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Profiles of Internet use and parental involvement, and rates of online risks and problematic Internet use among Spanish adolescents

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ABSTRACT

This study aimed to empirically identify the major adolescent Internet user profiles in Spanish secondary students based on self-reported pattern of use, level of parental control and parent-child conflict around use, and to characterize their demographics and rates of engaging in online risky experiences and screening positive for problematic Internet use (PIU). Students from 255 secondary schools throughout the Galicia region of Spain completed an anonymous, online survey in school, with 39,993 having sufficient data for analyses. We used two-stage cluster analysis to identify the groups, and then compared demographics, online risks and PIU rates across groups. We identified five clusters: *occasional users* (21.4%), *moderate users with parental control* (22.2%), *moderate users without parental control* (22.1%), *habitual users with parent-child conflict* (16.8%), and *intensive users* (17.5%). The heaviest user groups had the highest rates of any online risk (>60%) and PIU (>25%). The majority of adolescents with frequent Internet use have engaged in online risky experiences. Such behaviors, and problematic Internet use, are higher among adolescents without parental control over their use, so empowering parents to moderate their child's Internet use is encouraged. These findings highlight the need to support parents, schools, and policymakers in prevention, since it is a shared responsibility.

1. Introduction

Worldwide, Internet use has become a major part of adolescents' daily lives, thus making the understanding of its patterns and influence on adolescent behaviors and beliefs important topics for research (Livingstone, Haddon, Görzig, & Ólafsson, 2011; Rial, Gómez, Braña, & Varela, 2014). Recent figures indicate that Internet use is nearly universal among adolescents in developed countries. Across the European Union, 91% of 16–19-year-olds use Internet daily (Eurostat, 2016). A recent U.S. study found 92% of 13- to 17-year-olds reported going online daily, with 24% being online "almost constantly," and 56% "several times a day" (Lenhart, 2015).

A growing concern in recent years is the rise in Problematic Internet Use (PIU), that might be conceptualized as an inability to control one's use of the Internet which leads to negative consequences in daily life (Spada, 2014). As with other risky behaviors, adolescence is a vulnerable period for onset of PIU which tend to co-occur with other risky behaviors such as alcohol and drug use, and playing on slot machines, and be associated with adverse outcomes such as getting into trouble with police, losing friends, sexually transmitted diseases, and poor sleep or exercise habits (Secades-Villa et al., 2014; Suris et al., 2014; Wang, Luo, Gao, & Kong, 2012). Prevalence rates of adolescent PIU, however, remain unclear because of lack of agreement on terminology, conceptualization, defining criteria, and the different measures used (Kuss, van Rooij, Shorter, Griffiths, & van de Mheen, 2013; Rial, Gómez, Isorna, Araujo, & Varela, 2015; Spada, 2014). For instance, 19.9% of Spanish secondary school students were found to be Problematic Internet Users (Gómez, Rial, Braña, Varela, & Barreiro, 2014), while another study of European adolescents reported a 4.4% prevalence of Pathological Internet use, and 13.5% being "maladaptive" users (Durkee et al., 2012). A systematic review of U.S. studies on adolescents and university students found rates of PIU to range from 0%

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List of abbreviations

AGFI	Adjusted goodness of fit index
ANOVA	Analysis of variance
CFI	Comparative fit index
GFI	Goodness of fit index
NFI	Normed fit index
PIU	Problematic Internet use
PIUS-a	Problematic Internet Use Scale in adolescents
RMSEA	Root mean square error of approximation
ROC	Receiver Operating Characteristic
TLI	Tucker-Lewis index

to 26.3% (Moreno, Jelenchick, Cox, Young, & Christakis, 2011). However, given the fast evolution of the digital culture, more recent studies are needed that examine different adolescents' online behaviors and trends.

In addition, the role of parents deserves particular consideration in the prevention and mitigation of adolescent PIU. Parenting behaviors such as monitoring have been shown to help prevent other risky behaviors (e.g., substance use) (Dever et al., 2012; Steinberg, Fletcher, & Darling, 1994). However, studies to date examining the association between youth Internet use and parent-related factors, such as parenting style and parental monitoring, show mixed findings (Li, Garland, & Howard, 2014; Valcke, Bonte, De Wever, & Rots, 2010). Some studies found that more active parental involvement in, and greater restriction of, their child's Internet use, were associated with lower excessive Internet use (Kalmus, Blinka, & Ólafsson, 2015). Other studies, however, found no association between parenting styles and time online (Eastin, Greenberg, & Hofschire, 2006; Lee & Chae, 2007). Thus, more research is needed to clarify the relationship between parenting factors and adolescent Internet use, and what patterns of Internet use and parental involvement heighten risk for PIU and different online risks, related to the content they access, the contact they establish or the actions they carry out (Livingstone, Mascheroni, & Staksrud, 2015).

Therefore, this study aimed to empirically identify an inclusive typology of today's adolescent Internet users in Spain, based on dynamic variables that could be potentially modified to prevent or intervene if necessary, and then to characterize the resulting groups in terms of demographic data, their risk for PIU and online risks. Specifically, the profiles were derived based on Internet use patterns (i.e., the number of hours online per day during weekdays and weekends) as well as adolescent-reported degree of parental involvement (perceived parental control over their Internet use and parent-child arguments over their Internet use). Since no univocal theoretical background is available, this study has an exploratory nature.

To our knowledge, this is the first study in a large sample of adolescents in Spain to identify a comprehensive set of adolescent Internet user profiles (Brandtzæg, 2010; Hill, Beatty, & Walsh, 2013), specifically including the role of parents in those profiles, and examining their risk for PIU and online risks (Rial, Gómez, Picón, Braña, & Varela, 2015).

