time 2; SEM, structural equation modeling; NNFI, non-normed fit index; CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; ML, maximum likelihood; S-B χ^2 , Satorra–Bentler-scaled χ^2 index.

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More recent formulations of the cognitive-behavioral model (Caplan, 2010; Gámez-Guadix, Orue, & Calvete, 2013; Gámez-Guadix, Villa-George, & Calvete 2012) propose a series of related components of PIU. These components are a preference for online social relationships, mood regulation through the Internet, deficient self-regulation, and negative consequences. First, a preference for online social interaction stems from the belief that relationships through the Internet are safer, more comfortable, and less threatening than face-to-face interactions (Caplan, 2003; Morahan-Martin & Schumacher, 2003). This belief has been found in cross-sectional studies associated with other important aspects of PIU, such as turning to the Internet to alleviate psychological distress, compulsive Internet use, and the emergence of problems in an individual's life (Caplan, 2003, 2010). Second, mood regulation refers to the use of the Internet to reduce anxiety, feelings of isolation, or negative feelings. Thus, the Internet acts as a dysfunctional emotional controller (LaRose, Lin, & Eastin, 2003; McKenna, Green, & Gleason, 2002; Spada, Langston, Nikčević, & Moneta, 2008). For example, individuals who use the Internet excessively report using the Internet to alleviate feelings of sadness, anxiety, or loneliness more often than those who use the Internet less frequently (Muñoz-Rivas, Fernández, & Gámez-Guadix, 2010). Third, deficient self-regulation includes both obsessive thoughts and compulsive behaviors related to the Internet (Caplan, 2010; LaRose, Lin & Eastin, 2003). Obsessive thoughts refer to dysfunctional patterns of preoccupations regarding Internet use and the cognitive justification of the obsession with connecting via the Internet (Li, Zhang, Li, Zhen, & Wang, 2010). Compulsive use refers to the inability to control or regulate Internet connection behavior (Young, 2005). Deficient self-regulation has been identified by some studies as the central aspect of PIU (LaRose, Lin & Eastin, 2003). Finally, PIU has been characterized by the appearance of various negative consequences in the daily life of the individual, such as academic and occupational impairment, academic and/or work absenteeism, interpersonal problems, and withdrawal from real social activities (Junghyun, LaRose, & Wei, 2009; Morahan-Martin, 2007; Muñoz-Rivas, Fernández & Gámez-Guadix, 2010).

According to the cognitive-behavioral model, a preference for online social interaction is related to greater mood regulation using the Internet and more deficient self-regulation, which, in turn, is associated with more negative consequences for the individual (Caplan, 2010; Gámez-Guadix, Villa-George & Calvete, 2012). Previous findings suggest that the relationship among the model components is similar for men and women (Gámez-Guadix, Orue, & Calvete, 2013; Gámez-Guadix, Villa-George & Calvete, 2012). Although empirical evidence has documented a cross-sectional relationship among the different components of PIU, little is known about their relationships over time. To date and to our knowledge, no previous study has analyzed the temporal relationships among different aspects of PIU, which limits knowledge about the model. Therefore, the first objective of this study was to analyze the temporal and reciprocal relations and the gender differences associated with preference for online social interaction, the use of the Internet for mood regulation, deficient self-regulation, and negative consequences.

Numerous researchers have highlighted the similarities between PIU and problematic alcohol use or, alternatively, between Internet addiction and alcohol abuse (Holden, 2001; Ko et al., 2008; Shaffer et al., 2004; Shapira et al., 2003; Sun et al., 2012). Behavioral addictions such as Internet addiction may share the same neurobiological adaptive mechanisms as addictions to substances (Holden, 2001). At the behavioral level, PIU shares with substance addiction manifestations such as craving, tolerance, and withdrawal (Muñoz-Rivas, Fernández & Gámez-Guadix, 2010). Previous results also suggest that PIU and problematic alcohol use have the same psychological vulnerability factors, such as high sensation seeking, positive attitudes toward alcohol, family history of alcoholism, and the presence of deviant peers (Ko et al., 2008). Moreover, Problem Behavior Theory (Jessor, 1991) suggests that engaging in a problem behavior, such as PIU, increases the

likelihood of engaging in other problem behaviors, such as problematic alcohol use.

To date, empirical evidence on the association between PIU and problematic alcohol use has been very limited and has mostly emerged from cross-sectional studies. Thus, whereas the studies of Ko et al. (2008) and Kingston, Clarke, Ritchie, & Remington (2011) reported a positive association between PIU and problematic alcohol use, the study by De Leo & Wulfert (2013) found a non-significant relationship between the frequency of alcohol use and PIU. However, the latter study did not directly evaluate the problematic use of alcohol but, rather, examined the frequency of alcohol consumption. In the only longitudinal study conducted to date, Sun et al. (2012) found that higher compulsive Internet use at baseline was related to more binge drinking at 1-year follow-up for females but not for males. Baseline binge drinking was not found to predict Internet use at follow-up. Although the research by Sun et al. (2012) provided interesting preliminary data, the authors explicitly recognize the inherent methodological weakness of their study, which used an unvalidated subscale for "diminished impulse control", which is only a partial aspect of PIU, to measure compulsive Internet use, which may have biased the results (Sun et al., 2012). Therefore, more research is needed to elucidate the temporal relationship between different components of PIU and problematic alcohol use. Thus, the second objective of this study was to analyze the temporal and bidirectional relationships between PIU and problematic alcohol use. Because some differences have been documented between adolescent males and females for PIU and problematic alcohol use (Schulte, Ramo, & Brown, 2009; Shaw & Black, 2008), we also examined whether the relationship between these variables differs by gender.

2. Method

At the beginning of the study, participants were 976 adolescents between 13 and 18 years of age. All the participants were students recruited from 49 classrooms located in 12 secondary schools in Bizkaia, Spain. The sample was first stratified by school type: private and public schools. The classrooms were then selected randomly by means of a cluster sampling procedure stratified by school type. Of the 976 participants, 801 (59.7% females, 39.8% males, and 0.5% who did not indicate gender; mean age = 14.92, *SD* = 1.01) completed the measures at the two waves of the study (attrition rate = 17.93%). The reasons given for almost the entire attrition rate was absence from school because of illness. A series of *t*-tests were conducted to examine differences in all study variables at T1 among the 801 adolescents who completed the two waves and those who failed to complete the study. None of these differences was significant.

Most of the participants were Spanish (91.5%), and the remaining participants were South American (6.1%), Eastern European (0.3%), African (0.4%), Asian (0.5%), or other ethnicities (1.2%). Socioeconomic levels were determined by applying the criteria recommended by the Spanish Society of Epidemiology and Family and Community Medicine (Domingo-Salvany, Regidor, Alonso, & Alvarez-Dardet, 2000) based on information about parental occupation and income. Using these criteria, the sample can be described as 11.2% low, 16.8% medium-low, 31.9% medium, 30.3% medium-high, and 9.8% high income.

2.1. Measures

2.1.1. Problematic Internet use

We use the Generalized Problematic Internet Use Scale 2 (GPIUS2; Caplan, 2010), which assesses different components of PIU according to a cognitive-behavioral model. The GPIUS2 consists of 15 items grouped into four distinct subscales: a) preference for online social interactions (3 items; e.g., "I prefer online social interaction over face-to-face communication"), b) the regulation of mood through Internet use (3 items; e.g., "I have used the Internet to talk with others when I was feeling isolated"), c) deficient self-regulation (6 items; e.g., "I have

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