EMPIRICAL ARTICLE

Problematic internet use profiles and their associated factors among adolescents

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Abstract

The cognitive-behavioral model of generalized Problematic Internet Use (PIU) is the theoretical approach that has obtained the most evidence on the study of this problem, which includes four components: Online Social Preference, Mood Regulation, Deficient Self-Regulation, and Negative Outcomes. This study aimed to identify PIU profiles using Latent Profile Analysis, and to analyze the differences in them attending to some of the principal PIU risk and protective factors. A total of 675 Spanish adolescents completed questionnaires assessing PIU, Internet usage, mental health problems, personality, psychological strengths, and family relationships. Four profiles were obtained: Nonproblematic use (68.30% of the sample), Slightly problematic use (17.90% of the sample), Problematic use (8.50% of the sample), and Severe problematic use (5.40% of the sample). Results showed differences between them, with the profile with more PIU having more risk factors and less protective factors. Results showed that many different personal and social variables included in the study play a role in PIU. Knowing the different PIU profiles can help in the design of more specific and precise procedures and instruments for risk assessment, as well as aiding in prevention and in the design of more individualized treatments.

KEYWORDS
adolescents, internet addiction, latent profile analysis, problematic internet use, risk factors

INTRODUCTION

Problematic Internet Use (PIU, hereinafter) is a public health concern in modern societies across the globe, even more so because of the impact of the COVID-19 pandemic (Islam et al., 2020). The epidemiology of PIU is still unclear, with a wide range of reported point prevalence estimates, reflecting not only population differences but also the diversity of assessment tools and different operational definitions of PIU behaviors (Ioannidis et al., 2018; Pan et al., 2020). The cognitive-behavioral model of PIU has shown its robustness across different populations, including the Spanish adolescent population, thus being ideal for carrying out epidemiological studies of this phenomenon (Caplan, 2010; Fioravanti et al., 2013; Gámez-Guadix et al., 2013).

The theoretical approach that has received the most attention in explaining this phenomenon is the cognitive-behavioral model of generalized PIU (Caplan, 2010; Davis, 2001). This model proposes that such maladaptive use implies a set of cognitive processes and dysfunctional behaviors that have negative consequences for the person in different areas of life. In Caplan (2010) review of the model, four core components, called Preference for Online Social Interaction (POSI), Mood Regulation (MR), Deficient Self-Regulation (DSR), and Negative Outcomes (NO) are presented.

First, POSI refers to the belief that relationships through the Internet are safer, more comfortable and more effective, and less threatening than face-to-face interaction, which, in turn, would be associated with a greater

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PIU (Caplan, 2003; Caplan & High, 2011). In this vein, various studies have found that people with poor social skills, social anxiety, or isolation are more likely to make inappropriate use of the Internet (Caplan, 2007; Cheng et al., 2015).

Second, MR through the Internet refers to the use of the Internet to reduce anxiety, negative feelings, or isolation (Caplan, 2002). Thus, this use of the Internet acts as a dysfunctional emotion regulator (Gioia et al., 2021). In fact, individuals who use the Internet excessively have been reported to connect more frequently to relieve feelings of sadness, anxiety or loneliness than those who use the Internet adequately (Cai et al., 2023).

Third, DSR is conceptualized as a construct that includes two distinct but closely related components: cognitive preoccupation and compulsive Internet use (Caplan, 2010). Cognitive preoccupation refers to obsessive thought patterns about Internet use; compulsive Internet use refers to the inability to control or regulate Internet connection behavior. Studies have found that both deficient self-regulation components are central to the PIU (Caplan, 2010; Pichardo et al., 2021).

Finally, the model highlights the importance of the onset of NO. This component indicates the extent to which a person experiences personal, social, academic, or work-related problems because of dysfunctional use of the Internet. At an empirical level, numerous studies have found that Internet addiction is associated with negative consequences in the individual's personal life, such as academic impairment, interpersonal problems, or physical/health problems (Caplan, 2007; Fernández-Villa et al., 2015; Zhou et al., 2022).

Currently, there is still no consensus on what aspects clearly distinguish a problematic involvement from a truly dysfunctional involvement (e.g., Romero Saletti et al., 2021). In any case, the four components of Caplan's model are still currently included in the guidelines for prevention and intervention in the problematic use of new technologies and the Internet (Salabert, 2023). In this sense, salience (the addictive activity dominates thoughts, feelings, and behaviors), the search for a change in mood, tolerance, abstinence, intraindividual and interindividual conflicts, and relapse are among the main characteristics of PIU and addictive behaviors.

In turn, PIU, as a complex behavior, is predisposed by a wide range of risk and protective factors. Lam (2014) conducted a systematic review of longitudinal and prospective studies on this topic, which was later extended with further meta-analyses (Cai et al., 2023; Lozano-Blasco et al., 2022). From these reviews, it is concluded that an extensive variety of different risk and protective factors influence the onset and development of PIU. Although it is difficult to make generalizations related to the factors involved in this complex phenomenon, some variables that affect it should be considered (Vondráčková & Gabrhelík, 2016).

Some of the most important factors that have been found to be related to the development of PIU are emotional problems. Among these, the role of, for example,

depressive mood, psychological distress, general anxiety and social anxiety, negative self-esteem, low levels of overall life satisfaction and general well-being, obsessive-compulsive behaviors, and attention-deficit/hyperactivity disorder can be highlighted (Anderson et al., 2017; Coyne et al., 2019; Ioannidis et al., 2018). Behavioral problems, such as lack of self-control, low impulse control, and hostile behavior, as well as increased alcohol consumption, have also been linked to this phenomenon (Anderson et al., 2017; Chamberlain et al., 2018; Moreno et al., 2022; Sanchez-Fernandez et al., 2023; Yang & Zhu, 2023; Zych et al., 2023).

Personality appears to be another important factor related to PIU. Thus, in general terms, low levels of extraversion, kindness, responsibility, emotional stability, and openness to experience have been found to be associated with high PIU (Przepiorka et al., 2021; Xiao et al., 2019). However, positive relationships with extraversion and openness to experience have been found in some studies (Anderson et al., 2017; Xiao et al., 2019).

