Quality of Life Research (2018) 27:2609–2618
https://doi.org/10.1007/s11136-018-1901-9

Relationship between cyberbullying and health-related quality of life in a sample of children and adolescents

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Accepted: 31 May 2018 / Published online: 7 June 2018

Abstract

Purpose Health-related quality of life (HRQoL) is a well-known construct that refers to a state of complete physical, mental, and social well-being. Its relationship with multiple forms of violence, including bullying, has been widely explored, but this is not the case for cyberbullying. The main objective is to analyze how HRQoL varies depending on the role played in cyberbullying, its temporal stability, and gender and age differences.

Method An analytical and longitudinal study was conducted at two temporal moments. At Time 1 (December 2015), 920 Spanish students aged between 11 and 18 years participated ($M_{age} = 13.36$, SD = 1.83: 48.9% boys and 51.1% girls). At Time 2 (April 2016), there were 313 participants (M_{age} 12.81 years, SD = 1.59: 53.4% boys and 46.6% girls). We used the Cyberbullying Test (technological scale) and the Spanish version of the KIDSCREEN-52.

Results Cybervictims and cyberbully–victims present worse scores in all dimensions of the KIDSCREEN-52 ($p < .001$), compared to cyberbystanders or uninvolved individuals. There are gender differences only in cyberaggression and cyberbystanding. There are significant inverse correlations between all the dimensions of the KIDSCREEN-52 and cybervictimization, with Bullying ($r = -.603$, $p < .001$), Mood ($r = -.329$, $p < .001$), and School environment ($r = -.327$, $p < .001$) being particularly relevant. There were statistically significant differences between T1 and T2 for cyberbystanding (lower scores at T2).

Conclusion Cybervictims and cyberbully–victims have worse quality of life in all the dimensions than uninvolved individuals, especially in Psychological well-being, School environment, and Bullying.

Keywords Adolescent · Child · Quality of life · Health-related quality of life · Cyberbullying · Bullying

Introduction

Schools are environments that promote the advance and development of the human being, although they occasionally become places where psychosocial processes associated with peer violence are triggered. One of the best-known and most used definitions of bullying is the seminal one proposed by Olweus [1], according to which a student is being bullied when another student (or group of them) performs negative actions of a physical, verbal, social, or psychological nature, repeatedly and over time, and with the intention of inflicting harm. Likewise, cyberbullying is also an intentional and harmful act that is repeated over time, in which the suffering is caused by using electronic and digital technology, that is, Internet, smartphones, computers, social media, etc. [2]. The behavior of cyberbullies encompasses a variety of actions, for instance, sending electronic and online insults, sending mean or threatening emails or instant messages, making fun of someone in an online chat, spreading gossip about someone online, posting insults or humiliating comments online, taking embarrassing photos or videos and sharing them online, impersonating someone to humiliate him/her or cause harm, etc. [2].

In their systematic review, Modecki et al. [3] estimated the mean prevalence rate of bullying at 35%, and of victimization at 36%. In the case of the cyberbullying, the average perpetration rate was 16%, and the average victimization

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rate was 15%. However, the figures of cyberbullying vary between 5 and 72% [4]. As suggested by Berne et al. [5], this may be due to the assessment tools used or the procedure or type of analysis, but no doubt, all of them reflect that we face a real, widespread problem that affects a large number of countries [4, 6, 7].

The problem of bullying and cyberbullying lies in the fact that they can both be a cause and a consequence of different problems that, in most cases, affect the physical and psychological health of those involved. Thus, there is relationship between being a cybervictim and presenting anxiety and/or depression [8, 9]; furthermore, previously existing symptoms of depression will be aggravated [10]. An association between feelings of loneliness, avoidant or offensive communication patterns with the parents, and a severe degree of cybervictimization has been found [11]. Children who suffer from bullying have worse school performance and emotional adaptation, and lack of social relationships; it also affects education in adulthood [12–14].

In addition, according to some studies, cyberbullying can also be considered a stressor that produces even more stress than bullying [15] and increases the probability of suffering from physical and mental illnesses in adulthood due to epigenetic factors [16]. The alteration of the hypothalamic–pituitary–adrenal axis through an elevation of cortisol levels in cybervictims has recently been reported [17].

Therefore, bullying in any of its manifestations is a phenomenon that causes distress, not only during childhood and adolescence, but also persisting into adulthood [18]. This is primarily due to its perpetuation over time [19]. For this reason, it is very important to address bullying both within the framework of educational institutions and the health network (especially through the pediatric teams).

