Gender-specific pathways regarding the outcomes of a cyberbullying youth education program

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ARTICLE INFO

ABSTRACT

Introduction: Marked gender differences have been identified in cyberbullying perpetration and victimization in adolescence. Age and phenotypic traits, including impulsivity and problematic internet use may mediate the association between gender and cyberbullying intervention outcomes. This study thus aimed to explore gender differences and the potential mediating role of age, impulsivity and problematic internet use regarding the outcomes of an elementary school cyberbullying program.
Methods: The peer-led STAnD project shapes students' attitudes towards cyberbullying, and promotes help-seeking behaviors. Baseline sample consisted of 933 respondents (51.3% females, mean age = 11.25, sd = 1.64), and after a 42.55% drop-out, 536 remained in the sample for 6-month follow-up. Four primary outcome measures represented protective factors against cyberbullying.
Results: Three of the intervention outcomes – change in 1) helpline knowledge, 2) empathy towards the victims of cyberbullying, and 3) risk perception regarding online hazards - were best predicted by gender. A gender-specific path analysis model indicated that higher amount of time spent online might put a barrier to changes in risk awareness among females and in help-seeking willingness among males.
Conclusions: Future cyberbullying programs may design separate interventions for adolescent boys and girls with different emphasis placed on empathy training, or the barriers to help-seeking.

1. Introduction

Problematic internet use (PIU) is a fundamental contributor to prolonged screen-time, elevating the odds of mental and socioemotional difficulties among teenagers (Oswald et al., 2020), and associated with a wide spectrum of risky online activities, encompassing but not limited to cyberbullying, internet pornography, and internet fraud (Chao et al., 2020), of which cyberbullying is in the focus of the present study. The prevalence rates of cyberbullying perpetration and victimization among adolescents range between 6.0 and 46.3% and 13.99 and 57.55%, respectively, while the adverse consequences of cyberbullying include depression, psychoactive substance abuse, post-traumatic stress disorder

(PTSD), and suicidal ideation (Zhu et al., 2021). Importantly, both cyberbullying victims and perpetrators show higher odds of exhibiting suicidal behaviors (John et al., 2018), with an odds ratio of 2.10 and 1.21, as compared to nonvictims and nonperpetrators. This is by no means such a staggering result when we consider that cyberbullying perpetrators are often former cyberbullying victims (Zsila et al., 2019).

Hence, it is of great importance to develop and implement programs that may effectively increase cyberbullying awareness and reduce cyberbullying perpetration and victimization among underage populations. Such intervention effects were reported to be larger for cyberbullying victimization in case of a higher proportion of males were in the sample (Polanin et al., 2021). Gender may play a key differential

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role in cyberbullying patterns (Chao & Yu, 2017), with male gender usually standing out as a risk factor. We could assume that male gender may similarly be a risk factor regarding the effectiveness of cyberbullying programs. Still, gender is not necessarily significant as a stand-alone moderator (Polanin et al., 2021), implying that the association between gender and intervention outcomes is likely to be mediated by additional factors.

In terms of potential gender-related determinants of cyberbullying behaviors, anger rumination can elevate the risk of cyberbullying perpetration among male cyberbullying victims, whereas victimization in traditional bullying was reported as an important predictor of cyberbullying perpetration among females (Zsila et al., 2019). In case of females, a more pronounced connection was observed between social media use (SMU) and cyber-perpetration, while problematic SMU in itself was a significant correlate of both cyberbullying perpetration and victimization (Craig et al., 2020). Male gender is further associated with greater impulsivity, a highly heritable personality trait (Anokhin et al., 2015) leading to loss of control and impairment in delay of gratification and discounting (Göllner et al., 2018), and elevate the risk of both PIU (Liu et al., 2019), and cyberbullying perpetration (Khoury-Kassabri et al., 2019). PIU, which is also considered a relevant predictor of cyberbullying (Yudes et al., 2020), show gender differences in its prevalence (Su et al., 2019). Finally, age is an additional mediator, with the most pronounced association between impulsivity and gender identified in early adolescence, due to, for instance, the protracted maturation of the prefrontal cortex (PFC) and the parietal regions, resulting in delayed frontal control over the behavior (Romer, 2010). Younger males were accordingly reported to cyberbully others more often (Livazović and Ham, 2019), while late adolescence is characterized by more effective behavioral control, an overall decrease in impulsivity, and an increase in empathy.