2. Materials and methods

2.1. Participants

This study involved an online survey of Compulsory Secondary Education students (aged 12 to 17) in the Galician region of Spain during May 2014. With the aid of the Local Ministry of Culture, Education and University Planning, every secondary school in Galicia was invited to participate. Of 493 total schools, 255 agreed to participate (51.7% participation rate). No significant differences were found between participating and non-participating schools for type of school and region.

The analysis sample (n = 39,993; mean age = 14.09; *SD* = 1.36) was split by gender (49.8% girls); 75.2% attended public schools; 54.8% were in lower secondary education (1st or 2nd year); and one-quarter (24.2%) lived in rural areas, 44.0% in semi-rural, and 31.8% in urban locations.

2.2. Procedure

Every participating school designated a teacher or school counselor responsible for collecting the data. They received a written protocol with technical details and practical instructions about the procedure, and they attended a face-to-face training session for 2 h. On the data collection sessions, the trained teacher of each school gave students a detailed explanation of the study's purpose, confidentiality of responses, and instructions for completing the self-administered *ad hoc* individual questionnaire. Trained teachers could contact telephone technical support if needed. All Compulsory Secondary Education students at these schools were invited to participate. Participation was entirely voluntary and unpaid. Every student received a personal non-transferable password allowing a single entry into the online questionnaire. Students completed the anonymous questionnaire in school computer rooms in small groups (no more than 20 individuals), and the trained teacher was at their disposal for any question. The online system also registered the time spent completing the questionnaire. This study was approved by the school leadership and parents' associations, and the Bioethics Committee of the University of Santiago de Compostela.

The number of surveys collected was 44,051 (50.3% of all Galician students), but 495 surveys were excluded due to insufficient data (only the first block was completed), 568 due to completion in less than 3 min, 2033 due to questionable response patterns (e.g., answering the first option to every question; answering the last option to every question; answering 1234512345, etc.), and 962 due to lack of any Internet use and, therefore, had no further responses to any of the Internet-related measures. The final analysis sample included 39,993 adolescent Internet users. Comparison of gender, grade, province and type of school for respondents with any missing data versus those with none revealed no significant differences between the groups.

2.3. Instruments

The questionnaire consisted of three sections. The first block included 19 items on amount of weekday and weekend Internet usage (e.g. During the week (Monday to Friday), you are usually online … Less than 1 h a day/Between 1 and 2 h a day/Between 2 and 3 h a day/Between 3 and 5 h a day/More than 5 h a day), youth perceptions of parental control over their Internet use (Do your parents control or limit your Internet use? No/Yes) and of parent-child conflict over use (Do you usually have arguments with your parents because of the Internet use? No/Yes). The second section included the 11-item Problematic Internet Use Scale in adolescents (PIUS-a), a screening measure (Rial, Gómez, Isorna, et al., 2015). A prior study confirmed scale unidimensionality using confirmatory factor analysis (Goodness of fit index (GFI) = 0.96; Adjusted goodness of fit index (AGFI) = 0.95; Comparative fit index (CFI) = 0.95; Normed fit index (NFI) = 0.92; Tucker-Lewis index

(TLI) = 0.94; Root mean square error of approximation (RMSEA) [90% CI] = 0.054 [0.042 - 0.065]), and showed that its psychometric properties were acceptable in Spanish adolescents aged between 11 and 17 years (Cronbach's alpha value = 0.82; ordinal alpha index = 0.83; sensitivity = 0.810; specificity = 0.826 at an optimal cutpoint of 16 based on Receiver Operating Characteristic (ROC) analysis based on positives defined as having ≥5 h/day of Internet use and reporting frequent arguments with parents because of use) (Rial, Gómez, Isorna, et al., 2015). To aid question completion without assistance, the items' response format was changed from a five-point Likert agreement scale to a five-point frequency scale from 0 *Never* to 4 *Always*. In the present study the one-dimensional structure was again confirmed (GFI = 0.96; AGFI = 0.95; CFI = 0.94; NFI = 0.94; TLI = 0.92; RMSEA [90% CI] = 0.064 [0.062 - 0.065]), as well as an acceptable internal consistency (Cronbach's alpha value = 0.83; ordinal alpha index = 0.84). The third section had eight yes/no questions about past-12-month experience of online risks such as cyberbullying, betting money online, sexting or contacts with strangers (e.g. In the last 12 months, have you been threatened, harassed or humiliated through the Internet?)

2.4. Data analysis

The final analysis sample was obtained after in-depth missing data analysis and cleaning. The highest percentage of missing responses for any item was 1.2%, which represents an acceptable value (Cohen & Cohen, 1983). We conducted a two-stage exploratory cluster analysis to identify the major profile groups of adolescent Internet users. Because of the large size of the dataset, we first split the dataset into 5 randomly-selected non-overlapping sub-samples (each $n_x = 7800$) and conducted hierarchical cluster analysis of each data subset, using squared Euclidean distance as distance measure across respondents and Ward's method for combining clusters. Based on the resulting dendrograms (Milligan & Hirtle, 2003) and the change in the derived coefficients (within-cluster sum of squares) at each combination step (Burns & Burns, 2009), the five-cluster option was determined to be the optimal solution. The reliability of this solution was confirmed by entering the means of the five-cluster solution as the starting points (seeds) for an iterative *k*-means cluster analysis. We found more than 87% agreement in assignment of participants to specific clusters between both methods. In the second stage, we conducted a new *k*-means cluster analysis on the entire analysis sample as well as a confirmatory two-step cluster analysis. The agreement in assignment of adolescents to specific clusters between both solutions was higher than 92%.

