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Sex Differences in the Association Between Cyberbullying Victimization and Mental Health, Substance Use, and Suicidal Ideation in Adolescents

Différences entre les sexes dans l'association entre la victimisation par cyberintimidation et la santé mentale, l'utilisation de substances et l'idéation suicidaire chez les adolescents

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Abstract

Objective: To examine sex differences in the association between cyberbullying victimization and mental health (psychological distress and delinquency), substance use-related outcomes (drug and tobacco use, binge drinking), and suicide ideation among adolescents.

Method: Data were obtained from the Ontario Student Drug Use and Health Survey (OSDUHS; 2013, *N*=10,272, grade 7 to 12). The sample for analysis included 4,940 students with a mean age of 15.1 years (43.3% male). A series of multi-level, binary, logistic regression models were conducted separately for female and male adolescents to quantify the strength of associations between cyberbullying victimization and study outcomes, after accounting for traditional forms of bullying and demographic covariates.

Results: Female adolescents reported significantly higher prevalence of cyberbullying victimization (once, 9.4%; twice or more, 13.3%) as compared with male adolescents (once, 8.3%, twice or more, 7.8%). Exposure to cyberbullying victimization was associated with an increased odds for psychological distress, suicide ideation, and delinquency among both female and male adolescents (adjusted odds ratios ranged from 1.76 to 4.63); although, the effects were more pronounced in females. Among females, but not males, the odds of reporting psychological distress, suicide ideation, and delinquency increased (in a step-wise fashion) with more frequent exposure to cyberbullying victimization. Cyberbullying victimization was associated with an increased odds of adolescent substance use only among females.

Conclusion: Adolescents exposed to cyberbullying victimization demonstrate an increased odds of poorer mental health, substance use outcomes, and suicide ideation. The current study reveals increased risk among female adolescents as compared with male adolescents. These findings lend support for the need to develop and evaluate targeted preventative interventions specifically tailored for female and male adolescents.

Abrégé

Objectif : Examiner les différences entre les sexes dans l'association entre la victimisation par cyberintimidation et la santé mentale (détresse psychologique et délinquance), l'utilisation de substances (drogues et tabac, beuverie), et l'idéation suicidaire chez les adolescents.

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Méthode : Les données proviennent du Sondage sur la consommation de drogues et la santé des élèves de l'Ontario (SCDSEO; 2013, N = 10 272, 7e à 12e année). L'échantillon pour les analyses comprend 4 940 élèves (âge moyen = 15,1 ans, masculins = 43,3%). Une série de modèles de régression logistique binaire multi-niveaux a été menée séparément pour les adolescentes et les adolescents afin de quantifier la force de l'association entre la victimisation par cyberintimidation et les résultats de l'étude, après avoir pris en compte les formes traditionnelles d'intimidation et les covariables démographiques.

Résultats : Les adolescentes déclaraient une prévalence significativement plus élevée de victimisation par cyberintimidation (une fois = 9,4%, deux fois ou plus = 13,3%), comparativement aux adolescents (une fois = 8,3%, deux fois ou plus = 7,8%). L'exposition à la victimisation par cyberintimidation était associée à des probabilités accrues de détresse psychologique, d'idéation suicidaire et de délinquance tant chez les adolescentes que les adolescents (les rapports de cotes ajustés se situaient de 1,76 à 4,63), bien que les effets aient été plus prononcés chez les adolescentes. Chez les adolescentes, mais pas chez les adolescents, les probabilités de déclarer la détresse psychologique, l'idéation suicidaire et la délinquance augmentaient étape par étape, avec une exposition plus fréquente à la victimisation par cyberintimidation. La victimisation par cyberintimidation était associée à des probabilités accrues d'utilisation de substances seulement chez les adolescentes.

Conclusion : Les adolescents exposés à la victimisation par cyberintimidation démontrent des probabilités accrues de mauvaise santé mentale, de résultats d'utilisation de substances, et d'idéation suicidaire. La présente étude révèle un risque accru chez les adolescentes, comparativement aux adolescents. Ces résultats viennent à l'appui du besoin d'élaborer et d'évaluer des interventions préventives ciblées conçues pour les adolescentes et les adolescents.