Finally, in addition to the positive association between PIU and the use of social networks and gaming (Casale et al., 2021; Kircaburun & Griffiths, 2018), recent research has also focused on the relationship between parents and children, with results indicating that adolescents with less close and more dysfunctional relationships with their parents show greater symptoms of PIU (Loladze, 2020; Nielsen et al., 2020).

Due to the seriousness of the problem, currently, several international studies have tried to identify PIU profiles based on Latent Profile Analysis (LPA) to deepen the understanding of the problem (Machimbarrena et al., 2019; Pontes et al., 2016; Pontes & Macur, 2021; Wartberg et al., 2015). Thus, a study by Pontes et al. (2016) based on the dimensions of the Problematic Internet Use Scale-2 (GPIUS2), which, as mentioned above, is based on Caplan's (2010) PIU model, found three PIU profiles based on POSI, MR, DSR, and NO, which they assigned as low risk, medium risk, and high risk in the general Portuguese population. Another study in Slovenians, based on 6 items measuring obsession, neglect, and control disorder, obtained two profiles classified as low risk of PIU and high risk of PIU (Pontes & Macur, 2021). A third study conducted in German adolescents, although not based on Caplan's model, found five PIU profiles, categorized from low to high risk (Wartberg et al., 2015). Finally, a fourth study in Spanish adolescents was located that did use the components of Caplan's model but split the DSR component into its two subcomponents (i.e., cognitive preoccupation and compulsive Internet use). In this case, four profiles were detected, also categorized from nonproblematic to severe problematic use (Machimbarrena et al., 2019). However, none of these studies subsequently analyzed the differences between the profiles found and different risk or protective factors associated with this problem.

LPA allows us to classify individuals into homogeneous groups and then examine differences between groups attending to the variables of interest (Williams & Kibowski, 2016).

The purpose of this study was to find a theoretical and empirical approach to identify and categorize adolescents with PIU. Specifically, the novel aim of this study was (a) to analyze the different profiles of Spanish adolescents in terms of their PIU, specifically, according to the four components of Caplan's model; and (b) to analyze the differences between these profiles considering the main variables presented in the existing literature as risk or protective factors for this problem (i.e., Internet use, mental health problems, personality, psychological strengths, and family relationships).

Following the previous literature, the hypotheses are as follows: (H1) Taking as a reference the results found in the study of (Machimbarrena et al., 2019) in a sample of Spanish adolescents, in this study we also expect to obtain 4 profiles (although the four components of the Caplan's model are included directly and not the subcomponents of the DSR); (H2) We expect to find differences in the profiles obtained in terms of the different risk or protective factors related to PIU. Specifically, it is expected to find that the profile of adolescents with higher PIU will present more risk factors and fewer protective factors.

METHOD

Participants

The study sample was 675 Spanish students belonging to 7 secondary education centers in Spain. Participants ranged in age from 12 and 18 years (M = 14.2, SD = 1.6) and the gender distribution was 465 boys (58.8%). All participants were enrolled in one of the courses between 1st and 4th grade of compulsory secondary education, or between 1st and 2nd grade of a high school degree.

Measures

Generalized problematic internet use scale 2 (GPIUS2)

The GPIUS2 (Caplan, 2010; Spanish version: Gámez-Guadix et al., 2013). This scale evaluates the different components of generalized PIU. It consists of 15 items grouped into four differentiated subscales, which evaluate the four components of Caplan's model (POSI, MR, DSR, and NO). The response format used was a six-point Likert-type scale, ranging from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*). The internal consistency of the scale in previous studies was a Cronbach's alpha (α) of .91 (Caplan, 2010; Gámez-Guadix et al., 2013).

Short 6-item ad hoc questionnaire

To assess Internet use, a short 6-item ad hoc questionnaire was administered on issues related to the frequency of use of tools for communicating with other people (social networks, instant messaging, and e-mail), as well as the use of online games, using a 4-point Likert scale (from 1 = *never* to 4 = *always*). Examples of questions included were "How often do you use social networks via any device [computer, tablet, mobile, etc.]?", for Internet communication use, and "How often do you play online games via any device [computer, tablet, mobile, etc.]?" for online gaming use.

DetectaWeb-Distress scale

The *DetectaWeb-Distress scale* is an online screening questionnaire used to assess emotional disorders (García-Olcina et al., 2014). It consists of 30 items that evaluate the symptoms of anxiety disorders (separation anxiety disorder, specific phobia, social phobia, generalized anxiety disorder, panic disorder with/without agoraphobia), posttraumatic stress disorder, obsessive-compulsive disorder, and unipolar depressive disorders (major depressive disorder and dysthymia), together with suicidal behaviors (ideation, plans and attempts). It follows a Likert-type response format (from 0 = *Never* to 3 = *Always*). Three previous studies have supported its reliability and validity in evaluating anxiety, depression and suicidal behavior among children and adolescents (García-Olcina et al., 2014, 2017). Specifically, these studies in healthy and clinical populations have shown good psychometric properties, with internal consistencies (α) higher than .70 in most subscales, as well as medium and strong significant correlations with malaise and emotional well-being tests.

The strengths and difficulties questionnaire (SDQ)

The SDQ (Goodman, 1997; Spanish version downloaded from the SDQ website: ww.sdqinfo.org) is widely used to evaluate different emotional and behavioral problems in children and adolescents. It consists of five subscales but, for this study, only items belonging to the behavioral problems and hyperactivity/inattention disorder subscales, i.e., the externalizing symptoms, were used (5 items per factor). This version uses a three-point Likert-type response format (from 0 = *not true* to 2 = *true*). The SDQ has shown good psychometric properties among Spanish populations (α between .69 and .78) (Ortuño-Sierra et al., 2015).

Adolescent drug use inventory

This scale (Spanish version: Calvete & Estévez, 2009) was used to assess alcohol consumption, which was based on the one developed by Wills et al. (2001). Participants had to indicate through one item the extent to which they consumed alcohol, using a 6-point Likert from Never to Daily. The item was formulated as follows: "Indicate the extent to which you use alcohol using the following scale from Never to Daily".

