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EMPIRICAL RESEARCH

Cyber Bullying and Physical Bullying in Adolescent Suicide: The Role of Violent Behavior and Substance Use

Brett J. Litwiller · Amy M. Brausch

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Abstract The impact of bullying in all forms on the mental health and safety of adolescents is of particular interest, especially in the wake of new methods of bullying that victimize youths through technology. The current study examined the relationship between victimization from both physical and cyber bullying and adolescent suicidal behavior. Violent behavior, substance use, and unsafe sexual behavior were tested as mediators between two forms of bullying, cyber and physical, and suicidal behavior. Data were taken from a large risk-behavior screening study with a sample of 4,693 public high school students (mean age = 16.11, 47 % female). The study's findings showed that both physical bullying and cyber bullying associated with substance use, violent behavior, unsafe sexual behavior, and suicidal behavior. Substance use, violent behavior, and unsafe sexual behavior also all associated with suicidal behavior. Substance use and violent behavior partially mediated the relationship between both forms of bullying and suicidal behavior. The comparable amount of variance in suicidal behavior accounted for by both cyber bullying and physical bullying underscores the important of further cyber bullying research. The direct association of each risk behavior with suicidal behavior also underscores the importance of reducing risk behaviors. Moreover, the role of violence and substance use as mediating behaviors offers an explanation of how risk behaviors can increase an adolescent's likelihood of suicidal behavior through habituation to physical pain and psychological anxiety.

Keywords Adolescence · Suicide · Bullying · Cyber bullying · Substance abuse · Violence

B. J. Litwiller
Industrial/Organizational Psychology, University of Oklahoma, 455 West Lindsey Street, Norman, OK 73019, USA

A. M. Brausch (✉)
Department of Psychology, Western Kentucky University, 1906 College Heights Blvd., Bowling Green, KY 42101, USA
e-mail: amy.brausch@wku.edu

Introduction

For American youth between the ages of 10 and 24, suicide ranks as the third leading cause of death (Murphy et al. 2012). Recent increases in adolescent suicide rates have motivated attempts to identify and understand the causes of adolescent suicide (Cash and Bridge 2009). Research findings (e.g., Klomek et al. 2010) and media reports of adolescent suicides (e.g., Cloud 2010) have identified bullying as an environmental stress that substantially increases an adolescent's suicide risk. A large amount of theoretical and empirical evidence supports this relationship between bullying and adolescent suicide. Bullying consists of intentional and repeated aggression that involves a disparity of power between the victim and the perpetrator (Olweus 1993). Recent studies of bullying prevalence show that approximately 20–35 % of adolescents report involvement in bullying as a bully, victim, or both (Levy et al. 2012). Given the high prevalence of bullying in adolescence and its association with suicide risk, it is crucial to further study this relationship.

Bullying in adolescence has been identified as occurring in different forms, with different prevalence rates for the various forms. Bullying behavior generally takes one of four forms: physical (i.e., assault), verbal (i.e., threats or insults), relational (exclusion or rumor spreading), and cyber (i.e., aggressive texts or social network posts) (Wang et al. 2009). Previous findings from longitudinal and cross-

sectional research have shown that each of these types of bullying can increase the risk of a victimized adolescent experiencing suicidal thoughts and behaviors (Klomek et al. 2010). Several differences between cyber bullying and more traditional forms of bullying have been identified. Specifically, cyber bullying is perceived as different from other types of bullying by victims (Slonje and Smith 2008) more likely to occur outside of school (Smith et al. 2008). Unlike victims of the other three types of bullying, victims of cyber bullying are more likely to report depressive symptoms than cyber bullies or bully-victims (Wang et al. 2011). Current research suggests that cyber bullying occurs with less prevalence than the other types of bullying, but still affects around 10–20 % percent of adolescents who report being bullied or bullying others electronically (Ybarra, Boyd, et al. 2012; Ybarra, Mitchell, et al. 2012). The experience of bullying in childhood and adolescence is important to study as research has shown that childhood bullying predicts adult suicide attempts (Meltzer et al. 2011) as well as suicide deaths by the age of 25 (Klomek et al. 2009).

