



Cyberbullying and suicide ideation among Hong Kong adolescents: The mitigating effects of life satisfaction with family, classmates and academic results



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ABSTRACT

Notably cyberbullying victimization is a known risk factor of suicidal behavior among adolescents. In 2016, in Hong Kong, 36 adolescent suicides were identified, which significantly exceeded the annual average number of around 20 between the period from 2003 to 2015. The present study examines three hypotheses of whether life satisfaction with family, classmates and academic results mitigate the relationship between cyberbullying victimization and suicide ideation. All the mitigation effects were examined by mediation analysis using bootstrapping. A representative cross-sectional data of school-based sample of 3,522 Hong Kong adolescents in 2016 were used. 11.9% and 21.8% of the Hong Kong adolescents reported cyberbullying victimization and suicide ideation, respectively in the past year. After adjusting for gender and age, the present results show a 148% (OR = 2.48, 95% CI [1.99, 3.09]) likelihood increase of suicidal ideation on adolescents with cyberbullying victimization. This study further reveals that overall life satisfaction partially mitigates the relationship between cyberbullying victimization and suicide ideation ($b = 0.17$, 95% CI [0.10, 0.25]). Moreover, combatting the development of suicide ideation in the presence of cyberbullying, life satisfaction with family ($b = 0.19$, 95% CI [0.12, 0.26]) can confer much more resilience than satisfaction with classmates ($b = 0.08$, 95% CI [0.05, 0.13]) and academic achievements ($b = 0.03$, 95% CI [0.01, 0.05]). Therefore, life satisfaction, especially with family relationships, could confer resilience and should be taken into account in suicide preventive programs for adolescents.

1. Introduction

Globally (Nock et al., 2008; Wasserman et al., 2015), as well as in Hong Kong, suicide is one of the leading causes of death among the young population. Alarming, 36 student suicides occurred in 2016 with 20 taken place in the first four months of that year, which astoundingly exceeded the usual annual number of student suicides in Hong Kong, which was around 20 between the period from 2003 to 2015 (Cheng et al., 2017). Furthermore, at a global level, suicide in adolescents is an important public health problem as its suicide rate has been increasing in many countries. Therefore, evidence-based prevention programs are much need for effective intervention and prevention. Since potentially suicidal ideation has serious consequences, including substantial psychological effects, increased risks of subsequent suicide attempts, and deaths (Bergen et al., 2012; Borges et al., 2010), a better

understanding of suicidal ideation may help health professionals to sooner identify the at-risk adolescents and provide them with the help they need.

Cyberbullying is defined as “willful and repeated harm inflicted through the use of computers, cell phones and other electronic devices” (Hinduja and Patchin, 2010). In general, cyberbullying involves sending harassing or threatening messages, posting humiliating comments or threatening someone online, and the effects of cyberbullying are more severe because wider audiences can be reached through the internet, and the materials can be stored online, resulting in the victims reliving denigrating experiences more often (Patchin and Hinduja, 2006). In a recent study, about 23% Hong Kong adolescents reported being cyberbullied in the past month (Wong et al., 2014).

Cyberbullying has been identified as a risk factor for depression and anxiety symptoms (Navarro et al., 2015) as well as suicide ideation

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(Van Geel, Vedder, and Tanilon, 2014). Although there are few studies focusing on the relationship between cyberbullying and suicidal ideation, the results suggest that cyberbullying is as strongly related to suicidal ideation as traditional bullying (Hay and Meldrum, 2010; Hinduja and Patchin, 2010; Schneider et al., 2012). In some studies, they show that the victims of cyberbullying are more likely to report suicide ideation than those who experience physical or verbal bullying (Alavi et al., 2015; Van Geel et al., 2014).

While efforts have been made to understand the association between cyberbullying and suicide ideation, far less attention has been paid to the factors that confer resilience against the development of suicide ideation/behavior in the face of cyberbullying (Brailovskaia et al., 2018; Litwiller and Brausch, 2013). According to the Bi-Dimensional Framework (Johnson, 2016), a variable has to meet three criteria to be viewed as conferring resilience: (1) It should comprise of a separate dimension to risk and ease the association between risk and outcome; (2) It should be viewed as existing on a bipolar continuum with its inverse amplifying the association between risk and outcome; and (3) It should be a psychological construct, such as a set of positive beliefs.

