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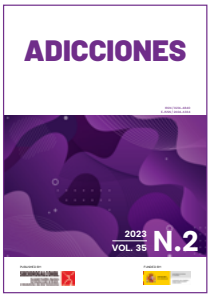

ORIGINAL

Problematic Internet use and Internet gaming disorder: Overlap and relationship with health-related quality of life in adolescents

Uso problemático de Internet y trastorno de juego por Internet: Solapamiento y relación con la calidad de vida relacionada con la salud en adolescentes

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Abstract

General Problematic Internet Use (GPIU) is a dysfunctional use of Internet handling and management in general. In contrast, Internet Gaming Disorder (IGD) is a specific behaviour linked to online videogames. Both problems are becoming common in adolescents, but they have hardly been studied simultaneously, and the joint relationship of the two constructs with Health-Related Quality of Life (HRQoL) is unknown. The general objective of this study is to analyse the relationship between GPIU and IGD and their association with HRQoL. The study is analytical and cross-sectional with 2,024 participants (46.4% boys, n = 939) from 16 schools of 7 Spanish regions. The mean age and standard deviation were 14.20±1.42, with a range of 11-18 years. The Spanish versions of the KIDSCREEN-10, the Revised Generalized and Problematic Internet Use Scale 2 and the Internet Gaming Disorder Scale were used. Of the total sample evaluated, 15.5% of the participants had high levels of GPIU, and 3.3% of video game players presented IGD. The dimensions of GPIU are strongly associated with those of IGD. HRQoL correlated significantly and negatively with all the dimensions of GPIU and IGD (p <.001). Participants who reported problems with GPIU or IGD, individually or conjointly, had significantly lower scores in HRQoL than those with no problems.

Keywords: problematic Internet use, Internet gaming disorder, health-related quality of life, adolescents, negative consequences

Resumen

El Uso problemático general de Internet (GPIU) supone un uso disfuncional del manejo y la gestión de Internet en general. En cambio, el Trastorno de juego por Internet (IGD) es una conducta específica vinculada a los videojuegos en línea. Ambos problemas comienzan a ser frecuentes en adolescentes, pero apenas han sido estudiados simultáneamente ni se conoce el papel conjunto de ambos constructos sobre Calidad de vida relacionada con la salud (CVRS). El objetivo general de este estudio es analizar la relación entre el GPIU y el IGD y su asociación con la CVRS. El estudio es analítico y transversal con 2024 participantes (46,4% chicos, n = 939) procedentes de 16 colegios en 7 regiones españolas. La media de edad y desviación típica fue de 14,20±1,42 en un rango de 11-18 años. Se usaron las versiones españolas del KIDSCREEN-10, del *Revised Generalized and Problematic Internet Use Scale* 2 y del *Internet Gaming Disorder Scale*. Un 15,5% del total de la muestra evaluada reportó niveles altos de GPIU y un 3,3% de los jugadores de videojuegos presentó IGD. Las dimensiones del GPIU están altamente asociadas a las del IGD. La CVRS correlacionó significativa y negativamente con todas las dimensiones del GPIU y del IGD (p < ,001). Los participantes que reportaron problemas en el GPIU o el IGD, individual o conjuntamente, presentan puntuaciones significativamente más bajas en la CVRS.

Palabras clave: uso problemático de Internet, trastorno de juego por Internet, calidad de vida relacionada con la salud, adolescentes, consecuencias negativas

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The conceptualization of inadequate Internet use has been explained in several different ways over the last two decades, adapting to the technological changes in society. Therefore, the literature has gathered different constructs measured with different assessment tools such as the "Internet Addiction" (Young, 1996), the "Compulsive Use of Internet" (Greenfield, 1999), the "Problematic Internet Use" (PIU; Davis, 2001), or the "Generalized Problematic Internet Use" (GPIU; Caplan, 2002, 2010).

Within this last category, we highlight the proposals of Davis (2001) and Caplan (2002, 2010). They were the first to propose a distinction between General Problem Internet Use (GPIU), referring to the global set of online behaviors, and Specific Problematic Internet Use (SPIU), indicating the specific use of the Internet for a purpose (e.g., videogames or social media). Regarding GPIU, Caplan's theoretical model hypothesizes that preference for online social interaction and online mood regulation increases the likelihood of poor self-regulation, which in turn leads to negative consequences in various areas of the individual's life (social, academic, work, health, etc.) (Caplan, 2010).