The current study thus aimed to explore the differential role of gender regarding the outcomes of a cyberbullying program carried out among elementary students, controlling for the potential confounders of age, impulsivity and PIU. We also aimed to explore the structural relationship between these selected constructs to identify gender-specific pathways regarding cyberbullying intervention outcomes.

2. Methods

2.1. The STAnD intervention

Supported by the Hungarian Academy of Sciences, the STAnD (an acronym for Study, Teach, Understand) intervention is a multilevel, multistep youth health education program aiming to increase health consciousness and enhance motivation for behavioral and attitude change among kindergarten and school-aged children by applying a pedagogical approach based on peer assisted teaching/learning. The internet safety and cyberbullying prevention STAnD project was launched in 2019. Consisting of four 45-minute educational sessions, the primary goals of the program was to 1) provide knowledge about internet security in order to facilitate conscious use of the web, 2) shape students' attitudes towards cyberbullying by raising awareness about the background and consequences of this phenomenon, and 3) promote help-seeking behaviors among students in need. The program followed a mixed method approach, incorporating peer-led team learning, situational games, psychoeducation, and skill training.

2.2. Sample and procedure

Four interactive sessions (multiplied by the number of target groups) were held in the Spring and Autumn of 2019 by four undergraduates (two studying health sciences, and two pedagogy) and a high school student. The target groups consisted of elementary students between the ages of 8 and 15 from five different schools in Budapest, Hungary. Most session groups included 20–25 students, while one tutor supervised the

process without unnecessary intervening. Intervention outcomes were assessed at three time points: 1) baseline data collection, one-week before the implementation of the program, 2) immediately after the program, and 3) at six-month follow-up. Parents gave their informed consent and permitted the participation of their children in the study. In order to be able to match baseline and follow-up data, participants received a unique identifier (a self-selected passphrase) and a reference number as well. The research adhered to all ethical principles for the conduct of research with humans outlined by the Declaration of Helsinki. Ethical approval was provided by Semmelweis University Regional and Institutional Committee of Science and Research Ethics (ethical approval number: SE RKEB 63/2019).

2.3. Measures

A self-report questionnaire contained demographic questions, items measuring internet use habits (such as daily frequencies), knowledge about cyberbullying and related helplines/websites, items assessing the level of empathy towards the victims of cyberbullying, risk perception about potential online hazards, and attitudes towards help-seeking.

Problematic internet use was measured by a shortened version of the Problematic Internet Use Questionnaire (PIUQ) (Demetrovics et al., 2008). The PIUQ assesses three aspects of problematic internet use (obsession, neglect, and control disorder), using a five-point Likert scale (from "never" to "always/almost always"). Higher total scale score indicates higher problematic internet use severity. The current study identified good internal scale consistency (Cronbach's alpha = 0.77).

Impulsivity was measured by using the impulsiveness subscale of the Hungarian version of the IVE-7 Impulsiveness, Venturesomeness and Empathy questionnaire (Eysenck & Eysenck, 1978; Kozéki, 1988). We preferred to use IVE-7 over more commonly applied impulsivity measures as it was specifically developed and validated for adolescent samples. The impulsiveness subscale consists of 23 items (with 3 reversed items), using dichotomous response categories (0 = no, 1 = yes). Good internal subscale consistency was found (Cronbach's alpha = 0.79) within the confines of the current study.

Four primary outcome measures were selected as dichotomized indices of persistent intervention effect on cyberbullying-related changes (where 0 represented no positive change at either the first, or the second follow-up time point, while 1 represented a positive change at the first or second follow-up that remained positive or increased at the second data collection). These outcome indices represented relevant protective factors (i.e. enhanced empathy, problem and risk awareness, seeking social support, netiquette) against cyberbullying, and were selected on the basis of the reviewed body of knowledge (e.g. Park et al., 2014; Zhu et al., 2021; Zych et al., 2019):

1) gaining permanent knowledge about possible cyberbullying helplines and websites ("*Do you know any helplines, websites, etc. where you can find help in case of cyberbullying?*");
2) changing attitude towards help-seeking behavior ("*Would you seek help in case of cyberbullying?*");
3) changing risk perception about internet security (i.e. perceived risk of e.g. using the same passwords in several sites, make contact with perfect strangers online, meeting someone personally you just got to know online, etc.);
4) changing empathy towards the victims of cyberbullying (e.g. "*To what extent do you consider sharing the secrets of someone else/sharing private photos/sending offending messages would cause suffering?*").