Life satisfaction is the subjective assessment of an individual towards his or her life quality on the basis of self-defined standards, including overall life satisfaction and specific life satisfaction. Overall life satisfaction is the general assessments of individuals on the quality of life, and specific life satisfaction is concrete assessments of individuals on different living environments for students such as satisfaction with family life, satisfaction with classmates and satisfaction with academic results, etc. (Seligson et al., 2003; Yao et al., 2014). Life satisfaction has demonstrated convergent and discriminant validity with other components of well-being which suggest that it provides valid information of well-being shared with other well-being components (Zou et al., 2013). According to previous studies, life satisfaction is proved to be negatively related to cyberbullying (Leung et al., 2018) and could significantly predict suicide ideation in adolescents (Hossain et al., 2016; Morales-Vives and Dueñas, 2018; Yao et al., 2014). However, up until now, facing cyberbullying among adolescents, it remains unclear whether life satisfaction could confer resilience against the development of suicide ideation. For them, home and school are the two settings which their lives mainly relate to. Overall life satisfaction might mask the students' important relationships with their families or schools (Moore et al., 2012). Further exploration is thus needed to determine which specific life satisfaction such as satisfaction with family life, satisfaction with classmates, and satisfaction with academic results is more sensitive to cyberbullying than others.

With this background, this study aims to examine the mitigating effects of life satisfaction on the association between cyberbullying victimization and suicide ideation among Hong Kong adolescents. Furthermore, the mitigating effects of the specific life satisfaction with family, classmates and academic results, respectively, on the association between cyberbullying victimization and suicide ideation among Hong Kong adolescents are examined and compared. Therefore, a simple mediation model was examined by including the overall life satisfaction as hypothetical mediator in the relationship between cyberbullying victimization and suicide ideation. Besides, a parallel multiple mediator model including satisfaction with family life, satisfaction with classmates, and satisfaction with academic results was analyzed as hypothetical mediators between cyberbullying victimization and suicide ideation.

2. Methods

2.1. Data and participants

The data used were from the Youth Sexuality Study, 2016 (YSS of the Family Planning Association of Hong Kong (“FPAHK”)). The YSS assessed the adolescents' social relationships, sex knowledge, attitudes

and experiences, problem behaviors and psychological status. With the help of the Education Bureau, a simple random cluster sample stratified by 4 general districts, namely Hong Kong Island, Kowloon, New Territories West and New Territories East, were conducted. The schools were randomly selected from the registered list of schools and all classes were surveyed from the selected schools. The students who enrolled in full-time middle and high schools (Grade 7 to Grade 12) were investigated. The sample consists of a total of 3907 students. Before the analyses, the cases with missing values on the investigated variables were excluded. Thus, 3522 cases with a mean age of 15.26 (SD = 1.93) were enrolled into the final analyses where 1978 (56.2%) were boys and 1,544 (43.8%) were girls. The survey was conducted in accordance with the ethical guidelines. The questionnaire was completed through a supervised self-administered approach. In the survey, the students were reassured of confidentiality and anonymity.

2.2. Measures

Cyberbullying victimization during the past year was assessed by a single item of “Have you been bullied online in the past twelve months, i.e., posting rumors about you, threatening or abusing you, or passing sexual remarks on you?” and the response was binary, Yes = 1 and No = 0. Suicidal ideation was asked as “Have you ever seriously considered killing yourself in the past one year?” This variable is also a dichotomous variable, Yes = 1 and No = 0.