The resulting cluster groups were then compared on demographic (gender, age, education level, type of school and habitat) and behavioral variables not included in the original clustering process (eight online risks such as cyberbullying, betting money online, sexting or contacting with strangers, and the 11-item PIUS-a). Categorical variables were analyzed using χ^2 analyses to determine global significance and adjusted residuals e^{adj} (Haberman, 1973) were examined to estimate the significance in each cell. These residuals are useful in visualizing contingency table data, making it understandable which cells are out of line with expectations, in which direction, and by how much. Continuous variables were analyzed using analysis of variance (ANOVA), and pairwise differences examined using the Scheffé post-hoc test. Statistically significant differences were expected for almost every comparison due to the large sample size. Therefore, effect size statistics were examined (Partial Eta-squared and Cramer's *V*). All statistical analyses were conducted using SPSS software v.20.

3. Results

In general terms, nearly three in four of the adolescents (73.7%) were daily users, and one in four (27.1%) reported using ≥ 3 h per weekday on average, shifting to nearly half (41.7%) reporting that level of use on weekends. About half reported parental control over their use, while over one in six (17.7%) reported experiencing conflict with their parents over use.

3.1. Resulting profile groups

Table 1 characterizes the five resulting profile groups with respect to each clustering variable. Group 1 is comprised of adolescents who had relatively infrequent Internet use, at an average of less than 2 h on days used (*Occasional users*). This group tended to report higher levels of parental control and lower levels of parent-child conflict with regards to Internet use. Group 2 consisted of more frequent users (daily users), as were all remaining groups, but who were similar to Group 1 in reporting greater parental involvement and little Internet-related parent-child conflict (*Moderate users with parental control*). Group 3 had similar use patterns as Group 2, but had a key difference of low parental involvement and low parent-child conflict regarding Internet use (*Moderate users without parental control).* Groups 4 and 5 tended to have the heaviest Internet use (highest proportion of youth with >5 h of use daily). The most striking feature of Group 4 is that every single member reported frequent parent-child conflicts over their Internet use *(Habitual users with parent-child conflict)*. Finally, Group 5 had the heaviest users (*Intensive users*), although they reported low levels of parent-child conflict over Internet use.

3.2. Demographic characteristics

The groups varied in their demographic composition (Table 2). Not surprisingly, the *Occasional users* (Group 1) and *Moderate users with parental control* (Group 2) were majority younger adolescents (1st/2nd years), while the heavier use groups (Groups 3–5) had majority older adolescents (3rd/4th years), in keeping with the acceleration of online involvement as youth age. Interestingly, there was no consistent relationship between gender and age composition and level of parental control across the groups. Groups 1 and 2 had the highest proportions reporting strong parental control and tended to be younger than the other groups, as expected. Group 4 (*Habitual users with parent-child conflict*), however, also tended to report high parental control but had majority older adolescents (55.8%). This group also had the highest proportion of girls (60.0%) across the groups, while a similar group in terms of age but which had no reported parental control or conflict and more moderate use (Group 3, *Moderate users without parental control*) were majority boys (57.8%). Between the two youngest groups (Groups 1 and 2), Group 2, which had more frequent use and parental control (100%), had more girls (52.4% vs. 45.9% in Group 1). Thus, gender may play a role in the likelihood of higher parental control over an adolescent's Internet use for a longer time. However, the group with the heaviest use and low parental control were equal proportion boys and girls, but they were the oldest in age.

Regarding type of school (public/private) and habitat (urban/semi-rural/rural), the youngest and lowest use group (Group 1) had a significantly higher percentage of public school students (77.9%) and rural students (26.8%). Meanwhile, Group 4, which had the highest parent-child conflict over use had significantly less from public schools (71.8%) and more from urban schools (34.5%).

Table 1
Comparison of clustering variable descriptive statistics across groups.

Clustering Variables	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
	n = 8547 (21.4%)	n = 8891 (22.2%)	n = 8849 (22.1%)	n = 6707 (16.8%)	n = 6999 (17.5%)	n = 39,993 (100.0%)
Frequency of use						
• Occasionally (some times a month)	25.7%$^{+}$	0.0%$^{-}$	0.0%$^{-}$	0.3%$^{-}$	0.3%$^{-}$	5.6%
• Weekly (some times a week)	74.3%$^{+}$	2.8%$^{-}$	9.6%$^{-}$	9.9%$^{-}$	2.3%$^{-}$	20.7%
• Daily (every day or almost every day)	0.0%$^{-}$	97.2%$^{+}$	90.4%$^{+}$	89.7%$^{+}$	97.3%$^{+}$	73.7%
Hours per day (Week days)						
• Less than 1 h	59.3%$^{+}$	23.3%	17.3%$^{-}$	8.2%$^{-}$	0.0%$^{-}$	23.0%
• Between 1 and 2 h	35.4%$^{+}$	41.7%$^{+}$	46.5%$^{+}$	25%$^{-}$	0.0%$^{-}$	31.3%
• Between 2 and 3 h	4.6%$^{-}$	25.2%$^{+}$	31.5%$^{+}$	22.9%$^{+}$	6.8%$^{-}$	18.6%
• Between 3 and 5 h	0.5%$^{-}$	8.9%$^{-}$	4.5%$^{-}$	20.3%$^{+}$	40.6%$^{+}$	13.6%
• More than 5 h	0.2%$^{-}$	0.9%$^{-}$	0.2%$^{-}$	23.7%$^{+}$	52.6%$^{+}$	13.5%
Hours per day (Weekends)						
• Less than 1 h	35.7%$^{+}$	11.2%$^{-}$	10.0%$^{-}$	3.4%$^{-}$	0.0%$^{-}$	12.9%
• Between 1 and 2 h	43.3%$^{+}$	28.4%$^{+}$	25.0%$^{+}$	11.2%$^{-}$	0.5%$^{-}$	23.1%
• Between 2 and 3 h	16.5%$^{-}$	30.2%$^{+}$	37.7%$^{+}$	20.8%$^{-}$	1.3%$^{-}$	22.3%
• Between 3 and 5 h	3.5%$^{-}$	24.3%$^{+}$	23.6%$^{+}$	23.9%$^{+}$	18.1%	18.5%
• More than 5 h	1.0%$^{-}$	6.0%$^{-}$	3.7%$^{-}$	40.7%$^{+}$	80.1%$^{+}$	23.2%
Parental involvement						
• Parental control	73%$^{+}$	100%$^{+}$	0.0%$^{-}$	57.7%$^{+}$	20.3%$^{-}$	51.1%
• Parent-child conflict	4.3%$^{-}$	0.0%$^{-}$	0.0%$^{-}$	100%$^{+}$	0.0%$^{-}$	17.7%

$^{+,-}$ Significant (positive or negative) associations between the cluster and the category of variable (standardized residuals; $\alpha = 0.05$).

