

Risky online behaviors among adolescents: Longitudinal relations among problematic Internet use, cyberbullying perpetration, and meeting strangers online

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Background and aims: This study aims to analyze the cross-sectional and longitudinal relationship between three major risky online behaviors during adolescence: problematic Internet use, cyberbullying perpetration, and meeting strangers online. An additional objective was to study the role of impulsivity–irresponsibility as a possible explanatory variable of the relationships between these risky online behaviors. *Methods:* The study sample was 888 adolescents that completed self-report measures at time 1 and time 2 with an interval of 6 months. *Results:* The findings showed a significant cross-sectional relationship between the risky online behaviors analyzed. At the longitudinal level, problematic Internet use at time 1 predicted an increase in the perpetration of cyberbullying and meeting strangers online at time 2. Furthermore, meeting strangers online increased the likelihood of cyberbullying perpetration at time 2. Finally, when impulsivity–irresponsibility was included in the model as an explanatory variable, the relationships previously found remained significant. *Discussion:* These results extend traditional problem behavior theory during adolescence, also supporting a relationship between different risky behaviors in cyberspace. In addition, findings highlighted the role of problematic Internet use, which increased the chances of developing cyberbullying perpetration and meeting strangers online over time. However, the results suggest a limited role of impulsivity–irresponsibility as an explicative mechanism. *Conclusions:* The findings suggest that various online risk activities ought to be addressed together when planning assessment, prevention and intervention efforts.

Keywords: problematic Internet use, Internet addiction, cyberbullying, meeting strangers online, risky behaviors

Adolescence is a particularly critical period in the development and progress of most risk and problem behaviors (Eaton et al., 2012). This increased vulnerability is due to psychobiological and evolutionary factors, which favor the emergence of various risky behaviors (Romer, 2010; Steingerg, 2007). Information and communication technologies (ICTs), such as the Internet and smartphones, exert a special fascination among adolescents, since they cover some of the main emotional and communication needs during adolescence (Dolev-Cohen & Barak, 2013; Valkenburg & Peter, 2011). Furthermore, ICTs have also become a way for the manifestation of different risky online behaviors during adolescence. In this regard, risky online behaviors include involvement in a number of situations that increase the likelihood of occurrence of negative consequences to self or others, such as emotional distress, victimization or deterioration at the social or academic level (Valcke, De Wever, Van Keer, & Schellens, 2011). The risky online behaviors most studied to date have been problematic Internet use and cyberbullying perpetration (Livingstone & Smith, 2014; Young & de Abreu, 2011). Also, the use of the Internet to meet strangers is an additional risky online behavior that has received increasing social and empirical attention in recent years (Valcke et al., 2011). Although it has been consistently found that different risk behaviors tend to be associated during adolescence (Jessor, 1991), to date there is

little empirical evidence on the temporal relationship between risky online behaviors. Therefore, the aim of this study was to analyze the cross-sectional, longitudinal, and reciprocal relationships between problematic Internet use, cyberbullying perpetration, and meeting strangers online, along with the role of impulsivity–irresponsibility in adolescence as a possible mechanism that explains the relationship between them.

Problematic Internet use involves a loss of control over the use of the Internet, a cognitive preoccupation with its use and continued use, despite the negative consequences (Caplan, 2010). This problem has also frequently been called compulsive use (Meerkerk, van den Eijnden, Franken, & Garretsen, 2010) or Internet addiction (Smahel, Brown, & Blinka, 2012). A recent review conducted by Pontes, Kuss, and Griffiths (2015) of 12 studies that examined nationally representative samples of adolescents reported prevalence rates for problematic Internet use between 1% and 18%, with an average prevalence rate of 7.5%. Cyberbullying, meanwhile, is an aggressive and repeated behavior carried out through ICTs, especially the