Keywords
cyberbullying, mental health, suicide ideation, substance use, adolescence, sex

Introduction

Adolescence represents a vulnerable developmental period for the emergence of mental disorders and suicidal ideation and behaviours. National trends in the US suggest that the prevalence of depression and suicide are increasing among adolescents overall, with females showing a more pronounced increase compared with males.[1,2] In 2015, the suicide rate among adolescents aged 15 to 19 years in Canada was 13 per 100,000 for males and 6.2 per 100,000 for females.[3] The lifetime prevalence of suicide ideation is much higher, with a complete reversal in the patterning of sex differences: about 15.3% of female adolescents, compared to 9.1% of male adolescents, in the US reported a lifetime history of suicide ideation.[4] Associations between suicidal behaviours and adolescent mental disorders have been well-documented.[4-6] Major depressive disorders represent the strongest predictors of suicidal thoughts, whereas disorders characterized by anxiety, agitation, and poor behavioural control are the strongest predictors of suicide attempt.[5,7] The early emergence of mental disorders and suicidal ideation during adolescence and evidence of increasing prevalence[8] signify a critical need to identify and mitigate risk factors during this vulnerable developmental period.

Adolescents today are exposed to a unique set of social processes embedded in the use of technology and social media, like cyberbullying victimization, which may increase their risk for mental disorders and suicide ideation. Carried out in an electronic context, cyberbullying consists of intentional and repeated aggression toward another individual.[9,10] Prevalence estimates of cyberbullying victimization range from 10% to 40%[11] and are highest among adolescents.[12] Cyberbullying victimization is associated with adolescent mental health problems.[13-15] For example, a recent meta-analysis showed a positive association between cyberbullying and both emotional (e.g., depression, anxiety, anger) and behavioural problems (e.g., aggression, substance use, risky sexual behaviour), with Pearson's *r* ranging from 0.14 to 0.34.[13] Related to this, epidemiological evidence suggests that cyberbullying victimization is positively associated with suicidal behaviour, as well as non-lethal and lethal suicide attempts among adolescents,[14-18] behavioural problems,[19] substance use,[20,21] and delinquency.[22,23]

Although cyberbullying victimization is associated with an increased risk of adolescent mental health difficulties, it is unclear whether the magnitude of risk differs for males v. females. Given adolescent females' increased susceptibility to depression in the context of interpersonal stressors,[24] it is plausible that this increased susceptibility may extend to cyberbullying victimization.[25,26] This hypothesis is supported by a longitudinal study that demonstrated that cyberbullying victimization predicted adolescent mental health problems among females but not males.[14] This study, however, did not test for the specificity of effects across different forms of mental health problems. In a recent cross-sectional study that distinguished between emotional versus behavioural problems, it was found that the association between cyberbullying victimization and emotional problems was stronger among females, compared with males, whereas the inverse is true when considering behavioural problems;[19] the latter finding is at odds with earlier work.[23] In terms of suicidal ideation, a single study examining the moderating effects of sex on cyberbullying reported no male to female differences.[14] The extensive examination of sex differences in the association between traditional forms of bullying and

suicidal ideation have identified elevated risk among female adolescents;[27,28] although, a recent meta-analysis concluded that sex does not moderate the association between traditional types of bullying and suicidal ideation.[29]

The current paper investigates sex differences in the association between cyberbullying victimization and suicide ideation, psychological distress, delinquency, and substance use among a representative sample of adolescent students in Ontario, Canada. We address these research objectives while controlling for adolescents' experiences of traditional bullying victimization, as well as several individual concerns known to be associated with mental health and substance use in this population.

Methods

Participants and Procedures

This study is a secondary analysis of data from the 2013 Ontario Student Drug Use and Health Survey (OSDUHS[30]). The OSDUHS uses a 2-stage (school, class), stratified (region and school type) cluster design to enlist a representative sample of students from grades 7 to 12 in Ontario, Canada. The 2013 OSDUHS includes 10,398 students from 671 classes and 198 schools. Student, class, and school-level response rates were 63%, 87%, and 61%, respectively. For the present study, our sample was restricted to adolescents who completed questionnaire A-SS (administered to students in grades 9 to 12) or questionnaire A-ES (administered to students in grades 7 and 8), which assesses cyberbullying, suicide ideation, delinquency, substance use, and psychological distress from the same students. Among the 5,478 eligible adolescents, 10.1% ($n = 538$) were excluded because they were missing responses on at least one variable needed for the analyses, leaving a final sample size of 4,940 students. Comparing those excluded with those included in the analyses revealed no statistically significant or substantively important differences. The Research Ethics Board at the Centre for Addictions and Mental Health and York University, and Public and Catholic school boards' research review committees throughout Ontario approved the 2013 OSDUHS protocol. All participating students required approval for school boards, school principals, classroom teachers, and parents.

Measures

Outcome variables

Suicide ideation. Represented by a single item that asked respondents to indicate whether they seriously considered attempting suicide in the previous 12 mo, coded as '0' for no and '1' for yes.

Psychological distress:[31]. Represented by a 10-item checklist to measure the frequency of experiencing anxiety and depression in the past 4 wk. The item response options, coded from '1' (none of the time) to '5' (all of the time), are summed to a generate total score. A binary measure of psychological distress was created, where '0' represents low to moderate distress (scores <22) and '1' equates to high to very high distress (scores ≥22).

