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Adolescent Cyberbullying and Weapon Carrying: Cross-Sectional and Longitudinal Associations

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Abstract

This study examines the cross-sectional and longitudinal associations between weapon carrying and cyberbullying (i.e., perpetration, victimization, and perpetration/victimization) and explore the relationship directions. Four waves of data were used from an ongoing longitudinal study. Participants were 1,042 adolescents, including 55.9 percent female, 31.7 percent Hispanic, 30.3 percent white, 26.6 percent African American, and 11.4 percent other, with a mean age of 15.1 years at baseline. Logistic regressions identified cross-sectional associations between weapon carrying and cyberbullying perpetration and victimization, but not for perpetration/victimization. Compared with their noninvolved counterparts, cyberbullying perpetrator were 1.97 times more likely to carry a weapon 1 year later and cyberbullying perpetrator/victims were 2.65 times more likely to carry a weapon one year later. Youth who had carried a weapon were 1.97 times more likely to be cyberbullying victims 1 year later and 1.70 times more likely to be a victim 2 years later, compared with their nonweapon-carrying counterparts. The findings highlight the importance of intervention programs targeting both cyberbullying perpetration and weapon carriage.

Keywords: cyberbullying, perpetration, victimization, perpetration/victimization, weapon carrying, adolescents

Introduction

ADOLESCENT WEAPON CARRYING has been associated with a range of other risky behaviors, including physical injury and hospitalization,[1] emotional distress,[2] substance use,[3] and early sexual debut.[4–6] According to the most recent Youth Risk Behavior Survey, 16.2 percent of youth reported carrying a weapon (e.g., knife, gun, club) during the past 30 days and 6 percent reported being physically threatened or hurt with a weapon on school property within the past 12 months.[7] Furthermore, weapon carrying in adolescence is predictive of weapon carrying in adulthood.[8] Thus, identifying factors that may explain adolescent weapon carrying is of great public health significance.

One possible reason for adolescent weapon carrying is the involvement in bullying, either as a victim or as a perpetrator.[9–11] Bullying is defined an aggressive act that is intended to cause harm or distress, is typically repeated over time, and reflects a power imbalance between the victim(s) and perpetrator(s).[12,13] Bullies may carry weapons to intimidate others, whereas victims may carry weapons for self-protection.[11] Indeed, a recent meta-analysis of 35 studies found that weapon carrying was significantly associated with both bullying perpetration and victimization.[14] Specifically, adolescents involved in any bullying—whether as bully, victim, or bully/victim (those who are both bully and victim)—all had higher odds of carrying a weapon compared with their noninvolved counterparts. Despite the documented link between weapon carrying and bullying, its association with cyberbullying, a closely related risk behavior to bullying, is unknown.

Cyberbullying is defined as ''bullying through the use of electronic venues, such as instant messaging, e-mail, chat rooms, websites, online games, social networking sites, and text messaging''[15(pS13)]. A systematic review of 58 studies reported that the prevalence of cyberbullying among United States middle and high school adolescents could range from 1 percent to 41 percent for perpetration, 3 percent to 72 percent for victimization, and 2 percent to 17 percent for perpetration and victimization combined.[16] This large discrepancy in range is likely due to the variability in how cyberbullying is defined and measured. Regardless of this vast range, involvement in cyberbullying has consistently been associated with a number of negative outcomes,[17]

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including depression,[18] social anxiety,[19] substance misuse,[20] and violent behavior.[20] Moreover, several studies have found higher incidence of suicidality among victims of cyberbullying.[21,22]

The conceptualization and comparison between cyberbullying and in-person bullying is ongoing. It is possible that cyberbullying is simply an extension of in-person bullying, as demonstrated by the strong correlation between online and offline experiences with bullying.[12,17,23,24] The distinct nature of cyberbullying—that is, the possibility of reaching a larger audience, relative anonymity, unlimited access to victims, lack of supervision, and inability to read nonverbal cues[25,26]—may make this behavior more dangerous than in-person bullying.[27,28] A study of Swiss and Australian adolescents found that cyberbullying victims reported higher levels of depressive symptoms than in-person bullying victims.[29] In another study, both cyberbullying perpetration and victimization contributed to unique variances in absenteeism, anxiety, depression, grades in school, physical health, and self-esteem while controlling for in-person bullying.[15] Regardless of the differences between in-person bullying and cyberbullying, research is clear that both forms of abuse are associated with a host of detrimental psychosocial consequences,[25] including anxiety, depression, substance use, violent behavior, unsafe sexual behavior, and suicidal behavior.[15,20]