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Ten-item personality inventory (TIPI)

The TIPI (Renau et al., 2013; Spanish version for children and adolescents-TIPI-CA: García-Oliva et al., 2017) is composed of 10 items, two for each dimension (extraversion, kindness, responsibility, emotional stability, and openness to experience). Each item was rated between 1 (*completely disagree*) and 7 (*completely agree*). In the study performed by López-Fernández et al. (2024), the authors reported appropriate properties of the TIPI-CA in terms of interitem correlations, temporal stability, factor analysis, as well as convergent, divergent, and criterion validity.

Aggression questionnaire-refined version (AQ-R)

The AQ-R (Bryant & Smith, 2001; Spanish version: Gallardo-Pujol et al., 2006). This scale is composed of 12 items that allow the assessment of aggression through four scales (hostility, anger, verbal aggression, and physical aggression), using a 5-point Likert scale (from 1 = *never* to 5 = *always*). The internal consistency values of the four scales in the Spanish validation study were between 0.58 and 0.70.

Avoidance and fusion questionnaire for youth (AFQ-Y)

The AFQ-Y (Greco et al., 2008; Spanish version Valdivia-Salas et al., 2017), was used to measure psychological inflexibility, which allows one to obtain a score in two dimensions, i.e., in cognitive fusion and experiential avoidance. It is a self-applied scale, consisting of 17 items with a 5-point Likert-type response format (from 0 = *not true* to 4 = *very true*). The authors of the Spanish version reported adequate psychometric properties (α = .81 and .76 respectively).

Social-emotional health survey-secondary (SEHS-secondary)

The SEHS-Secondary (Furlong et al., 2014; Spanish version: Piqueras et al., 2019) was used to assess the psychological strengths. The SEHS-S evaluates basic psychosocial resources based on a higher-order model of "Covitality" that consists of four latent traits: belief in oneself, belief in others' emotional competence and engaged living. It is a 36-item instrument suitable for application among adolescents aged between 14 and 18 years. For 10 of the 12 subscales, the response format is a 4-point Likert-type scale: from 1 = *not true* to 4 = *very true*. The Gratitude and Enthusiasm subscales have a 5-point response format: from 1 = *not at all* to 5 = *extremely*. The Spanish adaptation showed good psychometric properties, with a α above .82 on all four factors.

Child parental acceptance-rejection/control questionnaire short form (PARQ/C)

The mothers' and fathers' forms of the PARQ/C (Rohner, 2005); Spanish version: (del Barrio et al., 2014) were used to assess the parenting styles. This questionnaire consists of 29 items that are distributed across five scales: Non-Warmth/Affection, Hostility/Aggression, Indifference/Neglect, Undifferentiated Rejection and Control. In this study the first 4 scales were used, the sum of which forms the dimensions of acceptance-rejection. All items are rated on a 4-point Likert scale ranging from 1 (*Almost never true*) to 4 (*Almost always true*). The Spanish version has shown good reliability indices (α = .88 for the father and mother version).

APGAR-familiar questionnaire (APGAR)

The family functioning was measured through the *APGAR* (Smilkstein, 1978); Spanish version: (Bellón-Saameño et al., 1996). This is a 5-item questionnaire that assesses the adaptation, partnership, growth, affection, and resolve with a 3-point Likert-type response format (from 0 = *Almost Never* to 2 = *Almost Always*). It provides a total score indicating the subject's perceived family support. The Spanish version showed a good reliability index, with a α = .84.

Procedure

Seven educational centers wanted to participate in the study. The DetectaWeb platform (https://detecta-web.umh.es/) was used to screen the mental health of children and adolescents (Piqueras et al., 2017) and the recruited students were organized within their centers to complete the questionnaire in their computer rooms.

The data and syntax of this study are available to authors in the OSF repository by following the link below: https://osf.io/bzmwr/?view_only=46d51a4f4859415b841ddec97a54e8c0.

Statistical analysis

Descriptive statistics, internal consistency and Pearson's bivariate correlations were calculated. The magnitudes of association were interpreted after Bonferroni correction to obtain more accurate results (a significant effect was $p < .0015$), because of dividing the alpha (i.e., .05) by the number of analyses performed (i.e., 33). IBM SPSS (version 23) and Jamovi (version 1.6.23) statistical software were used.

Prior to obtaining the profiles, the four-factor solution of the GPIUS2 (scale used to obtain the profiles) was confirmed in the current sample by means of a Confirmatory Factor Analysis (CFA). To ensure accurate model estimation, the Diagonally Weighted Least Squares (DWLS) method was employed. Model fit was assessed using established

criteria: significance of the chi-square (χ^2) value ($p < .05$), Normalized Fit Index (NFI) exceeding 0.90, Comparative Fit Index (CFI) surpassing 0.95, Goodness of Fit Statistic (GFI) equal to or greater than 0.90, Standardized Root Mean Residual (SRMR) less than or equal to 0.05, and Root Mean Squared Error Approximation (RMSEA) less than or equal to 0.08 (Hu & Bentler, 1999; Kline, 2011). The values of the Average Variance Extracted (AVE) were also performed (values above 0.50 would indicate high convergent validity). This analysis was conducted using the R software (R Core Team).

Next, using the statistical program Mplus (version 7.3), PIU profiles were identified by Latent Profile Analysis (LPA) to explore the distribution of adolescents based on the four components of Caplan's model (i.e., POSI, MR, DSR, and NO). The LPA was developed from the standard score of the four variables to decrease the effect of measurement errors. Models with 1–8 profiles were obtained and several fit indices were considered: Akaike Information Criterion (AIC), the BIC adjusted for sample size (SSA-BIC), the Likelihood Ratio Test (LRT), the Log-Likelihood (LL), and the Entropy. The most optimal model was chosen considering the best combination of these indices: the smallest AIC, SSA-BIC, and LL values with the largest number of profiles, the significance of the LRT values ($p \leq .05$), and values as close as possible to 1 for entropy were considered. Care was also taken that no profile within each model had too small a percentage of participants (<5%), as would the elbow graph (Marsh et al., 2009; Morin et al., 2016).