Cannabis use. Represented by a single item assessing the frequency of cannabis use by students in the last 12 mo converted to a binary variable representing adolescent use ('1', used cannabis; '0', did not use cannabis).

Non-medical prescription drugs. Represented by a binary variable representing adolescent use ('1', used non-medical prescription drugs; '0', did not use non-medical prescription drugs) was computed from responses to questions about the use of various drug types at least once in the preceding 12 mo. The drug types included pain relief pills (e.g., Percocet, Percodan, etc.), OxyContin or OxyNeo, as well as medications typically used to treat attention deficit hyperactivity disorder (e.g., Ritalin, Concerta, etc.).

Tobacco use. Represented by a binary variable derived from a single question about cigarette smoking frequency over the last 12 mo. Adolescents who reported smoking a few puffs or more in the past 12 months were coded as '1', while those who never smoked or did not smoke in the past 12 months were coded as '0'.

Binge drinking. Represented by a binary variable derived from the question: how many times in the last 4 wk have you had 5 or more drinks of alcohol on the same occasion? Adolescents who reported drinking 5 or more drinks on the same occasion at least once were coded as '1'. All other responses were coded as '0'.

Delinquency. Represented by a binary variable ('1', yes; '0', no) derived from 11 items capturing respondent's engagement in problematic and/or illegal behaviours (e.g., taking a car, truck or SUV for a ride without the owner's permission; selling marijuana or hashish; among others) over the past 12 mo. Adolescents reporting none of these behaviours were coded as '0'; those reporting one or more of these behaviours, were coded as 1.

Independent variables

Cyberbullying victimization. Represented by a binary variable derived from adolescents' responses to the item 'in the last 12 mo, how many times did other people bully or pick on you through the internet?' Response options were '1' (don't use the internet) to '5' (4 or more times). Adolescents indicating that they 'don't use the internet' or 'never' experienced cyberbullying in the past 12 mo were coded as '0' (never) and considered not to have experienced cyberbullying victimization. Adolescents reporting one instance of exposure to cyberbullying victimization were coded as '1' (once) and those endorsing 2 or more instances of cyberbullying victimization were coded as '2' (twice or more).

Sex. Represented by a binary variable derived by self-report as either male ('0') or female ('1').

Covariates

Traditional bullying victimization. Traditional bullying victimization was coded as a binary variable ('1', yes; '0', no) and derived from one item. The OSDUHS provided a definition of bullying ('bullying is when one or more people tease, hurt, or upset a weaker person on purpose, again and again. It is also bullying when someone is left out of things on purpose') and then asked respondents to indicate how often they had been bullied at school since the start of the school year (i.e., September). Response options were '1' (never), '2' (daily), '3' (once a wk), '4' (once a mo) and '5' (less than once a mo). Adolescents indicating that they 'never' experienced bullying in the past 12 mo were coded as '0' (no) and considered to have not experienced traditional bullying victimization. Adolescents with all other responses were coded as '1' (yes) and considered to have experienced traditional bullying victimization.

Perceived socio-economic status (SES). Perceived SES was assessed in the OSDUHS using the MacArthur Subjective Socioeconomic Status Ladder, whereby respondents were asked to indicate the rung on the ladder that best represented their family's SES. The number of rungs depicted ranges from 1 (i.e., at the bottom of the ladder) to 10 (i.e., at the top of the ladder); rungs higher on the ladder (i.e., closer to the top) suggested higher perceived SES compared with one's peers. This SES variable was treated like a continuous variable in all analyses (i.e., '1', worst; '10', best).

Ethnicity. The OSDUHS asked participants to self-identify their race/ethnicity from among the following categories: White, Chinese, Filipino, South East Asian, Japanese, Korean, South Asian, West Asian, Black, Aboriginal, Latino, and Other. For the purposes of the present analyses, the following groups were created: White (served as the reference group), East and South East Asian (including Chinese, Japanese, Korean and Filipino), South and West Asian (Arab), Black, Aboriginal and First nation, Latino, and Other Ethnicity.

Model-Based Analyses

To account for response clustering (strata, school, student), separate, multi-level, binary logistic regression analyses in MLwiN (V 2.35) were used to estimate the strength of an association between cyberbullying victimization and the following adolescent outcomes separately for females and males, after controlling for age, sex, perceived SES, ethnicity, and exposure to traditional forms of bullying: 1) suicide ideation, 2) psychological distress, 3) delinquency, 4) tobacco use, 5) binge drinking, 6) cannabis use, and 7) non-prescription drug use,. To explicitly test for sex differences in the strength of an association between cyberbullying victimization and each of the outcomes, analyses were repeated in a combined sample of male and female adolescents and included a series of higher-order interaction terms between sex and each response category for cyberbullying victimization. Adjusted odds ratios (aOR) and 95% CIs are reported. All continuous variables were grand mean centred for model-based analyses, and normalized sampling weights based on the probability of selection and non-response were applied in all analyses.

