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Original article

## Longitudinal and Reciprocal Relations of Cyberbullying With Depression, Substance Use, and Problematic Internet Use Among Adolescents

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### ABSTRACT

**Purpose:** To analyze the temporal and reciprocal relationships between being a victim of cyberbullying (CB) and three frequent problems during adolescence: depressive symptoms, substance use, and problematic Internet use; also, to analyze whether the relationship between CB and these psychological and behavioral health problems differs as a function of being only a victim or being both bully and victim.

**Method:** A total of 845 adolescents (mean age = 15.2, SD = 1.2) completed measures at T1 and at T2, 6 months apart. The relationship among variables was analyzed using structural equation modeling.

**Results:** CB victimization at T1 predicted depressive symptoms and problematic Internet use at T2, and higher depressive symptoms and more substance use at T1 predicted more CB victimization at T2. However, the relationships of CB predicting substance use and problematic Internet use predicting CB were not significant. Bully-victims presented higher levels than victims of all three problem variables, both at T1 and T2.

**Conclusions:** CB is predictive of some significant psychological and behavioral health problems among adolescents. Intervention efforts should pay attention to these in the prevention and treatment of consequences of CB.

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### IMPLICATIONS AND CONTRIBUTION

This study contributes to better understanding of the temporal and reciprocal relationships between cyberbullying and psychological health and behavior problems among adolescents. Adolescents who are victims of cyberbullying are more likely to develop depressive symptoms and problematic Internet use. Additionally, adolescents who present depressive symptoms and more substance use are vulnerable targets for being victims of cyberbullying.

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Cyberbullying (CB) is a growing phenomenon that seems to be a common feature of interpersonal relationships during adolescence. Many studies find that approximately 20%–40% of young people have been victims of CB, at least occasionally [1,2]. In addition, CB has been associated with a number of problems for the psychological and behavioral health of victims [3–6].

Despite the growing interest in these new forms of violence, only a few longitudinal studies have analyzed the relationship between CB and psychological and behavioral health problems [3,7]. Furthermore the possible bidirectional relations remain unexamined. The great majority of studies have used cross-sectional designs, which prevents the establishment of temporal and bidirectional relationships among variables [1].

For this reason, this study aimed to analyze the temporal and bidirectional relationships between CB victimization and three frequent problems during adolescence, namely: depressive symptoms, substance use, and problematic Internet use (PIU). An additional objective was to analyze whether the relationship between CB and these psychological and behavioral health problems differs as a function of being only a victim or being both a victim and bully. We first describe previous empirical research, along with its main limitations, that suggests that the relationships of CB with depressive symptoms, substance use, and PIU can be bidirectional.

#### *Why focus on the relationship of cyberbullying with depression, substance abuse, and problematic Internet use?*

Depression and substance use are two of the most common and serious problems during adolescence. The prevalence rates of depressive disorders increase from 3% to 18% between ages 15 and 18 years [8]. Also, substance use increases dramatically at the age of 15 years to reach a prevalence of 70% [9]. The prevalence of PIU is not well known, but the data indicate that it is a growing problem [10]. CB also increases during adolescence, peaking around eighth grade [1]. Therefore, CB, depression, alcohol use, and PIU are important health problems that increased markedly during adolescence, making this period a critical time to begin prevention efforts.

Most previous research has focused on the temporal relationships of being a victim of traditional bullying (TB) and other psychological and behaviour problems [11]. However, there are some differences between TB and CB that may make the predictor and consequences of CB different from those of TB. Victims of CB are often attacked by anonymous aggressors, who can rapidly disseminate photos, videos, rumors, etc. throughout the Web, reaching a much wider audience than happens in TB. Furthermore, there is no escape from the attack, as it can happen anywhere and at any time [2]. These differences highlight the importance of further study of the specific association between CB and psychological and behavioral health problems.