Although each form of bullying has been shown to relate to adolescent suicide, significant uncertainty exists regarding the relationship between victimization from bullying and suicidal behavior. Currently, there are no empirically supported answers to questions of why victimization increases the risk for suicidal behavior or how the effects of cyber bullying compare to the effects of specific traditional forms of bullying (e.g., physical, verbal, and relational). A widely supported theory of suicide etiology, called the interpersonal theory of suicide, appears to have tremendous value for explaining the effects of bullying on suicidal behavior (Joiner 2005). The interpersonal theory of suicide posits that thwarted belongingness and perceived burdensomeness cause suicidal desire. The theory further states that individuals with high amounts of suicidal desire only become capable of engaging in suicidal behavior through habituation to the physically painful and anxiety provoking nature of self-harming behaviors (Van Orden et al. 2010).

Bullying and Suicidal Behavior

In the context of the interpersonal theory of suicide, victimization from bullying would represent an environmental cause of thwarted belongingness, perceived burdensomeness, and ultimately suicidal desire. Victimization from bullying has been shown to associate with low self-esteem (Juvonen et al. 2000), anxiety (Kumpulainen et al. 1998), and depression (Fekkes et al. 2004; Klomek et al. 2007). Low self-esteem, anxiety, and depression also have all been identified as correlates of thwarted belongingness and perceived burdensomeness (Van Orden et al. 2008; Van Orden et al. 2012). To result in suicidal behavior, victimized adolescents who are habituated to the physical and psychological pain associated with suicidal behavior may then develop suicidal desire and capability. Consequently, one attempt to explain how bullying results in suicidal behavior is to examine risk behaviors that co-vary with both bullying and suicidal behavior and may habituate adolescents to physical pain and psychological anxiety. Joiner (2005) proposed that painful and provocative behaviors, such as drug use, prostitution, and violent behavior may provide pathways to an acquired capability for suicidal behavior. In adults, these painful and provocative behaviors have been shown to increase an individual's capability for self-harm (Van Orden et al. 2008). The current study attempted to examine some behaviors that may result in habituation to physical pain and emotional distress that also relate to bullying in an adolescent sample.

Risk Behaviors

Several painful and provocative behaviors have been identified consistently as behaviors that relate to both bullying and adolescent suicidal behavior. Of all such risk behaviors, alcohol and/or illicit drug use has most frequently been shown to relate to bullying and suicidal behavior. Victimization from bullying generally has been shown to associate with or predict adolescent alcohol/drug use (Mitchell et al. 2007; Windle 1994). Findings from these studies of bullying victimization and alcohol use suggest that experiences of bullying produce negative psychological states that increase the probability than an adolescent will engage in substance use. This view of alcohol use as a means to cope with negative affect is consistent with past research related to the etiology of adolescent substance use (Sher, Grekin, and Williams 2005). Findings from other studies also have shown substance use to increase an adolescent's risk of performing suicidal behaviors (Bolognini et al. 2003; Deykin and Buka 1994; Fombonne 1998; Spirito et al. 2003). These findings suggest that substance use may contribute to habituation of physical pain and psychological anxiety associated with self-harm. Specifically, substance use may enable adolescents already experiencing suicidal desire to perform suicidal behaviors by decreasing inhibition, encouraging self-harming behaviors, and exacerbating pre-existing negative moods (Gould et al. 1998).

Like substance use, the amount of violent or physically aggressive behavior exhibited by adolescents also relates positively to victimization from bullying and suicidal behavior. In particular, adolescents who experience physically violent victimization have been shown to be more likely to act violently towards others (Cleary 2000; Ma 2001; Nickerson and Slater 2009). Klomek et al. (2007) found that adolescents who reported being both a bully and

a victim of bullying were most at risk. Taken together, these findings related to bullying and the performance of violent behavior suggest a possible cyclical relationship between being a victim of violent bullying and violently bullying others. Additional studies also have shown that engaging in violent behavior increases the probability that an adolescent will perform suicidal behavior (Borowsky et al. 2001; Evans et al. 2001). The findings regarding bullying, violent behavior, and suicidal behavior support theoretical views that physical pain and psychological anxiety provoked by violent behavior may habituate adolescents to the physical and psychological pain associated with suicidal behavior (Joiner 2005).