Given that the extant literature has identified a link between in-person bullying and weapon carrying[9–11,13] and the similarities between in-person bullying and cyberbullying,[12] we aim to examine whether cyberbullying (victimization, perpetration, and perpetration/victimization) is associated with weapon carrying. Cyberbullying victimization may associate with weapon carrying because, as suggested in general strain theory,[30] the experience of cyberbullying victimization, a form of experienced strain, can result in delinquent coping. It is also possible that adolescents who experience peer cyberbullying may feel unsafe at school and thus carry weapons for self-protection.[31] The other direction—weapon carrying resulting in cyberbullying—is also plausible. As suggested by lifestyle-routine activity theory,[32] a deviant lifestyle and routine activities (e.g., weapon carrying) put people in risky situations with increased opportunities for victimization. Although the cross-sectional associations between weapon carrying and cyberbullying victimization have been identified in prior research,[33–35] longitudinal research is needed to determine a temporal link. Thus, one purpose of this study is to explore the longitudinal associations between cyberbullying victimization and weapon carrying and test the direction of the relationship.

In addition to cyberbullying victimization, we also examine the associations between weapon carrying and cyberbullying perpetration and perpetration/victimization. To the best of our knowledge, this is the first study to examine these associations. However, a co-occurrence pattern of adolescent risk behaviors is commonly observed, including the associations between bullying and weapon carrying.[14] Given the similarities between bullying and cyberbullying, it is possible that cyberbullying perpetration is associated with weapon carrying as well. As prior research has observed for offline bullying perpetration/victimization,[11] cyberbullying perpetration/victimization, a behavior that shares the characteristics of both perpetration and victimization, may exhibit an even stronger association with weapon carrying. Thus, in this study we investigate (a) the cross-sectional and longitudinal associations between weapon carrying and three types of cyberbullying (i.e., perpetration, victimization, and perpetration/victimization); and (b) test the direction of this relationship, that is, if cyberbullying predicts weapon carrying or vice versa.

Materials and Methods

Participants

We used data from baseline (T1, spring, 2010, $n = 1{,}042$), Time 2 (T2, spring, 2011, $n = 964$), Time 3 (T3, spring, 2012, $n = 894$), and Time 4 (T4, spring, 2013, $n = 776$) of an ongoing longitudinal study of youth risk behaviors.[36] At baseline, participants were 55.9 percent female, 31.7 percent Hispanic, 30.3 percent white, 26.6 percent African American, and 11.4 percent other (e.g., Asian Americans, Native Americans), with a mean age of 15.1 years (standard deviation = 0.79). See Table 1 for the number of participants who reported weapon carrying and cyberbullying experiences at each time point.

Procedure

Adolescents were originally recruited in spring 2010 from multiple public high schools in southeast Texas. Schools were selected based on their representative makeup of ethnically diverse and low-income students as well as to represent urban, rural, and suburban areas. All contacted schools agreed to participate. Participants were recruited during school hours in courses with mandated attendance, where they completed paper–pencil surveys. Participants were followed up annually. Online surveys were completed by those who were no longer attending their original school at T4. Parental consent and child assent were obtained from each participant during baseline recruitment. Participants re-consented when they turned 18. Participants received gift cards of $10 at T1–3 and $20 at T4. The study procedure was approved by the last author's institutional review board.

Measures

Weapon carrying was measured with the following yes/no question: ''In the past year, did you carry a weapon such as a gun, knife, or club?'' For cyberbullying perpetration, participants responded yes/no to the question, ''In the past year, have you used the Internet, e-mail, or text messaging to threaten, harass, or embarrass another teen by posting information or sending messages about them?'' For cyberbullying victimization, participants reported yes/no to the question ''In the past year, has anyone used the Internet, e-mail, or text messaging to threaten, harass, or embarrass you by posting information or sending messages about you?.'' Participants who reported yes to both cyberbullying questions were considered cyberbullying perpetrator/victims. These three questions were asked in all four surveys. Demographic information (i.e., age, gender, and race) was gathered at baseline.