*Cyberbullying and depressive symptoms.* A number of studies have assessed cross-sectional relationships between CB and depression, showing that adolescents who are cyberbullied experience more depressive symptoms [12–15]. According to the stress-generation model of depression [16], individuals with depressive symptoms may contribute to the generation of additional stress in their lives, including victimization. This is supported by longitudinal studies on the causal relationships between TB and depressive symptoms that suggest that this relationship could be bidirectional [11]. However, few studies have assessed longitudinal relationships between CB and depression [3] and, to our knowledge, no previous study has analyzed bidirectional relationships, so it is unclear whether depressive symptoms are antecedents or consequences of CB; the direction of causality may be both ways as has been found in studies of TB [11].

Consequently, our first aim was to analyze the bidirectional relationships between CB and depressive symptoms among adolescents.

*Cyberbullying and substance use.* According to Problem Behavior Theory, youth who engage in behaviors that deviate from the norm, such as substance abuse, are at a greater risk of getting involved in other health-compromising behaviors, such as violence [17]. The relationship between TB victimization and substance use has been reported in several studies [4,18]. However, few studies have analyzed the relationship between CB and substance use. For example, Hinduja and Patchin (2008) found that CB victimization was linked to adolescents who reported several behavior problems, including substance use [19].

Again, there is a lack of evidence on the temporal order of these variables. To our knowledge, no study to date has examined the temporal association between CB and substance use. Although some studies suggest that victimization may precede substance use [18], it is also possible that substance use precedes victimization. For example, adolescents with higher substance use could maintain more relationships with antisocial peers, increasing the risk of victimization. Therefore, our second objective was to analyze the temporal relationships between CB and substance use among adolescents.

*Cyberbullying and problematic Internet use.* PIU, often also called compulsive Internet use or Internet addiction, includes cognitive preoccupation with the Internet, an inability to control the Internet use, and continued use despite negative consequences [10,20]. While CB is a specific type of aggressive behavior, PIU involves psychological dependence on the Internet and an inability to control time spent on the network.

Previous findings suggest that CB and PIU could be related. Adolescents who spend more time on the Internet are exposed to a number of potential risks, including risks related to being cyberbullied, such as being the target of harassment, invasion of privacy online, identity theft, or sexual exploitation and manipulation [21]. However, no study to date has explored the temporal relationships between CB and PIU. It is possible that those adolescents with PIU have a greater chance of being victims of CB because of their greater exposure to the risks of being online [22]. Alternatively, CB could also lead to PIU, as a consequence of being victimized. Thus, our third objective was to analyze longitudinal and bidirectional relationships between CB and PIU.

*Differences between victims and victim-bullies.* Research on TB suggests that bully-victims show more dysfunctional symptoms than those victims who are not bullies [23,24]. However, CB research in this regard has been limited and contradictory. Some studies find that psychosocial adjustment could be worse for bully-victims [15], others have found no differences [12], while some have found differences as a function of the type of problems considered [25].

Given that the studies are scarce and the results have been mixed, our analyses were aimed at exploring differences between victims and bully-victims in the consequences of CB.

## **Method**

### *Participants*

The initial sample comprised 1,021 adolescents between 13 and 17 years of age. Participants were students from 31 classrooms located in 10 secondary schools in Bizkaia, a province of the Basque Country, Spain. The schools were selected randomly and included both public and private educational centers. The

attrition rate was 17.2%. The final sample included 845 adolescents (498 girls, 337 boys, and 10 who did not indicate sex; mean age = 15.22, SD = 1.2) who completed the measures both at Time 1 (T1) and at Time 2 (T2). There were no differences in any of the variables of the study between the adolescents who completed the study and those who did not. Following Goodman and Blum [26], we used logistic regression analyses to test whether or not attrition might have biased results. In this analysis, we regressed a dichotomous variable (distinguishing the participants who responded in both time points and those who dropped out at T2) on all the variables of interest measured at T1. This analysis did not show any significant coefficients, indicating that the data are missing at random.

To assess the socioeconomic levels of the sample we used the criteria recommended by the Spanish Society of Epidemiology [27], based on information about parental occupation and income. By these criteria the sample could be described as 10.4% low, 24.9% low-medium, 21.1% medium, 25.4% high-medium, and 18.5% high in socioeconomic level. This distribution is comparable to that of the general population in Spain.