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Internet and smartphones, which aims to cause harm to the victim who cannot easily defend him or herself (Smith, Mahdavi, Carvalho, & Tippett, 2006). Prevalence of cyberbullying has ranged between 20% and 40% in the majority of studies (Kowalski, Giumetti, Schroeder, & Lattanner, 2014). Third, meeting strangers online has also been considered a risky online behavior among adolescents that has been associated with experiences of sexual grooming (i.e., sexual harassment of children via the Internet performed by adults; Williams, Elliott, & Beech, 2013) and may result in offline assault (Dowdell, 2011). Although empirical evidence is limited, between 4% and 14% of adolescents report having contact with strangers online and then meeting them in person (Dowdell, 2011; Valcke et al., 2011; Valcke, Schellens, Van Keer, & Gerarts, 2007).

From the theory of risk and problem behaviors during adolescence (Jessor, 1991; Jessor & Jessor, 1977), one would expect these three risky online behaviors to be related. According to this theory, adolescents and youth who engage in one risky or problem behavior are likely to engage in other risky behaviors. At the empirical level, it has been consistently found that risk behaviors during adolescence, such as substance abuse, interpersonal violence or sexual risk behaviors tend to co-vary and could share the same underlying explanatory mechanism (Feldstein & Miller, 2006; Muñoz-Rivas, Gámez-Guadix, Graña, & Fernández, 2010). In the case of risky online behaviors, preliminary empirical evidence of cross-sectional studies suggests that problematic Internet use, cyberbullying perpetration, and meeting strangers online could also be related. For example, Morahan-Martin and Schumacher (2000) found that problematic Internet users, as compared to no pathological users, were more likely to use the Internet for meeting strangers. Also, Casas, Del Rey, and Ortega-Ruiz (2013) found that problematic Internet use was associated with the perpetration of cyberbullying among adolescents. In addition, a recent meta-analysis by Kowalski et al. (2014) reported that perpetrating cyberbullying was significantly associated with other risky online behaviors ($r = .23$). At the longitudinal level, Gámez-Guadix, Orue, Smith, and Calvete (2013) found that cyberbullying victimization predicted more problematic Internet use six months later. However, little is known about the prospective relationship between problematic Internet use and cyberbullying perpetration.

IMPULSIVITY–IRRESPONSIBILITY DURING ADOLESCENCE AS EXPLANATORY MECHANISM

The degree of impulsivity–irresponsibility of adolescents could be a possible explicative mechanism of the relationship between different risk behaviors during adolescence. Risk behaviors could be more likely when the behavior is carried out impulsively without fully considering the possible consequences for oneself or for the victims. Empirically, several studies have found that impulsivity–irresponsibility is related to different risk and problem behaviors during adolescence, such as interpersonal violence and addictive behavior (Jolliffe & Farrington, 2011). Impulsivity has also been found to be associated with problematic Internet use

(Meerkerk et al., 2010) and cyberbullying perpetration (Gámez-Guadix, Villa-George, & Calvete, 2014; Kokkinos, Antoniadou & Markos, 2014). In addition, impulsivity includes features such as sensation seeking, novelty seeking, and disinhibition (Stautz & Cooper, 2013) that could be associated with meeting strangers online regardless of the potential adverse effects this might have. Therefore, given that impulsivity may be related to risky online behaviors, it is reasonable to think that this variable can explain why problematic Internet use, cyberbullying perpetration and meeting strangers online could be related during adolescence. However, to date no previous study has examined this issue.

OVERVIEW OF THE PRESENT STUDY

Taking into account the previous review, the aim of this study was to analyze the cross-sectional and longitudinal relationships between problematic Internet use, cyberbullying perpetration and meeting strangers online. Moreover, given the limited information on the directionality of these relationships, we also analyze the possible reciprocity between them. Since little is known about the mechanism explaining the association among these variables, our second objective was to analyze the role of impulsivity–irresponsibility in explaining the relationship between problematic Internet use, cyberbullying perpetration, and meeting strangers online during adolescence.