Results

The mean (SD) age of participants was 15.19 (1.8) years, and 56.7% of the sample identified as female. Table 1 presents sample characteristics by sex. The 12-mo prevalence of cyberbullying victimization for females was 9.4% (cyberbullied once) and 13.3% (cyberbullied twice or more times), and 8.3% and 7.8% for males, respectively.

Tables 2 and 3 present the aORs and their 95% CIs for the associations between cyberbullying victimization and mental health and substance-use related outcomes, separately for female and male adolescents. Among female adolescents, cyberbullying victimization was consistently associated with an increased aOR of each outcome. For most mental health-related outcomes, the aOR increased in a step-wise fashion in relation to the frequency of exposure to cyberbullying victimization. For example, compared with females never exposed to cyberbullying victimization, the aOR of suicide ideation among females exposed to cyberbullying victimization once was 1.87 (95% CI, 1.37 to 2.54) and among those exposed 2 or more times, 4.60 (95% CI, 3.36 to 6.29). A similar pattern was evident for psychological distress. Compared with females not exposed to cyberbullying victimization, those exposed once were more than twice as likely to report psychological distress (aOR, 2.42, 95% CI, 1.85 to 3.18), whereas those exposed at least twice were more than 4.5 times as likely to report psychological distress (aOR, 4.63; 95% CI, 3.45 to 6.21). The increased aORs for substance use, as a function of cyberbullying victimization frequency (Table 3), were not as pronounced as those for mental health-related outcomes (Table 2). For example, the aOR for non-medical drug use went from 1.34 (95% CI, 0.93 to 1.94) for those exposed to cyberbullying victimization once, to 1.64 (95% CI, 1.13 to 2.37) for those exposed 2 or more times, compared with those never exposed. Comparable estimates for binge drinking were 1.64 (95% CI, 1.17 to 2.30) and 1.77 (95% CI, 1.28 to 2.46), respectively. Females who experienced traditional forms of bullying victimization were about twice as likely to report suicidal ideation (aOR, 2.29; 95% CI, 1.77 to 2.96), psychological distress (aOR, 2.29; 95% CI, 1.84 to 2.85) and delinquency (aOR, 1.76; 95% CI, 1.37 to 2.28), as compared with females never exposed (Table 2). In contrast, exposure to traditional forms of bullying victimization was associated with a limited number of substance use outcomes, namely binge drinking (aOR, 1.35; 95% CI, 1.02 to 1.80) and non-medical drug use (aOR, 1.53; 95% CI, 1.13 to 2.09).

Among males, significant associations between exposure to cyberbullying victimization and mental health-related outcomes emerged primarily among those exposed to

Table 1. Sample Characteristics by Sex.

Study Characteristics	Female	Male	Test statistics
Cyberbullying victimization (%)			
Never	77.3	83.9	$\chi_{2\,(2)} = 41.51$; $P \leq 0.001$
Once	9.4	8.3	
Twice or more	13.3	7.8	
Traditional forms of bullying (%)	27.6	22.7	$\chi_{2\,(1)} = 15.23$; $P \leq 0.001$
Outcomes (%)			
Suicidal Ideation	18.0	9.1	$\chi_{2\,(1)} = 78.54$; $P < 0.001$
Psychological Distress	35.8	17.5	$\chi_{2\,(1)} = 2{,}023.30$; $P < 0.001$
Delinquency	25.9	35.8	$\chi_{2\,(1)} = 56.65$; $P < 0.001$
Tobacco use	6.9	8.4	$\chi_{2\,(1)} = 4.17$; $P < 0.05$
Binge drinking	27.6	27.0	$\chi_{2\,(1)} = 0.27$; $P > 0.05$
Cannabis use	20.4	23.1	$\chi_{2\,(1)} = 5.27$; $P < 0.05$
Non-medical drug use	12.5	14.0	$\chi_{2\,(1)} = 2.40$; $P > 0.05$
Ethnicity (%)			
White	64.5	60.6	$\chi_{2\,(6)} = 36.77$; $P < 0.001$
East and South East Asian	6.7	10.3	
South and West Asian	12.6	13.6	
Black	5.6	5.8	
Aboriginal/First nation	3.5	2.1	
Latin American	3.7	4.9	
Other Ethnicity	3.4	2.8	
Socio-economic status, M (SD)	7.01 (1.58)	7.14 (1.49)	$F_{(1,\,4938)} = 8.59$; $P < 0.01$
Age, M (SD)	15.23 (1.76)	15.14 (1.84)	$F_{(1,\,4938)} = 2.74$; $P > 0.05$