### Measures

**Cyberbullying.** We used the victimization subscale of the Cyberbullying Questionnaire [12,28]. This is a behavior-based scale, in Spanish, with nine items regarding the frequency with which adolescents had ever experienced different behaviors of CB via the Internet or cellular phone, such as “someone sending me threatening or insulting messages.” The response options to assess how often each experience had happened was: 0 (never); 1 (1 or 2 times); 2 (3 or 4 times); or 3 (5 or more times). The Cyberbullying Questionnaire also includes a subscale to measure CB perpetration (14 items) that was used to create typologies of “only victim” and “bully-victim.” The internal consistency in this sample was  $\alpha = .77$ .

**Depressive symptoms.** We used the depression subscale of the Spanish version of the Brief Symptom Inventory [29]. This subscale is made up of six items. Adolescents had to indicate how much each problem has bothered or distressed him or her during the past 2 weeks, using a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*). A sample item is “feelings of worthlessness.” The internal consistency in this sample was  $\alpha = .84$ .

**Substance use.** Habits of substance use were assessed with the Adolescents Drugs Abuse Inventory, which consists of nine items [30]. Adolescents had to indicate how often they consume a number of substances (tobacco, alcohol, marijuana, cocaine, speed, LSD, ecstasy, hashish, others) using the following scale: 1 (*never*); 2 (*once or twice in the past year*); 3 (*four or five times in the past year*); 4 (*a few times a month*); 5 (*a few times a week*); and 6 (*daily*). The internal consistency in this sample was  $\alpha = .78$ .

**Problematic Internet use.** To measure PIU we used the Generalized Problematic Internet Use Scale 2 [10,31], comprised of 15 items that assess generalized and problematic Internet use. A sample item is “I have difficulty controlling the amount of time I spend online.” The response format was a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The internal consistency in this sample was  $\alpha = .90$ .

### Procedure

Data were collected at two measurement occasions spaced 6 months apart, in November and December, 2011, and May and June, 2012. The Ethics Committee of the University of Deusto approved this study. We informed adolescents we were conducting a study on different behaviors among youth, including their use of new technologies, for which we asked their collaboration. Similar information was provided to parents. Responses were anonymous in order to promote honesty, and participation was voluntary. Parents were notified and given the option of refusing to allow their child's participation in the two waves of the study. None of the parents refused to allow their child to participate. Similarly, all of the adolescents consented to participate. The adolescents filled in the questionnaires in their classrooms. Participants were encouraged to ask questions if they had any trouble answering the items. In order to pair the questionnaires of T1 and T2, a code known only by the participant was used. The questionnaires took 30–40 minutes to complete.

### Results

#### Descriptive analyses and bivariate correlations

Table 1 presents the prevalence rates of each type of CB. Altogether, 24.1% of participants reported having received one CB behavior, 15.9% reported two CB behaviors, 8% reported three CB behaviors, and 4.7% reported receiving four or more CB behaviors.

Table 2 presents the descriptive statistics (mean and SD) and the Pearson correlations for the variables in this study. All of the correlations were significant and in the expected directions. Because participants were nested in classrooms, we also checked the intraclass correlation coefficients to determine whether it was necessary to conduct multilevel modeling to analyze the data. All the intraclass correlation coefficients were very small ( $<.09$ ), which suggested that it was not necessary to model the variables as a multilevel structure [32].

#### Analyses of the longitudinal model

We used structural equation modeling to test our hypotheses. Goodness of fit was assessed by the non-normed fit index (NNFI), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SMRS). NNFI and CFI values of .90 or higher indicate a good fit. RMSEA values of less than .06, and SMRS values less than .08 reflect an adequate fit [32]. Three indicators (i.e., parcels) were used for each latent variable except for depression, which was indicated by two parcels. Each item was randomly assigned to one of the item-parcels.

The structural equation modeling models were tested via maximum likelihood with EQS 6.1 [33]. Due to a violation of the normality assumption that was observed in the data (normalized Mardia's coefficient = 117.42), we employed the robust maximum likelihood estimation method, which includes the Satorra–Bentler scaled  $\chi^2$  index ( $S-B\chi^2$ ) and other corrected statistics. The error terms of the latent variables at T1 and T2 were conceptualized as correlated with each other.