Overall life satisfaction in this study was measured by the satisfaction with life scale (“SWLS”) (Diener et al., 1985). The SWLS is a 5-item self-report instrument used to assess the overall cognitive judgements of one's life satisfaction. The response is answered in a 7-point Likert Scale, ranging from 1 = “strongly disagree” to 7 = “strongly agree”. The Chinese version of the SWLS has been well validated and showed good reliability and validity among Chinese adolescents (Shek, 1992). In this study, the score ranged from 5 to 35, and Cronbach's α was 0.96. According to the cutoff value (Diener et al., 1985), the sum score was recoded as 1 (extremely dissatisfied) to 7 (extremely satisfied).

Satisfaction with family life, classmates and academic results was measured by single items. The respondents were asked about whether they were satisfied with their family life, classmates and academic results, respectively. Each item was rated on a 5-point Likert Scale, ranging from 1 = “very dissatisfied” to 5 = “very satisfied”.

2.3. Analytic strategies

Descriptive analyses including simple counting, percentages, mean values, standard deviations, and missing values were conducted to describe the demographics and other characteristics of the samples. In the following analyses, missing data were managed by the means of listwise deletion. The associations between investigated variables were assessed by logistic regression and multiple linear regression analyses. Two mediation models using model 4 of the macro process were analyzed to explain the process from cyberbullying victimization to suicide ideation. Mediation is one way to explain the process or mechanism by which one variable affects another (MacKinnon et al., 2007). A simple mediation model explores into whether the relation between two variables is explained in part by a third variable, or by a mediator (Frazier et al., 2004). A parallel multiple mediator model allows two or more mediators between the predictor variable and the outcome variable in a single model (Preacher and Hayes, 2008) to compare the sizes of the indirect effect through different mediators (Hayes, 2014). All the mediation effects were examined by the bootstrapping procedure (5000 times), providing 95% confidence intervals.

Bootstrapping is a well-known nonparametric approach to test a hypothesis that makes no assumptions on the sampling distributions or the shape of the distributions of the variables (Efron and Tibshirani, 1994; Mooney et al., 1993). Bootstrapping is suggested to be a way to circumvent the power problem by asymmetries and other forms of non-

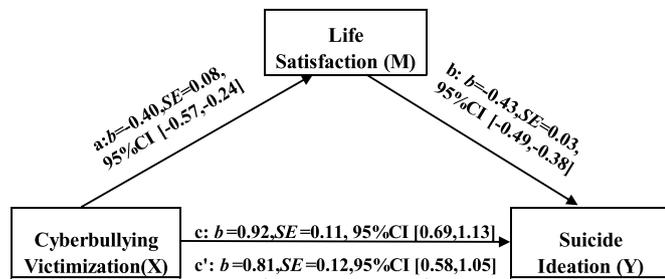


Fig. 1. Simple mediation model including cyberbullying victimization(X), Overall life satisfaction(M), and suicide ideation(Y).
 Note: *c* = total effect, *c'* = direct effect; *b* = standardized regression coefficient, SE = standard error, CI = confidence interval. Covariates are age and gender.
 The indirect effect of cyberbullying victimization on suicide ideation through life satisfaction was *b* = 0.17, SE = 0.04, 95% CI [0.10, 0.25].

normality in the sampling distribution of the indirect effect (Lockwood and MacKinnon, 1998; Shrout and Bolger, 2002), and it can yield references that are more likely to be accurate than when the normal theory approach is used (Hayes, 2014). According to Baron and Kenny (1986), variable M can be regarded as a mediator if (1) X(predictor) significantly predicts Y(outcome); (2) X significantly predicts M; and (3) M significantly predicts Y controlling for X. Statistically, significant mediation effects were inferred if the 95% confidence interval of the mean estimates did not include zero (Preacher and Hayes, 2008). All the mediation analyses in this study were conducted with SPSS 24.0 and the macro process 3.1 (<http://processmacro.org/index.html>).

A simple mediation was conducted to examine the mitigating role of overall life satisfaction in the associations between cyberbullying victimization and suicide ideation (see Fig. 1). In this mediation model, the relationship between cyberbullying victimization (predictor, X) and suicide ideation (outcome, Y) was denoted by *c* (the total effect). The path from cyberbullying victimization to overall life satisfaction (mediator, M) was denoted by *a*. The path from overall life satisfaction to suicide ideation was denoted by *b*. The direct effect of cyberbullying victimization on suicide ideation after including the mediator was denoted by path *c'*. Age and gender were controlled in this model.