Epidemiological studies indicate that around 15% of adolescents show problematic use of the Internet and/or Smartphone (Cha & Seo, 2018; Gómez, Rial, Braña, Golpe & Varela, 2017; Machimbarrena et al., 2018; Muñoz-Miralles et al., 2016; Yudes-Gómez, Baridon-Chauvie & González-Cabrera, 2018). In terms of gender, there is no consensus. Some works indicate that GPIU is higher in boys (Durkee et al., 2012; Laconi, Tricard & Chabrol, 2015; Munno et al., 2017), whereas others state that it is higher in girls (Gómez et al., 2017; López-Fernández, 2018; Machimbarrena et al., 2018, 2019; Yudes-Gómez et al., 2018). This lack of consensus also affects the variable age during adolescence, with some studies suggesting that students aged 16-18 have more PIU than those between the ages of 10-13 (Gómez et al., 2017; Machimbarrena et al., 2019). Some studies also find no differences between pre-adolescence (10-14 years) and adolescence (15-18 years) (Yudes-Gómez et al., 2018) or in university samples (Carbonell, Chamarro, Oberst, Rodrigo & Prades, 2018). Likewise, PIU manifestation is differential depending on the country, with the range of problems varying between 14.3% in Germany and 54.9% in England (with a value of 23.7% for Spain) (Laconi et al., 2018).

Although GPIU is configured as a construct of the dysfunctional use of the Internet in general, new realities have emerged that focus on more specific problems (SPIU) such as the *Internet Gaming Disorder* (IGD), which has recently been included in section III of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; (American Psychiatric Association, 2013). IGD is described as an addictive disorder without substance whose essential characteristic is participation in online videogames recurrently and persistently over time, which leads to clinically significant distress (Carbonell, 2014). IGD includes the characteristics of addiction model (Griffiths, 2005), such as salience, mood modification, tolerance, withdrawal, personal/social/academic/work conflicts and relapse. According to a meta-analysis performed with adolescent sample, the mean prevalence of IGD is 4.6%, with a higher percentage among males (6.8%) than among females (1.3%) (Fam, 2018). In addition, prevalences across countries vary and are higher in Asia and the US than in Europe (Fam, 2018). In particular, in Spain, the prevalence of IGD has a broad range, between 1.9% (Beranuy et al., 2020) and 8.3%, (Buiza-Aguado, Alonso-Canovas, Conde-Mateos, Buiza-Navarrete & Gentile, 2018) with higher scores for boys than for girls. Finally, most studies find higher prevalence of IGD in young age groups (15-21 years) than in older groups (Fam, 2018).

As for the relationship between the two concepts, GPIU and IGD, the research carried out is very scarce and has produced mixed results. For example, one study found a weak relationship between the two concepts (López-Fernández, 2018), whereas others have found a higher association between GPIU and SPIU (Caplan, Williams & Yee, 2009; Cudo, Kopiś, Stróżak & Zapala, 2018; Laconi et al., 2015). These preliminary results indicate the need to delve into the relationship and overlap of these two constructs.

On another hand, both constructs can have a negative impact on health and well-being. GPIU has been associated with numerous psychosocial and physical and mental health problems (Aznar-Díaz, Kopecký, Romero-Rodríguez, Cáceres-Reche & Trujillo Torres, 2020; Beranuy-Fargues, Chamarro, Graner & Carbonell, 2009; Machimbarrena et al., 2019). The same goes for problems related to online videogames and issues such as depression, anxiety, social phobias, and sleep disorders (Gentile, Coyne & Walsh, 2011; Kim, Namkoong, Ku & Kim, 2008; Thomée, Härenstam & Hagberg, 2011). Overall, current research has addressed the negative effects of GPIU and IGD on different variables, but few studies have focused on biopsychosocial variables such as Health-Related Quality of Life (HRQoL). HRQoL refers not only to the absence of diseases or conditions, but to a state of complete physical, mental, and social well-being that is perceived by the subjects themselves and by those around them (Wallander & Koot, 2016). The few existing studies indicate that inadequate use of the Internet is related to low HRQoL scores, as well as to lower perceived social support and more friends known only over the Internet (Barayan, Al Dabal, Abdelwahab, Shafey & Al Omar, 2018; Machimbarrena et al., 2019; Takahashi et al., 2018; Wartberg, Kriston & Kammerl, 2017). In the same vein, other works analyzing constructs such as personal satisfaction or psychological adjustment associate

them negatively with the inappropriate use of the Internet and online videogames (Buiza-Aguado et al., 2018; Kojima et al., 2019; Lemmens, Valkenburg & Gentile, 2015).