Unsafe sexual behavior, such as unprotected sex, anonymous sex, or coerced sex, constitutes a third painful and provocative behavior that co-varies with both bullying and adolescent suicidal behavior. Specifically, adolescents who reported being victims of relational or verbal bullying have been found to be more likely to engage in unsafe sexual behavior (Zweig et al. 2002). These findings suggest that sexual behavior may represent a means of coping with negative psychological consequences of victimization. Investigations of these behaviors demonstrate that unsafe sexual behavior may have consequences comparable to victimization. Several studies have shown that unsafe sexual behavior increased the likelihood that an adolescent would engage in suicidal behavior (Houck et al. 2008; Silverman et al. 2001). Like violent behavior and substance use, repeated experiences of unsafe sexual behavior may habituate adolescents to the physical pain and psychological anxieties associated with suicidal behavior and exacerbate any suicidal desire caused by being a victim of bullying.

Rationale and Hypotheses

The present study attempted to examine the role of painful and provocative risk behaviors as potential explanations for how adolescents who are bullied acquire the ability to perform suicidal behaviors. This study also attempted to determine if a novel form of bullying, cyber bullying, had a similar relationship with suicidal behavior as a physical bullying. To examine these research questions, the study tested two different models that predicted adolescent suicidal behavior. Each model used a different form of bullying, cyber or physical, to predict suicidal behavior. Both models hypothesized that the amount of bullying experienced by an adolescent would positively predict substance use, violent behavior, unsafe sexual behavior, and ultimately suicidal behavior. Additionally, hypotheses presented by the models posited that substance use, violent behavior, and unsafe sexual behavior would each uniquely predict suicidal behavior and mediate the relationship between both forms of bullying and suicidal behavior. If supported as mediators, substance use, violent behavior, and unsafe sexual behavior would provide three related explanations for how adolescents who experienced bullying acquired the capability to perform suicidal behavior.

Method

Participants and Procedure

Data for the current study were accessed from an existing database of a large-scale community mental health screening in a rural area of a Midwestern state in the US The data collection occurred in the spring of 2008 and was collected from 27 high schools in a seven-county region. All high schools in the region received the opportunity to participate in the survey. Regional enrollment for all high schools for the academic year was 7,232 and 4,693 students completed the survey, for a participation rate of 65 %. A local coalition, sponsored by the community hospital, conducts biennial screenings of area high schools for prevalence and prevention purposes, and received approval from the hospital's Human Subjects Review Board. Similarly, the authors consulted with the university Institutional Review Board with whom both authors were previously affiliated, and received approval for analyzing an archival data set. The coalition utilized passive parental consent, and students were not asked to sign assent documents to protect confidentiality of students at schools with low enrollment (e.g., total student body <100).

Adolescents were between the ages of 14 and 19 years old ($M = 16.11$, $SD = 1.20$) and were all high school students. The ethnic distribution of the sample was 89 % White, 1.5 % Black, 1.5 % Hispanic, 1.0 % Asian, 2.0 % American Indian, 1.0 % Native Hawaiian or other Pacific Islander, and 3.6 % multi-racial. The sample had a near equal distribution of participants in the freshmen, sophomore, junior, and senior grade levels. Participant sex was equally distributed with 47 % percent of the sample male, 47 % female, and 6 % of participants not identifying a sex.

Data collection took place at schools attended by the adolescents during school days. Generally, data was collected from large groups of students who sat at individual desks in classrooms. Before beginning the survey, research assistants and staff from the coalition instructed adolescents that their participation was completely voluntary and that they could stop at any time for any reason. Students were told to mark their responses on a bubble sheet and avoid marking any identifying information on the response sheet or survey packet. Throughout the survey, project staff

members were present to collect response sheets and answer any participant questions.

Measures

During the study, adolescents completed a packet of survey questions which mainly included items from the Youth Risk Behavior Survey (YRBS; CDC 2008), but also included items written by coalition members or consulting board members to further assess health and risk behaviors of interest to the region. The Youth Risk Behavior Survey is a scale created by the Centers for Disease Control and Prevention (CDC) to assess the prevalence of risk behaviors that contribute to the leading causes of death, disability, and social problems among youth and adults in the United States. The scale contains approximately 98 self-report items designed to measure the frequency and severity of behaviors within six categories: violent and self-injurious behavior, tobacco use, alcohol and other drug use, sexual behavior, unhealthy dietary behaviors, and physical inactivity (CDC 2008). Several studies have examined the psychometric properties of the YRBS. The results of these examinations indicate that the YRBS has sufficient levels of test–retest reliability and that adolescents accurately report behaviors on the measure (Brener et al. 1995, 2002, 2003). No formal subscales or scoring procedure exists for the YRBS. In the present study, subscales were created by grouping items by content, and also through the use of internal consistency analyses. Any item that lowered a subscale's alpha value below .70 was discarded. Through internal consistency analyses, six subscales were derived. These subscales measured physical bullying, cyber bullying, suicidal behavior, drug use, violence, and sexual behavior.