Due to potential baseline differences in the level of impulsivity and PIU, we expected gender-specific trajectories of intervention outcomes in terms of the above indicators.

2.4. Statistical analysis

Descriptive and basic comparative statistics (chi square test for categorical, independent samples *t*-test, and Mann Whitney *U* test) were computed in relation to gender differences. As a next step, a series of logistic regression models were computed to identify significant predictors of main intervention outcomes. Goodness-of-fit was assessed by Hosmer and Lemeshow Test in these cases. Cross-association between intervention outcomes was also tested by performing chi square statistics. These calculations were all performed in SPSS v. 20 (IBM Corp., 2011).

Finally, gender-specific path analysis models were tested to analyze structural relationship between gender (grouping variable), age, impulsivity (covariates), problematic internet use, average daily time spent online on weekdays (mediator variables), and follow-up changes in primary outcome measures of the STAnD intervention. Considering the high rates of missing values, case-wise/full-information ML (maximum likelihood) estimation with nlminb optimization was used. A model was acceptable if root-mean-square error of approximation (RMSEA) < 0.08, comparative fit index (CFI) > 0.95, non-normed fit index or Tucker-Lewis index (TLI) > 0.95. The presented structural equation modeling (SEM) was performed in R version 4.0.3 (R Core Team, 2020) by using the *lavaan* (Latent Variable Analysis) package (Rosseel, 2012). Besides the aforementioned model fit indices, best performing models were selected on the basis of lower BIC (Bayesian Information Criterion) scores, and avoiding over-fitting/saturation by reducing the number of explanatory variables.

3. Results

3.1. Sample characteristics

Baseline sample consisted of 933 students (51.3% females, mean age = 11.25, SD = 1.64), and after a 42.55% drop-out, 536 remained in the sample for 6-month follow-up (54.7% females, mean age = 11.22 SD = 1.57). These 536 students provided the sample for assessing the structural relationship between selected study variables and main intervention outcomes. Table 1 presents detailed sample characteristics in light of gender differences at baseline assessment. Female students were more likely coming from a family background with higher parental educational level, showed higher empathy towards the victims of cyberbullying, were characterized by higher risk perception regarding online hazards, showed stronger willingness to seek help in case of being victimized. Females were further defined by lower levels of impulsivity, less problematic and less frequent internet use.

3.2. Predictors of intervention outcomes

The Hosmer and Lemeshow goodness-of-fit test indicated acceptable model fit regarding all outcome measures: 1) change in helpline knowledge ($\chi2$ (8, N = 351) = 10.84, p > 0.05), 2) change in help-seeking willingness ($\chi2$ (8, N = 364) = 8.69, p > 0.05), 3) change in empathy towards the victims of cyberbullying ($\chi2$ (8, N = 369) = 9.73, p > 0.05), and 4) change in risk perception regarding online hazards ($\chi2$ (8, N = 296) = 6.60, p > 0.05). Based on the results of the logistic regression analyses, being a female student approximately doubled the odds for positive changes in helpline knowledge (O.R. = 2.36, p < 0.01), but decreased the odds of positive changes considering the empathy towards the victims of cyberbullying (O.R. = 0.39, p < 0.01) and risk perception about online hazards (O.R. = 0.38, p < 0.01). Average daily time spent online was a further significant predictor of risk perception changes. Higher daily average times spent online decreased the odds of positive changes in risk perception (O.R. = 0.57, p < 0.05) (Table 2).

As a next step, cross-association between intervention outcomes was assessed in order to explore whether the direction or extent of certain changes would show any connection with the lack of further goal-related

		Boys (n = 452)	Girls (n = 477)	χ2 test/ independent sample *t*-test/ Mann Whitney *U* test	Effect size
Age mean (SD)		11.18 (1.65)	11.31 (1.62)	t = 1.22	r = 0.04
Parental educational background	Mother mean (SD)	3.65 (0.69)	3.75 (0.59)	U = 61,469.5*	r = 0.08
	Father mean (SD)	3.60 (0.73)	3.69 (0.64)	U = 58678*	r = 0.07
Number of siblings living with together mean (SD)		1.36 (0.97)	1.25 (0.99)	t = 1.72	r = 0.06
Baseline empathy towards cyberbullying victims mean (SD)		22 (6.76)	23.52 (6.36)	t = 3.41**	r = 0.11
Baseline knowledge about cyberbullying helplines/ websites N of positive answers (%)		61 (14.7%)	70 (15.7%)	χ2 = 0.17	r = 0.01
Baseline risk perception about online hazards mean (SD)		25.41 (5.66)	26.48 (5.34)	t = 2.82**	r = 0.09
Baseline help-seeking willingness mean (SD)		3.91 (1.26)	4.12 (1.12)	U = 83,745.5*	r = 0.09
Problematic internet use (PIUQ total score) mean (SD)		14.01 (4.51)	12.53 (4.49)	t = 4.93***	r = 0.16
Average daily time spent online on weekdays mean (SD)		1.88 (0.83)	1.75 (0.79)	U = 67,675.5*	r = 0.08
Impulsivity (IVE-7 subscale total score) mean (SD)		10.42 (4.85)	9.53 (4.44)	t = 2.68**	r = 0.12