The above review shows the relevance of GPIU and IGD to adolescent health and well-being. However, little is known about the possible overlap between the two problems, and the potential cumulative impact on HRQoL. Consistent with these antecedents, the objectives of this study are: 1) to analyze the prevalences of GPIU and IGD; 2) to study the association between the dimensions of GPIU and IGD; 3) to examine the relationship of GPIU and IGD jointly with HRQoL; 4) to examine sex- and age-related differences in GPIUS and IGD. In relation to the hypotheses, we expect the prevalence data to be similar to those from other studies of both GPIU (Machimbarrena et al., 2018, 2019) and IGD (Beranuy et al., 2020; Fuster, Carbonell, Pontes & Griffiths, 2016). We also expect that GPIU and IGD will be positively and significantly associated with each other (Caplan et al., 2009; Cudo et al., 2018; Laconi et al., 2015; Lam, 2014). In addition, we expect that participants who present GPIU and IGD problems conjointly will have poorer HRQoL than participants with a single problem or none, as previous studies indicate that the sum of risks on the Internet implies a decrease in quality of life (Buiza-Aguado et al., 2018; González-Cabrera et al., 2019; Takahashi et al., 2018; Wartberg et al., 2017). On another hand, we expect that the components related to dysfunctions in emotion regulation and to the negative consequences (which are shared by the two problems) will be the most strongly associated with HRQoL (Caplan, 2010). Finally, in relation to sex, we expect no sex differences in GPIU (Yudes-Gómez et al., 2018), but we expect more IGD problems in boys (Fam, 2018) and worse HRQoL scores in girls (Machimbarrena et al., 2019; Vélez-Galárraga, López-Aguilà & Rajmil, 2009). Finally, higher GPIU scores and lower HRQoL scores are expected in older participants (Gómez et al., 2017; Machimbarrena et al., 2019; The Kidscreen Group Europe, 2006).

Method

Design and Participants

An analytical and cross-sectional study was performed between April and June of 2018. The sample was made up of 2,024 participants, of whom 46.4% were boys (n = 939) and 53.6% were girls (n = 1085). The mean age and standard deviation were 14.20±1.42, with a range of 11-18 years. Of the sample, 35.2% (n = 712) was between 11 and 13 years old, 46.5% (n = 941) was between 14 and 15 years, and 18.3% (n = 371) was between 16 and 18 years. Although attempts were made to ensure the representativeness of the school levels with the participation of 16 schools in seven Spanish regions (Aragón, Asturias, Basque Country, Castilla la Mancha, Castilla-León, Madrid and Valencia), the sampling was non-probabilistic.

Instruments

The participants provided information about demographic variables such as sex, grade, school, and age. For the analysis of the variables under study, the following instruments were used.

The Spanish version of the Generalized Problem Internet Use Scale (GPIUS2; Caplan, 2010; Gámez-Guadix, Orue & Calvete, 2013) was used for GPIU assessment. It consists of 15 items divided into four factors: (1) preference for online social interaction; (2) mood regulation; (3) negative consequences; and (4) poor self-regulation. Agreement with the items is rated on a six-point Likert scale, ranging from 1 (*completely disagree*) to 6 (*completely agree*). Participants were asked about their behavior in the last 5 months. The reliability obtained is shown in Table 2.

The Spanish version of Internet Gaming Disorder Scale, IGD-20, (Fuster et al., 2016; Pontes, Király, Demetrovics & Griffiths, 2014) was used to evaluate IGD. The questionnaire consists of 20 items that evaluate activity in online videogames during the last 12 months, through the dimensions of (Griffiths, 2005) addiction model mentioned in the introduction. It uses a five-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The reliability obtained is shown in Table 2.

Finally, for the evaluation of HRQoL, we used the Spanish version of the KIDSCREEN-10 (The Kidscreen Group Europe, 2006) for children and adolescents aged 8 to 18 years. This version evaluates a global dimension across 10 items. It uses a 5-point Likert scale to rate agreement and/or frequency, ranging from 1 (*strongly disagree/never*) to 5 (*strongly agree/always*). This general HRQoL index collects key indicators of physical well-being, psychological well-being, autonomy, and relationship with parents, friends, and social support and school environment. The questionnaire provides a score for each participant in relation to the sample used for its standardization in Spain (The Kidscreen Group Europe, 2006). For KIDSCREEN-10, the mean scores varied around 50 (SD = 10) due to the standardization of the T-value. The reliability obtained for α and ω was .81.