First, a preliminary confirmatory factor analysis indicated the appropriateness of measuring the latent variables with the indicators and confirmed that the factor loadings were

**Table 1**  
Prevalence of cyberbullying victimization in the sample

	1 or 2 times	3 or 4 times	5 or more times	Total
1. Receive threatening or insulting messages	14.4%	1.5%	1.3%	17.2%
2. Posting on the Internet or sending humiliating images of me	13.0%	.9%	.1%	14%
3. Writing embarrassing jokes, rumors, gossip, or comments about me on the Internet	24.4%	4.6%	1.5%	30.5%
4. Hacking me to send messages by e-mail or social networks that could be troublesome for me	9.8%	.7%	.2%	10.7%
5. Recording a video or taking pictures by cell phone while a group laughs and forces me to do something humiliating or ridiculous	1.7%	0%	.1%	1.8%
6. Recording a video or taking pictures by cell phone while someone hits or hurts me	.8%	0%	.1%	.9%
7. Broadcasting online secrets, compromising information or images about me	15.9%	.8%	.7%	17.4%
8. Deliberately excluding me from an online group	6.7%	.8%	.2%	7.7%
9. Recording a video or taking cell phone pictures of me performing some type of behavior of a sexual nature	.8%	.1%	0%	.9%

significantly different from zero. Second, we examined whether the measurement model was equivalent over time. To this end, we tested the fit of two alternative models (differing in levels of parameter restrictions) and compared them to one another using the  $S-B\chi^2$  [34]. We undertook a longitudinal confirmatory factor analysis, which included all observed and latent variables from each time, with freely estimated parameters. Then, we compared this model with a more restrictive model in which factor loadings within constructs across the two time points were specified as equal. This comparison was not statistically significant,  $\Delta SB\chi^2(7, N = 845) = 6.68, p = .46$ , indicating measurement invariance across time points.

Next, the hypothesized structural model was tested (Figure 1). In order to analyze the relations of CB with depression, substance use, and PIU we examined a theoretical model specifying bidirectional relationships between CB and these psychological and behavior health problems. Thus, the hypothesized model included paths from T1 CB to T2 depression, substance use, and PIU, and paths from T1 depression, substance use, and PIU to T2 CB. The model also included the autoregressive paths from each variable in T1 to the same variable at T2. This allows for examination of the extent to which T1 predictors account for change in a T2 variable over time.

The fit indexes were satisfactory for the model:  $SB\chi^2(182, N = 845) = 29.86, NNFI = .98, CFI = .98, RMSEA = .027$  (90% CI: .01; .33), SRMR = .040. However, the path from T1 PIU to T2 CB, and the path from T1 CB to T2 substance use were not significant. Next, the model was re-estimated without the nonsignificant paths. The fit indexes for the final model were also satisfactory:  $SB\chi^2(184, N = 845) = 297.76, NNFI = .98, CFI = .98, RMSEA = .027$  (90% CI: .021; .033), SRMR = .041.

As shown in Figure 2, results revealed several significant relations. First, CB at T1 increased the probability of reporting

depressive symptoms at T2. Second, more depressive symptoms at T1 increased the probability of CB at T2. Third, being a victim of CB at T1 increased the probability of PIU at T2. And, fourth, higher substance use at T1 increased the probability of CB at T2.

In addition, the autoregressive paths for CB, depression, substance use, and PIU between T1 and T2 were all highly correlated and significant.