METHODS

Participants

The initial sample consisted of 1009 Spanish adolescents aged between 13 and 18 years. Participants were students from 46 classrooms in various schools of secondary education. Participants were assessed two times with an interval of 6 months between each. The retention rate between time 1 (T1) and time 2 (T2) was 88.01%. The final sample consisted of 888 adolescents (526 women, 358 men, and 4 who did not indicate sex; mean age = 15.42 years, $SD = 1.01$) who completed measures at T1 and T2. No differences were found in any of the study variables among adolescents who completed the study and those who did not.

Measures

Problematic Internet use. We used the Generalized and Problematic Internet Use Scale 2 (GPIUS2; Caplan, 2010; Gámez-Guadix, Villa-George, & Calvete, 2012), which consists of 15 items (e.g., “I have difficulty controlling the amount of time I spend online”). The response format is a Likert scale with six alternatives, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). This scale has shown adequate psychometric properties, including construct and convergent validity, and adequate reliability (Caplan, 2010; Gámez-Guadix et al., 2012). Internal consistency in this study was $\alpha = .90$ at T1 and $.91$ at T2.

Cyberbullying perpetration. We used the subscale of perpetration of the Cyberbullying Questionnaire (CBQ;

Gómez-Guadix et al., 2014) that consists of 14 items each measuring a distinct cyberbullying behavior. Sample items include: “Sending threatening or insulting messages” and “Posting links of humiliating images to other people for them to see”. Adolescents had to indicate how often they had performed cyberbullying behaviors through the Internet or mobile phones during their lifetimes, such as sending threatening or insulting messages to others. The response format used was: 0 (*never*), 1 (*1 or 2 times*), 2 (*3 or 4 times*), or 3 (*5 or more times*). The CBQ has shown good psychometric properties in Spanish-speaking samples, including construct and convergent validity and reliability (Gómez-Guadix et al., 2014). In this study, the internal consistency was $\alpha = .75$ at time 1 and $\alpha = .76$ at time 2.

Meeting strangers online. We included an item to ask how many times per day, on average, adolescents used the Internet to meet new people with the intention of meeting them in person (i.e., “How long do you use the Internet daily to meet new people with the intention of meeting them face to face?”). The response scale included six alternatives: 1 (*never*), 2 (*less than 30 minutes*), 3 (*between 30 minutes and one hour*), 4 (*between one and two hours*), 5 (*two to three hours*), and 6 (*more than 3 hours per day*).

Impulsivity–irresponsibility. The impulsivity–irresponsible subscale of the Spanish version of the Youth Psychopathic Inventory (YPI; van Baardewijk et al., 2010) was used. This subscale consists of six items that measure impulsivity–irresponsibility. Each item in the YPI is answered on a 4-point scale ranging from 0 (*does not apply at all*) to 3 (*applies very well*). A sample item is “I consider myself a pretty impulsive person.” This scale has shown good construct and predictive validity and reliability among Spanish adolescents (Hilterman, 2010). The internal consistency in this sample was $\alpha = .70$.

Procedure

Data were collected two times with an interval of 6 months between each. At the beginning of the investigation, adolescents were informed that their participation was part of a study on different behaviors among youth, including the use of new technologies. Participants completed the questionnaires in their classroom. In order to match the questionnaires for both times, a code known by each participant was

used. The time required to complete the questionnaire was 30–40 minutes.

Statistical analysis

The program package SPSS version 19.0 (IBM Corp., 2010) was used for descriptive analyses. To analyze the relationship between the variables, the EQS 6.1 program was employed (Bentler, 2005). We used the robust maximum likelihood (ML) estimation method with the Satorra–Bentler scaled Chi-squared (S-B χ^2) because data did not meet the assumption of normality (the normalized Mardia’s coefficient = 115.77). To study the adequacy of the estimated models, we used a non-normative fit index (NNFI), comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). For the NNFI and the CFI, values over .90 indicate an acceptable fit. Values on the SRMR and the RMSEA less than .08 indicate an acceptable fit (Byrne, 2006; Hu & Bentler, 1999).