Procedure

The questionnaires were applied in online format through Qualtrics. Participants responded to the questionnaires in computer classrooms coordinated by the orientation departments of each center and under the supervision of the classroom tutor, who had previously been trained for this purpose. The time required to complete the questionnaires ranged from 10 to 18 minutes.

Statistical Analysis

Firstly, to determine the internal consistency of the instruments used, Cronbach alphas and omega coefficients were

estimated. The former was obtained using the Statistical Package for the Social Sciences 23 (SPSS) (IBM Corp, 2015), and the latter using R software (R Development Core Team 3.0.1, 2013) program, and the Psych package (Revelle, 2015). The rest of the analyses were carried out with SPSS 23.

The criteria established in the literature were used for GPIU and IGD standardization. In the case of IGD, a cut-off point above 75 points established by Fuster et al. (2016) was considered. For GPIUS classification, the cut-off point was 52, following Machimbarrena et al. (2019).

For the first objective, the following analyses were performed: analysis of frequencies and chi-square for the contrast of proportions and analysis of adjusted standardized residuals. For the second objective, canonical correlations (CCA) were used. For the third objective, Welch's t for independent samples, Pearson correlations, and multiple regression analysis were carried out. For the last objective, we used central trend and dispersion measurements of the study variables, Welch's t for independent samples, and analysis of variance (Welch's *F*) with post-hoc Games-Howell comparisons. A value of less than $p = .05$ was considered significant.

Ethical Considerations

The study was carried out with the authorization of the participants, the schools, and the political-educational institution of the Autonomous Community. Through the official communication channels with the families, the schools sent a passive consent form that informed the parents/tutors about the purpose of the study and its characteristics, its promoters, and their right not to participate. Those parents/tutors who did not wish to allow participation returned the signed consent. This occurred in less than 1% of the sample. The favorable report of the Research Ethics Committee of the Principality of Asturias was obtained (Ref. 231/17).

Results

Prevalence Rate, Descriptive Analyses, and Correlations

Table 1 shows the prevalence of GPIU and IGD according to the aforementioned cut-off points. A significantly higher percentage of girls reported GPIU problems, whereas more boys presented IGD problems.

To analyze the multivariate-shared relationship between GPIU and IGD, a CCA was conducted using the four GPIUS dimensions as independent variables and the six IGD dimensions as criterion variables. This analysis produced four canonical functions, with only the first two functions yielding interpretable squared canonical correlation (Rc^2) effect sizes of 22.8% and 10.2%, respectively. The third and fourth functions explained less than 1% of the variance (0.7% and 0.3%, respectively) and were therefore omitted from interpretation.

To explore differences across sex, two sets of canonical correlations were performed for each sex. This procedure yielded similar results to those obtained with the overall sample (Wilks's $\Lambda = .572$ criterion, $F(24, 2760.68) = 19.94$, $p < .001$ for males; and Wilks's $\Lambda = .702$ criterion, $F(24, 2450.20) = 10.89$, $p < .001$ for females) and, therefore, only the results of the overall sampled are described. Collectively, the full model across all functions was statistically significant using the Wilks's $\Lambda = .685$ criterion, $F(24, 5244.55) = 25.03$, $p < .001$. Because Wilks's Λ represents the variance unexplained by the model, $1 - \Lambda$ yields the full model effect size in an r^2 metric (Henson, 2006). Thus, for the set of four canonical functions, the r^2 type effect size was .32, which indicates that the full model can explain a substantial portion, approximately 32%, of the variance shared by the variable sets.