Although it was not an objective of the study, once the most optimal profile model was obtained, the probability (i.e., odds ratios) of belonging to one or the other profile as a function of the gender and age variables was tested by logistic regression analysis. To obtain robust results, the three-step method (R3STEP function) of MPLUS was used.

Finally, an analysis of variance (ANOVA) and the BCH method of MPLUS were used to analyze the differences between the profiles obtained with the LPA in terms of risk and protective factors of adolescents (Asparouhov & Muthén, 2014). Given the multiple comparisons, it was considered appropriate to apply a stricter p-significance value. Specifically, differences were considered significant at p values <.01.

RESULTS

Descriptive statistics

Table 1 presents the results of the correlation analyses between the GPIUS2 scores and each of the studied variables. The total score and most of the GPIUS factors correlated significantly and negatively with personality traits, except for openness to experience. Aggressiveness and psychological inflexibility were positively correlated. Positive relationships were also observed with almost all factors related to mental health problems (except for alcohol consumption), Internet use, and parenting style. In contrast, they correlated

negatively with psychological strengths and family functioning. Most correlation values showed weak to moderate magnitudes of association.

Table 1 also presents the scores of the participants on the different self-reports administered as well as the internal consistency values of each of the subscales. All instruments present adequate internal consistency rates except for the five personality factors, obsessive-compulsive disorder, and behavioral problems, with scores below 0.60.

Latent profile analysis

Before obtaining the profiles using the factors of the GPIUS2 scale, its factor structure was tested. The CFA showed the following fit indices: $\chi^2 = 446.182$, df = 84, $p < .001$, NFI = 0.906, GFI = 0.646, CFI = 0.915, SRMR = 0.050, RMSEA = 0.080. A good model fit was obtained. In addition, AVE values between 0.50 and 0.65 were obtained for the factors.

Table 2 shows the results of the LPA used to explore the distribution of adolescents in terms of their PIU. The solutions of five, six, seven and eight profiles were discarded because they presented a profile with a very small percentage of participants, which might not be representing a singular latent profile (Marsh et al., 2009). Furthermore, the five-, seven- and eight-profile solutions presented an LRT value that did not reach significance ($p > .05$), so they had to be rejected as well; and the same was true for the three-profile model, i.e., it had to be rejected as it did not reach the significance level. Of the remaining two models, i.e., the two-profile and the four-profile model, the fit indices were examined to analyses which one fitted the data better. As a result, the four-profile solution was found to be the most optimal after considering the combination of the lowest LL, AIC and SS-BIC values and the highest entropy values. The elbow plot also allowed this decision to be made by showing that the four-profile model could be a suitable choice (Figure 1).

As a result of the four-profile model, the following classification was obtained: (1) A profile of adolescents characterized by low levels of PIU by having the lowest scores on the four factors, hereafter referred to as Nonproblematic use (68.30% of the sample); (2) A profile of adolescents characterized by moderate levels of PIU by having medium scores on POSI and RM, and medium-high scores on DSR and NO, hereafter referred to as Slightly problematic use (17.90% of the sample); (3) A profile of adolescents characterized by having medium-high levels of PIU, by having medium scores on DSR and NO, but by having medium-high scores on RM and the highest scores of the four profiles on POSI, hereafter referred to as Problematic use (8. 50% of the sample); and (4) A group of adolescents characterized by high levels of PIU by having the highest scores on three of the four factors (i.e., on RM, DSR and NO) and, although not the highest compared to the other three profiles, also high scores on POSI, hereafter referred to as Severe problematic use (5.40% of the sample). As can be seen, the most represented profiles are the Nonproblematic use and the Slightly problematic use.

TABLE 1 Bivariate correlations between Problematic Internet Use and variables of interest, means, standard deviations and reliability indices.

	Total GPIUS2	Preference for online social interactions	Mood regulation	Deficient self-regulation	Negative outcomes	M (SD)	Cronbach's alpha	McDonald's omega
Internet usage								
Communication use	.17*	.01	.12**	.21*	.13*	9.13 (2.95)	.67	.69
Online gaming	.12**	.15*	.11**	.05	.11**	1.17 (1.08)	—	—
Mental health problems								
Depressive symptoms	.50*	.41*	.39*	.39*	.41*	3.56 (3.28)	.83	.83
Suicidal behaviors	.31*	.29*	.23*	.22*	.27*	.43 (1.28)	.85	.87
Anxiety symptoms	.37*	.21*	.30*	.34*	.24*	14.76 (6.52)	.79	.80
Obsessive-compulsive disorder	.34*	.23*	.23*	.31*	.27*	1.55 (1.58)	.53	.55
Posttraumatic stress disorder	.32*	.25*	.29*	.23*	.24*	.93 (1.48)	.75	.75
Behavioral problems	.31*	.13*	.20*	.31*	.28*	1.94 (1.6)	.48	.52
Attention deficit/hyperactivity disorder	.31*	.12**	.22*	.31*	.24*	4.06 (2.16)	.64	.65
Alcohol consumption	.12**	-.02	.08	.14*	.13*	1.12 (1.33)	—	—
Personality								
Extraversion	-.15*	-.34*	-.07	-.05	-.13*	5.08 (1.45)	.49	.50
Kindness	-.25*	-.17*	-.15*	-.23*	-.23*	5.51 (1.14)	.31	.31
Responsibility	-.29*	-.26*	-.18*	-.24*	-.26*	5.11 (1.25)	.25	.27
Stability	-.28*	-.15*	-.19*	-.29*	-.18*	4.41 (1.5)	.49	.49
Openness	-.09	-.13**	-.05	-.06	-.07	5.28 (1.26)	.32	.32
Verbal aggression	.28*	.13*	.25*	.25*	.23*	6.54 (2.49)	.64	.66
Physical aggression	.29*	.18*	.18*	.26*	.30*	5.27 (2.71)	.79	.80
Hostility	.40*	.33*	.30*	.32*	.32*	5.78 (2.74)	.80	.81
Anger	.30*	.15*	.19*	.29*	.27*	6.36 (2.96)	.76	.77
Cognitive fusion	.50*	.34*	.42*	.41*	.37*	9.08 (6.42)	.80	.81
Experiential avoidance	.37*	.25*	.32*	.31*	.26*	12.51 (7.04)	.75	.75
Psychological strengths								
Belief in oneself	-.31*	-.31*	-.19*	-.25*	-.26*	27.45 (5.53)	.85	.86
Belief in others	-.16*	-.17*	-.06	-.14*	-.13*	29.93 (5.65)	.87	.87
Emotional competence	-.20*	-.15*	-.10	-.18*	-.2*	28.42 (5.04)	.84	.84