As can be seen, many constructs have been studied but there is scarce literature that associates bullying with health-related quality of life (HRQoL, hereafter) in children and adolescents. HRQoL is a widely studied construct (especially in adults), but it is not defined only by the absence of diseases or conditions, and instead by a state of complete physical, mental, and social well-being [20]. Its approach is multidimensional (addressing physical, mental, emotional, social, and behavioral levels) and it is designed considering the person's welfare, which must be perceived by the individual in question and by those who surround him or her [20, 21]. In the literature, we find studies on HRQoL and mental status [22], relationship with the professional activity [23] and chronic diseases, social support, and family income [24]. In addition, being a victim of bullying increases up to three times the chances of having a lower HRQoL than unbullied students [13] and, in particular, being a victim of relational bullying has been associated with significantly worse HRQoL [25]. Other studies combine HRQoL with different forms of violence, such as maltreatment [26], abuse [27], victimization [28], or poly-victimization [29], all of them indicating that violence is related to a decline of HRQoL.

With the boom of communication technologies and Internet, new forms of violence have emerged whose relationship with HRQoL has not yet been explored. Cyberbullying has even worse effects than bullying. For this reason, the objectives of this research are to: (1) analyze differences in HRQoL depending on the role played in cyberbullying, in addition to possible differences by gender and age; (2) relate dimensions of the HRQoL that are associated with cybervictimization, cyberbullying, and cyberbystanding; (3) determine which dimensions of HRQoL predict cybervictimization; (4) analyze the temporal stability of the dimensions of interest.

Our working hypothesis is that, as with other violent processes related or unrelated to bullying, HRQoL will be lower in the profiles associated with cybervictims compared with those who assault or with uninvolved individuals. Regarding the variable gender, as shown in earlier studies, HRQoL scores may be lower in girls than in boys [30]. Finally, we considered that the measures in the study dimensions would be stable between Time 1 (T1) and Time 2 (T2) [31].

Materials and methods

Participants

An analytical and longitudinal study was conducted at two temporal moments with a 5-month interval, between December 2015 (T1) and April 2016 (T2). The sampling process is described below and shown in Fig. 1. The initial sample was made up of 1026 students at T1, who came from 47 classes of three schools (one of the Princedom of Asturias, one of the Community of Madrid and one of the Valencian Community). Due to incomplete questionnaires or response errors, the final sample was made up of 920 students. Of these students, 450 (48.9%) were boys and 470 (51.1%) were girls. The adolescents were aged between 11 and 18 years ($M = 13.36$, SD = 1.83). Subsequently, at T2, for reasons of expediency, participants were 313 students from 24 classes (they were initially 371, but 58 could not be matched due to coding problems). Of these students, 167 were boys (53.4%) and 146 were girls (46.6%). These adolescents were also aged between 11 and 18 years ($M = 12.81$, SD = 1.59). At T1, 92% of the participants were Spanish, 7% were from South America, and the rest from different countries. At T2, 95% of the participants were Spanish and 5% were from South America.