*Differences between victims and bully-victims*

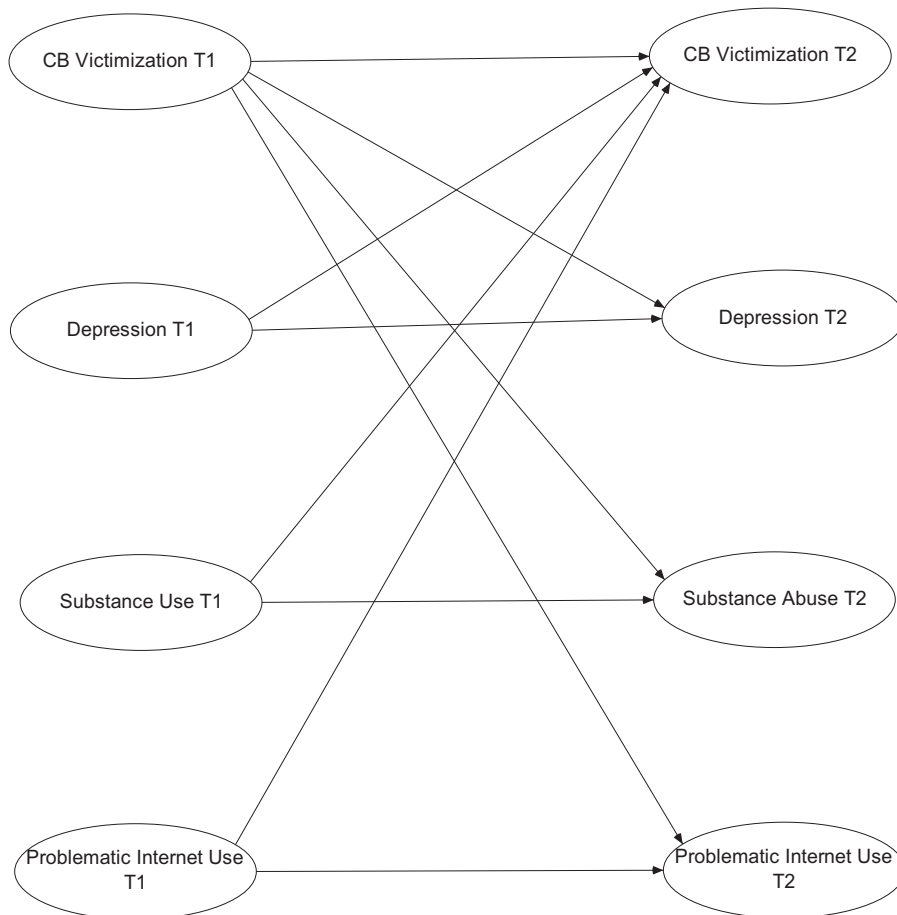
Finally, we examined whether the relationship between victimization and psychological and behavioral health problems differed depending on being only a victim of CB or a bully-victim. We also included the noninvolved adolescents as an additional comparison group. We performed a two-factor mixed design ANOVA (Group x Time, with Time as repeated measure) with a post-hoc Tukey test to identify significant differences among groups. The mean scores in psychological and behavior health problems for each group are presented in Table 3.

The post-hoc analyses showed that being a bully-victim at T1, as compared with being only a victim was related to higher levels of depression, substance use, and PIU at T1. There are differences between victims and bully-victims in the same direction at T2 that were statistically significant for substance use and PIU. In addition, compared with noninvolved pupils, bully-victims scored worse on all three variables at both time points; those who were only victims scored worse than noninvolved on depression and PIU, but not on substance use, at both time points (Table 3). Time x Group interactions for depression substance use, and PIU were not statistically significant. Only the main effect of Time for substance abuse was significant ( $F_{708, 1} = 91.38, p < .001$ ), showing an increase over time.

**Table 2**  
Descriptive statistics, gender differences, and correlations for the study variables

	1	2	3	4	5	6	7	8
1. CB victimization T1								
2. CB victimization T2	.573***							
3. Depressive symptoms T1	.367***	.322***						
4. Depressive symptoms T2	.256***	.324***	.568***					
5. Substance use T1	.220***	.220***	.205***	.189***				
6. Substance use T2	.213***	.214***	.178***	.188***	.857***			
7. Problematic Internet use T1	.279***	.254***	.370***	.331***	.183***	.161***		
8. Problematic Internet use T2	.197***	.234***	.302***	.336***	.101**	.122***	.531***	
Total sample [M (SD)]	.13 (.19)	.13 (.20)	1.09 (.80)	1.07 (.83)	.37 (.46)	.42 (.47)	2.12 (.94)	2.02 (1.16)
Males [M (SD)]	.12 (.18)	.11 (.19)	.89 (.76)	.89 (.80)	.36 (.50)	.39 (.49)	1.92 (.99)	1.89 (1.43)
Females [M (SD)]	.15 (.20)*	.15 (.22)**	1.23 (.82)***	1.18 (.82)***	.40 (.45)	.44 (.45)	2.27 (.99)***	2.12 (.92)**

Note: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .



**Figure 1.** Hypothesized model on the relationships between cyberbullying and psychological and behavioral health problems.

## Discussion

The purpose of this study was to provide evidence on the temporal relationships between CB and certain psychological and behavioral health problems during adolescence, including new evidence on the reciprocal relationships of CB victimization with depressive symptoms, substance use, and PIU.

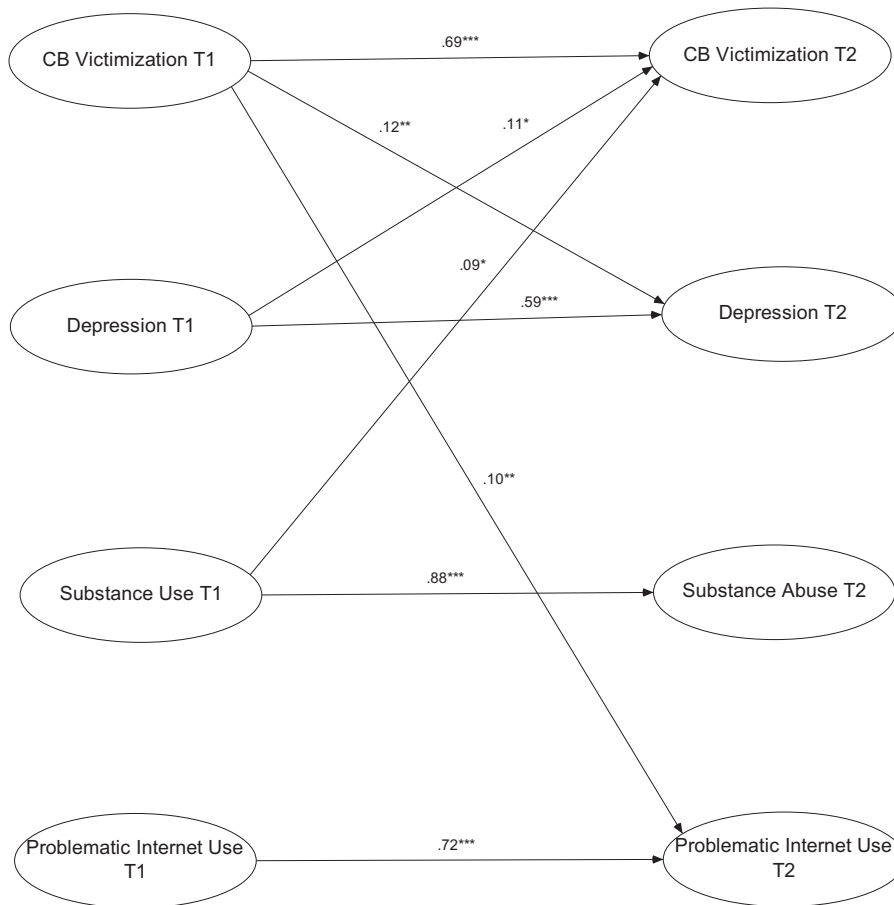
Reciprocal relationships were found between depressive symptoms and CB. CB victimization leads to an increase in depressive symptoms, and depressive symptoms, in turn, increase the probability of CB [3,11]. The results regarding depressive symptoms as precursors of CB are consistent with the stress generation model of depression [16]. This effect has recently been found regarding TB [11]. Our results add to the previous findings, suggesting that the stress generation hypothesis of depression applies also to CB. One possible explanation is that depressed adolescents may have fewer social skills and a tendency to isolation that makes them less attractive to peers, thus increasing the likelihood of becoming victims. CB, in turn, could lead to loneliness, which is typically defined as the awareness of a deficiency in one's personal and social relationships associated to feelings of sadness and rejection by the other.

Substance use predicted increased CB victimization. However, CB does not seem to increase the probability of substance use.