Physical Bullying

The physical bullying subscale consisted of 3 items from the Youth Risk Behavior Survey (YRBS; CDC 2008) intended to measure how frequently adolescents were victims of bullying at school. All items were presented with Likert scales that asked adolescents to rate how frequently they experienced physical bullying or fears of physical bullying victimization during the past 30 days (e.g., "On how many days did you not go to school because you felt you would be unsafe on your way to or from school?", "During the past 30 days, how many times has someone threatened or injured you with a weapon, such as gun, knife, or club on school property?", and "During the past 30 days, how often has someone threatened or injured you on school property?"). The 3 items were summed with higher scores corresponding to more experiences of being physically bullied. The subscale demonstrated a satisfactory level of internal consistency ($\alpha = .77$).

Cyber Bullying

The cyber bullying subscale consisted of 3 items written by coalition members intended to measure how frequently adolescents were bullied by peers through electronic communication mediums (i.e., text message, social networking). All items were presented with dichotomous scales that asked participants to respond "Yes" or "No" to questions about cyber bullying (e.g., "Has someone spread a rumor about you online, in a chat room, through a social networking website, in emails, or through a text message?", "Has there even been an inappropriate photo post of you online (illegal activity or sexually compromising)?", and "Has anyone sent you a threatening or aggressive, e-mail, instant message, or text message?"). The format of these items was consistent with the recommended item format for studying cyber bullying (Wang et al. 2009). The 3 items were summed with higher scores corresponding to more experiences of being victimized by cyber bullying. The subscale demonstrated a satisfactory level of internal consistency ($\alpha = .71$).

Suicidal Behavior

The suicidal behavior subscale contained four items from the Youth Risk Behavior Survey (YRBS; CDC 2008), which were used to assess how many suicidal thoughts and behaviors adolescents experienced during the past year. The items asked adolescents to respond "no" or "yes" to items measuring suicidal ideation (e.g., "During the past 12 months, did you ever seriously consider attempting suicide?"), suicide planning (e.g., "During the past 12 months did you make a plan about how you would attempt suicide?"), self-injury and suicide attempts (e.g., "During the past 12 months, how many times did you actually attempt suicide?"). The suicidal behavior subscale had good internal consistency ($\alpha = .88$).

Substance Use

The substance use subscale consisted of 17 items from Monitoring the Future survey (MTF; Johnston et al. 2009) and 7 coalition-authored items designed to assess adolescent's history of using alcohol, marijuana, inhalants, LSD, ecstasy, cocaine, crack, heroine, methamphetamine, tranquilizers, cigarettes, and smokeless tobacco. Adolescents rated their responses on Likert scales which assessed frequency of use. Higher ratings indicated more frequent, reckless, or earlier use of a specific substance (e.g., "During your life how many times have you used methamphetamines?"). The substance use subscale demonstrated sufficient internal consistency ($\alpha = .87$).

Violent Behavior

The violent behavior subscale contained 4 items from the Youth Risk Behavior Survey (YRBS; CDC 2008) which measured the violent or threatening behavior exhibited by adolescents. The items asked adolescents to rate how frequently they hurt another student, threatened another student, and carried a weapon during the last 30 days (e.g., "During the past 30 days, on how many days did you carry a gun?" or "During the past 30 days, how many times were you in a physical fight on school property?"). Adolescents rated their responses to each item on Likert scales. The violent behavior subscale had good internal consistency ($\alpha = .81$).

Sexual Behavior

The sexual behavior subscale consisted of 5 items from the Youth Risk Behavior Survey (YRBS; CDC 2008). These items measured how early adolescents began having sex, their number of sexual partners, their history of sexually transmitted disease, pregnancy, and the amount of protection they used while having sex. Adolescents rated their history of sexual behavior on Likert scales. A lower score indicated a lower amount of potentially dangerous sexual behavior (e.g., "The last time you had sexual intercourse, what one method did you or your partner use to prevent pregnancy?" or "During the past three months, with how many people did you have sexual intercourse?"). The sexual behavior subscale had a sufficient level of internal consistency ($\alpha = .87$).