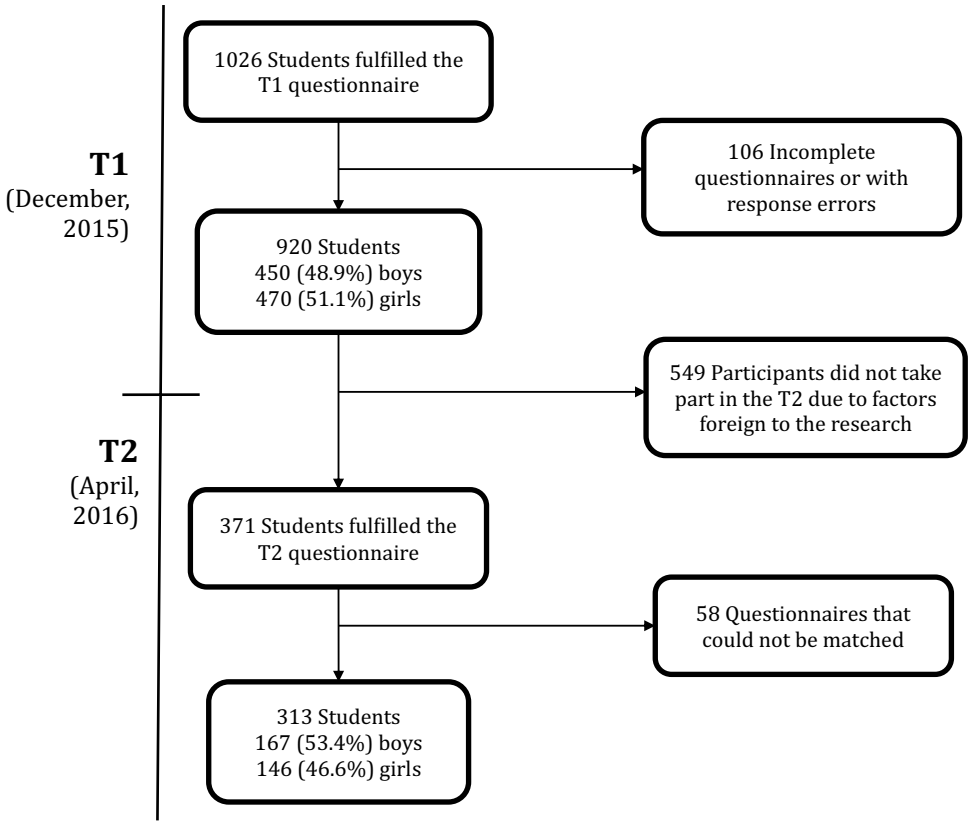

Fig. 1 Diagram of the sampling process between T1 and T2

Assessment instruments

The participants responded to various questions about sociodemographic variables such as gender, grade, association to which they belonged, and province of residence and age. Age was recoded for analytical purposes into four age groups (11–12 years, 13–14, 15–16, and 17–18).

Cyberbullying test (technological scale) [32]

A distinctive characteristic of this tool is that it assesses the extent to which a subject plays the role of a cybervictim (someone who has been targeted by cyberbullies and has not bullied others), cyberbully (someone who has cyberbullied others and has not been targeted), cyberbystander (someone who has observed or witnessed cyberbullying, but has not bullied and has not been targeted either), cyberbully–victim (someone who has cyberbullied others and has also been the target of cyberbullies).It is a self-reported questionnaire that consists of 45 items (15 for cybervictimization, 15 for cyberbullying, and 15 for cyberbystanding). It taps the most significant behaviors associated with cyberbullying (sending/receiving humiliating messages, making/receiving annoying phone calls, recording/being recorded in offensive videos, spreading rumors/being the victims of rumors, impersonation, phishing, etc.). An example item of cybervictimization goes as follows: "Have you ever received an offensive or abusive message through your mobile phone or the Internet?" When the item refers to a cyberbully the same action reads as follows: Have you ever sent an offensive or abusive message through your mobile phone or the Internet? Finally, when the same action is only observed, it is considered cyberbystanding, which reads as follows: Have you ever seen someone sending an offensive or abusive message through a mobile phone or the Internet?

It complies with the recommendations of Berne et al. [5] with appropriate indicators of validity and reliability. There are also standardization data according to gender and age. The Cronbach alphas at T1 in this study were 0.91 for cybervictimization, 0.81 for cyberbullying, and 0.93 for cyberbystanding. At T2, they were 0.89, 0.80, and 0.90, respectively.

Spanish version of the KIDSCREEN-52 [20, 21]

This questionnaire assesses HRQoL in children and adolescents aged 8–18 years. This version contains 52 items divided into ten dimensions: (1) Physical well-being, (2) Psychological well-being, (3) Mood, (4) Self-perception, (5) Autonomy, (6) Parent relation and home life, (7) Financial resources, (8) Peersand social support, (9) School environment, and (10) Social acceptance. This last dimension in the study is especially important because it asks about specific

problems of traditional bullying (e.g., "Have other girls and boys bullied you?"). Some items of different dimensions are: "Have you felt fit and well?", "Have you felt satisfied with your life?" "Have you felt loved by your parent(s)?", and "Have you got on well at school?" The development of the KIDCREEN was based on the probabilistic partial credit model (PCM), which belongs to the family of Rasch models. PCM tries to explain the actual behavior of the responders in the testing situation by the estimated person parameter and the location of the item-response-category-thresholds. The PCM assumes all items of a scale to be the indicators of a single unidimensional latent trait [20]. For the KIDSCREEN-52, the mean scores varied around 50 (SD = 10) due to *T* value standardization. It has appropriate levels of internal reliability and validity, and there are some population values for the Spanish sample. The alpha coefficients in this study were 0.90 at T1 and 0.87 at T2.