TABLE 1 (Continued)

	Total GPIUS2	Preference for online social interactions	Mood regulation	Deficient self-regulation	Negative outcomes	M (SD)	Cronbach's alpha	McDonald's omega
Engaged living	−.30*	−.33*	−.18*	−.23*	−.25*	35.52 (7.5)	.92	.92
Family relationships								
Acceptance-rejection mother	.29*	.29*	.18*	.22*	.24*	37.3 (11.93)	.92	.92
Acceptance-rejection father	.29*	.24*	.19*	.25*	.25*	38.3 (12.11)	.92	.93
Family functioning	−.27*	−.25*	−.17*	−.23*	−.21*	7.54 (2.39)	.78	.79
M (SD)	2.2 (.89)	1.79 (1.03)	2.72 (1.41)	2.4 (1.12)	1.7 (.95)	—	—	—
Cronbach's alfa	.89	.84	.78	.85	.72	—	—	—
McDonald's Omega	.89	.84	.79	.86	.75	—	—	—

Abbreviation: GPIUS2, Generalized Problematic Internet Use Scale 2.

*$p < .0015$ (Bonferroni fit), **$p < .01$.

Figure 2 shows the distribution of the 4 profiles and Table 3 shows the descriptive statistics.

Table 4 shows the odds ratios of the association between the four profiles obtained and the sociodemographic variables (i.e., gender and age). Few differences were obtained according to these variables. Specifically, being female tends to be a criterion for classification into the Slightly problematic use profile compared to the Nonproblematic use profile (females were up to 1.62 times more likely to have high scores on PIU). In turn, being older was also associated with a significantly increased risk of being classified in the Problematic use profile compared to the Nonproblematic use profile (being older was up to 1.24 times more likely to have high scores on PIU). Among the remaining profiles, neither gender nor age played a role in differentiating them.

Differences between the profiles in terms of risk and protective factors of adolescents

Regarding the differences between the profiles obtained with the LPA and the risk and protective factors of the adolescents, the BCH method of MPLUS showed statistically significant differences ($p \leq .001$ and $p \leq .01$). Among the profiles that most differences were found was between the Nonproblematic use and the rest of the profiles (as can be seen in the Table 5, there are more significant differences between this profile and the rest). Among the remaining profiles, that is, among the profiles with moderate to high levels of PIU (i.e., Slightly Problematic use, Problematic use, and Severe Problematic use) there were significant differences between them on fewer PIU risk and protection variables.

These results revealed that the Severe problematic use profile is the highest user of online communication tools and online video games. In addition, this profile scored highest on most mental health problem factors (the Slightly problematic use profile scored highest on hyperactivity/inattention and alcohol consumption, and the Problematic use profile scored highest on obsessive-compulsive disorder). At the same time, these individuals appear to be less extroverted, less friendly, less responsible, less emotionally stable, and less open to experience. They also seem to show more aggressive, hostile, and angry behaviors, as well as greater psychological inflexibility. Finally, they also seem to show less psychological strengths (although the Problematic use profile seems to believe less in others) and more dysfunctional family relationships.

DISCUSSION

Because of the serious public health problem of PIU in modern societies around the world, the importance of considering this phenomenon in the study of adolescent development (Dong et al., 2020; Ehrenreich et al., 2021; Gecaite-Stonciene et al., 2021; Islam et al., 2020; Király et al., 2020), and the interest in identifying PIU profiles in the population through

TABLE 2 Model fit indices for 1- through 8-profile solutions.

Profiles	Parameters	LL	AIC	SSA-BIC	LRT p	Entropy	% smallest group
1	8	–	7674.265	7684.982	–	–	–
2	13	−3829.133	6981.749	6999.164	.0000	0.864	23.70%
3	18	−3477.875	6726.005	6750.118	.3185	0.896	5.20%
4	23	−3345.002	6577.560	6608.372	.0089	0.907	5.40%
5	28	−3265.780	6493.237	6530.747	.6297	0.838	3.20%
6	33	−3211.166	6390.423	6434.630	.0171	0.859	2.20%
7	38	−3162.211	6330.945	6381.851	.5037	0.854	1.90%
8	43	−3120.898	6257.339	6314.942	.4726	0.873	1.90%

Abbreviations: AIC, Akaike Information Criteria; LL, Log-Likelihood; LRT, Likelihood Ratio Test; SSA-BIC, Sample Size Adjusted Bayesian Information Criteria.
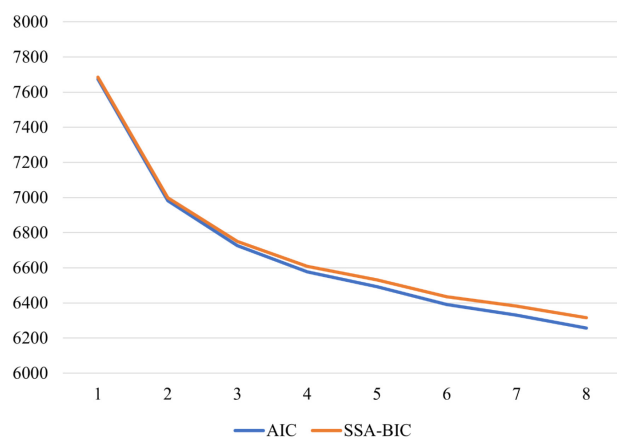

FIGURE 1 Elbow plots for Latent Profile Analysis (LPA): Akaike Information Criterion (AIC) and BIC adjusted for sample size (BIC) values for the eight models obtained in the LPA.