* p < 0.05.
** p < 0.01.
*** p < 0.001.

changes. Changes in risk perception about online hazards showed significant but reversed association with changes in empathy towards the victims of cyberbullying ($\chi2$ (1, N = 408) = 9.34, p = 0.002) (i.e. the majority of the students characterized by elevated risk perception showed no prolonged changes in empathy and *vica versa*). None of the remaining pairwise cross-tabulated count comparisons yielded significant results.

3.3. Results of the SEM model: gender-specific pathways regarding intervention outcomes

As a final step, gender-specific structural relationships between the assessed study variables were explored. Our SEM models (as presented by Fig. 1) showed acceptable goodness-of-fit indices (CFI = 0.98, TLI = 0.95, RMSEA = 0.03).

Boys and girls were characterized by similar, yet slightly different pathways regarding the structural relationship between study variables and intervention outcomes. In case of boys, higher age predicted higher daily frequencies of internet use (B = 0.23, p = 0.000), however, age was a not a significant covariate of problematic internet use severity (B = −0.11, p = 0.398), or the level of impulsivity (B = −0.03, p = 0.862). Impulsivity predicted both problematic internet use (B = 0.33, p = 0.000) and daily internet use frequencies (B = 0.04, p = 0.000). The frequency of daily internet use was a significant predictor of more severe problematic internet use (B = 0.87, p = 0.000), and was negatively associated with the change in help-seeking willingness considering cyberbullying (B = −0.06, p = 0.034). In case of girls, higher age was associated with higher impulsivity levels (B = 0.33, p = 0.014) and higher daily internet use frequencies (B = 0.27, p = 0.000). Impulsivity was a positive associate of both problematic internet use (B = 0.35, p =

Table 2
Predictors of outcome measures in a series of logistic regression models.

Change in helpline knowledge

	B (SE)	p	Odds ratio	95% CI
$R^2 = 0.032$ (Cox&Snell), 0.050 (Nagelkerke), N = 351				
Gender	0.86-(0.29)	0.003	**2.36**	1.34, 4.15
Age	−0.03-(0.09)	0.772	0.98	0.82, 1.16
Impulsivity	−0.01-(0.03)	0.755	0.99	0.93, 1.05
Daily time spent online	−0.02-(0.19)	0.911	0.98	0.68, 1.41
Problematic internet use	−0.01-(0.04)	0.706	0.99	0.92, 1.06

Change in help-seeking willingness

	B (SE)	p	Odds ratio	95% CI
$R^2 = 0.018$ (Cox&Snell), 0.029 (Nagelkerke), N = 364				
Gender	−0.15-(0.27)	0.588	0.86	0.51, 1.47
Age	−0.06-(0.09)	0.493	0.94	0.79, 1.12
Impulsivity	−0.01-(0.03)	0.796	0.99	0.93, 1.06
Daily time spent online	−0.30-(0.19)	0.116	0.74	0.51, 1.08
Problematic internet use	0.06-(0.03)	0.064	1.06	0.99, 1.14

Change in empathy towards the victims of cyberbullying

	B (SE)	p	Odds ratio	95% CI
$R^2 = 0.033$ (Cox&Snell), 0.056 (Nagelkerke), N = 369				
Gender	−0.93-(0.30)	0.002	**0.39**	0.22, 0.72
Age	−0.12-(0.09)	0.221	0.89	0.74, 1.07
Impulsivity	−0.03-(0.03)	0.397	0.97	0.91, 1.04
Daily time spent online	−0.08-(0.20)	0.703	0.93	0.63, 1.37
Problematic internet use	−0.01-(0.04)	0.755	0.99	0.92, 1.07