Procedure

The battery of questionnaires was applied directly in the different classrooms by a researcher in coordination with the school's orientation department or the tutor of the group in question. Participants were encouraged to answer truthfully, not to spend too much time on any particular question, and to write down any doubts on the last sheet. There were no student's questions or doubts. The time needed to fill out the questionnaires ranged between 25 and 35 min, depending on students' age and reading comprehension. Collaboration was voluntary, anonymous, and disinterested. A code known only by the participant was used to match the questionnaires at T1 and T2. The study was conducted with the authorization of all the participants in the investigation and with the consent of the school directors and parents. This project was approved by the Committee of Research Ethics of the Principado de Asturias (Spain) (Ref 11/15). There were no specific inclusion criteria, as all students of the targeted ages who were willing to participate at both temporal moments were considered suitable. The only exclusion criterion was not having a consent form signed by their parents or legal guardians.

Statistical analysis

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) 23 (IBM®) program and were as follows: (1) confirmation of the assumption of normality for the variables involved in the study (Shapiro–Wilks statistic) as well as the homogeneity of the variances for the group comparisons (Levene test); (2) analysis of frequencies and of central tendency and dispersion measures of the instrument; (3) calculation of standardized scores for variables that established relations; (4) partial correlations controlling for age; (5) Student's *t* test for dependent and independent samples. In those cases where statistically significant differences were found, we calculated Cohen's *d*; (6) analysis of variance with post-hoc Bonferroni comparisons; (7) stepwise multiple linear regression using the probability of *F* for an input value of 0.15 and 0.20 for an output value. A value of less than $p = .05$ was considered significant.

Results

Table 1 shows the means, standard deviations, and differences for the variable gender in all the dimensions of the study at T1 and T2. The only differences in the variable gender were in cyberbullying (at T1, $t = 2.71$, $p = .007$, $d = 0.21$, and at T2, $t = 2.02$, $p = .045$, $d = 0.23$), with higher scores at both times for boys, and in cyberobservation (at T1, $t = -4.68$, $p < .000$, $d = -0.31$), which was higher for girls. There were no significant differences for the diverse dimensions of the KIDSCREEN-52. The effect sizes could be considered small in all cases (< 0.40).

There were statistical differences between the recoded variable Age (11–12, 13–14, 15–16, and 17–18 years) in three dimensions of the KIDSCREEN-52. The first dimension is Physical well-being ($F_{3,916} = 4.501$, $p = .004$) with higher scores in the 15- to 16-year-old group than the 13- to 14-year-old group ($p = .010$). The second dimension is Psychological well-being ($F_{3,916} = 4.107$, $p = .007$), with the 17- to 18-year-old group obtaining higher scores than the 11- to 12-year-old group ($p = .038$). The third and last dimension is Parent relation and home life ($F_{3,916} = 2.89$, $p = .035$), where the 17- to 18-year-olds obtained higher scores than the 13- to 14-year-old group ($p = .023$). Regarding cyberbullying, there were only differences in cyberbystanding ($F_{3,916} = 3.174$, $p = .024$), with the 17- to 18-year-old group obtaining higher scores than the 13- to 14-year-old group ($p = .033$).

Table 2 shows the partial correlations (controlling for age) of all dimensions of the study at T1. It can be seen in general that the higher the cybervictimization, the worse are the scores in HRQoL, and its relationship with the KIDSCREEN-52 dimensions of Bullying ($r = -.603$, $p < .001$), Mood ($r = -.329$, $p < .001$), Parent relation and home life ($r = -.345$, $p < .001$), and School environment ($r = -.327$, $p < .001$) is noteworthy.