The test of only Functions 2–4 was also statistically significant, Wilks's $\Lambda = .889$, $F(15, 4152.28) = 12.16$, $p < .001$, $Rc^2 = 11.2\%$. However, the tests of Functions 3-4 did not explain a high amount of variance shared by the

Table 1. ***Prevalence of each of the risks as a function of problem severity for the total sample and of sex.***

Construct	Problem Severity	Total *f* (%) *n* = 1977	Boys *f* (%) *n* = 914	Girls *f* (%) *n* = 1063	χ^2 *(p)*
General Problematic Internet Use	No problem	1670 (84.5)	791 (86.5) *	879 (84.5) **	5.56 (.018)
	Problem	307 (15.5)	123 (13.5) **	184 (15.5) *	
		Total *f* (%) *n* = 1437[1]	Boys *f* (%) *n* = 750	Girls *f* (%) *n* = 687	χ^2 *(p)*
Internet Gaming Disorder	No problem	1389 (96.7)	714 (495.29) **	675 (98.3) *	10.35 (.001)
	Problem	48 (3.3)	36 (4.8) **	12 (0.8) *	

Note. [1] 585 participants reported not playing videogames.
*Adjusted standardized residuals > 1.96. **Adjusted standardized residuals < -1.96.

Table 2. ***Canonical correlations between GPIU and IGD (GPIU, n = 1065; IGD, n = 729).***

		Function 1			Function 2					
	Variable	**Coef.**	***R***	***%r$_s^2$***	**Coef.**	**R**	***%r$_s^2$***	***h²***	**α**	**ω**
GPIU	POSI	-0.23	-.69	47.75	0.15	.28	7.78	55.53	.83	.83
	Mood Regulation	-0.18	-.68	45.56	1.07	**.71**	**49.70**	**95.27**	.84	.84
	Negative consequences	-0.65	**-.94**	87.61	-0.69	-.28	8.07	**95.68**	.81	.81
	Deficient self-regulation	-0.15	-.79	61.62	-0.23	-.04	0.14	61.76	.90	.90
	GPIU (Adequacy)			60.64			16.42	77.06		
	R_c^2			22.84			10.24			
	IGD (Adequacy)			78.18			6.92	85.10		
Internet Gaming Disorder	Salience	-0.20	-.88	77.97	-0.17	-.07	0.52	78.49	.77	.79
	Mood modification	-0.24	-.82	66.75	1.38	**.57**	**32.38**	**99.13**	.85	.85
	Tolerance	0.08	-.85	72.25	-0.11	-.07	0.52	72.77	.78	.78
	Withdrawal	-0.10	**-.90**	80.82	-0.13	-.09	0.72	81.54	.87	.87
	Conflict	-0.36	**-.93**	85.56	-0.67	-.26	6.50	**92.07**	.86	.86
	Relapse	-0.29	**-.93**	85.75	-0.17	-.09	0.86	86.61	.76	.77

Note. Coef. = standardized canonical function coefficient; r_s = structure coefficient; r_s^2 = squared structure coefficient or explained variance; h^2 =communalities across the two functions for each variable; POSI = Preference for Online Social Interaction; Adequacy = a measure of how the synthetic scores on a function behave when reproducing the variance in a set of variables. The most relevant structure coefficients are in bold type. α = Cronbach's alpha; ω = McDonald's Omega.

variable sets, Wilks's Λ = .989, $F(8, 3010) = 2.07$, $p = .035$, Rc^2= 1.1%, and Wilks's Λ = .996, $F(3, 1506.00) = 1.77$, $p = .150$, Rc^2 = 0.3%, respectively. Table 2 presents the standardized canonical function coefficients and structure coefficients for Functions 1 and 2. The squared structure coefficients are also given, as well as the communalities (h^2) across the two functions for each variable.

For Function 1 coefficients, the relevant criterion (IGD) variables were primarily Withdrawal, Conflict, and Tolerance, with correlations equal to or above .90, although the rest of the dimensions also make significant contributions. Furthermore, all of these variables' structure coefficients have the same sign, indicating that they are all positively related to each other. Concerning the independent variables in Function 1, the dimension Negative Consequences of the GPIU makes the largest contribution but the other three dimensions also make significant contributions, with values over .60. All the GPIU variables in the predictor set also share the same sign with each other and with the criterion variables, indicating that they are positively correlated.

Concerning Function 2, the coefficients suggest that the only criterion variable of relevance is Mood Modification, which is negatively correlated to the rest of the variables. As for GPIU, the Mood Regulation dimension makes the greatest contribution. The sign of the correlations shows that this dimension is negatively related to negative consequences and deficient self-regulation but positively correlated to Preference for social interaction and to the criterion variable Mood Modification.

