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Bullying Victimization and Substance Use Among U.S. Adolescents: Mediation by Depression

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Abstract

This study examined the link between bullying victimization and substance use and tested the mediating role of depression in male and female adolescents. Cross-sectional data were collected from a national sample of 1,495 tenth graders who participated in the 2005/06 Health Behaviors in School-aged Children U.S. Survey. Victimization, depression and substance use were all measured as latent variables. Substance use was measured by drinking alcohol, being drunk, smoking cigarettes and using marijuana in the past 30 days. Multiple-group structural equation modeling showed that victimization was linked to substance use in both males and females. Among females, depression was positively associated with both victimization and substance use and mediated the association between the two latter variables. Among males, depression was associated with victimization but not with substance use. Results highlight the elevated risk for victimization and substance use problems that depression poses among adolescent females.

Keywords

Victimization; Depression; Substance use; Mediation; Sex difference

Bullying victimization is a prevalent problem among adolescents (Nansel et al. 2001) and it is associated with a wide range of psychosomatic adjustment problems such as loneliness, depression, and suicidal risk (Gini and Pozzoli 2009; Hawker and Boulton 2000). However, few studies have examined the association between victimization and substance use in adolescents. Among these few studies, Kuntsche and Gmel (2004) reported increased likelihood of victimization among Swiss adolescents who drink alcohol alone. Sullivan et al. (2006) showed that physical and relational victimization were related to alcohol and marijuana use in African Americans. In a national sample, Mitchell et al. (2007) found that online victimization was independently associated with depression and substance use. Tharp-Taylor

et al. (2009) found that victimization from mental and physical bullying predicted later substance use in early adolescence. Although research to date suggests that victimization may elevate subsequent risks for substance use, two gaps in the literature deserve attention. First, only one previous study used a nationally representative sample of U.S. adolescents and it focused on online victimization alone. Second, no previous study that we are aware of has examined potential mediation of the association between victimization and substance use.

Depression as a Candidate Mediator

A body of literature suggests a positive association between victimization and depression across various forms of bullying (Hawker and Boulton 2000). Seals and Young (2003) found that victims involved in traditional bullying are at higher risks for depression in both male and female adolescents. Similarly, Menesini et al. (2009) reported that victims were more likely to experience depressive symptoms than bullies and uninvolved students. Recent research further suggests that the association with depression is not limited to traditional victimization but extends to cyber victimization. Specifically, harassment through the Internet was associated with elevated depressive symptoms, suggesting a link between cyber victimization and depressive mood (e.g., Ybarra 2004). Taken together, research thus far suggests an association between depression and victimization in all forms of bullying among both male and female adolescents.

Studies have also shown that depression predicts later substance use in adolescence, especially among females (Needham 2007; Wu et al. 2008). Sihvola and colleagues (2008) suggested that early onset of depressive disorders was predictive of multiple substance use outcomes including daily smoking, frequent alcohol use and frequent illicit drug use 3 year later. Other studies further suggest that sex moderates the relationship between depression and substance use. Acierno and colleagues (2000) found that depression was a risk factor for smoking among female but not male adolescents. Similarly, Fleming and colleagues (2008) suggested that depressive symptoms had a stronger association with substance use in females. The stronger relationship between depression and substance use among females fits nicely into existing research showing elevated depression among females which emerges during adolescence (e.g., Galambos et al. 2004). Based on existing sex differences in depression, it is reasonable to postulate that depression may pose elevated risk for victimization and substance use problems among female adolescents.

Using a nationally representative sample of tenth grade U.S. adolescents, the purposes of the present study were to (1) examine the association between victimization and substance use; (2) test whether the level of depression mediates the association between victimization and substance use; and (3) evaluate potential sex differences in the mediational pathways. We hypothesized a positive association between victimization and substance use and that the level of depression would mediate this relationship. We also expected that this mediational pathway would be stronger among female than male adolescents.

Method

Sample and Procedures

Data on adolescents' involvement in bullying victimization, depression, and substance use were obtained from the 2005/2006 U.S. Health Behavior in School-aged Children (HBSC) survey. The sample was collected through a multiple-stage stratified design, with clustering by school districts, stratification by census regions and grades, and oversampling of minority groups. Youth assent and parental consent were obtained as required by the participating school districts. The study protocol was reviewed and approved by the Institutional Review Board of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

Measures

Demographic Variables—Demographic variables included sex, race/ethnicity (Caucasian, African-American, Hispanic, and others), and Family Affluence Scale (FAS; Currie et al. 2008).

Victimization—Victimization was measured by seven items from the Olweus' revised bully/victim instrument (Olweus 1996) and two additional items assessing adolescent cyber victimization. Adolescents were asked "how often have you been bullied at school in the past couple of months" in nine different ways. The content of each item is outlined in Fig. 1. For each item, three categories were created: "never," "once or twice," and "more than twice." The victimization items in this study showed desirable reliability (Cronbach's $\alpha=.84$).