Table 3 presents the comparisons in the ten dimensions of the KIDSCREEN-52 as a function of the roles of cybervictim, cyberbully, cyberbystander, cyberbully–victim, and uninvolved individuals. These mutually exclusive categories are obtained from the standardization data of Garaigordobil [32]. The "uninvolved" role implies that the participant does not report any behaviors of cyberbullying, cybervictimization, or cyberbystanding. In this sense, the

Table 1 Means, standard deviations, and differences in the variable gender in all the dimensions studied at T1 and T2

T1 ($n=920$)	Boys ($n=450$)		Girls ($n=470$)		Differences		
	Mean	SD	Mean	SD	*t*	*p*	*d*
CB-V	1.45	2.78	1.71	3.01	−1.34	.181	−0.09
CB-A	0.80	2.11	0.5	1.24	2.71	.007	0.17
CB-B	3.86	5.4	5.61	5.68	−4.78	.000	−0.31
KD52-phy	51.32	7.34	50.38	7.82	1.87	.062	0.12
KD52-psy	50.63	11.25	51.09	11.03	−0.63	.529	−0.04
KD52-mood	51.82	9.2	52.05	8.73	−0.384	.701	−0.03
KD52-self	49.08	10.9	49.09	10.3	−0.001	.999	0
KD52-autono	50.81	10.02	50.09	9.6	1.11	.269	0.07
KD52-parents	49.57	10.71	49.69	10.1	−0.176	.861	−0.01
KD52-money	51.24	8.2	51.89	8.12	−1.21	.228	−0.08
KD52-peers	50.74	10.74	51.13	10.57	−0.537	.592	−0.04
KD52-school	50.21	11.68	50.62	11.38	−0.542	.588	−0.04
KD52-bullying	52.09	9.5	52.72	8.99	−1.04	.298	−0.07
T2 ($n=313$)	Boys ($n=167$)		Girls ($n=146$)		Differences		
	Mean	SD	Mean	SD	*t*	*p*	*d*
CB-V	1.23	2.25	1.79	3.57	−1.7	.091	−0.19
CB-A	0.81	1.62	0.47	1.26	2.02	.045	0.23
CB-B	3.1	4.3	3.9	4.46	−1.6	.111	−0.18
KD52-phy	50.71	5.8	50.97	6.24	−0.396	.693	−0.04
KD52-psy	50.24	10.44	50.41	9.1	−0.156	.876	−0.02
KD52-mood	51.13	9.89	51.25	8.51	−0.113	.91	−0.01
KD52-self	49.14	10.46	48.81	9.98	0.286	.775	0.03
KD52-autono	51.15	8.57	50.47	8.24	0.702	.483	0.08
KD52-parents	49.48	10.92	48.83	9.7	0.554	.580	0.07
KD52-money	50.05	8.41	51.51	6.55	−1.67	.095	−0.19
KD52-peers	49	11.25	51.21	10.47	−1.79	.073	−0.21
KD52-school	49.17	12.5	51.23	10.4	−1.57	.117	−0.18
kd52-bullying	51.5	9.81	51.45	8.88	0.015	.998	0.00

CB-V cybervictimization, *CB-A* cyberaggression, *CB-B* cyberbystanding, *KD52-phy* Physical well-being, *KD52-psy* Psychological well-being, *KD52-mood* Mood, *KD52-self* Self-perception, *KD52-autono* Autonomy, *KD52-parents* Parent relation and home life, *KD52-money* Financial resources, *KD52-peers* Peers and social support, *KD52-school* School environment, *KD52-bullying* Bullying

prevalence of cyberbullying is distributed with 19.5% of cybervictims, 16.7% of cyberbully–victims, 5.8% of cyberbullies, and 11.3% of cyberbystanders, whereas 46.7% do not participate in any role (uninvolved).

Regarding the above, the differences found between these profiles in the dimensions of Bullying ($F_{4,915}$ = 94.61, $p < .001$), Parent relation and home life ($F_{4,915}$ = 36.14, $p < .001$), and School environment ($F_{4,915} = 21.17$, $p < .001$) are especially noteworthy. The cybervictimization profile obtained systematically worse scores than all the other roles, and the differences were significant ($p < .001$). The same thing occurred with cyberbully–victims, except for the dimensions of Financial resources and Peers and social support. The cyberbystander and uninvolved roles obtained systematically higher scores, with no significant differences between them in any dimension.

Table 4 presents the mean scores, standard deviations, and comparisons of means between T1 and T2 in the study variables. We note a tendency maintained over time in the study dimensions, with no significant differences in any variable, except for cyberbystanding (at T1, $M=4.26$, SD = 5.39, at T2, $M=3.45$, SD = 4.39, $t=3.27$, $p < .001$, $d=0.16$).