Pearson correlations were also carried out to relate the total GPIU and IGD scores to HRQoL (r = -.354, $p < .001$;

Table 3. ***Differences in age (11-13, 14-15, and 16-18 years) in the studied constructs (n = 1977).***

	11-13 years[a] *n* = 705		**14-15 years[b] *n* = 922**		**16-18 years[c] *n* = 350**		***Welch's F***	**η²**	**Post hoc (Games-Howell)**
	M	*SD*	*M*	*SD*	*M*	*SD*			
General Problematic Internet Use	31.59	14.83	36.19	15.54	36.96	14.58	24.01***	.023	a<b; a<c
Internet Gaming Disorder	28.56	14.27	31.23	15.91	31.50	15.41	5.79***	.008	a<b; a<c
Health-related quality of life	48.61	8.60	45.94	8.16	43.66	7.55	48.91***	.045	a>b; a>c; b>c

Note. M = arithmetic mean; *SD* = standard deviation; η^2 = eta squared; *** = $p < .001$. All post hoc comparisons are significant at $p < .001$.

Table 4. ***Differences in health-related quality of life as a function of problem severity in General Problem Internet Use and Online Gaming Disorder based on the profile (no problems, problems only with GPIU, problems only with IGD, problems with GPIU and IGD).***

	Level of severity	**HRQoL** *M* (*SD*)	**Welch's** *t* **(Cohen's** *d***)**
General Problematic Internet Use (GPIU) (*n* = 1977)	No problems (*n* = 1670)	47.37 (8.26)	11.91*** (0.71)
	Problems (*n* = 307)	41.91 (7.20)	
Internet Gaming Disorder (IGD) (*n* = 1437)	No problems (*n* = 1389)	46.95 (8.10)	6.64*** (0.97)
	Problems (*n* = 48)	39.13 (8.01)	
			F (η^2) de Welch Post hoc
Overlap between GPIU and IGD (*n* = 1980)	No problems[a] (n = 1654)	47.73 (8.02)	53.61*** (.066) a>b, c, d b > d
	Problems only with GPIU[b] (*n* = 278)	42.32 (7.08)	
	Problems only with IGD[c] (*n* = 19)	40.89 (8.93)	
	Problems with GPIU+IGD[d] (*n* = 29)	37.98 (7.28)	

Note. CVRS = HRQoL = Health-Related Quality of Life; η^2 = eta squared; *M* = arithmetic mean; *SD* = standard deviation. *** = $p < .001$. All post hoc comparisons are significant at $p < .05$.

r = -.203, p < .001, respectively). All GPIU dimensions correlated significantly and inversely with HRQoL: Online Interaction Preference (r = -.219, p < .001), Mood Regulation (r = -.246, p < .001), Negative Consequences (r = -.308, p < .001) and Poor Self-Regulation (r = -.277, p < .001). The same situation occurs with the dimensions of the IGD: Salience (r = -.237, p < .001), Mood Modification (r = -.253, p < .001), Tolerance (r = -.233, p < .001), Withdrawal (r = -.272, p < .001), Conflict (r = -.272, p < .001), and Relapse (r = -.258, p < .001).

Globally, there were no differences in the GPIU scores between boys (M = 34.2, SD = 15.1) and girls (M = 35.01, SD = 15.5); t (1977) = -1.21, p = .226; however, significantly higher IGD scores were found in boys (M = 34.7, SD = 16.2) than in girls (M = 25.2, SD = 12.0), t (1569) = -13.14, p < .001, d = 0.66. In GPIU, the only difference was in the dimension of Poor Self-Regulation (t (1985) = -3.05; p = .002; d = 0.14), with girls obtaining higher scores. In the IGD, there were significant differences in all the dimensions, which were in all cases higher for boys than for girls. The dimensions with the greatest differences were Salience (t (1569) = 14.5 p < .001, d = 0.72) and Tolerance t (1567) = 12.99, p < .001, d = 0.65. In HRQoL, girls had worse scores: boys (M = 47.62, SD = 8.36) and girls (M = 45.48, SD = 8.31); t (2017) = 5.74, p = .001, d = 0.26).

In terms of differences as a function of age group, statistically significant differences were found for the three constructs (see Table 3). For both GPIU and IGD scores, the scores of participants aged 11-13 were lower than those of participants aged 14-15 and 16-18. The opposite occurred with HRQoL, where the highest scores were associated with the 11-13-year-old group, decreasing significantly in the older groups.