As presented in Fig. 2, satisfaction with family life, satisfaction with classmates, and satisfaction with academic results were examined as mediators between cyberbullying victimization and suicide ideation in the multiple mediator model. Relationship between cyberbullying victimization (predictor, X) and suicide ideation (outcome, Y) was denoted by *c* (the total effect). The relationship between cyberbullying victimization with the proposed mediators(Mi) was denoted by path Ai. The path Bi denoted the relationships between multiple mediators and suicide ideation. The direct effect of cyberbullying victimization on suicide ideation after the inclusion of the three mediators (i.e., satisfaction with family life, satisfaction with classmates, and satisfaction with academic results) was denoted by path *c'*. Age and gender were also employed as the covariates in this model.

3. Results

Table 1 gives the descriptive analyses of the present samples, 11.9% of the adolescents reported having been cyberbullied during the past twelve months and 21.8% of the adolescents were found to have suicide ideation in the past year in Hong Kong. Furthermore, after adjusting for gender and age, the risk of suicide ideation among Hong Kong adolescents with cyberbullying victimization was 2.48 times higher than among adolescents without being cyberbullied (OR = 2.48, 95% CI [1.99, 3.09]).

Fig. 1 illustrates a simple mediation model which examines the mitigating role of overall life satisfaction in the associations between cyberbullying victimization and suicide ideation. As presented in Fig. 1,

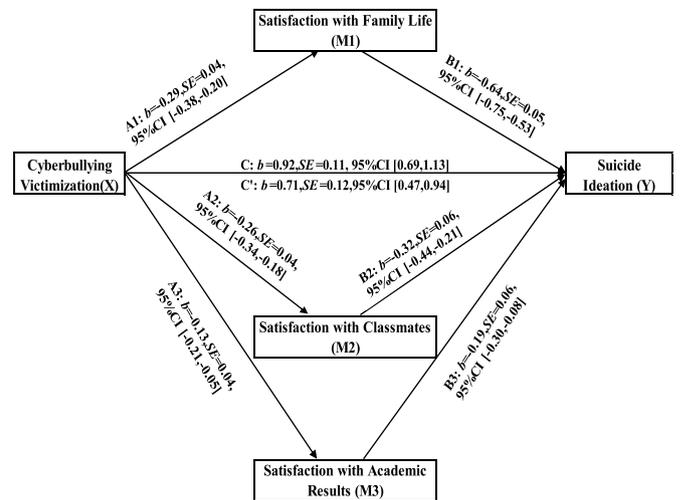


Fig. 2. Mediation model including cyberbullying victimization(X), satisfaction with family life(M1), satisfaction with classmates(M2), satisfaction with academic results(M3) and suicide ideation(Y).
 Note: *c* = total effect, *c'* = direct effect; *b* = standardized regression coefficient, SE = standard error, CI = confidence interval. Covariates are age and gender.
 The indirect effect of cyberbullying victimization on suicide ideation through satisfaction with family life was *b* = 0.19, SE = 0.03, 95% CI [0.12, 0.26].
 The indirect effect of cyberbullying victimization on suicide ideation through satisfaction with classmates was *b* = 0.08, SE = 0.02, 95% CI [0.05, 0.13].
 The indirect effect of cyberbullying victimization on suicide ideation through satisfaction with academic results was *b* = 0.03, SE = 0.01, 95% CI [0.01, 0.05].