We then performed stepwise multiple linear regressions to analyze which dimension of the KIDCREEN-52 and which dimension of cyberbullying best predicted the scores of cybervictimization and cyberbullying at T2. Cybervictimization at T2 was predicted by

Table 2 Partial correlations among the study dimensions, controlling for age, and means and standard deviations at T1 ($n = 920$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean ± SD
1. CB-V	—													1.61 ± 2.91
2. CB-A	0.602**	—												0.64 ± 1.73
3. CB-B	0.518**	0.43**	—											4.37 ± 5.61
4. KD52-phy	−0.201**	−0.1*	−0.129**	—										50.84 ± 7.6
5. KD52-psy	−0.31**	−0.151**	−0.16**	0.68**	—									50.86 ± 11.1
6. KD52-mood	−0.329**	−0.158**	−0.143**	0.511**	0.694**	—								51.94 ± 8.96
7. KD52-self	−0.210**	−0.099*	−0.111**	0.433**	0.589**	0.572**	—							49.11 ± 10.61
8. KD52-autono	−0.178**	−0.056	−0.091*	0.499**	0.565**	0.531**	0.663**	—						50.44 ± 9.8
9. KD52-parents	−0.345**	−0.180**	−0.189**	0.464**	0.644**	0.650**	0.726**	0.679**	—					49.63 ± 10.4
10. KD52-money	−0.179**	−0.056	−0.031	0.36**	0.517**	0.573**	0.5**	0.405**	0.568**	—				51.57 ± 8.13
11. KD52-peers	−0.209**	−0.086*	−0.038	0.565**	0.622**	0.578**	0.520**	0.527**	0.573**	0.513**	—			50.93 ± 10.65
12. KD52-school	−0.327**	−0.199**	−0.2**	0.508**	0.664**	0.678**	0.689**	0.554**	0.780**	0.609**	0.631**	—		50.42 ± 11.52
13. KD52-bullying	−0.601**	−0.354**	−0.4**	0.264**	0.431**	0.45**	0.296**	0.285**	0.491**	0.274**	0.285**	0.446**	—	52.41 ± 9.2

CB-V cybervictimization, *CB-A* cyberbullying, *CB-O* cyberbystanding, *KD52-phy* Physical well-being, *KD52-psy* Psychological well-being, *KD52-mood* Mood, *KD52-self* Self-perception, *KD52-autono* Autonomy, *KD52-parents* Parent relation and home life, *KD52-money* Financial resources, *KD52-peers* Peers and social support, *KD52-school* School environment, *KD52-bullying* Bullying

*$p < .05$; **$p < .001$

Table 3 Comparisons based on the roles of cybervictim, cyberbully, cyberbystander, cyberbully–victim, and uninvolved on the ten dimensions of the KIDSCREEN-52 at T1 ($n = 920$)

	Cybervictim (1) $n = 179$ (19.5%)		Cyberbully (2) $n = 53$ (5.8%)		Cyberbystander (3) $n = 104$ (11.3%)		Cyberbully-victim (4) $n = 154$ (16.7%)		Uninvolved (5) $n = 430$ (46.7%)		Differences		Post hoc Bonferroni
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	p	
KD52-phy	49.33	6.25	54.33	5	52.32	7.44	48.88	6.26	51.39	8.54	$F_{4,915} = 8.94$	< .001	1 < 2, 3, 5/4 < 2, 3, 5
KD52-psy	46.02	11.05	54.42	9.57	52.96	9.96	47.80	9.76	53.04	11.2	$F_{4,915} = 19.15$	< .001	1 < 2, 3, 5/4 < 2, 3, 5
KD52-mood	48.21	8.78	54.88	7.76	53.89	8.8	49.58	8.33	53.5	8.62	$F_{4,915} = 17.53$	< .001	1 < 2, 3, 5/4 < 2, 3, 5
KD52-self	45.49	8.78	52.21	10.75	49.9	10.55	47.14	8.27	50.7	11.55	$F_{4,915} = 10.63$	< .001	1 < 2, 3, 5/4 < 2, 5
KD52-autono	46.69	7.33	54.76	9.78	50.99	9.05	49.29	8.03	51.77	10.9	$F_{4,915} = 13.29$	< .001	1 < 2, 3, 5/4 < 2
KD52-parents	43.76	8.81	51.44	10.81	52.86	10.19	45.57	9.06	52.52	10	$F_{4,915} = 36.14$	< .001	1 < 2, 3, 5/4 < 2, 3, 5
KD52-money	49.35	6.76	53.23	6.5	52.67	8.19	50.76	7.5	52.32	8.84	$F_{4,915} = 5.77$	< .001	1 < 2, 3, 5
KD52-peers	47.01	8.39	53.02	8.22	53.17	12.22	49.79	8.21	52.18	11.64	$F_{4,915} = 10.03$	< .001	1 < 2, 3, 5
KD52-school	46.28	9.56	52.37	11.71	53.26	11.99	45.64	9.5	52.94	11.8	$F_{4,915} = 21.17$	< .001	1 < 2, 3, 5/4 < 2, 3, 5
KD52-bullying	46.36	10,92	55.75	6.58	55.27	6.42	45.24	10.29	56.4	5.1	$F_{4,915} = 94.61$	< .001	1 < 2, 3, 5/4 < 2, 3, 5