Missing Data

As a result of the large scale nature of data collection and the limited amount of time available to complete the questionnaire, a number of participants failed to complete the survey or skipped survey items. Of the original 4,693 participants, only 3838 participants completed all items. Missing data were replaced by multiple imputation, a procedure for generating multiple simulated values for each missing data point (Schafer 1997) to create an analytic sample of 4,376. Complete data sets were created from the original data sets using the SPSS Missing Values 20 program. One thousand Monte Carlo Marko Chain imputations were calculated, with every 200 imputations used to create a total of 5 data sets. Statistical analyses were conducted on each data set and then combined to yield a single set of results applying "Rubin's rules" for combining the results of an analysis of multiple imputed data sets (Rubin 1987).

Results

Descriptive statistics and intercorrelations amongst study variables appear in Table 1. Prevalence rates of cyber bullying, physical bullying were comparable to prevalence rates from previously reviewed studies (e.g., Levy et al. 2012; Ybarra, Mitchell, et al. 2012) and the prevalence rate of suicidal ideation and suicidal behavior was higher than in previous studies. Subscale responses indicated that 33 % of adolescents reported being a victim of physical bullying, 23 % of adolescent reported being a victim of cyber bullying, and 30 % of adolescents reported experiencing suicidal ideation or performing suicidal behavior in the past year. All study variables were significantly correlated with each other. The observed correlations supported the two hypothesized multiple mediator models. To test both mediational models, a bootstrapping approach was used. The bootstrapping (or resampling) approach to mediational analysis enables the inclusion of multiple mediators in a single model that does not impose the assumption of normality of the sampling distribution (Preacher and Hayes 2008). This analytic approach provides more accurate Type 1 error rates and greater power for detecting mediating effects (Preacher and Hayes 2008). In models with multiple mediators, bootstrapping entails repeatedly sampling from the data set and estimating the total indirect effect and specific indirect effects in each resampled data set. These

Table 1 Subscale, Cronbach's alpha values, descriptive statistics and zero-order correlations between bullying, risk behaviors, and suicidal behavior

	Scale	α	*M*	*SD*	*Skew*	1	2	3	4	5	6
1	Physical bullying	.77	4.72	2.86	2.01	–					
2	Cyber bulling	.71	5.38	1.60	.60	.55*	–				
3	Substance use	.87	40.72	18.96	1.29	.70*	.57*	–			
4	Violence	.81	6.62	3.71	2.09	.79*	.53*	.63*	–		
5	Sexual behavior	.87	12.20	7.03	.48	.42*	.29*	.65*	.44*	–	
6	Suicidal behavior	.88	6.72	2.28	1.17	.73*	.68*	.74*	.67*	.45*	–

* $p < .001$

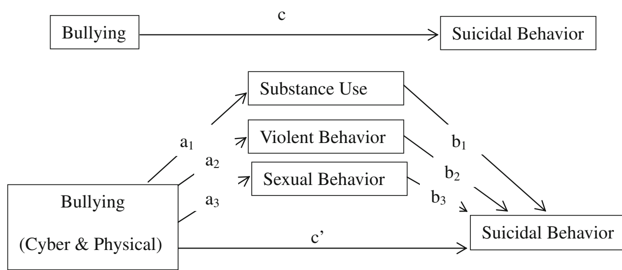

Fig. 1 Analytic diagram for the multiple mediation model proposed

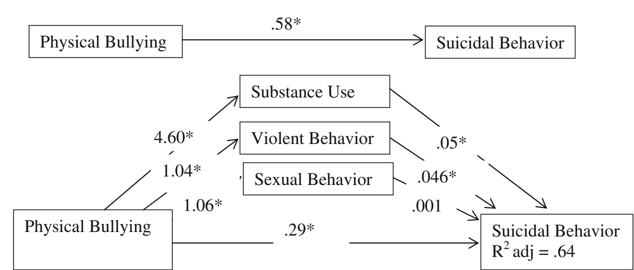

Fig. 2 Physical bullying, risk behaviors and suicidal behavior. * $p < .001$

estimates are used to construct confidence intervals for the total and specific indirect effects. The total indirect effect describes cumulatively how all of the mediators transmits the effect of the predictor variable on the outcome variable and the specific indirect effects describe how each individual mediator transmit the effect of the predictor variable on the outcome variable.