LPA (Machimbarrena et al., 2019; Pontes et al., 2016; Pontes & Macur, 2021; Wartberg et al., 2015), the aim of this work emerged. Thus, the main objective was (a) to analyze the different profiles of Spanish adolescents in terms of their PIU, specifically, according to the four components of Caplan's model; and (b) to analyze the differences between these profiles considering the main variables presented in the existing literature as risk or protective factors for this problem (i.e., Internet use, mental health problems, personality, psychological strengths, and family relationships).

Firstly, correlation analyses showed that all the variables included in the present study play a significant role in PIU. All the relationships obtained are in line with the results obtained in previous studies, since positive relationships have been obtained with the use of social networks and online gaming, with different mental health and behavioral problems, including alcohol consumption and aggressive behaviors, and with dysfunctional family relationships; and negative relationships were also found with the Big Five personality traits and with psychological strengths (Anderson et al., 2017; Casale et al., 2021; Chamberlain et al., 2018; Dong et al., 2020; Ioannidis et al., 2018; Kircaburun & Griffiths, 2018; Loladze, 2020; Marci et al., 2021; Moreno et al., 2022; Nielsen et al., 2020; Przepiorka et al., 2021;

Shokri et al., 2017; Xiao et al., 2019; Yang & Zhu, 2023; Zych et al., 2023).

Secondly, the LPA showed four different profile groups, with a profile with higher Internet use problems and a profile with lower problems at the extremes. In the middle, two profiles were found, one of them with moderate PIU scores overall, and one of them also with moderate scores, but with the highest POSI score of the four profiles. In previous baseline research, two extreme profiles were also found representing a group with high PIU levels and a group with low PIU levels, with the most represented profile being the one with lower PIU levels (Machimbarrena et al., 2019; Pontes et al., 2016; Pontes & Macur, 2021; Wartberg et al., 2015). In turn, these results are in line with those obtained in the study by Machimbarrena et al. (2019), who also tried to identify PIU profiles based on the factors of Caplan's model in adolescents and found four profiles (H1 is accepted). However, in contrast to our study, Machimbarrena et al. (2019) obtained the highest scores in all the factors included in the LPA in the profile with the highest levels of PIU, which could be due to the difference in sample size and/or to the fact that in their study they included five and not four factors of the Caplan model (they divided the DSR into cognitive preoccupation and compulsive Internet use).

Results show that all the variables included in the present study play a significant role in PIU. Specifically, significant differences were found between the four PIU profiles obtained in terms of risk or protective factors. In line with previous literature, it was observed that the Severe problematic use profile, i.e., those with the highest levels of PIU, had more risk factors and fewer protective factors (H2 is accepted): adolescents in this profile use more communication tools and online video games (Casale et al., 2021; Kircaburun & Griffiths, 2018); have more mental health problems, such as depressive and anxiety symptoms, obsessive-compulsive behaviors, and have lower psychological strengths and general wellbeing (Anderson et al., 2017; Ioannidis et al., 2018); they have more behavioral problems, such as hostility and aggression, and higher alcohol consumption (Anderson et al., 2017; Chamberlain et al., 2018; Moreno et al., 2022; Sanchez-Fernandez et al., 2023; Shokri et al., 2017; Yang & Zhu, 2023; Zych et al., 2023); appear to be less extroverted, friendly, responsible, and less emotionally stable and open
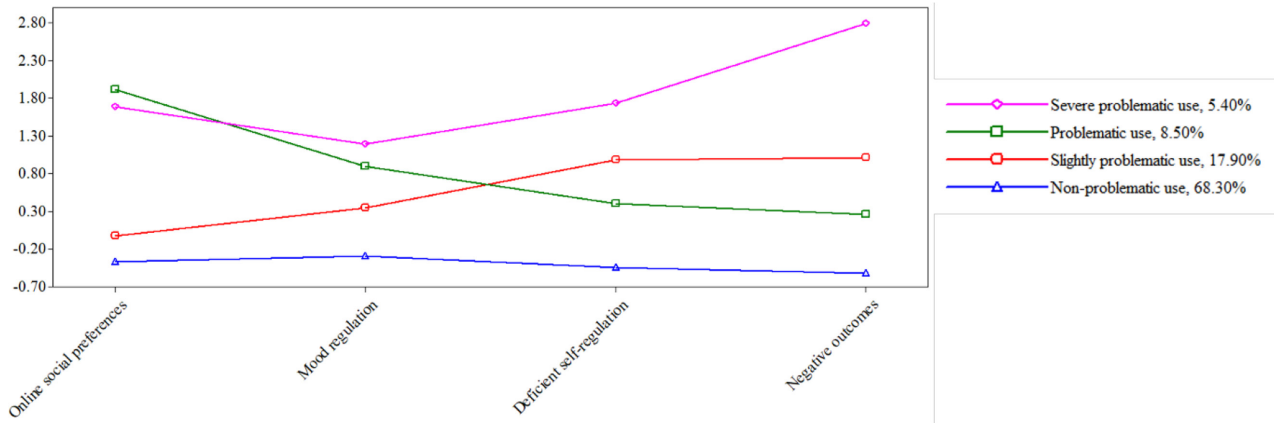
FIGURE 2 Profiles of Problematic Internet Use: Profiles of Spanish adolescents in terms of their PIU, according to the four components of Caplan's model.

TABLE 3 Means and standard errors (z scores) for the 4-latent profile analysis.

	Profiles							
	Nonproblematic use (n = 470)		Slightly problematic use (n = 116)		Problematic use (n = 52)		Severe problematic use (n = 37)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
POSI	−0.36	0.04	−0.02	0.14	1.92	0.25	1.68	0.28
MR	−0.30	0.05	0.34	0.10	0.90	0.19	1.20	0.19
DSR	−0.44	0.04	0.98	0.11	0.40	0.15	1.73	0.19
NO	−0.52	0.02	1.01	0.12	0.27	0.20	2.79	0.32

Abbreviations: DSR, Deficient Self-Regulation; MR, Mood Regulation; NO, Negative Outcomes; POSI, Preference for Online Social Interaction.