CB-V cybervictimization, *CB-A* cyberaggression, *CB-B* cyberbystanding, *KD52-phy* Physical well-being, *KD52-psy* Psychological well-being, *KD52-mood* Mood, *KD52-self* Self-perception, *KD52-autono* Autonomy, *KD52-parents* Parent relation and home life, *KD52-money* Financial resources, *KD52-peers* Peers and social support, *KD52-school* School environment, *KD52-bullying* Bullying

Table 4 Means, standard deviations, and Student's t for dependent samples between T1 and T2 for all the study dimensions

T1–T2 ($n = 313$)	T1		T2		Differences		
	Mean	SD	Mean	SD	t	p	d
CB-V	1.65	3.12	1.5	2.97	1.15	.252	0.05
CB-A	0.72	1.91	0.66	1.5	1.07	.286	0.03
CB-B	4.26	5.39	3.45	4.39	3.27	.001	0.16
KD52-phy	51.13	7.59	50.84	6.1	0.848	.397	0.04
KD52-psy	50.4	12	50.32	9.91	0.176	.861	0.00
KD52-mood	51.19	9.25	48.21	10.84	1.46	.143	0.30
KD52-self	48.21	10.84	49	8.57	− 1.68	.094	− 0.08
KD52-autono	50.55	8.88	51.1	8.62	1.25	.213	0.06
KD52-parents	48.7	10.57	49.17	10.32	− 1.13	.259	− 0.04
KD52-money	50.94	7.99	50.91	7.6	0.107	.915	0.00
KD52-peers	49.69	11.5	50.06	10.9	− 1.21	.226	− 0.03
KD52-school	49.72	12.2	50.14	11.6	− 0.949	.343	− 0.03
KD52-bullying	52.38	9.51	51.97	9.31	1.38	.169	0.04

CB-V cybervictimization, *CB-A* cyberaggression, *CB-B* cyberbystanding, *KD52-phy* Physical well-being, *KD52-psy* Psychological well-being, *KD52-mood* Mood, *KD52-self* Self-perception, *KD52-autono* Autonomy, *KD52-parents* Parent relation and home life, *KD52-money* Financial resources, *KD52-peers* Peers and social support, *KD52-school* School environment, *KD52-bullying* Bullying

cybervictimization at T1 ($\beta = 0.893$, $p < .001$) and the KIDSCREEN-52 dimension of Bullying ($\beta = 0.177$, $p < .001$, $r^2 = 0.628$). Cyberbullying at T2 was predicted by cyberbullying at T1 ($\beta = 0.753$, $p < .001$) and the KIDSCREEN-52 dimension of Self-perception ($\beta = -0.067$, $p < .001$, $r^2 = 0.589$).

Discussion

This work contributes to our knowledge of a reality that has hardly been explored so far in relation to cyberbullying: how it affects students' perceived quality of life.

The main objective was to analyze differences in HRQoL on the basis of the role performed in cyberbullying, in addition to possible differences due to gender and age. In this sense, it should be noted that we found that 36.2% of the participants was related to cybervictimization (19.5% cybervictims and 16.7% cyberbully–victims). These data agree with those found using the Cyberbullying Test (technological scale) by Garaigordobil [32, 33], who reported 30.2% of cybervictims in a sample of 3026 participants aged 12–18 years, and the results of González-Cabrera et al. [17] who found 34.5% of cybervictims. However, both works reported higher percentages of cyberbullying than those indicated in Table 3 (5.8%) with 15.5 and 23.5% of cyberbullies, respectively. If the results of the study are compared with other studies carried out with different evaluation instruments in the general population, the results of cybervictimization are higher [34, 35]. For example, a study with a representative Spanish sample also reports lower percentages of cybervictimization: 6.9% [36].