Ethics

The study procedures were carried out in accordance with the APA Ethics Code. The survey procedures were reviewed and approved by the Ethics Committee of the University of Deusto, Bilbao, Spain. Students were informed that the general purpose of the survey was to study Internet use among adolescents and that the anonymity of their responses and their participation was voluntary. All adolescents agreed to participate. Parents of adolescents received similar information and were informed that they could refuse their child’s participation for both times of the study. None of them refused their child’s participation in the study.

RESULTS

Descriptive analyses

The correlations and descriptive statistics (means and standard deviations) of the variables included in the study are provided in Table 1. As shown in the table, the highest correlations, in general, were established between the same variable at T1 and T2.

Table 1. Pearson correlations and descriptive statistics (means and standard deviations) for the variables in this study

	1	2	3	4	5	6	7
1. Problematic Internet use T1							
2. Problematic Internet use T2	.72***						
3. Cyberbullying perpetration T1	.29***	.22***					
4. Cyberbullying perpetration T2	.26***	.25***	.58***				
5. Meeting strangers online T1	.25***	.22***	.16***	.19***			
6. Meeting strangers online T2	.19***	.27***	.15***	.15***	.45***		
7. Impulsivity–irresponsibility	.39***	.32***	.35***	.30***	.15***	.10**	
Mean	2.12	1.99	.12	.11	.27	.23	1.09
Standard deviation	.95	.88	.18	.18	.83	.72	.55

Note: Range of scores: Problematic Internet use: from 1 (*strongly disagree*) to 6 (*strongly agree*); Cyberbullying perpetration: 0 (*never*), 1 (*1 or 2 times*), 2 (*3 or 4 times*), or 3 (*5 or more times*); Meeting strangers online: 1 (*never*) to 6 (*more than 3 hours per day*); Impulsivity–irresponsibility: from 0 (*does not apply at all*) to 3 (*applies very well*). ** $p < .01$; *** $p < .001$.