TABLE 4 Odds ratio of the association between the psychopathological profiles and sociodemographic variables.

Predictors	Profile		OR	95% CI
Gender	1- Nonproblematic use	2- Slightly problematic use	1.62	1.02, 2.57
	1- Nonproblematic use	3- Problematic use	0.76	0.38, 1.53
	1- Nonproblematic use	4- Severe problematic use	1.03	0.49, 2.14
	2- Slightly problematic use	3- Problematic use	0.47	0.21, 1.05
	2- Slightly problematic use	4- Severe problematic use	0.63	0.28, 1.46
	3- Problematic use	4- Severe problematic use	1.35	0.51, 3.59
Age	1- Nonproblematic use	2- Slightly problematic use	1.14	1, 1.30
	1- Nonproblematic use	3- Problematic use	1.24	1.04, 1.48
	1- Nonproblematic use	4- Severe problematic use	1.14	0.92, 1.42
	2- Slightly problematic use	3- Problematic use	1.09	0.89, 1.33
	2- Slightly problematic use	4- Severe problematic use	1	0.79, 1.28
	3- Problematic use	4- Severe problematic use	0.92	0.71, 1.21

Note: Gender was coded as 1 = Male/2 = Female; Age ranged from 12 to 17 years.
Abbreviations: 95% CI, confidence interval (OR significant when the CI does not contain 1); OR, odds ratio.

to experience (Anderson et al., 2017; Przepiorka et al., 2021; Xiao et al., 2019); and have more dysfunctional family relationships (Anderson et al., 2017; Loladze, 2020; Marci et al., 2021; Nielsen et al., 2020). In addition, they have greater psychological inflexibility, which has also been shown to be an important variable to explain addictive behaviors (Stotts et al., 2015).

Better understanding the characteristics of the PIU, identifying profiles, and further study of risk and protective factors can improve the design of more effective prevention

TABLE 5 Means and standard errors (z scores) for adolescent's mental health outcomes across latent groups.

Variables	M (SE)				χ²					
	1-Nonproblematic use (n=470)	2-Slightly problematic use (n=116)	3-Problematic use (n=52)	4-Severe problematic use (n=37)	1 vs. 3	2 vs. 3	3 vs. 4	1 vs. 2	1 vs. 4	2 vs. 4
Internet usage										
Communication use	−0.09 (0.05)	0.27 (0.10)	−0.06 (0.16)	0.29 (0.16)	0.03	2.87	2.46	10.32**	5.37*	0.02
Online gaming	−0.06 (0.05)	−0.10 (0.10)	0.41 (0.17)	0.45 (0.18)	6.86**	6.03*	0.03	0.10	7.69**	6.82**
Mental health problems										
Depressive symptoms	−0.28 (0.04)	0.33 (0.11)	0.81 (0.20)	1.19 (0.23)	27.68***	4.07*	1.54	27.26***	39.21***	10.86**
Suicidal behaviors	−0.19 (0.03)	0.21 (0.14)	0.61 (0.25)	0.81 (0.29)	10.40**	1.95	0.26	8.02**	11.96**	3.42
Anxiety symptoms	−0.18 (0.05)	0.32 (0.11)	0.40 (0.16)	0.65 (0.15)	11.70**	0.15	1.34	17.21***	28.99***	3.10
Obsessive-compulsive disorder	−0.22 (0.04)	0.38 (0.10)	0.62 (0.18)	0.57 (0.25)	20.88***	1.38	0.03	30.58***	9.59**	0.48
Posttraumatic stress disorder	−0.18 (0.04)	0.18 (0.12)	0.60 (0.22)	0.68 (0.26)	11.50**	2.59	0.06	8.14**	10.38**	2.92
Behavioral problems	−0.18 (0.04)	0.49 (0.11)	0.05 (0.14)	0.56 (0.23)	2.56	5.62*	3.59	29.52***	10.12**	0.07
Hyperactivity/inattention	−0.20 (0.05)	0.49 (0.10)	0.34 (0.16)	0.38 (0.20)	10.55**	0.65	0.03	40.02***	8.33**	0.25
Alcohol consumption	−0.06 (0.05)	0.32 (0.10)	−0.23 (0.04)	0.04 (0.17)	1.31	9.49**	1.49	11.18**	0.33	1.84
Personality										
Extraversion	0.10 (0.05)	0.14 (0.10)	−0.63 (0.18)	−0.69 (0.19)	15.84***	13.82***	0.04	0.18	15.46***	13.92***
Kindness	0.14 (0.05)	−0.33 (0.11)	−0.20 (0.15)	−0.37 (0.20)	4.39*	0.47	0.47	14.86***	6.48*	0.03
Responsibility	0.16 (0.05)	−0.22 (0.10)	−0.45 (0.16)	−0.60 (0.18)	13.22***	1.44	0.39	12.15***	17.21***	3.43
Stability	0.12 (0.05)	−0.30 (0.11)	−0.06 (0.15)	−0.45 (0.18)	1.33	1.43	2.59	11.87**	9.24*	0.48
Openness	0.05 (0.05)	−0.01 (0.11)	−0.06 (0.15)	−0.47 (0.20)	0.39	0.06	2.78	0.19	6.67*	4.22*
Verbal aggression	−0.14 (0.05)	0.26 (0.11)	0.08 (0.14)	0.76 (0.19)	2.25	0.97	8.09**	10.66**	20.25***	4.75*
Physical aggression	−0.18 (0.04)	0.31 (0.12)	0.17 (0.15)	0.94 (0.22)	4.51*	0.48	8.18**	14.39***	24.90***	6.16*
Hostility	−0.21 (0.04)	0.27 (0.11)	0.48 (0.17)	1.06 (0.21)	15.93***	1.04	4.47*	17.65***	34.49***	10.52**
Anger	−0.18 (0.04)	0.37 (0.12)	0.16 (0.18)	0.82 (0.19)	3.28	0.96	6.37*	19.69***	26.87***	3.89*
Cognitive fusion	−0.27 (0.04)	0.45 (0.10)	0.67 (0.17)	0.93 (0.23)	27.63***	1.18	0.80	44.71***	27.34***	3.65
Experiential avoidance	−0.18 (0.05)	0.32 (0.09)	0.29 (0.16)	0.70 (0.22)	8.06**	0.02	2.28	22.26***	15.69***	2.50
Psychological strengths										
Belief in oneself	0.18 (0.05)	−0.22 (0.10)	−0.58 (0.16)	−0.65 (0.19)	19.96***	3.35	0.06	12.45***	17.44***	3.69
Belief in others	0.13 (0.05)	−0.19 (0.10)	−0.45 (0.18)	−0.27 (0.19)	9.64**	1.44	0.45	7.50**	4*	0.13
Emotional competence	0.14 (0.04)	−0.30 (0.10)	−0.21 (0.19)	−0.45 (0.21)	3.10	0.14	0.68	14.54***	7.48**	0.40
Engaged living	0.19 (0.04)	−0.26 (0.10)	−0.57 (0.22)	−0.65 (0.20)	11.65**	1.64	0.08	16.37***	17.72***	3.16