Change in risk perception regarding online hazards

	B (SE)	p	Odds ratio	95% CI
$R^2 = 0.058$ (Cox&Snell), 0.090 (Nagelkerke), N = 296				
Gender	−0.96-(0.31)	0.002	**0.38**	0.21, 0.70
Age	0.18-(0.10)	0.073	1.19	0.98, 1.46
Impulsivity	−0.03-(0.04)	0.457	0.97	0.91, 1.04
Daily time spent online	−0.56-(0.22)	0.012	**0.57**	0.37, 0.89
Problematic internet use	−0.03-(0.04)	0.515	0.97	0.90, 1.05

Note: Significant explanatory variables and related values are boldfaced. CI = confidence interval.

0.000) and daily internet use frequencies (B = 0.03, p = 0.004). The severity of problematic internet use predicted cyberbullying help-seeking willingness (B = 0.02, p = 0.009), while the frequency of daily internet use was negatively associated with a change in risk perception regarding internet-specific hazards (B = −0.06, p = 0.047), indicating that the higher amount of time spent online might put a barrier to risk awareness and internet safety.

4. Discussion

Our study demonstrated subtle gender differences and gender-specific pathways considering the outcomes of a cyberbullying intervention. As it was stated by former researchers as well (e.g. Zsila et al., 2019), gender differences should be considered during the planning, development and implementation of intervention efforts against cyberbullying, in order to increase the efficacy of such programs. Regarding gender differences in terms of the outcome measures, most of our findings are comparable to those of preceding research. Similarly, to others (e.g. Van der Graaff et al., 2018), we found that female students more likely show empathic concerns towards the victims of cyberbullying. Van der Graaff et al. (2018) further emphasized the relevance of gender-specific connection between prosocial behavior and empathy-related traits, as well as different developmental trajectories regarding age-related changes in prosocial behavior among adolescent boys and girls, namely that the peak age and decline of prosocial behavior differ between genders. With regard to the association between empathy and bullying, Kral et al. (2017) noted that adolescents with lower levels of empathy are more likely to suffer from bullying, implying that empathic skills may serve as protective means against similar interpersonal conflicts. As such, one of the major goals of the STAnD education program (that is, increasing empathic concerns) could implicate a two-fold impact on later welfare of the target population: 1) facilitate their readiness to care about and perhaps help their peers in need, 2) foster their ability of self-care in bullying situations.

Female students were characterized by greater risk perception regarding the hazards of internet use. By following a similar path-analytical approach as we did, Reniers et al. (2016) not only identified gender differences in risk perception (with adolescent girls showing greater risk perception), but additionally presented how age, behavioral inhibition and impulsivity may influence risk perception. We found an indirect association between impulsivity and a lack of change in risk perception (mediated by daily internet use frequencies) only within the subsample of girls. Higher rates of screen-time predicted a resistance to
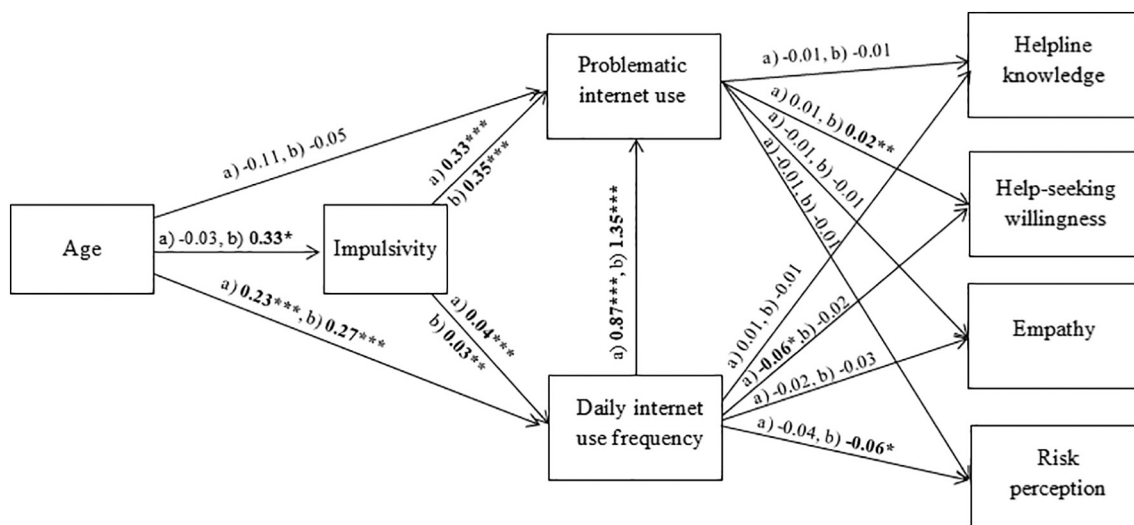