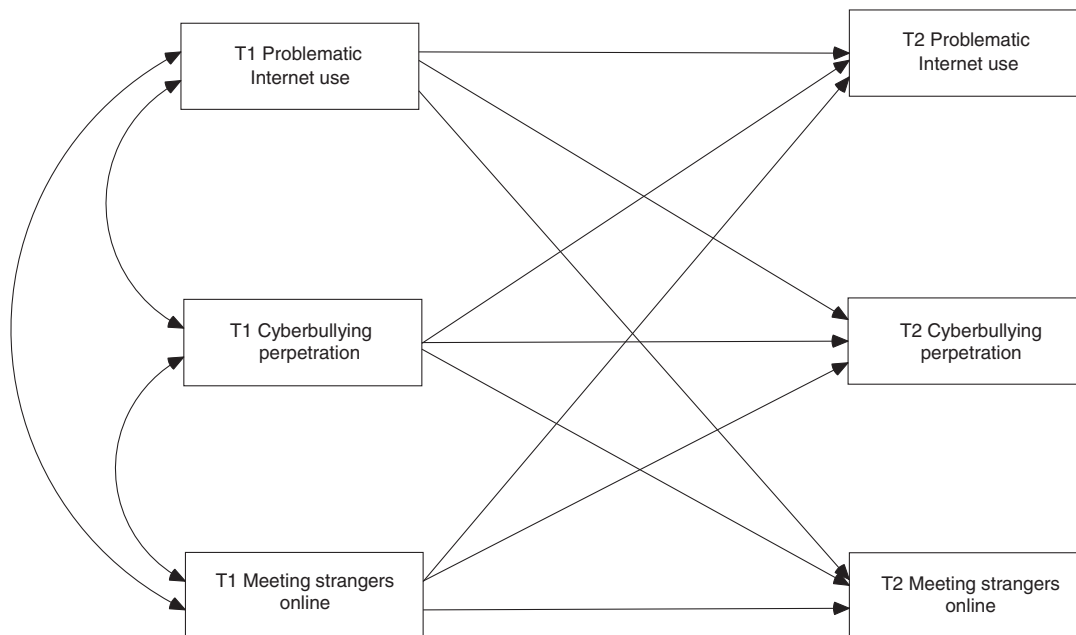


Figure 1. Hypothesized theoretical model

In addition, we analyzed the prevalence of the risky online behaviors included in the study. Regarding adolescents who presented different behaviors of problematic Internet use (response options: 5 = *somewhat agree* and 6 = *strongly agree*), 16.9% showed a single behavior out of the 15 behaviors measured, 9.5% two behaviors, 5.5% three behaviors, 3.9% four behaviors, 3.1% five behaviors, 3.8% six behaviors, and 6.8% seven or more behaviors at T1. At T2, 15.3% showed one behavior of problematic Internet use, 8.6% two behaviors, 5.8% three behaviors, 3.8% four behaviors, 2.7% five behaviors, 3.1% six behaviors and 3.8% seven or more behaviors. With regard to cyberbullying, 33.3% at T1 and 35% at T2 reported perpetrating cyberbullying (i.e., reporting cyberbullying perpetration “three or more times” for at least one item). Finally, 13.4% of adolescents at T1 and 12.8% at T2 reported using the Internet to meet strangers (response options other than *never*).

Analyses of the relationship between the risky online behaviors

First, we estimated a model that included the analysis of the relationship between problematic Internet use, cyberbullying perpetration, and meeting strangers online at T1, as well as at T2, as shown in Figure 1. The model also included autoregressive paths between a given variable at T1 and the same variable at T2. This strategy enabled us to analyze whether the change of variables at T2 can be explained by the remaining predictors once the base level in T1 is controlled.

The initially estimated model showed that some paths were not statistically significant. Specifically, T1 cyberbullying perpetration was not related to T2 problematic Internet use or T2 meeting strangers online; in addition, T1 meeting strangers online was not associated with T2 problematic Internet use. These paths were removed from the model,

which was then re-estimated with only the significant paths. The fit indexes for the estimated final model were overall adequate: $\chi^2(5, N = 888) = 29.87$, NFI = .94, CFI = .95, RMSEA = .06, SRMR = .03.

Figure 2 shows the standardized parameters of the final model. At the cross-sectional level, all the relationships between the risky online behaviors were significant and ranged between .13 and .27 (all, $p < .001$). At the longitudinal level, the autoregressive paths were high and significant, ranging between .44 and .72 ($p < .001$). Finally, the results showed that T1 problematic Internet use predicted a significant increment of T2 cyberbullying perpetration ($\beta = .11$, $p < .01$) and T2 meeting strangers online ($\beta = .09$, $p < .01$). Furthermore, T1 meeting strangers online predicted an increased T2 cyberbullying perpetration ($\beta = .09$, $p < .01$). Although statistically significant, the effect size for the longitudinal relationships was small (Cohen, 1992).

The role of impulsivity–irresponsibility during adolescence as an explanatory mechanism

Our second objective was to analyze the role of impulsivity–irresponsibility during adolescence as a possible mechanism that explains the relationships between the risky online behaviors. If the relationship between risky behaviors were explained by impulsivity–irresponsibility, then by including impulsivity–irresponsibility in the model the relationships found among them would become non-significant.

Therefore, we included impulsivity–irresponsibility at T1 as a predictor variable on T2 problematic Internet use, cyberbullying perpetration, and meeting strangers online. Results showed that T1 impulsivity–irresponsibility was only significantly associated to T2 cyberbullying perpetration ($\beta = .08$, $p < .01$). The relationships between risky online behaviors described in the previous section remained significant after including impulsivity–irresponsibility as a predictor variable.