The analytic diagram (see Fig. 1) presents the conceptual meaning of each coefficient in both multiple mediator models. The "a" coefficients represent the effect of the predictor variable on each mediator, the "b" coefficients represent the effect of each mediator on suicidal behavior when controlling for the effect of the predictor variable, the "c" represents the total effect of the predictor on the outcome, and the "c′" coefficient represents the direct effect of the predictor variable on suicidal behavior. In addition to the variables featured in the analytic diagram, both multiple mediation models controlled for the effects of gender, age, and ethnicity. An SPSS Macro for multiple mediation was used to examine the hypotheses (Preacher and Hayes 2008). The analyses used 1000 bootstrap samples to create a population of indirect effects. This population of indirect effects enabled the creation of ninety-five percent confidence intervals that evaluated the significance and magnitude of indirect effects generated through the bootstrapping technique. A significant effect does not have a confidence interval that includes zero. The regression coefficients generated by both multiple mediation models are unstandardized. The scale of unstandardized coefficients is determined by the scale of measurement of variables included in the analysis Unstandardized metrics are the preferred metric in causal modeling because standardized effect sizes provide no additional meaning and can actually obscure interpretation of the effects of some predictors (Hayes 2009).

Results from the first mediation model showed that physical bullying had significant and positive direct effects on substance use, violent behavior, sexual behavior, and suicidal behavior. Tests of the direct effects of the mediators on the outcome showed that substance use and violent behavior had significant direct positive effects on suicidal behavior. Sexual behavior, however, did not have a significant direct effect on suicidal behavior in the presence of other mediators. The total effect of physical bullying on suicidal behavior was also significant and positive. Overall, the model that used physical bullying as a predictor explained 64 % of the variance in suicidal behavior (see Fig. 2).

The hypothesized mediators of physical bullying's effects on suicidal behavior had a significant total indirect effect on suicidal behavior and several significant specific indirect effects on suicidal behavior. The total indirect effect was significant ($CI_{.95} = .26, .32$) (see Table 2). Examination of the proportion of effects mediated shows that 50 % of the total effect of physical bullying on suicidal behavior was mediated by substance use and violent behavior. The specific indirect effects derived by the model indicate substance use ($CI_{.95} = .22, .27$) and violent behavior ($CI_{.95} = .02, .08$) both uniquely mediated the effects of physical bullying on suicidal behavior (see Table 2).

Results from the multiple mediator model that used cyber bullying as the predictor showed direct effects similar to the ones found by the physical bullying model. Specifically, results showed that cyber bullying had significant and positive direct effects on substance use, violent

Table 2 Total and specific mediated effects and their corresponding bootstrap confidence intervals for physical bullying and cyber bullying

Indirect Effects	Physical bullying			Cyber bullying		
	Estimate	SE	95 % CIs	Estimate	SE	95 % CIs
Substance use	.25	.011	(.22, .27)	.32	.012	(.28, .35)
Physical violence	.048	.02	(.02, .08)	.16	.01	(.14, .19)
Sexual behavior	<.001	.01	(.00, .001)	.003	.005	(.00, .015)
Total	.29	.01	(.26, .32)	.48	.013	(.45, .51)

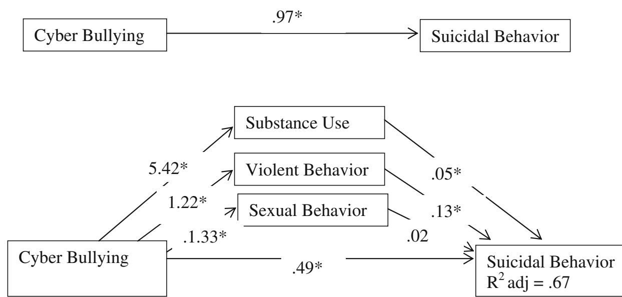

Fig. 3 Cyber bullying, risk behaviors and suicidal behavior. * $p < .001$

behavior, sexual behavior, and suicidal behavior. Tests of the direct effects of the mediators on the outcome showed that substance use and violent behavior had significant direct positive effects on suicidal behavior. Additionally, sexual behavior did not have a significant direct on suicidal behavior in the presence of other mediators. The total effect of cyber bullying on suicidal behavior was also significant and positive. Overall, the model that used cyber bullying as a predictor explained 67 % of the variance in suicidal behavior (see Fig. 3).