cyberbullying victimization at least twice. Compared with males never exposed, those exposed at least twice demonstrated an increased aOR for suicidal ideation (aOR, 2.46; 95% CI, 1.60 to 3.79), psychological distress (aOR, 2.26; 95% CI, 1.53 to 3.33), and delinquency (aOR, 1.86; 95% CI, 1.32 to 2.64). Associations between cyberbullying victimization and substance use-related outcomes among males were not statistically significant. Similarly, exposure to traditional forms of bullying victimization was not significantly associated with substance use among males (Table 3). In contrast, males exposed to traditional forms of bullying victimization were 2 to 3.5 times more likely to report suicidal ideation (aOR, 2.91; 95% CI, 2.01 to 4.21), psychological distress (aOR, 3.59; 95%CI, 2.74 to 4.71), and delinquency (aOR, 1.93; 95% CI, 1.56 to 2.37) (Table 2).

Significant sex differences in the strengths of the associations between cyberbullying victimization and the following outcomes emerged in combined analyses that included interaction terms between sex and cyberbullying victimization: psychological distress, suicidal ideation, delinquency, and cannabis use (see Supplemental Appendix Tables 1 and 2). The aOR for psychological distress, suicide ideation, delinquency, and cannabis use were magnified among females exposed to cyberbullying victimization as compared with males. Figure 1 presents the unadjusted sex differences in the prevalence of psychological distress, suicide ideation, and cannabis use by cyberbullying victimization frequency.

In the present study, 263 participants (5.3%) reported not using the internet and were classified as not exposed to cyberbullying victimization. To evaluate the impact of this decision, we repeated our analyses after removing these 263 participants. In all male, female, and combined sample analyses, the differences in the main effects (aORs) for cyberbullying victimization and interaction terms between sex and cyberbullying victimization were small, falling within |0.1| and had no discernible impact on the statistical reliability of the reported estimates.

Discussion

This study examined sex differences in the association between cyberbullying victimization and mental health, suicide ideation, and substance-related outcomes in a large, representative sample of students in grades 7 to 12 in Canada. The 1-y prevalence of adolescent cyberbullying victimization in the present study (19.8%) is comparable with estimates reported in previous literature.[32,33] The prevalence of cyberbullying victimization was significantly higher among female adolescents as compared with male adolescents. Also consistent with previous studies is the increased odds of adverse mental health outcomes (suicide ideation, psychological distress, and delinquency) associated with exposure to cyberbullying victimization.[14-17,29,34] Overall, a sex-specific trend was observed in the association between cyberbullying victimization and mental health outcomes. For example, whereas the odds for mental health problems increased in a step-wise fashion with more frequent exposure to cyberbullying victimization in female adolescents, this effect was absent among male adolescents. Furthermore, the association between cyberbullying

Table 2. Associations between cyberbullying victimization and mental health related outcomes, Adjusted Odds Ratios (aOR) and 95% Confidence Intervals (95%CI).