Differences according to sex were found in the KIDSCREEN-52 Social acceptance (Bullying) dimension at T1, which was more prevalent in boys, and in cyberbystanding, which was more prevalent in girls. This is partly consistent with the study of Garaigordobil [33], although the differences are often codependent on the context, as suggested by Zych et al. [6]. We found no age differences, although several studies indicate an increase in cyberbullying with age, but this claim has recently been the object of debate [6].

The results shown in Table 3 confirm that cyberbullying reduces HRQoL in profiles related to the role of victim, especially compared with bullies, bystanders, and uninvolved individuals. Cyberbully–victims follow the same trend, although there are no differences in the dimensions of Financial resources and Peers and social support. This loss of HRQoL had been already reported in other studies with different forms of childhood–adolescent violence, such as maltreatment [26], abuse [27], victimization [28] or polyvictimization [29], in addition to cases of traditional bullying [13, 25], but this is the first time it is described in relation to cyberbullying.

In relation to the variable sex, we expected lower scores of HRQoL in girls than in boys [30], but this was not observed either at T1 or at T2. However, the mean HRQOL scores (Table 1) are adequate regardless of gender, especially in participants who are uninvolved in cyberbullying (Table 3) [20, 21].

All this confirms part of the hypothesis concerning the reduction of HRQoL in profiles related to cybervictimization, but we found no significant gender differences.

The HRQoL dimensions that are mainly associated with cybervictimization and cyberbullying behaviors are Psychological well-being, Mood, Parent relation and home life, School environment, and Bullying. These results are consistent and convergent with the literature that has related bullying behaviors with worse psychological well-being [37], poorer quality of life [38], worse relations with parents [39], and school environment [40]. Likewise, the best predictors of cyberbullying at T2 are the KIDSCREEN-52 dimension of Bullying and cybervictimization at T1. These findings are along the same lines as those of other authors who suggest that whereas peers and social support are a protective factor, the lack of friends and low social support are related to victimization [35].

Cyberbullying-related behaviors between T1 and T2 were stable, as hypothesized. This coincides with the study of Gámez-Guadix et al. [34], among others. In addition, a temporal interval of 5 months seems sufficient to ensure a relationship between the two moments, because as time passes, there is more room for biological and environmental changes that contribute to the variability of adolescents' behavior [19]. The HRQoL dimensions were also stable between the two temporal moments. This may be due to the conceptual solidity of the construct or the need for a greater lapse in time to appraise changes [31].

The present study presents some limitations. Firstly, the results are based on self-reports, so response biases are possible. This could be improved in the future with complementary measures (parents, teachers, and peers) with which to triangulate a more complete view. Secondly, the study sampling could have been randomized and we could have used a larger sample. Thirdly, there was an important experimental mortality at T2 due to factors foreign to the research, which reduced the available sample size. Fourthly, we could not perform techniques like path analysis to analyze the direct and indirect contribution of the independent variables (dimensions at T1) to explain the variability of the dependent variables (dimensions at T2). This was due to the high collinearity of the dimensions between the two times (higher than 0.8 in many cases). In addition, caution should be exerted when extrapolating these results, which should be considered as a first approximation to the reality of cyberbullying and HRQoL. Future studies should replicate these findings with additional samples in other countries and propose longitudinal studies.

In conclusion, it should be noted that this study provides empirical evidence, unknown till now, about the loss of HRQoL in adolescents who are cybervictims or cyberbully–victims. All the dimensions of the KIDSCREEN-52 were reduced significantly when cybervictimization occurred. We recommend conducting assessments of HRQoL when bullying-related problems are suspected and evaluating their impact. This is of special interest to teachers, together with the departments of educational orientation, as well as the pediatric teams. Primary care teams can perform a great job on this issue, because they often attend

to the psychological, physical, and psychosomatic consequences in the victims.

Acknowledgements The funding was supported by Universidad Internacional de la Rioja (Grant No.: Bienio III 2015/17 y Bienio IV 2017/19).

Funding This project was supported by Universidad Internacional de La Rioja (UNIR, http://www.unir.net), as part of the Research Plan 3 [2015–2017], Research Group "Analysis and prevention of cyberbullying" and Plan 4 [2017–2019], with the Research Group "Cyberpsychology: psychosocial analysis of online contexts".

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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