The hypothesized mediators of cyber bullying's effects on suicidal behavior had a significant total indirect effect on suicidal behavior and several significant specific indirect effects on suicidal behavior. The total indirect effect was significant ($CI_{.95} = .45, .51$) (see Table 2). Examination of the proportion of effects mediated showed that 48 % of the total effect of cyber bullying on suicidal behavior was partially mediated by substance use and violent behavior. The proportion of effect mediated in the cyber bullying model is substantially larger than the proportion of effect mediated in the physical bullying model. The specific indirect effects derived by the cyber bullying model indicated that substance use ($CI_{.95} = .28, .35$) and violent behavior ($CI_{.95} = .14, .19$) both uniquely mediated the effects of cyber bullying on suicidal behavior (see Table 2).

Discussion

With suicide remaining one of the leading causes of death for adolescents, recent research has emphasized the identification of factors in adolescent suicide risk (Brausch and Gutierrez 2010). Bullying victimization repeatedly has been found to associate with or predict adolescent suicide risk (Kim and Leventhal 2008). Although clear evidence for links between bullying victimization and suicide exists, no previous research has attempted to determine empirically why bullying might increase an adolescent's risk for suicidal behavior. Behavioral outcomes associated with being a victim of bullying may increase an adolescent's suicide risk (e.g., Wang et al. 2011).

Consequently, this study examined whether three behavioral outcomes frequently associated with bullying and suicidal behavior, substance use, violent behavior, and unsafe sexual behavior, mediated the frequently observed relationship between victimization from bullying and adolescent suicidal behavior. Two types of bullying were examined in this study, cyber bullying and physically violent bullying. Generally, the results revealed that both types of bullying, cyber and physical, positively predicted suicidal behavior, substance use, violent behavior, and unsafe sexual behavior. Cyber bullying accounted for slightly more variance in all four of these behaviors than physical bullying. Findings from the two models tested also showed that two risk behaviors, substance use and violent behavior, positively predicted adolescent suicidal behavior and partially mediated the relationship between both forms of bullying and suicidal behavior.

The role of physical bullying as a factor that may increase the risk of adolescent suicidal behavior supports previous cross-sectional and longitudinal research that has shown a relationship between the two variables (Klomek et al. 2010). The relationship between cyber bullying and suicidal behavior in the current study, however, extends findings from limited previous research on cyber bullying which used measures that were less behaviorally specific and did not include assessment of communication with social networks (Klomek et al. 2008; Hinduja and Patchin 2010). The current study also showed that cyber bullying had a similar sized effect on suicidal behavior, substance use, violent behavior, and unsafe sexual behavior as physical bullying. This finding provides further evidence of the potential consequences of cyber bullying. In contrast to physical bullying, cyber bullying has been found to be more difficult to avoid, anonymous, and likely to coincide with other forms of bullying (Li 2005). Although not specifically examined in this study, victims of cyber bullying may more be likely to experience negative psychological states, thus contributing to feelings of thwarted belongingness and perceived burdensomeness. If cyber bullying activates feeling like one does not belong or is a burden to others, an adolescent's risk of suicidal behavior may increase, especially if adolescents are also engaging in risk behaviors that may habituate them to pain and fear of death.

Bullying, Risk Behaviors and Suicide

The two models tested in this study supported this possible effect of cyber bullying by showing that substance use and violent behavior could explain how both physical bullying and cyber bullying increase suicidal behavior risk for adolescents. Correlates of victimization, such as low self-esteem (Juvonen et al. 2000), anxiety (Kumpulainen et al. 1998), and depression (Fekkes et al. 2004), could motivate

adolescents to use substances to cope with negative feelings. If an adolescent's substance use resulted in painful or provocative behaviors, such as self-injection, then the adolescent may acquire the capability to overcome the physical pain and psychological stress that prevents many people with suicidal desire from actually performing suicidal behavior (Joiner 2005). This possibility that substance use could help adolescents become more capable of performing suicidal behavior draws support from previous research that shows adolescent substance use to be one of the more frequently identified predictors of suicidal behavior for adolescents (e.g., Bolognini et al. 2003; Spirito et al. 2003).

Findings from both multiple mediator models suggest that violent behavior has a similar role as substance use in inoculating adolescents to physical pain and psychological fears that prevent suicidal behavior. Certain behaviors related to violent behavior, such as participating in physical fights, have been shown to increase suicidal behavior capability in adults (Van Orden et al. 2008). Many of the injury and pain outcomes associated with physical fights could slowly habituate adolescents to suicidal behavior. Moreover, the well-established presence of a victim-bully cycle (Ma 2000; Pellegrini and Bartini 2001) suggests that violent behavior may mediate the relationship between bullying victimization and suicidal behavior because adolescents who are bullied are more likely to bully others. This bullying of others could result in the same type of violent behavior that has been shown many time to increase an adolescent's risk of suicidal behavior (Borowsky et al. 2001; Evans et al. 2001; Swahn et al. 2008).