	Suicidal ideation		Psychological distress		Delinquency	
	Female	Male	Female	Male	Female	Male
Cyberbullying Victimization[a]						
Once	1.87*** (1.37 to 2.54)	1.68 (1.03 to 2.75)	2.42*** (1.85 to 3.18)	1.40 (0.94 to 2.08)	2.39*** (1.80 to 3.17)	2.07*** (1.47 to 2.92)
Twice or more	4.60*** (3.36 to 6.29)	2.46*** (1.60 to 3.79)	4.63*** (3.45 to 6.21)	2.26*** (1.53 to 3.33)	3.07*** (2.30 to 4.10)	1.86*** (1.32 to 2.64)
Traditional Victimization[b]	2.29 *** (1.77 to 2.96)	2.91*** (2.01 to 4.21)	2.29*** (1.84 to 2.85)	3.59*** (2.74 to 4.71)	1.76*** (1.37 to 2.28)	1.93*** (1.56 to 2.37)
Covariates						
Age	1.12*** (1.06 to 1.19)	1.19*** (1.09 to 1.31)	1.25*** (1.18 to 1.32)	1.32*** (1.24 to 1.41)	1.23*** (1.16 to 1.30)	1.21*** (1.15 to 1.28)
SES	0.82 (0.44 to 1.55)	0.84 (0.33 to 2.15)	0.66 (0.42 to 1.04)	0.72 (0.34 to 1.54)	0.82 (0.49 to 1.40)	0.69 (0.44 to 1.10)
Ethnicity[c]						
East and South East Asian	1.87** (1.31 to 2.67)	1.53 (0.96 to 2.46)	1.48* (1.03 to 2.15)	1.72** (1.23 to 2.40)	0.76 (0.53 to 1.08)	1.02 (0.74 to 1.41)
South and West Asian	1.08 (0.79 to 1.50)	0.87 (0.53 to 1.44)	1.45** (1.11 to 1.89)	1.41* (1.00 to 1.99)	0.82 (0.62 to 1.09)	1.08 (0.81 to 1.43)
Black	0.86 0.56 to 1.32)	1.15 (0.62 to 2.16)	1.46* (1.04 to 2.05)	1.07 (0.61 to 1.89)	1.51* (1.00 to 2.27)	1.51* (1.10 to 2.08)
Aboriginal and First Nation	2.05** (1.26 to 3.35)	0.66 (0.23 to 1.91)	1.73* (1.10 to 2.73)	0.81 (0.39 to 1.66)	1.49 (0.94 to 2.35)	1.13 (0.67 to 1.92)
Latin American	1.34 (0.79 to 2.26)	1.28 (0.56 to 2.89)	1.44 (0.90 to 2.31)	1.35 (0.69 to 2.62)	1.00 (0.62 to 1.61)	1.39 (0.86 to 2.25)
Other Ethnicity	1.43 (0.91 to 2.23)	1.35 (0.59 to 3.10)	1.55* (1.03 to 2.33)	1.91* (1.07 to 3.45)	1.13 (0.75 to 1.71)	1.21 (0.69 to 2.15)

[a]Reference group is never exposed to cyberbullying victimization.
[b]Reference group is never exposed to traditional bullying victimization.
[c]Reference group is White.
*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

victimization and mental health outcomes and cannabis use was stronger for female as compared with male adolescents.

With respect to associations between cyberbullying victimization and substance use-related outcomes, the results from the current study are consistent with past literature.[20-22,35] In the current study, cyberbullying victimization was significantly associated with substance use among females only. Also, the intensity of cyberbullying victimization did not produce a gradient effect on substance use among females. The absence of significant associations among male adolescents may be due in part to how substance use has been measured across studies. For instance, other studies have combined different types of substances into a single classification or measure,[20-22,35,36] which is in direct contrast to the approach in the present study, where each substance has been examined separately. Future research studies are needed with robust sample sizes capable of disentangling the independent and overlapping impact of cyberbullying victimization on different types of substance use. Further studies on sex differences in the association between cyberbullying victimization and substance use should be conducted to confirm our current findings.

Consistent with previous literature, adolescent females reported significantly higher prevalence of cyberbullying victimization than their male counterparts.[37] This disproportionate risk for victimization could be partially explained by gender-specific social media utilization patterns. For example, evidence indicates that female adolescents are more likely to use social media for social relationship purposes than their male peers[38] and are more likely to be victims of relational aggression.[39] Importantly, cyberbullying victimization is characteristically similar to the experience of indirect and relational aggression; that is, it excludes physical contact and involves the process of social exclusion as well as the development and spreading of malicious rumours, but in the cyberspace context. Although not possible with the 2013 OSDUHS dataset, it would be prudent for future work to take into consideration the independent and potentially intersecting experiences of cyberbullying victimization, indirect aggression, and relational aggression on adolescent mental health outcomes to understand the extent to which these experiences overlap, but also, their contributions to the mental health and substance use sequelae considered in the present study.

Table 3. Associations between Cyberbullying Victimization and Substance Use-Related Outcomes, Adjusted Odds Ratios (aOR) and 95% Confidence Intervals (95% CI).