Table 2
Comparison of demographic characteristics across groups.

Demographic characteristics	Test statistic	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
		n_1 = 8547 (21.4%)	n_2 = 8891 (22.2%)	n_3 = 8849 (22.1%)	n_4 = 6707 (16.8%)	n_5 = 6999 (17.5%)	n = 39,993 (100.0%)
Gender							
• Male	$V = 0.119^{*}$	54.1%$^{+}$	47.6%$^{-}$	57.8%$^{+}$	40.0%$^{-}$	49.2%	50.2%
• Female		45.9%$^{-}$	52.4%$^{+}$	42.2%$^{-}$	60.0%$^{+}$	50.8%	49.8%
Age	$\eta^2_p = 0.109^{*}$	13.43^{2345}	13.79^{1245}	14.34^{135}	14.38^{135}	14.68^{1234}	14.09
Education level							
• 1st–2nd year	$V = 0.292^{*}$	77.7%$^{+}$	62.9%$^{+}$	45.5%$^{-}$	44.2%$^{-}$	38.5%$^{-}$	54.8%
• 3rd–4th year		22.3%$^{-}$	37.1%$^{-}$	54.5%$^{+}$	55.8%$^{+}$	61.5%$^{+}$	45.2%
School							
• Public	$V = 0.044^{*}$	77.9%$^{+}$	75.2%	74.7%	71.8%$^{-}$	75.6%	75.2%
• Private		22.1%$^{-}$	24.8%	25.3%	28.2%$^{+}$	24.4%	24.8%
Habitat							
• Urban	$V = 0.030^{*}$	30.4%$^{-}$	32.0%	31.6%	34.5%$^{+}$	30.6%$^{-}$	31.8%
• Semi-rural		42.8%$^{-}$	43.9%	44.5%	43.3%	45.8%$^{+}$	44.0%
• Rural		26.8%$^{+}$	24.1%	23.8%	22.2%$^{-}$	23.6%	24.2%

^{1,2,3,4,5} Significantly different groups (Scheffé test; $\alpha = 0.05$).
* = $p < 0.001$.
$^{+,-}$ Significant (positive or negative) associations between the cluster and the category of variable (standardized residuals; $\alpha = 0.05$).Cramer's V and partial eta-squared are reported for categorical and quantitative variables, respectively.

3.3. Online risks

Table 3 shows the comparison of profile groups in their rates of reporting experiencing various online risks. Overall, nearly half the sample (46%) reported engaging in at least one such experience, and the top three most common were being in contact with strangers through the Internet (32.1%), entering websites with erotic content (17.3%), and meeting people online that are known only through the Internet (10.3%). In general, the prevalence rates of online risks increased with heavier use (Cramer's V = 0.307). Groups 1 and 2 tended to report the lowest rates across the various experiences while Groups 4 and 5 tended to report the highest rates. This pattern was particularly evident for the two risks involving interacting with strangers online (being in contact with strangers: V = 0.275, meeting people who are only known online: V = 0.206). Interestingly, Group 4, in which all reported parent-child conflict over use, tended to have online risks rates similar to or higher than Group 5, despite Group 5 being heavier Internet users on average and experiencing no parent-child conflict over use.

3.4. Problematic Internet Use

Table 4 shows descriptive statistics for every item in the PIUS-a, and the total scale score, across the profile groups. In the overall sample, 16.3% scored positive for PIU. The groups varied widely in PIU-positive rates. As expected, the rates increased with heavier Internet use. Of note is that Group 4 (*Habitual users with parent-child conflict)* had the highest rate (43%), while only 24.9% of Group 5 (*Intensive users*), who had the heaviest use of all the groups, were PIU-positive. The remaining three groups all had ≤10%.

In general, the most frequently experienced items were “When you are online you feel time flies, and hours pass without realizing” (34.6% reported “many times” or “always”), “You have had the sensation that if you were not online, you could be missing something really important” (12.4%), and “You have got irritated or in a bad mood because of not being able to connect to the Internet or having to disconnect” (12.3%). The items of lowest frequency were “You have given up doing things that before you were interested in (hobbies, sports, etc.) to get connected” (2.4%) and “You lied to your parents or your family about the time you spend

Table 3
Comparison of rates of online risks across groups.