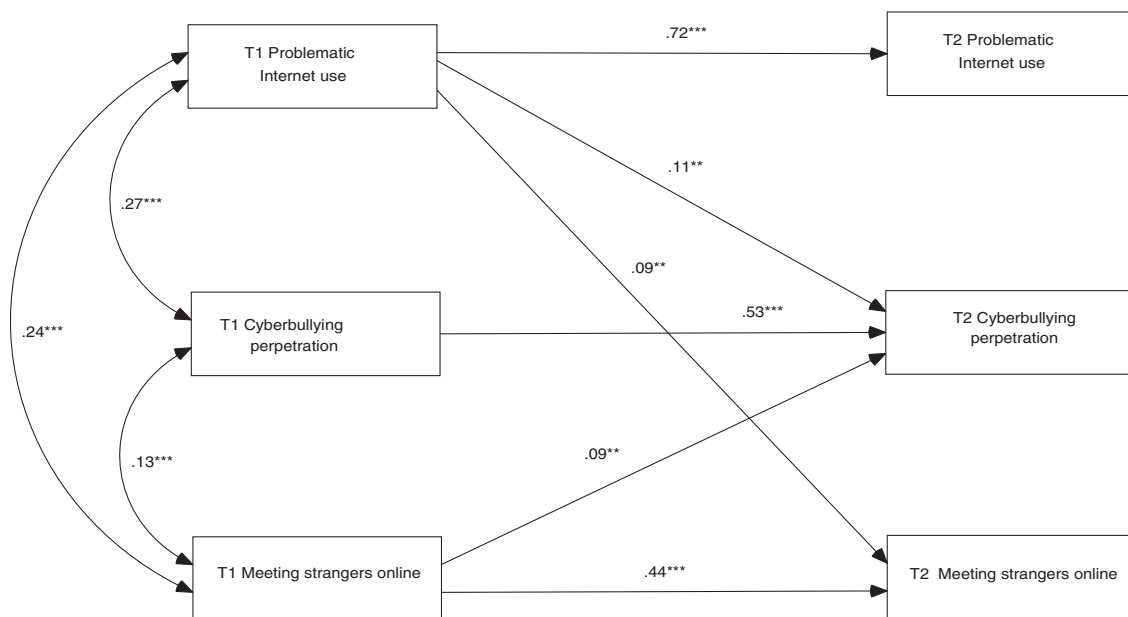


Figure 2. Relationships between online risky behaviors (estimated final model); ** $p < .01$; *** $p < .001$

DISCUSSION

This study is the first research conducted to date in order to analyze both the cross-sectional and longitudinal relationships between three major risky online behaviors during adolescence, namely the problematic Internet use, cyberbullying perpetration, and meeting strangers online.

Findings showed that problematic Internet use, cyberbullying perpetration, and meeting strangers online were cross-sectionally related. These results are consistent with previous studies reporting that different risky online behaviors tend to be related (Casas et al., 2013; Kowalski et al., 2014; Morahan-Martin & Schumacher, 2000). These results are also coherent with the problem behavior theory (Jessor, 1991), supporting a relationship between different risky behaviors in cyberspace. In addition, it is important to highlight that autoregressive paths for each risky behavior (i.e., the relationship between the same variable at T1 and at T2) were medium to large in size (from .44 for meeting strangers online to .72 for problematic Internet use). This finding indicates considerable stability of these risky online behaviors over time.

The data also revealed important findings at the longitudinal level. First, more problematic Internet use predicted an increase in the perpetration of cyberbullying and meeting strangers online six months later. In this regard, it is important to note that problematic Internet use is characterized by a loss of control over the Internet connection (Muñoz-Rivas, Fernández, & Gómez-Guadix, 2010; Young, 1998), which could lead to difficulty in controlling other online problem behaviors such as bullying through new technologies and meeting with strangers. Adolescents who are unable to control their Internet use could act in a thoughtless and uncontrolled way, for example, responding aggressively to provocation or contacting people they do not know.