Table 5. ***Multiple Regression Analysis with Health-Related Quality of Life as Dependent Variable.***

	HRQoL				
	B	*SE*	β	*t*	*p*
Step 1					
Sex	-2,68	0,42	-0,16	-6,262	< ,001
Age	-1,01	0,13	-0,18	-7,89	< ,001
Adjusted R^2 *for Step 1*	,078				
Step 2					
Online interaction preference	-0.17	0.07	-0.07	-2.63	.009
Mood Regulation	-0.19	0.06	-0.10	-3.06	.002
Negative consequences	-0.44	0.08	-0.18	-5.49	< .001
Poor self-regulation	-0.03	0.04	-0.03	-0.93	.352
Salience	0.06	0.13	0.02	0.30	.762
Mood modification	-0.22	0.12	-0.06	-1.88	.061
Tolerance	0.15	0.14	0.05	1.20	.230
Withdrawal	-0.27	0.16	-0.08	-1.58	.114
Conflict	-0.06	0.12	-0.02	-0.43	.666
Relapse	0.00	0.12	0.00	-0.05	.961
Adjusted R^2 *for Step2*		.202			
F		32.39			

Note. '0' represents boys and '1' represents girls in the sex variable; *B* = non-standardized beta; *SE* = standard error; *β* = standardized beta.

Relationship of GPIU and IGD with HRQoL

Considering the total sample, 15.5% reported high levels of GPIU, and 3.3% of the video game players presented IGD. The participants who did not present either problem had a significantly higher score in HRQoL than those reporting problems (see Table 4). It can be seen that those who did not present problems are in the range of the reference values of the Spanish population standardized around 50 (*SD* = 10). In contrast, participants who were classified as having problems, either of GPIU or IGD, had a score in HRQoL nearly one standard deviation lower. In addition, approximately 1.47% (*n* = 29) of the sample presented problems both in GPIU and IGD, and these participants had the lowest scores in HRQoL. It should also be noted that 60.4% of participants with IGD problems also had GPIU.

Finally, a hierarchical regression analysis was carried out to identify which specific dimensions of the GPIU and the IGD are related to HRQoL (see Table 5). All dimensions of the GPIU and IGD were used as explanatory variables. The analyses showed that age, sex, preference for online social interaction, mood regulation, and negative consequences were statistically and significantly associated with HRQoL. No dimension of the IGD was significantly associated with HRQoL.

Discussion

The expansion of Internet use among adolescents has led to the development of new problematic behaviors. This study has examined the co-occurrence of Problematic Internet Use and Internet Gaming Disorder and provides evidence of their association with adolescents' health related quality of life.

Regarding the prevalence of GPIU and IGD, the results indicated that 15.5% of adolescents present GPIU. These values are convergent with those of other studies (Cha & Seo, 2018; Gómez et al., 2017; Machimbarrena et al., 2018, 2019; Yudes-Gómez et al., 2018). In addition, 3.3% exceed the cut-off point for the diagnosis of IGD. This figure is slightly lower than that of the meta-analysis on the prevalence of IGD (Fam, 2018), although it is within a similar range as that found by the authors of the IGD-20 (Fuster et al., 2016) and also slightly higher than that found with the Spanish version of the IGDS9-SF (Beranuy et al., 2020). Nonetheless, it is consistent with other studies carried out with the IGD-20 (Bernaldo-de-Quirós, Labrador-Méndez, Sánchez-Iglesias & Labrador, 2020).

As had been hypothesized, there is a significant and positive association between GPIU and IGD, which is in line with the findings of other studies (Caplan et al., 2009; Cudo et al., 2018; Laconi et al., 2015). The results of the canonical correlations provide very relevant evidence. In the first function, the most important variable is negative consequences, but in the second function, it is mood regulation. This is consistent with the profile study carried out by Machimbarrena et al. (2019) proposing four profiles: non-problematic, problem user, severe problem, and mood regulator. The last one is related to the second-function data, where the Internet is used to change one's mood, but which presents no negative consequences or poor self-regulation. On the contrary, the first function is related to problem users or users with severe problems, as there are negative consequences and poor self-regulation. This may be relevant for studies suggesting that mood regulation is important in the spontaneous remission of problematic Internet use (Wartberg & Lindenberg, 2020).