Online Risks	Test statistic	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
Being threatened, harassed or humiliated through the Internet	$V = 0.133^{*}$	5.6%$^{-}$	7.2%$^{-}$	6.3%$^{-}$	16.2%$^{+}$	11.1%$^{+}$	8.9%
Threatening, harassing or humiliating others through the Internet	$V = 0.167^{*}$	2.3%$^{-}$	3.0%$^{-}$	6.1%$^{-}$	12.7%$^{+}$	11.5%$^{+}$	6.6%
Sending erotic or sexual photos or videos of yourself to someone through the Internet	$V = 0.115^{*}$	1.5%$^{-}$	1.5%$^{-}$	3.7%	6.6%$^{+}$	6.3%$^{+}$	3.7%
Being blackmailed with publishing and disseminating photos or videos of yourself on the Internet	$V = 0.089^{*}$	2.1%$^{-}$	2.4%$^{-}$	3.2%$^{-}$	6.7%$^{+}$	5.0%$^{+}$	3.7%
Entering websites with erotic content	$V = 0.190^{*}$	7.6%$^{-}$	10.9%$^{-}$	22.6%$^{+}$	22.8%$^{+}$	25.3%$^{+}$	17.3%
Betting money on online gambling or betting sites	$V = 0.102^{*}$	1.6%$^{-}$	2.0%$^{-}$	4.7%$^{+}$	4.8%$^{+}$	6.9%$^{+}$	3.8%
Being in contact with strangers through the Internet	$V = 0.275^{*}$	15.0%$^{-}$	23.3%$^{-}$	33.0%	48.5%$^{+}$	47.3%$^{+}$	32.1%
Meeting people you have known only through the Internet	$V = 0.206^{*}$	3.3%$^{-}$	5.7%$^{-}$	8.8%$^{-}$	18.6%$^{+}$	18.5%$^{+}$	10.3%
TOTAL	$\eta^2_p = 0.102^{*}$	0.39^{2345}	0.56^{1345}	0.88^{1245}	1.37^{123}	1.32^{123}	0.86
At least one risky behavior	$V = 0.307^{*}$	25%$^{-}$	35.1%$^{-}$	49.7%$^{+}$	64.6%$^{+}$	63.2%$^{+}$	46.0%

^{1,2,3,4,5} Significantly different groups (Scheffé test; $\alpha = 0.05$).
$^{*} = p < 0.001$.
$^{+,-}$ Significant (positive or negative) associations between the cluster and the category of variable (standardized residuals; $\alpha = 0.05$).

connected to the Internet" (4.3%). Item means were significantly higher in Group 4 than all other groups, even Group 5.

4. Discussion and conclusions

The major goals of this study were the identification of different clusters of Spanish secondary students based on their pattern of internet use and their parental involvement, and the characterization of these clusters in terms of demographics, and rates of problematic Internet use and different online risks.

Adolescence is a critical period during which the foundation for future health behaviors and outcomes is established, including responsible use of the Internet. Thus, it is important to understand adolescent Internet use patterns and their associated risks, as well as the role of parent behaviors, in order to elucidate target areas for intervention and prevention. While conducted in the Galician region of Spain, this study moves the field forward by being one of the largest population-based studies to date of adolescent Internet use profiles and their relative risk for problematic use and online risks. This study of 33,993 secondary students identified the major profiles empirically through cluster analysis, and, guided by Bronfenbrenner's Ecological Systems Theory of child development (Bronfenbrenner, 1992), expanded the determination of these profiles to including parenting factors. Our analysis identified five major groups, labeled based on their distinguishing characteristics: (1) *Occasional users*, (2) *Moderate users with parental control*, (3) *Moderate users without parental control*, (4) *Habitual users with parent-child conflict*, and (5) *Intensive users*. These five groups show some parallels to the four user types proposed by Brandtzæg (Brandtzæg, 2010): *Sporadics* (Group 1), *Instrumental users* (Group 2), *Socializers* (Group 3) and two different *Advanced Users* (Group 4 & 5), respectively.

Group 1 or *Occasional users* were mostly younger boys attending public schools in rural areas. They had the lowest Internet involvement, with concomitant low rates of online risk behaviors and PIU. Group 2 and 3 had similar *moderate* use profiles, but had opposite gender and parental-control profiles, with Group 2 majority girls with universal parental control, and Group 3 boys with no parental control. Group 2 members were slightly younger, and reported fewer online risk behaviors, while Group 3 had higher rates, especially in entering erotic websites and betting money online. Both had relatively lower rates of PIU. Groups 4 and 5 were mostly older adolescents, had the highest use levels and rates of PIU and online risks. Group 4 had the highest rate of PIU, with nearly half (43%) scoring PIU-positive, and was uniquely characterized by universal parent-child conflict over use. In contrast, Group 5 had little parental control over Internet use, and had the highest rate of visiting erotic and betting websites.

Our findings corroborate those of previous smaller studies that showed greater Internet involvement was associated with higher interference with daily life activities, greater engagement in problematic online behaviors such as gambling and bullying, and greater exposure to harmful online experiences such as being threatened or blackmailed (Cao, Sun, Wan, Hao, & Tao, 2011; Suris et al., 2014). Our study was unique, however, in providing a glimpse into the variation in parent-adolescent interactions around adolescent Internet use patterns. Parental involvement appeared to be stronger at younger ages (Groups 1 and 2), and greater for girls (Groups 2 and 4). The younger groups had the lowest rates of heavy Internet use, PIU and online risks, and little parent-child conflict over their use. Because of the descriptive nature of our study, we are unable to determine the relative contribution of younger age vs. greater parental control on lower Internet use levels and rates of Internet-associated risks in these groups. The older groups, Groups 4 and 5, on the other hand, had heavy Internet use and high rates of PIU and risk behaviors, but had opposite patterns of parental involvement; all Group 4 (with the highest risks and PIU rates) reported parent-child conflicts because of the Net, but was not universal in reporting parental control over their use, while Group 5 rarely reported parental control and none reported conflicts. Our results indicate that parenting behavior regarding their child's Internet use may operate in two ways. First, parental control and limits around Internet use may be associated with moderation of an adolescent child's Internet use and associated risks (Chow, Leung, Ng, & Yu, 2009; Kalmus et al., 2015; Valcke, Schellens, Van Keer, & Gerarts, 2007). On the other hand, parental control may increase in reaction to their child's problematic use of the Internet and online risk taking, resulting in the creation or exacerbation of conflicts between parents and their adolescents who may oppose such restrictions, particularly as they grow older (Sasson & Mesch, 2014). Despite the challenges, research shows that parental monitoring is not only important for younger teens, but it continues to exert protective effects for older teenagers, among both male and female adolescents (Khurana, Bleakley, Jordan, & Romer, 2015).