	Tobacco Use		Cannabis Use		Binge Drinking		Non-Medical Drug Use	
	Female	Male	Female	Male	Female	Male	Female	Male
Cyberbullying Victimization[a]								
Once	1.82*	1.38	2.06***	0.96	1.64**	1.54	1.34	1.42
	(1.05 to 3.17)	(0.78 to 2.46)	(1.47 to 2.89)	(0.61 to 1.51)	(1.17 to 2.30)	(0.95 to 2.47)	(0.93 to 1.94)	(0.91 to 2.21)
Twice or more	3.40***	1.90	3.15***	1.50	1.77**	1.60	1.64**	1.46
	(1.90 to 6.09)	(1.01 to 3.56)	(2.15 to 4.61)	(0.96 to 2.32)	(1.28 to 2.46)	(0.98 to 2.60)	(1.13 to 2.37)	(0.90 to 2.36)
Traditional Victimization[b]	1.20	1.22	1.12	0.92	1.35*	1.00	1.53**	1.28
	(0.75 to 1.90)	(0.77 to 1.94)	(0.82 to 1.53)	(0.67 to 1.27)	(1.02 to 1.80)	(0.71 to 1.41)	(1.13 to 2.09)	(0.93 to 1.78)
Covariates								
Age	1.60***	1.60***	1.75***	1.68***	2.06***	2.32***	1.12***	1.12**
	(1.45 to 1.76)	(1.43 to 1.80)	(1.63 to 1.89)	(1.54 to 1.83)	(1.91 to 2.23)	(2.09 to 2.57)	(1.05 to 1.19)	(1.04 to 1.20)
SES	0.66	1.62	0.75	0.71	1.15	0.73	1.05	0.77
	(0.21 to 2.05)	(0.70 to 3.75)	(0.40 to 1.44)	(0.34 to 1.47)	(0.67 to 1.97)	(0.36 to 1.48)	(0.55 to 1.99)	(0.38 to 1.57)
Ethnicity[c]								
East and South East Asian	0.33*	0.63	0.38***	0.36***	0.27***	0.21***	1.10	1.33
	(1.11 to 0.98)	(0.31 to 1.28)	(0.22 to 0.65)	(0.22 to 0.59)	(0.16 to 0.44)	(0.11 to 0.39)	(0.68 to 1.79)	(0.92 to 1.93)
South and West Asian	0.87	0.75	0.37***	0.56**	0.22***	0.15***	2.20***	1.22
	(0.51 to 1.47)	(0.45 to 1.26)	(0.24 to 0.57)	(0.39 to 0.81)	(0.14 to 0.34)	(0.09 to 0.26)	(1.61 to 3.00)	(0.84 to 1.78)
Black	0.97	1.26	0.66*	0.64	0.37**	0.30**	1.77*	1.23
	0.48 to 1.96)	(0.59 to 2.68)	(0.44 to 1.00)	(0.39 to 1.03)	(0.21 to 0.65)	(0.14 to 0.61)	(1.09 to 2.87)	(0.70 to 2.14)
Aboriginal and First Nation	1.63	2.15	1.04	1.45	1.10	1.34	1.20	0.93
	(0.85 to 3.12)	(0.82 to 5.58)	(0.64 to 1.69)	(0.81 to 2.61)	(0.69 to 1.74)	(0.67 to 2.63)	(0.63 to 2.31)	(0.40 to 2.15)
Latin American	0.96	2.59**	0.68	0.78	0.56	0.52	1.40	2.19
	(0.43 to 2.14)	(1.35 to 4.96)	(0.37 to 1.23)	(0.41 to 1.50)	(0.29 to 1.09)	(0.25 to 1.11)	(0.80 to 2.45)	(1.22 to 3.94)
Other Ethnicity	1.20	2.20	0.32	0.87	0.65	1.48	1.55	0.93
	(0.47 to 3.09)	(0.92 to 5.22)	(0.12 to 0.88)	(0.43 to 1.75)	(0.31 to 1.35)	(0.75 to 2.93)	(0.91 to 2.65)	(0.44 to 1.97)

[a]Reference group is never exposed to cyberbullying victimization.
[b]Reference group is never exposed to traditional forms of bullying victimization.
[c]Reference group is White.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Our findings corroborate previous work pointing to a vulnerability among female adolescents for experiencing emotional problems and suicidal ideation when exposed to cyberbullying victimization. For instance, in a meta-analysis by Kowalski et al.,[11] the authors reported that sex significantly moderated the association between cyberbullying victimization and depression, with females being more negatively affected by cyberbullying victimization than males. Other work has made a clear and compelling case that female adolescents are more vulnerable to interpersonal stress as well as emotional problems. [24-26,40] A study by Lewinsohn et al.[41] as well as Wunderlich et al.[42] demonstrated a similar sex-specific association with suicide attempt rates, with rates among female adolescents significantly higher than their male counterparts. It is possible that, through their elevated vulnerability to interpersonal stress, females' risk for emotional problems may be exacerbated in the context of cyberbullying victimization, relative to males. In sum, our findings highlight the risks associated with cyberbullying victimization for all adolescents, and particularly for female adolescents.

The adverse effects of traditional forms of bullying victimization on adolescent mental health problems in the present sample are well documented.[43-46] In this regard, our study corroborates the finding that traditional bullying is associated with increased odds of suicide ideation, psychological distress, and delinquency.