Depression—Depressive symptoms were measured by six items derived from the Center for Epidemiologic Studies Depression Scale (Radloff 1977). These items were validated in adolescents and demonstrated good reliability (Dahlberg et al. 2005; Orpinas 1993). Participants were asked how often in the past 30 days they: (1) were very sad; (2) were grouchy or irritable, or in a bad mood; (3) felt hopeless about the future; (4) felt like not eating or eating more than usual; (5) slept a lot more or a lot less than usual; and (6) had difficulty concentrating on their school work. Responses were coded one to five: "never," "seldom," "sometimes," "often," and "always." This scale showed a desirable reliability in the current sample (Cronbach's $\alpha=.82$).

Substance Use—Adolescent substance use was measured by number of occasions in the past 30 days they had (1) smoked cigarettes; (2) drunk alcohol; (3) been drunk and (4) used marijuana. For each item, four categories were created: "never," "once or twice," "three to five times" and "more than five times." This scale had a desirable reliability in this sample (Cronbach's $\alpha=.82$).

Data Analyses

Analyses were conducted following three steps. First, measurement invariance was tested for victimization, depression and substance use, with sex as the grouping variable. Second, a multiple-group structural equation model (SEM) was used to examine the association between victimization and substance use and whether the association differed by sex. Third, the mediating role of depression in the association between victimization and substance use was tested using a multiple-group SEM by sex. The theoretical model is shown in Fig. 1.

The software package Mplus (Muthén and Muthén 1998–2008) was used to account for the sampling design of this study (complex survey feature) and to conduct the mediation analysis. Direct and indirect effects were reported using the MODEL INDIRECT option in Mplus. We used three goodness-of-fit indexes: CFI, TLI, and RMSEA (Browne and Cudeck 1993). Usually CFI and TLI values above .95 and RMSEA less than or equal to .06 indicate acceptable fit (Hu and Bentler 1999). Chi-square statistics were less suitable in our study, given the large sample size.

Results

Sample Characteristics

Among 1,559 adolescents in grade 10 who completed the HBSC survey of 2005, 64 (4.1%) were excluded from our analyses due to missing data. The remaining 1,495 adolescents included 49.3% male and 45.9% Caucasian, 18.9% African American, 23.8% Hispanic, and 11.4% other racial/ethnic background, with a mean age of 16.1.

Step 1 Measurement invariance (multiple-group CFA)

All three models showed acceptable model fit, which indicated that the assumption of measurement invariance was met for further structural equation models.

Step 2 Association between victimization and substance Use

The SEM provided acceptable indices of goodness-of-fit, CFI=.972, TLI=.973, and RMSEA=.051. Victimization was positively associated with substance use in both males ($\beta=0.365$, $p<.001$) and females ($\beta=0.196$, $p=.004$). Race/ethnicity and FAS were not statistically associated with substance use, when victimization was controlled for in the model. R-squares were .151 for male and .050 for female. To test moderation by sex, the regression coefficients of victimization on substance use were fixed for males and females. The restricted chi-square, $\chi^2(1)=3.129$, $p=.07$, indicated that the moderation by sex approached significance.

Step 3 Mediating role of depression

The derived mediation model is shown in Fig. 2, with standardized regression coefficients for both males and females. Indices of goodness-of-fit of the mediation model showed a desirable fit, CFI=.962, TLI=.963, and RMSEA=.048. The covariates, race/ethnicity and FAS, were not statistically associated with substance use, when victimization and depression were controlled for. For both males and females, victimization was significantly associated with depression. The more frequently the individual was victimized, the higher the level of depression he or she reported (male: $\beta=0.380$, $p<.001$; female: $\beta=0.422$, $p<.001$). Depression was not associated with substance use for males ($\beta=0.052$, $p=.289$) but was positively associated with substance use for females ($\beta=0.261$, $p=.003$). After controlling for depression, victimization was not directly associated with substance use for females ($\beta=0.069$, $p=.223$), indicating the possibility of a mediation effect. Among males, victimization had a significant direct relationship with substance use ($\beta=0.332$, $p<.001$).

The results of direct, indirect and total effect from the output of Mplus further indicated a sex difference in the relationships among victimization, depression, and substance use. For both males and females, victimization had a significant total effect on substance use (male: $\beta=0.365$, $p<.001$; females: $\beta=0.234$, $p=.028$). However, for males, the association between victimization and substance use was direct ($\beta=0.344$, $p<.001$) and was not mediated by depression ($\beta=0.021$, $p=.276$). For females, the association between victimization and substance use was mediated by depression (indirect effect: $\beta=0.144$, $p=.023$). After controlling for depression, there was no significant direct effect of victimization on substance use among females ($\beta=0.090$, $p=.223$).