These results highlight the need to educate parents about the potential risks associated with greater Internet exposure for their adolescents (Khurana et al., 2015), and to equip parents with information and skills for moderating their child's Internet use (Lee, 2012), as well as intervening effectively when problems develop (Vanderhoven, Schellens, & Valcke, 2016). Parents who are not yet online should be encouraged to become familiar with the Internet, so as to knowledgeably guide safe Internet use for their children (Livingstone & Haddon, 2009; Rial, Gómez, Picón, et al., 2015). Participatory learning might also be an appropriate parental

Table 4
Descriptive statistics of the 11-item Problematic Internet Use Scale across groups.

Items	Test statistic	Group 1		Group 2		Group 3		Group 4		Group 5		TOTAL	
		M	Many times or always	*M*	Many times or always	*M*	Many times or always	*M*	Many times or always	*M*	Many times or always	*M*	Many times or always
1. When you are online you feel time flies, and hours pass without realizing	$\eta^2_p = 0.079^*$	1.61^{2345}	19.6%	1.89^{1345}	28.2%	1.97^{1245}	31.1%	2.61^{1235}	55.6%	2.32^{1234}	45.5%	2.05	34.6%
2. You have tried to control or reduce your Internet use, but you were not able	$\eta^2_p = 0.036^*$	0.66^{34}	8.1%	0.68^{34}	6.2%	0.55^{1245}	4.6%	1.13^{1235}	14.6%	0.66^{34}	7.4%	0.72	7.9%
3. You have come to neglect some of your homework or to perform less in exams because of connecting to the Internet	$\eta^2_p = 0.143^*$	0.41^{2345}	2.8%	0.62^{1345}	3.9%	0.84^{1245}	7.9%	1.56^{1235}	23.5%	1.25^{1234}	17.5%	0.89	10.2%
4. You need to spend more and more time connected to the Internet to feel comfortable	$\eta^2_p = 0.093^*$	0.31^{2345}	1.9%	0.45^{145}	3.1%	0.49^{145}	4.1%	1.18^{1235}	16.6%	0.86^{1234}	11.5%	0.62	6.8%
5. You have got irritated or in a bad mood because of not being able to connect to the Internet or having to disconnect	$\eta^2_p = 0.153^*$	0.44^{2345}	3.4%	0.65^{1345}	5.2%	0.76^{1245}	7.8%	1.76^{1235}	31.0%	1.27^{1234}	19.8%	0.92	12.3%
6. You lied to your parents or your family about the time you spend connected to the Internet	$\eta^2_p = 0.102^*$	0.17^{2345}	1.1%	0.26^{145}	1.6%	0.30^{145}	2.7%	0.96^{1235}	14.0%	0.38^{1234}	4.6%	0.39	4.3%
7. You have given up doing things that before you were interested in (hobbies, sports, etc.) to get connected	$\eta^2_p = 0.033^*$	0.16^{345}	1.2%	0.17^{1345}	1.1%	0.20^{1245}	1.4%	0.50^{1235}	6.2%	0.29^{1234}	3.1%	0.25	2.4%
8. You have connected to the Internet even though you knew it could get you in trouble	$\eta^2_p = 0.060^*$	0.43^{2345}	3.9%	0.52^{1345}	4.9%	0.63^{1245}	7.5%	1.19^{1235}	17.9%	0.89^{1234}	13.6%	0.70	9.0%
9. Spending hours without connecting to the Internet has come to annoy you very much	$\eta^2_p = 0.123^*$	0.42^{2345}	2.9%	0.63^{1345}	4.3%	0.69^{1245}	5.8%	1.49^{1235}	23.7%	1.18^{1234}	16.7%	0.84	9.7%
10. You have had the sensation that if you were not online, you could be missing something really important	$\eta^2_p = 0.111^*$	0.50^{2345}	4.3%	0.75^{1345}	6.3%	0.82^{1245}	8.7%	1.62^{1235}	27.7%	1.28^{1234}	19.8%	0.95	12.4%
11. You have come to do or say things online that you would not do or say in person	$\eta^2_p = 0.066^*$	0.38^{2345}	3.1%	0.53^{1345}	4.4%	0.68^{1245}	6.8%	1.13^{1235}	16.5%	0.94^{1234}	12.7%	0.70	8.1%
TOTAL SCORE	$\eta^2_p = 0.227^*$	5.50^{2345}	SD = 4.68	7.16^{1345}	SD = 5.64	7.93^{1245}	SD = 5.09	15.12^{1235}	SD = 7.03	11.33^{1234}	SD = 7.97	9.04	SD = 6.92
% PIU	$V = 0.374^*$	$4.3\%^-$		$6.9\%^-$		$10.3\%^-$		$43.0\%^+$		$24.9\%^+$		16.3%	

[1,2,3,4,5] Significantly different groups (Scheffé test; $\alpha = 0.05$).
$^* = p < 0.001$.
$^{+,-}$ Significant (positive or negative) associations between the cluster and the category of variable (standardized residuals; $\alpha = 0.05$).

mediation strategy which implies that parents and children learn from each other in a co-constructive way (Clark, 2011). Parents should monitor and set rules for their child's online activity, as well as educate them about potential risks, and promote self-management skills as their child ages (Livingstone et al., 2011). Parents should be encouraged to seek help (for both their children and themselves), and become educated about available help resources if Internet use becomes a problem and seriously interferes with everyday life (Keith & Steinberg, 2017).

This study has some potential limitations. First, our sample was drawn from a specific region of Spain (Galicia); thus, the results may not be generalizable to Spain as a whole, or to other countries. However, recent studies have shown commonalities regarding Internet usage among youth across the world (Moeller, Powers, & Roberts, 2012), so there would be good grounds for considering the likely generalizability of our findings. Secondly, our data relied on adolescents' self-report, and may be subject to recall error or social desirability bias. However, the survey was anonymous and self-administered, and prior research indicates that adolescent self-report of sensitive behaviors (e.g., alcohol and other drug use), under confidential conditions, is reliable and valid (Babor, Kranzler, & Lauerman, 1989; Winters, Stinchfield, Henly, & Schwartz, 1990).