significant effects of cyberbullying victimization on overall life satisfaction (path *a*: *b* = -0.40, *p* < 0.001, 95% CI [-0.57, -0.24]) and suicide ideation (path *c*: *b* = 0.92, *p* < 0.001, 95% CI [0.69, 1.13]) are found. In addition, overall life satisfaction is significantly associated with suicide ideation (path *b*: *b* = -0.43, *p* < 0.001, 95% CI [-0.49, -0.38]). Further, the bootstrapped mediation analyses show the indirect effect (*ab*) of cyberbullying victimization on suicide ideation through life satisfaction is significant (*b* = 0.17, SE = 0.04, 95% CI [0.10, 0.25]). After the inclusion of overall life satisfaction, the effect of cyberbullying victimization on suicide ideation is reduced but nonetheless remains significant (path *c'*: *b* = 0.81, SE = 0.12, 95% CI [0.58, 1.05]). The 95% confidence interval does not include zero shows significant mitigation effects of overall life satisfaction (Preacher and Hayes, 2008). Thus, the overall life satisfaction is a significant mitigator that partially mitigates the association between cyberbullying victimization and suicide ideation.

As presented in Fig. 2, satisfaction with family life, satisfaction with classmates, and satisfaction with academic results are examined as mediators between cyberbullying victimization and suicide ideation in the multiple mediator model. The total indirect effect of cyberbullying victimization on suicide ideation through satisfaction with family life, satisfaction with classmates, and satisfaction with academic results is 0.30 (95% CI [0.21, 0.39]). The specific indirect effect of cyberbullying victimization on suicide ideation through satisfaction with family life is 0.19 (95% CI [0.12, 0.26]), through satisfaction with classmates is 0.08 (95% CI [0.05, 0.13]), and through satisfaction with academic results is 0.03 (95% CI [0.01, 0.05]). Therefore, the association between cyberbullying victimization and suicide ideation is partially mitigated by satisfaction with family life, satisfaction with classmates, and satisfaction with academic results, respectively. In addition, satisfaction with family life accounts for the largest indirect effect, followed by satisfaction with classmates, and satisfaction with academic results.

4. Discussion

In Hong Kong, 11.9% of the adolescents reported having been

Table 1
Descriptive Information about the Participants (N = 3907).

Variables	N (%)	M(SD)	Missing Values N (%)
Gender			0(0%)
Male	2243(57.4%)		
Female	1664(42.6%)		
Age		15.26(1.93)	86(2.2%)
Overall Life Satisfaction (1 “very dissatisfied” to 7 “very satisfied”)		4.31(1.37)	81(2.1%)
Satisfaction with Family Life (1 “very dissatisfied” to 5 “very satisfied”)		3.68(0.87)	63(1.6%)
Satisfaction with Classmates (1 “very dissatisfied” to 5 “very satisfied”)		3.88(0.73)	23(0.6%)
Satisfaction with Academic Results (1 “very dissatisfied” to 5 “very satisfied”)		2.93(0.81)	22(0.6%)
Cyberbullying Victimization	464(11.9%)		22(0.6%)
Suicide Ideation	820(21.8%)		150(3.8%)

cyberbullied during the past twelve months and 21.8% of them reported suicide ideation in the past year. After controlling for gender and age, the present result shows a 148% likelihood increase of suicidal ideation on adolescents with cyberbullying victimization (OR = 2.48, 95% CI [1.99, 3.09]). The results are also similar to the existing studies (Hay and Meldrum, 2010; Hinduja and Patchin, 2010; Schneider et al., 2012). Cyberbullying is positively associated with suicide ideation in the present sample of adolescents in Hong Kong. The relative high prevalence rate of cyberbullying coupled with the alarming high risk of suicidality in cyberbullying victimization thus calls for more prevention and intervention programs.

The present simple mediation model further indicates that overall life satisfaction partially mitigates the relationship between cyberbullying victimization and suicide ideation. As cyberbullying victimization is in itself an independent risk factor of suicide ideation, simultaneously, there are existing studies which suggest that high levels of emotional, cognitive and psychological well-being can confer resilience against cyberbullying and suicidality (Brailovskaia et al., 2018). Mediation analyses in this study reveal that life satisfaction only partially mitigates the increased risk of suicide ideation in adolescents who suffer from cyberbullying victimization. Nonetheless, life satisfaction can ease the association between cyberbullying and suicide ideation, with its inverse amplifying the association between risk and outcome. Moreover, life satisfaction is defined as the degree to which a person positively evaluates the overall quality of his/her life as a whole (Veenhoven, 1996), which can therefore be viewed as a positive psychological construct. As such, according to Johnson's Bi-Dimensional Framework (2016), the present results demonstrate that facing cyberbullying among adolescents, improving life satisfaction may be an effective strategy to confer resilience against the development of suicide ideation.