Fig. 1. Pathways of intervention outcomes within the subsamples of boys and girls.
Note: *p < 0.05, **p < 0.01, ***p < 0.001, a) SEM estimates for boys; b) SEM estimates for girls. Significant estimators are boldfaced.

increase risk perception among the full sample, reducing the odds of a positive change by almost half (O.R. = 0.57). Females showed a stronger pre-intervention/baseline willingness to seek help in case of being victimized. This finding is in line with the assumptions that young men are often reluctant to seek help, due to sociocultural influences (such as the masculinity ideal) (Powell et al., 2016), peer expectations, the inhibition of emotional expressiveness (Möller-Leimkühler, 2002), or higher rates of maladaptive self-medication tendencies (such as psychoactive substance use) (Lynch et al., 2018). Notwithstanding, we should note that individual's ethnical and cultural background may moderate gender differences in help-seeking attitudes (Nam et al., 2010), while family communication, family life satisfaction, and sociability are further predictors of help-seeking willingness among cyberbullying victims (Sitnik-Warchulska et al., 2021).

Some of our results did not meet our preliminary expectations based on previous research findings. Age was a significant predictor of higher impulsivity levels only among females, while former empirical evidence suggests a linear pattern regarding the linkage between age differences, and impulsivity for both genders (Steinberg et al., 2008), and in addition to that, impulsivity was reported to decline from the age of 10. Nevertheless, certain observations about pubertal maturation potentially elucidate our results, as maturation speed in case of boys and pubertal timing in case of girls has been linked to enhanced propensity to impulsivity (Mathias et al., 2016). Average daily time spent online was not a significant predictor of empathic changes neither in our logistic regression model, nor in the path analysis model (implying a gender-independent result), although a growing body of evidences support the notion that increased screen-time may lead to reduced emotion understanding (Skalická et al., 2019) and empathy (Twenge & Campbell, 2018). Finally, being a female was a negative predictor for a change in risk perception and empathy. This result might seem a bit contradictory at first glance, however, it may be explained by initial gender differences in these variables (boys showed lower scores at baseline assessment), thus boys were more prone to change their risk perception and empathy towards cyberbullying victims as a desired outcome of the intervention.

4.1. Limitations and future directions

Our study was not without any limitations. Although we assessed a sample with acceptable size, the drop-out rate was still quite high due to the COVID-19 pandemic leading to school lockdowns and thus the stoppage of follow-up data collections in certain classes. Additionally, the STAnD project consisted of only four 45-minute educational sessions, as compared to other cyberbullying programs with an average duration of 22 weeks (Polanin et al., 2021). For that reason, the STAnD aimed to focus more on protective strategies that may prevent future cyberbullying perpetration and victimization, instead of, for instance, changing the school climate or policy, which would have taken much more time. Furthermore, we did not assess several additional confounding factors (e.g. personality dimensions, emotion regulation abilities, ADHD, psychiatric symptoms, etc.) that would have changed or at least influenced some of our results. The STAnD intervention did not aim to reduce daily internet use frequency among the adolescent population. However, based on our findings, the program (and any other similar cyberbullying prevention projects) would benefit from targeting the reduction of internet use frequency as an intermediate objective in order to increase changes in outcome measures.

5. Conclusions

Gender differences were identified in terms of both the intervention outcomes and the pathways leading to them. Future cyberbullying programs should take these differences into account at an early stage during the planning of the intervention and, where appropriate, may even design separate programs for adolescent boys and girls with slightly different emphasis placed on empathy training, or the barriers to help-seeking.

CRediT authorship contribution statement

Máté Kapitány-Fövény: Writing, Methodology; Ágnes Lukács J: Methodology, Reviewing, Conceptualization; Johanna Takács: Data curation, Reviewing and Editing; István Kitzinger: Resources, Investigation; Zsuzsanna Soósné Kiss: Resources, Reviewing; Gábor Szabó: Reviewing; András Falus: Conceptualization, Supervision; Helga Judit Feith: Conceptualization, Supervision, Methodology, Reviewing.

Declaration of competing interest

Authors declare no conflict of interest.

Acknowledgments

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