Beyond the above, as a specific contribution of this study, it should be noted that 2% (*n* = 29) of the participants who played videogames presented GPIU and IGD problems conjointly, and moreover, 60.4% of the participants who had IGD problems also presented GPIU. These data relate to the cumulative risk model of Evans, Li and Whipple (2013), which suggests analyzing the overlap or co-occurrence of different risks. This co-occurrence is related to worse indicators for health and psychological well-being than when only one of the problems is presented (González-Cabrera et al., 2019; Machimbarrena et al., 2018). Thus, our results showed that adolescents who presented both problems scored lower in HRQoL than those who did not have problems or who only had one of the two problems (confirming the study's hypothesis). This is a unique contribution of this study, and the findings are consistent with previous studies that have shown that the accumulation of risks is related to poorer HRQoL (Buiza-Aguado et al., 2018; González-Cabrera et al., 2019; Takahashi et al., 2018; Wartberg et al., 2017). The results also show that the GPIU dimensions (online social preference, poor self-regulation, and negative consequences) better explain the scores in HRQoL. These results therefore partially confirm the proposed hypothesis and are related to Caplan's (2010) model and to the Spanish version of the GPIUS2 carried out by Gámez-Guadix et al. (2013).

On another hand, the results revealed differences in the prevalence of the two problems as a function of sex and age. Thus, a higher percentage of boys had IGD, in line with the meta-analytic results of Fam (2018), whereas a higher number of girls presented GPIU problems. This can be explained particularly because boys are higher consumers of videogames, even if the trend is changing (Fam, 2018). These data confirm the proposed hypothesis regarding sex and IGD, but not with respect to GPIU, where we had hypothesized that there would be no differences, considering the conflicting results of previous studies. Our results add evidence to previous research that points to a greater number of girls who have GPIU problems (Gómez et al., 2017; López-Fernández, 2018; Machimbarrena et al., 2019; Yudes-Gómez et al., 2018). The differences

sex-related found in GPIU can be explained by different factors, the most likely being the use of different evaluation instruments and cut-off points in this context. Other explanations may focus on the fact that GPIU is associated with other specific Internet risks that were not assessed, such as nomophobia (which affects girls significantly, especially between ages 12 and 16) (León-Mejía, González-Cabrera, Calvete, Patino-Alonso & Machimbarrena, 2020). It may also be due to the use of differential technology in boys and girls (Tokunaga, 2017)

In terms of age, significant differences were found between the groups, with older participants obtaining higher scores in GPIU and IGD and lower scores in HRQoL. These results are in line with other studies (Gómez et al., 2017; The Kidscreen Group Europe, 2006) and confirm the study hypothesis. Higher scores in GPIU and IGD may be related to the increase in the consumption of Internet and of owing a mobile phone. In general, as adolescence progresses, the percentage increases each year. Thus, according to data from the INE (2019), at the age of 10 years, 79% of users owns a computer, and at age 15, the percentage is 93.6%. Also, at 10 years of age, 22.3% owns a mobile, reaching 93.8% at the age of 15. Online parental mediation practices are also more restrictive in early adolescence (9-12 years), and this potentially exposes the child to fewer risks (Martínez, Casado & Garitaonandia, 2020).

This study presents limitations: a) the study is cross-sectional, which prevents the establishment of directionality between the variables. Therefore, it would be appropriate in future research to design longitudinal studies; b) the study did not include other variables that could explain some of the relationships found. For example, having information about the stressors and the nature of adolescents' interpersonal relationships could help to understand the relationship between GPIU, IGD, and HRQoL; c) only self-reports were used, with the possible biases associated with their use. In the future, it would be of great interest to include hetero-reports (e.g., parents or teachers) to evaluate HRQoL and introduce clinical evaluation by an IGD specialist; d) the results could have been affected by retrospective bias; e) the maturative development of the participants was not evaluated; f) the sample, while broad and from different geographical areas, was obtained through non-probabilistic sampling.

The findings of this study may have relevant implications both for educators and for clinicians. When detecting a problem in one of these constructs, it would be relevant to evaluate the other one because of their close relationship. It is imperative for future prevention programs to address the risks of inadequate internet use conjointly and not just specifically. It would also be of great interest to include skills for conflict resolution and the development of adequate emotion and mood regulation through the Internet.

In conclusion, this study relates General Problematic Internet Use and the Internet Gaming Disorder in a sample of adolescents. In addition, relationships are established between the two constructs, and a lower health-related quality of life is shown, especially when the disorders occur together.

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Conflict of interests

The authors have no conflict of interest.

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