Furthermore, the present multiple mediator model shows that the relationship between cyberbullying victimization and suicide ideation is partially mitigated by satisfaction with family life, satisfaction with classmates, and satisfaction with academic results, respectively. According to previous studies, students who received more social support from family and friends reported greater life satisfaction (Kong and You, 2013). Individuals who perceive high levels of available social support are optimistic, and hence possess a strong sense of self efficacy, positive evaluation of self, low anxiety, and positive expectations in social interactions (Seth et al., 2016). Interestingly, another important finding from the present study reveals that satisfaction with family life accounts for the largest indirect effect, followed by satisfaction with classmates, and satisfaction with academic results. The result indicates that among Hong Kong adolescents, in the presence of cyberbullying, perceived satisfaction with family rather than satisfaction with school life can confer much more resilience against the development of suicide ideation. Among the Chinese communities, followed by friends, family

has been shown to be the most important source of social support (Chang et al., 2018; Chen et al., 2014). Similarly, the present results reveal that family members may also play a defining role in the well-being of the teenagers in Hong Kong, followed by their friends in school and/or at work.

In terms of the clinical implication on suicide prevention, firstly, the results of the current study suggest that awareness of the risks inherent in the increased access to the internet and the possible increased risk of cyberbullying are important information for health care professionals. Compared to those bullied by more traditional means, adolescents who are cyberbullied are less likely to report and seek help, thus decreasing their levels of social support and putting them at a greater risk of suicidal ideation (Bonanno and Hymel, 2013). Unlike traditional forms of bullying, cyberbullying has characteristics that make it much more pernicious than traditional bullying in that such as regardless of time and place, the victims may continue to receive emails, Facebook or Twitter messages or text messages, and the possibility of widespread dissemination of demeaning or threatening materials to a large audience of peers (Alavi et al., 2015). Therefore, timely interventions of bystanders such as teachers, parents, or peers would be well advised to ask whether the youth is being threatened or demeaned on the social media, such as on Facebook, emails, and texting and provide the necessary social support to the students undergoing cyberbullying victimization.

Furthermore, the present mediation results suggest that in addition to the risk factors in clinical and preventive programs for adolescents' suicidality, it is equally important to account for the presence of resilience factors such as life satisfaction. Among other components of subjective well-being, life satisfaction is seen as the most stable as well as the key indicator of subjective well-being (Ehrhardt et al., 2000). In particular, satisfaction with family life, classmates and academic results could be the priority to focus on. Moreover, since satisfaction with family life most significantly alter the negative impact of cyberbullying, it may also be more effective to confer resilience. Thus, a special focus should be put on working with families to improve their awareness of cyberbullying on their children, together with enhancing family relationships for early identification and intervention to prevent cyberbullied adolescents from suicidality. In addition, it should be appreciated that students face a great number of challenges and stressors related to school life. Regarding school life, there should be a significant shift away from a functionalist view on children and adolescents to seeing them as more than just learners and promoting their rights and needs in school (Crede et al., 2015). The change from curriculum focused to student-centered learning experiences would be beneficial to improving school life experience to build up resiliency (Sham et al., 2019).

It must however be borne in mind that this mediation study has several limitations that must be considered in interpreting the findings.

In the first place, a major limitation of this current study is that suicide ideation and specific life satisfaction are measured by single items, thus comprehensive measures are needed in future studies. Moreover, as the current study is a cross-sectional design, the observed associations do not necessarily indicate causality. Furthermore, since only students who enrolled in full-time middle/high schools are investigated in this study, generalization of the results on other age or societal groups other than adolescents is not possible.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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