Despite these limitations, this study provides insight into the Internet use patterns, perceived parent-child interactions related to those patterns of use, and the rates of problematic Internet use and risky behaviors in a large population-based sample of Spanish adolescents. Future studies should develop and test strategies to promote effective parenting to prevent Internet use-related problems and risks throughout adolescence, and identify adolescent risk factors for the development of PIU (Gámez-Guadix, Orue, Smith, & Calvete, 2013; Livingstone & Smith, 2014).

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Conflicts of interest

The authors declare no conflicts of interest.

Author contributions

A. Rial designed the study. C. Barreiro and M. Isorna collected the data. P. Gómez and S. K. Harris analyzed and interpreted data. P. Gómez wrote the first version of the manuscript. P. Gómez, S.K. Harris, C. Barreiro, M. Isorna and A. Rial collaborated on writing the final article. All authors have approved the final version for publication.

References

Babor, T. F., Kranzler, H. R., & Lauerman, R. J. (1989). Early detection of harmful alcohol consumption: Comparison of clinical, laboratory, and self-report screening procedures. *Addictive Behaviors, 14*, 139–157. http://dx.doi.org/10.1016/0306-4603(89)90043-9.

Brandtzæg, P. B. (2010). Towards a unified media-user typology (MUT): A meta-analysis and review of the research literature on media-user typologies. *Computers in Human Behavior, 26*(5), 940–956. http://dx.doi.org/10.1016/j.chb.2010.02.008.

Bronfenbrenner, U. (1992). Ecological systems theory. In R. Vasta (Ed.), *Six theories of child development: Revised formulations and current issues* (pp. 187–250). London, England: Jessica Kingsley Publishers.

Burns, R. B., & Burns, R. A. (2009). *Business research methods and statistics using SPSS*. Thousand Oaks, CA: Sage.

Cao, H., Sun, Y., Wan, Y., Hao, J., & Tao, F. (2011). Problematic Internet use in Chinese adolescents and its relation to psychosomatic symptoms and life satisfaction. *BMC Public Health, 11*(1), 802. http://dx.doi.org/10.1186/1471-2458-11-802.

Chow, S. L., Leung, G. M., Ng, C., & Yu, E. (2009). A screen for identifying maladaptive internet use. *International Journal of Mental Health Addiction, 7*, 324–332. http://dx.doi.org/10.1007/s11469-008-9170-4.

Clark, L. S. (2011). Parental mediation theory for the digital age. *Communication Theory, 21*(4), 323–343. http://dx.doi.org/10.1111/j.1468-2885.2011.01391.x.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlational analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Dever, B. V., Schulenberg, J. E., Dworkin, J. B., O'Malley, P. M., Kloska, D. D., & Bachman, J. G. (2012). Predicting Risk-Taking with and without substance use: The effects of parental monitoring, school bonding, and sports participation. *Prevention Science, 13*(6), 605–615. http://dx.doi.org/10.1007/s11121-012-0288-z.

Durkee, T., Kaess, M., Carli, V., Parzer, P., Wasserman, C., Floderus, B., … Wasserman, D. (2012). Prevalence of pathological internet use among adolescents in Europe: Demographic and social factors. *Addiction, 107*(12), 2210–2222. http://dx.doi.org/10.1111/j.1360-0443.2012.03946.x.

Eastin, M., Greenberg, B., & Hofschire, L. (2006). Parenting the internet. *Journal of Communication, 56*, 486–504.

Eurostat. (2016). *Survey on information and communications technology (ICT) usage in households and by individuals*. Luxembourg, Luxembourg: Eurostat.

Gámez-Guadix, M., Orue, I., Smith, P. K., & Calvete, E. (2013). Longitudinal and reciprocal relations of cyberbullying with depression, substance use, and problematic internet use among adolescents. *Journal of Adolescent Health, 53*(4), 446–452. http://dx.doi.org/10.1016/j.jadohealth.2013.03.030.

Gómez, P., Rial, A., Braña, T., Varela, J., & Barreiro, C. (2014). Evaluation and early detection of problematic Internet use in adolescents. *Psicothema, 26*, 21–26. http://dx.doi.org/10.7334/psicothema2013.109.

Haberman, S. J. (1973). The analysis of residuals in cross-classified tables. *Biometrics, 29*, 205–220.

Hill, W. W., Beatty, S. E., & Walsh, G. (2013). A segmentation of adolescent online users and shoppers. *Journal of Services Marketing, 27*(5), 347–360. http://dx.doi.org/10.1108/JSM-10-2011-0157.

Kalmus, V., Blinka, L., & Ólafsson, K. (2015). Does it matter what mama says: Evaluating the role of parental mediation in European adolescents' excessive internet use. *Children & Society, 29*, 122–133. http://dx.doi.org/10.1111/chso.12020.

Keith, B. E., & Steinberg, S. (2017). Parental Sharing on the Internet: Child privacy in the age of social media and the pediatrician's role. *JAMA Pediatrics, 171*(5), 413–414. http://dx.doi.org/10.1001/jamapediatrics.2016.5059.

Khurana, A., Bleakley, A., Jordan, A. B., & Romer, D. (2015). The protective effects of parental monitoring and internet restriction on adolescents' risk of online harassment. *Journal of Youth and Adolescence, 44*(5), 1039–1047. http://dx.doi.org/10.1007/s10964-014-0242-4.

Kuss, D. J., van Rooij, A. J., Shorter, G. W., Griffiths, M. D., & van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior, 29*(5), 1987–1996. http://dx.doi.org/10.1016/j.chb.2013.04.002.