Unlike substance use and violent behavior, unsafe sexual behavior was not found to mediate the relationship between victimization from either form of bullying and suicidal behavior in this study. It was also not a significant predictor of suicidal behavior in either model. This lack of prediction indicates that unsafe sexual behavior by itself does not enable suicidal behavior. Especially painful and dangerous sexual behaviors that were not measured in this study, such as prostitution or sexual assault, may represent the only sexual behaviors that can habituate people to the physical and psychological pain associated with self-harm. Although unsafe sexual behavior did not predict suicidal behavior, both forms of bullying did predict sexual behavior. This finding provides the first known evidence of a link between bullying and sexual behavior and suggests that negative emotional states associated with bullying may still have life altering consequences for adolescents apart from suicidal behavior, substance use, and violent behavior.

Limitations

A number of limitations existed in this study as a result of the sample size, measures used, and cross-sectional study design. The large size of the sample likely inflated the statistical significance of several regression model findings. Although statistically significant, several findings from the study may possess lesser clinical significance than similar findings obtained from a smaller sample (Odgaard and Fowler 2010). The use of a cross-sectional design prevents the testing of directionality of the relationship between victimization and suicidal behavior. The use of self-report measures to assess victimization from bullying also may limit the findings because it excluded other frequently used methods of collecting victimization data, such as reports from parents, teachers, and peers, which could have improved the victimization measure and introduces the possibility of shared method variance. The bullying measures also contain several limitations. Specifically, discrepancies in the length assessed between the cyber bullying and physical bullying measures limit comparisons of the two forms of bullying in this study. Also, the combination of threats and actual experiences measured in both of the bullying measures reduce their construct validity and introduce a need for more precise measurement in future studies. As another measurement limitation, the measures of sexual behavior and substance used in this study were widely used measures of those constructs that did not specifically assess the pain and fear habituating aspects of substance use and sexual behavior.

Future Directions

Despite the above limitations, results from this study do provide the first empirically supported explanation for how bullying may increase suicide risk. Future research could extend the findings from this study by further examining the value of the Interpersonal Theory of Suicide (Joiner 2005) as an explanation for the relationship between bullying and suicidal behavior. Specifically, future studies related to bullying and suicide should measure constructs such as perceived burdensomeness, thwarted belongingness, suicidal behavior, and other painful or provocative behavior that could be included in a model to explain how bullying ultimately increases an adolescent's risk for suicidal behavior. With sufficient measurement of the various types of bullying, future research could also attempt to determine if relational, physical, verbal, and cyber bullying differentially affect suicidal behavior.

Conclusion

Models of adolescent risk behavior often examine how a sequence of events that lead to a risk behavior can occur as a result of exposure to certain risk factors (Compas et al. 1995). This cross-sectional study provides the first indication for

how bullying victimization may trigger a sequence of events that results in suicidal behavior. Rejection by peers and bullying specifically has been found to trigger psychological processes that result in externalizing behavior (Deater-Deckard 2001). Key findings from this study show that harmful externalizing behaviors that can develop during adolescence, such as substance use and violent behavior, mediate the effects between of both cyber and physical bullying on suicidal behavior. This finding draws support from theory regarding the importance of habituation to pain to acquiring the ability to perform self-injury (Joiner 2005) and provides modifiable behaviors that should receive attention in interventions aimed at preventing adolescent suicide. Professionals who aid adolescent victims of bullying should encourage healthy coping behaviors and support interventions that diminish the probability of an adolescent engaging in substance use or violent behavior.

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Author Biographies

Brett Litwiller is a Ph.D. candidate in Industrial/Organizational Psychology at the University of Oklahoma. He earned his Master's in Clinical Psychology from Eastern Illinois University. His major research interests include risk-taking behaviors in adolescents, as well as individual differences and organizational characteristics that influence physical and mental health outcomes experienced by employees in the workplace.

Amy Brausch is an Assistant Professor of Psychology at Western Kentucky University. She received her Ph.D. in Clinical Psychology from Northern Illinois University. Her major research interests encompass adolescent suicide and non-suicidal self-injury, risk-taking behaviors, body image, and disordered eating.