Based on evidence arising from this study, front-line practitioners need to be attuned to the possibility that adolescents may be exposed to cyberbullying victimization.[47-49] Specifically, taking a history about the indicators of cyberbullying from parents or caregivers separately from the child or adolescent may be warranted to discern the child/adolescents source for distress and to appropriately plan interventions. Tools and checklists that have the potential to support the identification and response to these experiences have been developed.[48,50]

There are several notable limitations to the current study. The cross-sectional design renders it impossible to demonstrate the temporal relationship between respondents' exposure to cyberbullying victimization and the outcomes. Furthermore, the authors acknowledge the limitations of relying on a self-report single item to assess traditional bullying, cyberbullying, and suicide ideation, which reduces measurement sensitivity. Also, although the measure of psychological distress captures symptoms of depression and anxiety, it does not provide information on clinical levels

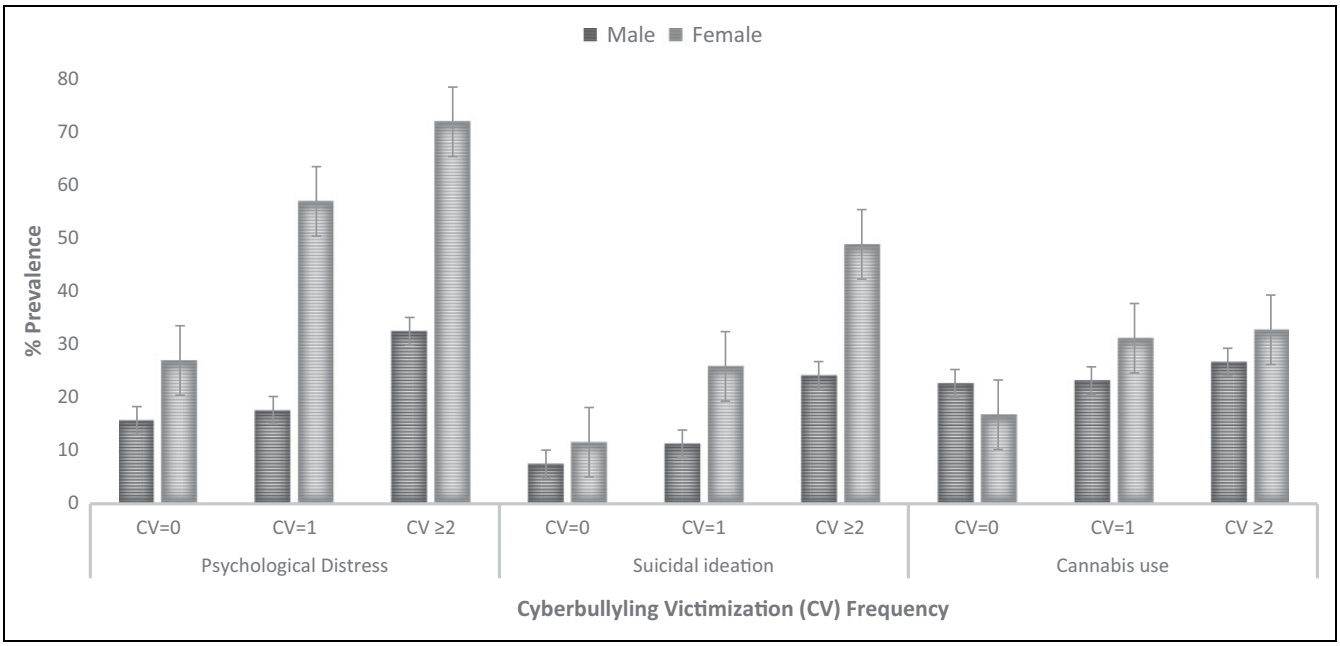

Figure 1. Sex differences in the prevalence of mental health and substance use-related outcomes by cyberbullying victimization (CV) frequency.

of depression and anxiety. Furthermore, despite a high co-occurrence rate of cyberbullying perpetration and victimization, perpetration was not controlled in the analysis, as it was not measured in OSDUHS 2013. Among others, screen time (time spent online) is a possible confounder that may be contributing to the reported associations between cyberbullying victimization and outcomes. We were unable to include this variable in the current study because the specific measure of cyber-screen time was unavailable in 2013 OSDUHS. The present study was based on secondary analyses of existing data. There is a need for replication and extension in future, primary studies that comprehensively assess and evaluate the antecedents, correlates, and outcomes of cyberbullying experiences.

Despite these limitations, the present study expands our current understanding of cyberbullying by estimating sex differences in the prevalence of cyberbullying victimization and its association with mental health and substance use-related outcomes in a large, representative sample of adolescents in Canada. Also, the current study controlled for potential confounding effects of traditional bullying victimization, which allowed us to estimate the unique contributions of cyberbullying victimization on mental health and substance-related outcomes. Our findings indicate that cyberbullying victimization has a stronger association with mental health problems and substance use in females and these associations may be distinct from the potential sex-specific impacts of traditional bullying victimization.

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Supplemental Material

Supplemental material for this article is available online.

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