Discussion

This study examined the mediating role of depression in the association between victimization and substance use in a national sample of U.S. tenth-grade adolescents. Our results indicated that victimization was positively associated with substance use in both males and females. Mediation analysis further showed that depression mediated the association between victimization and substance use for females only. No significant mediation effect of depression was found for males.

The significant relationship between victimization and substance use in both males and females is consistent with a growing number of studies (e.g., Mitchell et al. 2007; Tharp-Taylor et al. 2009). Our results extend previous research by showing that increased victimization was linked to elevated substance use in a nationally representative sample of U.S. adolescents. The findings suggest that victimization was not only associated with psychosocial adjustment problems (Gini and Pozzoli 2009; Nansel et al. 2001) but also linked to adolescent substance

use. The significant, positive association between victimization and substance use underscores the need to intervene with bullying behaviors among adolescents.

Depression was associated with victimization for both males and females, but it was only associated with substance use for females. In females, there was no significant relationship between victimization and substance use after controlling for depression, indicating the possibility of a mediation effect. Sex difference in the association between depression and substance use is consistent with research showing that the association between depression and substance use is stronger for females than males (Acierno et al. 2000; Fleming et al. 2008). Our findings fit into existing research showing higher levels of depression among female adolescents (Galambos et al. 2004). It is possible that female adolescents were more affected by relational problems that were due to victimization, contributing to the moderation by sex in the mediational pathway from victimization to substance use.

The significant mediation by depression in female adolescents suggests that victimization among females may lead to elevated depressive symptoms, resulting in more substance use. Due to the use of cross-sectional data in this study, we cannot rule out alternative mechanisms. For example, a recent longitudinal study showed that the association between depression and victimization may be reciprocal (Sweeting et al. 2006). Yet in another longitudinal study, the path from victimization to depression was found to be stronger than the path from depression to victimization (Bond et al. 2001), which is consistent with our hypothesized mediational pathway as outlined in Fig. 1.

This study addressed existing gaps in the literature in three ways. First, the use of a nationally representative sample of U.S. adolescents enabled us to overcome previous limitations regarding the generalizability of findings. Second, unlike many studies that focused on traditional victimization, we measured victimization with multiple indicators that included both traditional and cyber victimization. Third, we measured victimization, depression and adolescent substance use as latent variables, which enabled us to model measurement errors to obtain unattenuated estimates on associations among the three key variables in the current study.

The findings of this study should be interpreted in light of its limitations. First, due to the cross-sectional nature of the data, our ability to draw strong mediational conclusions is limited. Although there is previous research supporting the direction of the relationships proposed in our mediation model (Bond et al. 2001; Tharp-Taylor et al. 2009), longitudinal studies are needed to further determine the direction of effects. Second, we only included tenth-grade adolescents in our analysis. The proposed mediational pathway remains to be tested in other age groups. Third, we did not measure each substance separately and we cannot rule out the possibility that each substance might be associated with victimization and depression in different ways.

Despite its limitations, the present study contributes to the literature by elucidating the inter-relationships between victimization, depressive symptoms, and substance use among tenth-grade US adolescents. We found that, among female adolescents, depression mediated the relationship between victimization and substance use. Yet depression was only associated with victimization and not with substance use among male adolescents. The identification of depression as a mediating factor for female adolescents but not male adolescents may provide valuable information to guide prevention efforts. For example, our results emphasize the importance of addressing depression among female adolescents who are victims of bullying to prevent the risk for subsequent substance use. Future studies should test this relationship longitudinally and explore multiple pathways from bullying victimization to adolescent substance use, particularly for male adolescents.