Lee, S.-J. (2012). Parental restrictive mediation of children's internet use: Effective for what and for whom? *New Media & Society, 15*(4), 466–481. http://dx.doi.org/10.1177/1461444812452412.

Lee, S.-J., & Chae, Y.-G. (2007). Children's internet use in a family context: Influence on family relationships and parental mediation. *CyberPsychology & Behavior, 10*(5), 640–644. http://dx.doi.org/10.1089/cpb.2007.9975.

Lenhart, A. (2015). *Teens, social media and technology overview 2015*. Washington, DC: Pew Research Center.

Li, W., Garland, E. L., & Howard, M. O. (2014). Family factors in internet addiction among Chinese youth: A review of english- and Chinese-language studies. *Computers in Human Behavior, 31*(1), 393–411. http://dx.doi.org/10.1016/j.chb.2013.11.004.

Livingstone, S., & Haddon, L. (2009). *EU kids Online: Final report 2009*. London, UK: EU Kids Online Network.

Livingstone, S., Haddon, L., Görzig, A., & Ólafsson, K. (2011). *Risks and safety on the internet: The perspective of European children. Full findings*. London, UK: EU Kids Online.

Livingstone, S., Mascheroni, G., & Staksrud, E. (2015). *Developing a framework for researching children's online risks and opportunities in Europe*. London, UK: EU Kids Online.

Livingstone, S., & Smith, P. K. (2014). Annual research review: Harms experienced by child users of online and mobile technologies: The nature, prevalence and management of sexual and aggressive risks in the digital age. *Journal of Child Psychology and Psychiatry, 55*(6), 635–654. http://dx.doi.org/10.1111/jcpp.12197.

Milligan, G. W., & Hirtle, S. C. (2003). Clustering and classification methods. In I. B. Weiner (Ed.), *Handbook of psychology* (pp. 165–186). Hoboken, NJ, USA: John Wiley & Sons, Inc.

Moeller, S., Powers, E., & Roberts, J. (2012). "The world unplugged" and "24 hours without media": Media literacy to develop self-awareness regarding media. *Comunicar, 20*(39), 45–52. http://dx.doi.org/10.3916/C39-2012-02-04.

Moreno, M. A., Jelenchick, L., Cox, E., Young, H., & Christakis, D. A. (2011). Problematic internet use among US youth: A systematic review. *Archives of Pediatrics & Adolescent Medicine, 165*, 797–805. http://dx.doi.org/10.1001/archpediatrics.2011.58.

Rial, A., Gómez, P., Braña, T., & Varela, J. (2014). Actitudes, percepciones y usos de Internet y las redes sociales entre los adolescentes de la comunidad gallega (España) [Attitudes, perceptions and Internet and social networks use among Galician (Spain) teens]. *Anales de Psicología, 30*(2), 642–655. http://dx.doi.org/

10.6018/analesps.30.2.159111.
Rial, A., Gómez, P., Isorna, M., Araujo, M., & Varela, J. (2015). PIUS-a: Problematic internet use scale in adolescents. Development and psychometric validation. *Adicciones, 27*, 47–63.
Rial, A., Gómez, P., Picón, E., Braña, T., & Varela, J. (2015). Identification and characterization of adolescent internet User's profiles. *The Spanish Journal of Psychology, 18*, e50. http://dx.doi.org/10.1017/sjp.2015.55.
Sasson, H., & Mesch, G. (2014). Parental mediation, peer norms and risky online behavior among adolescents. *Computers in Human Behavior, 33*, 32–38. http://dx.doi.org/10.1016/j.chb.2013.12.025.
Secades-Villa, R., Calafat, A., Fernández-Hermida, J. R., Juan, M., Duch, M., Skärstrand, E., … Talic, S. (2014). Duration of Internet use and adverse psychosocial effects among European adolescents. *Adicciones, 26*(3), 247–253.
Spada, M. M. (2014). An overview of problematic Internet use. *Addictive Behaviors, 39*(1), 3–6. http://dx.doi.org/10.1016/j.addbeh.2013.09.007.
Steinberg, L., Fletcher, A., & Darling, N. (1994). Parental monitoring and peer influences on adolescent substance use. *Pediatrics, 93*, 1060–1064.
Suris, J. C., Akre, C., Ambresin, A.-E., Berchtold, A., Piguet, C., & Zimmermann, G. (2014). Problematic internet use and substance use in adolescence. *Journal of Adolescent Health, 54*(2), S8. http://dx.doi.org/10.1016/j.jadohealth.2013.10.032.
Valcke, M., Bonte, S., De Wever, B., & Rots, I. (2010). Internet parenting styles and the impact on Internet use of primary school children. *Computers & Education, 55*(2), 454–464. http://dx.doi.org/10.1016/j.compedu.2010.02.009.
Valcke, M., Schellens, T., Van Keer, H., & Gerarts, M. (2007). Primary school children's safe and unsafe use of the Internet at home and at school: An exploratory study. *Computers in Human Behavior, 23*(6), 2838–2850. http://dx.doi.org/10.1016/j.chb.2006.05.008.
Vanderhoven, E., Schellens, T., & Valcke, M. (2016). Decreasing risky behavior on social network sites: The impact of parental involvement in secondary education interventions. *The Journal of Primary Prevention, 37*(3), 247–261. http://dx.doi.org/10.1007/s10935-016-0420-0.
Wang, L., Luo, J., Gao, W., & Kong, J. (2012). The effect of internet use on adolescents' lifestyles: A national survey. *Computers in Human Behavior, 28*(6), 2007–2013. http://dx.doi.org/10.1016/j.chb.2012.04.007.
Winters, K. C., Stinchfield, R. D., Henly, G. A., & Schwartz, R. H. (1990). Validity of adolescent self-report of alcohol and other drug involvement. *International Journal of the Addictions, 25*, 1379–1395.