This finding is consistent with previous studies that have found that substance use during adolescence is associated with different types of violent victimization, such as dating violence, TB, and CB [18,19]. This finding is also consistent with Problem Behavior Theory. Thus, it is possible that the substance use is part of a larger pattern of behavior problems in adolescence, such as relationships with antisocial peers or involvement in violent behaviors [17]. It, in turn, may increase the risk of CB victimization.

CB victimization predicted an increment in PIU relative to non-victims, but PIU did not predict CB. These results are consistent with the findings of previous cross-sectional studies on the relationship between PIU and online victimization [22], and expand the data on the temporal relationships between these variables. It is possible that through new technologies victims of bullying use the Internet to escape or evade the distress due to victimization. In fact, it has been found that one of the most important components of PIU is the use of the Internet to reduce anxiety, feelings of isolation, or negative emotions [10,31].

We also analyzed whether the relationships between CB and depression, substance use, and PIU differed between victims and bully-victims. At T1, compared with those who were victims only, being a bully-victim increased the probability of these psychological and behavioral health problems, which is



**Figure 2.** The estimated model on the relationships between CB and psychological and behavioral health problems (standardized parameters). Note: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ;  $\chi^2$  (182,  $N = 845$ ) = 297.76, NNFI = .98, CFI = .98, RMSEA = .027 (90% CI: .021–.033), SRMR = .041.

consistent with most studies on TB [24] and several studies on CB [35]. These differences between victims and bully-victims tended to be maintained at T2; the difference became nonsignificant for depression but remained significant for substance use and PIU. It is possible that victims with more psychological and behavioral problems respond to victimization by bullying others [24]. However, this possibility should not obscure the fact that both victims and bully-victims presented, overall, higher scores in problem behaviors than the noninvolved adolescents.

An important consideration regarding our results for bully-victims is that 39% of our sample falls into this category. This large proportion is due to a lenient frequency criterion (just once or twice). It does mean that we cannot consider our bully-victims

as in any sense unusual or outliers in our sample—they are those who are at least mildly involved in both getting and receiving negative behaviors on the Internet or mobile phone. However, what is interesting is that despite this lenient criterion for categorizing bully-victims, we get many highly significant differences from victims only and noninvolved. We feel this in itself is an important finding, because it signals that even quite low-level involvement in CB may be a risk factor for the psychological and behavior problems considered.

In summary, the study contributes to better understanding of the relationship between CB and psychological and behavioral health problems. Findings have several implications for interventions. Regarding prevention, given the relationship of CB to other risk behaviors such as substance use, it could be

**Table 3**  
Means and standard deviations for psychological and behavior problems of participants non-involved, bully-victims, and victims of cyberbullying

	Noninvolved $N = 261$	Victims $N = 117$	Bully-victims $N = 330$	F	Tukey post-hoc comparisons
Depression T1	.81 (.72)	1.07 (.75)	1.36 (.81)	37.28***	BV > V > NI
Depression T2	.81 (.77)	1.14 (.80)	1.27 (.83)	23.82***	BV, V > NI
Substance use T1	.21 (.36)	.31 (.47)	.51 (.50)	33.48***	BV > V, NI
Substance use T2	.27 (.39)	.34 (.40)	.55 (.50)	32.01***	BV > V, NI
Problematic Internet use T1	1.73 (.72)	2.03 (.93)	2.46 (1)	49.88***	BV > V > NI
Problematic Internet use T2	1.66 (.67)	2 (.84)	2.33 (1.55)	23.31***	BV > V > NI

Note: \*\*\* $p < .001$ ; BV = Bully-victims; NI = noninvolved; V = Victims.

important to include strategies to prevent CB within interventions in behavior problems during adolescence. In addition, as depressive symptoms appear to predict CB victimization, prevention programs of CB could be fostered by promoting self-esteem, or increasing social support (perhaps through peer support schemes, see [36]) among potential victims. On the side of intervention, providing counseling services for PIU, similar to those that exist for other addictions, could be very important, given that PIU seems a growing health problem during adolescence. In addition, given that CB victimization predicts more depressive symptoms and a greater risk of PIU, mental health professionals should pay special attention to these problems in the treatment of victims of CB.

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