TABLE 5 (Continued)

Variables	M (SE)				χ^2					
	1-Nonproblematic use (n = 470)	2-Slightly problematic use (n = 116)	3-Problematic use (n = 52)	4-Severe problematic use (n = 37)	1 vs. 3	2 vs. 3	3 vs. 4	1 vs. 2	1 vs. 4	2 vs. 4
Family relationships										
Acceptance-rejection mother	−0.17 (0.04)	0.17 (0.10)	0.49 (0.19)	0.84 (0.20)	10.92**	2.08	1.55	9.50**	23.73***	8.58**
Acceptance-rejection father	−0.17 (0.04)	0.29 (0.10)	0.36 (0.20)	0.65 (0.18)	6.46*	0.08	1.15	16.33***	19.89***	2.86
Family functioning	0.17 (0.04)	−0.31 (0.11)	−0.38 (0.18)	−0.51 (0.21)	8.33**	0.12	0.22	16.11***	9.86**	0.73

Note: Asterisk in χ^2 values refers to groups significantly different: $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Abbreviations: M, Mean; SE, Standard error; χ^2, chi-square value.

and treatment programs (Kuss & Lopez-Fernandez, 2016; Shapira et al., 2003). Therefore, knowing the profiles of PIUs and the differences between them could help in the selection of the best prevention and treatment programs according to the type of participants and their problems, in short, to target these programs more effectively.

However, it is important to note that in this study significant differences were found for few risk and protective factors between the Problematic internet use and the Severe problematic use profiles. The Problematic use profile had lower levels of PIU than the Severe problematic use profile but scored higher than the Severe problematic use profile on the POSI factor, and hardly any differences were found between the two profiles on the ER factor. Therefore, it seems important to focus also on adolescents in this profile since no significant differences were found between this profile and the most severe profile (i.e., the Severe problematic use profile) in terms of Internet use, mental health problems, psychological strengths, and dysfunctional family relationships.

Finally, although some studies conclude that men tend to have higher PIU scores than women (with small effect sizes), this study revealed hardly any gender differences between profiles (e.g., Anderson et al., 2017; Baloğlu et al., 2020; Su et al., 2019). That is, being male or female did not appear to be a risk factor for belonging to profiles with higher PIU. The same was true for age, as some studies also tend to conclude that older adolescents tend to have more PIU, but our study showed hardly any differences between profiles (e.g., Ioannidis et al., 2018; Sanchez-Fernandez et al., 2023). The studies cited above consider that other variables, such as those considered in our study, play a more relevant role in determining PIU than sociodemographic variables such as sex and age.

Limitations and future lines of research

Concerning the limitations of the study, it is worth mentioning those relating to the cross-sectional design, which prevent establishing clear causal relationships, as well as the type of sampling used (i.e., convenience sampling), which limits the generalization of results. Likewise, the different sample sizes obtained in the profiles (profiles with large *n* vs. profiles with small *n*) could also be a limitation of the study. On the other hand, a common problem both in studies on PIU and other addictive behaviors can be the bias of social desirability in the self-report. The next natural step to be taken by the present research team, as well as by other researchers within this field, is to design longitudinal studies that confirm the outlined research lines and provide greater evidence on the relationships between the variables discussed herein and the 4-profile model of problematic use of the Internet.

Finally, another possible limitation of the study may be related to the scale used to measure PIU (i.e., the GPIUS2). This is because, although it is a widely used scale with good

psychometric properties, it was validated in 2010 and, as discussed in the introduction to this paper, there is currently still no consensus on what aspects clearly distinguish a problematic involvement from a truly dysfunctional involvement. Therefore, it would also be of interest to replicate this study using other measurement scales.

CONCLUSIONS

This study contributes significantly to our understanding of PIU among adolescents, adopting the cognitive-behavioral model as a theoretical framework. By identifying distinct PIU profiles, ranging from Nonproblematic use to Severe problematic use, we unveil nuanced patterns that offer valuable insights for both formal and informal societal responses to youth and adolescence. The delineation of these profiles not only informs risk assessment procedures but also holds implications for the development of targeted prevention strategies and individualized treatments. Recognizing that the Severe problematic use profile is associated with elevated risk factors and diminished protective factors underscores the urgency for tailored interventions. It is important to contemplate that adolescents with higher levels of PIU exhibit characteristics that align with universal signs of addiction, emphasizing that behavioral addictions can be as severe as substance addictions (Griffiths, 2019). Thus, this research, by shedding light on the interplay between PIU, Internet use, mental health problems, personality, psychological strengths, and family relationships, provides a foundation for shaping societal responses at both policy and grassroots levels. The findings call for an integrated approach that involves parents, peers, and social institutions to address the multifaceted challenges posed by PIU during the critical period of youth and adolescence.

CONFLICT OF INTEREST STATEMENT
The Authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT
The data and syntax of this study are available to authors in the OSF repository by following the link below: https://osf.io/bzmwr/?view_only=46d51a4f4859415b841ddec97a54e8c0.

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