Second, using the Internet to meet strangers was associated with an increase of perpetration of cyberbullying six

months later. One possible explanation for these results is that contact with strangers is a risk factor for further victimization (Dowdell, 2011). Since victimization and perpetration of cyberbullying seem to have bidirectional relationships (Gómez-Guadix, Calvete, Orue, & Las Hayas, 2015; Gómez-Guadix, Gini, & Calvete, 2015; Kowalski et al., 2014), it is possible that meeting strangers online leads to higher victimization, which, in turn, leads to an increased risk of perpetration of cyberbullying. Future studies should explore this hypothesis.

We found no significant relationships of T1 cyberbullying perpetration with T2 problematic Internet use and T2 meeting strangers online, nor of T1 meeting strangers online with T2 problematic Internet use. In this regard, it should be kept in mind that the absence of longitudinal evidence does not necessarily mean the absence of a relationship. Perhaps the small variation of the dependent variable at time 2 (which is under the strict control of the baseline at T1) could result in no statistically significant relationship with the rest of the predictors. In this regard, a longer longitudinal study, with more than only two waves, could shed more light on the relationships of these variables over time.

Finally, the data did not support the role of impulsivity–irresponsibility as a mechanism that explains the relationships found between these risky online behaviors. By including impulsivity–irresponsibility as a predictor variable in the model, relationships between risky online behaviors remained significant. These findings indicated that impulsivity–irresponsibility during adolescence seems to have a limited role in explaining the relationships among these variables. These results suggest that the specific loss of control related to Internet use, as previously noted, rather than the overall level of impulsivity–irresponsibility, appears to increase the likelihood of different risky online behaviors. In addition, other personal variables such as emotional distress or an increased tendency to social isolation may increase problematic Internet use (Tokunaga & Rains, 2010),

which in turn could increase the likelihood of having other risk behaviors such as cyberbullying or meeting strangers online. Future studies should explore these possible explanations.

This study has some limitations that should be considered when interpreting the results. First, the data were based solely on self-reporting of adolescents. Future studies should include the reports of others (e.g., teachers, peers), and use other measurement techniques such as peer nominations. Second, this paper presents the results of a short-term longitudinal study, which could have attenuated the change of a given variable from time 1 to time 2. For this reason, prospective relationships between different risky online behaviors, even though they were statistically significant, may have showed small effect sizes (around .10). Relationships between variables may be stronger at longer periods of time. A longer longitudinal study would be informative on the development of the interplay between these risky online behaviors over time. Moreover, including participants of younger ages could also help tracking the origins of these dysfunctional relationships. Third, the evaluation of meeting strangers online was assessed by one item over a short time frame (i.e., per day), which may be less suitable to capture more sporadic use of the Internet to meet strangers (e.g., number of times used per month). This should be taken into account when interpreting the results. A more comprehensive evaluation of this construct is recommended in further research. Finally, future research would benefit from analyzing possible outcomes (e.g., cybervictimization) as a result of the interaction of different risky online behaviors.

Despite the limitations, this study has important implications for practice. First, the high stability over time of the risky online behaviors studied suggests the need to develop interventions for adolescents who are involved in these behaviors to avoid continuation and worsening over time. Second, the results highlight the importance of designing more holistic prevention strategies that address several, not just one, risky online behaviors during adolescence. So far, most of the preventive interventions have focused on specific problem behaviors such as cyberbullying (Del Rey, Casas, & Ortega, 2012; Garaigordobil & Martínez-Valderrey, 2015). However, the evidence shows that these behaviors tend to co-occur, indicating that prevention efforts must take into account the interrelationships between multiple risk activities online. Prevention programs that take into account various risky online behaviors in adolescence may be more effective than others focused on partial aspects. Moreover, mental health professionals working with adolescents with problematic Internet use should explicitly evaluate the presence of other risky online behaviors, since the problematic Internet use seems to precede a more general pattern of risk taking on the Internet.

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Authors' contribution: MGG conducted the study design, managed the data analysis and wrote the first draft of the Introduction, Results, and Discussion. EB conducted data collection and wrote the first draft of the Methods. CA participated in the interpretation of the results and reviewed the entire manuscript.

Conflict of interest: The authors declare no conflict of interest.

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