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References

- Acierno R, Kilpatrick D, Resnick H, Saunders B, De Arellano M, Best C. Assault, PTSD, family substance use, and depression as risk factors for cigarette use in youth: Findings from the National Survey of Adolescents. *Journal of Trauma Stress* 2000;13:381–396.
- Bond L, Carlin J, Thomas L, Rubin K, Patton G. Does bullying cause emotional problems? A prospective study of young teenagers. *British Medical Journal* 2001;323:480–484. [PubMed: 11532838]
- Browne, MW.; Cudeck, R. Alternative ways of assessing model fit. In: Bollen, KA.; Long, JS., editors. *Testing structural equation models*. Newbury Park, CA: Sage; 1993. p. 136-162.
- Currie C, Molcho M, Boyce W, Holstein B, Torsheim T, Richter M. Researching health inequalities in adolescents: The development of the Health Behaviour in School-Aged Children (HBSC) Family Affluence Scale. *Social Science and Medicine* 2008;66:1429–1436. [PubMed: 18179852]
- Dahlberg, LL.; Toal, SB.; Swahn, M.; Behrens, C. *Measuring violence-related attitudes, behaviors, and influences among youths: A compendium of assessment tools*. Atlanta, GA: The National Center for Injury Prevention and Control; 2005.
- Fleming C, Mason W, Mazza J, Abbott R, Catalano R. Latent growth modeling of the relationship between depressive symptoms and substance use during adolescence. *Psychology of Addictive Behaviors* 2008;22:186–197. [PubMed: 18540716]
- Galambos NL, Leadbeater BJ, Barker ET. Gender differences in and risk factors in depression in adolescence: A 4-year longitudinal study. *International Journal of Behavioral Development* 2004;28:16–25.
- Gini G, Pozzoli T. Association between bullying and psychosomatic problems: A meta-analysis. *Pediatrics* 2009;123:1059–1065. [PubMed: 19255040]
- Hawker D, Boulton M. Twenty years' research on peer victimization and psychosocial maladjustment: A meta-analytic review of cross-sectional studies. *Journal of Child Psychology and Psychiatry* 2000;41:441–455. [PubMed: 10836674]
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling* 1999;6:1–55.
- Kuntsche E, Gmel G. Emotional wellbeing and violence among social and solitary risky single occasion drinkers in adolescence. *Addiction* 2004;99:331–339. [PubMed: 14982546]
- Menesini E, Modena M, Tani F. Bullying and victimization in adolescence: Concurrent and stable roles and psychological health symptoms. *Journal of Genetic Psychology* 2009;170:115–133. [PubMed: 19492729]
- Mitchell KJ, Ybarra M, Finkelhor D. The relative importance of online victimization in understanding depression, delinquency, and substance use. *Child Maltreatment* 2007;12:314–324. [PubMed: 17954938]
- Muthén, LK.; Muthén, BO. *Mplus user's guide*. 5th ed.. Los Angeles: Authors; 1998–2008.
- Nansel T, Overpeck M, Pilla R, Ruan W, Simons-Morton B, Scheidt P. Bullying behaviors among US youth: Prevalence and association with psychosocial adjustment. *Journal of the American Medical Association* 2001;285:2094–2100. [PubMed: 11311098]
- Needham BL. Gender differences in trajectories of depressive symptomatology and substance use during the transition from adolescence to young adulthood. *Social Science & Medicine* 2007;65:1166–1179. [PubMed: 17574316]
- Olweus, D. *The revised Olweus Bully/Victim Questionnaire*. Research Center for Health Promotion (HIMIL). Patent N-5015. 1996.
- Orpinas, P. Unpublished doctoral dissertation. Houston: University of Texas Health Science Center; 1993. Skills training and social influences for violence prevention in middle schools: A curriculum evaluation.

- Radloff L. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement* 1977;1:385–401.
- Seals D, Young J. Bullying and victimization: Prevalence and relationship to gender, grade level, ethnicity, self-esteem, and depression. *Adolescence* 2003;38:735–747. [PubMed: 15053498]
- Sihvola E, Rose R, Dick D, Pulkkinen L, Marttunen M, Kaprio J. Early-onset depressive disorders predict the use of addictive substances in adolescence: A prospective study of adolescent Finnish twins. *Addiction* 2008;103:2045–2053. [PubMed: 18855807]
- Sullivan T, Farrell A, Kliewer W. Peer victimization in early adolescence: Association between physical and relational victimization and drug use, aggression, and delinquent behaviors among urban middle school students. *Developmental Psychopathology* 2006;18:119–137.
- Sweeting H, Young R, West P, Der G. Peer victimization and depression in early-mid adolescence: A longitudinal study. *British Journal of Educational Psychology* 2006;76:577–594. [PubMed: 16953963]
- Tharp-Taylor S, Haviland A, D'Amico E. Victimization from mental and physical bullying and substance use in early adolescence. *Addictive Behaviors* 2009;34:561–567. [PubMed: 19398162]
- Wu P, Hoven C, Liu X, Fuller C, Fan B, Musa G, et al. The relationship between depressive symptom levels and subsequent increases in substance use among youth with severe emotional disturbance. *Journal of Studies on Alcohol and Drugs* 2008;69:520–527. [PubMed: 18612567]
- Ybarra M. Linkages between depressive symptomatology and Internet harassment among young regular Internet users. *Cyberpsychology and Behavior* 2004;7:247–257. [PubMed: 15140367]

Fig. 1.

Theoretical model of the mediating role of depression. This figure shows the hypothesized mediating role of depression on the association of victimization with substance use. All three variables (i.e., victimization, depression and substance use) are latent variables measured by a few indicators. Socio-demographic variables were included as covariates to the outcome variable (i.e., substance use)

Fig. 2.

Results of the mediation model. The multiple-group SEM provided acceptable indices of goodness-of-fit, CFI=.962, TLI=.963, and RMSEA=.048. The path weights in the graph were standardized