TABLE 1. FREQUENCIES AND BIVARIATE CORRELATIONS AMONG VARIABLES

	Frequency (percent)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1. Weapon T1	176 (17.0)	—														
2. Weapon T2	143 (14.9)	0.54**	—													
3. Weapon T3	141 (15.8)	0.45**	0.56**	—												
4. Weapon T4	103 (17.4)	0.36**	0.57**	0.59**	—											
5. CBP T1	117 (11.3)	0.11**	0.12**	0.06	0.08*	—										
6. CBP T2	91 (9.5)	0.07*	0.12**	0.09**	0.11**	0.27**	—									
7. CBP T3	83 (9.3)	0.05	0.05	0.08*	0.06	0.24**	0.32**	—								
8. CBP T4	36 (4.7)	0.03	0.04	0.01	0.06	0.19**	0.16**	0.27**	—							
9. CBV T1	195 (18.8)	0.06	0.07*	0.06	0.07	0.40**	0.21**	0.08*	0.12**	—						
10. CBV T2	188 (19.6)	0.08*	0.09**	0.04	0.04	0.15**	0.44**	0.15**	0.14**	0.30**	—					
11. CBV T3	155 (17.4)	0.05	0.04	0.06	0.02	0.09**	0.23**	0.46**	0.25**	0.22**	0.30**	—				
12. CBV T4	78 (10.2)	0.07	0.09*	0.10**	0.11*	0.14**	0.20**	0.24**	0.52**	0.18**	0.22**	0.32**	—			
13. CBPV T1	73 (7.0)	0.05	0.11**	0.07*	0.08	0.77**	0.23**	0.18**	0.16**	0.57**	0.17**	0.12**	0.14**	—		
14. CBPV T2	67 (7.0)	0.06	0.12**	0.09**	0.09*	0.24**	0.85**	0.24**	0.18**	0.23**	0.56**	0.21**	0.25**	0.26**	—	
15. CBPV T3	60 (6.7)	0.01	–0.01	0.03	0.02	0.19**	0.31**	0.84**	0.27**	0.10**	0.18**	0.59**	0.24**	0.18**	0.25**	—
16. CBPV T4	29 (3.8)	0.03	0.05	0.01	0.05	0.18**	0.17**	0.25**	0.89**	0.12**	0.16**	0.23**	0.59**	0.17**	0.19**	.023**

Note: $^{*}p<0.05$, $^{**}p<0.01$.
Weapon, weapon carrying; CBP, cyberbullying perpetration; CBV, cyberbullying victimization; CBPV, cyberbullying perpetration/victimization.

Data analysis

Preliminary analyses were conducted in IMB SPSS Statistics for Windows, version 24.0[37] to examine the frequencies and bivariate correlations among variables. To examine the cross-sectional and longitudinal associations, multivariate logistic regression was tested in Mplus 8[38] using robust maximum likelihood estimation method. We first examined cross-sectional associations between cyberbullying and weapon carrying by regressing weapon carrying (T1) on cyberbullying (T1) controlling for age, gender, and race. Next, we assessed longitudinal associations by using cyberbullying (T1) to predict weapon carrying at one (T2), two (T3), and three (T4) years postbaseline, controlling for baseline weapon carrying, age, gender, and race. Finally, to determine the direction of the relationships, we repeated the longitudinal analyses using weapon carrying as a predictor for cyberbullying. In all the analyses, we also controlled for potential school-level standard errors by including six dummy-coded variables for the seven schools students were recruited from. Missing data were treated with full information maximum likelihood.[39]

Results

Cross-sectional associations between cyberbullying and weapon carrying

As shown in Table 2, multivariate logistic regression tests identified significant cross-sectional associations between weapon carrying and cyberbullying perpetration and victimization. Youth who reported having cyberbullied others were 2.38 times (95 percent confidence interval [CI]: 1.49–3.80) more likely to have carried a weapon in the past year compared with their counterparts who have not cyberbullied others. Similarly, youth who had been cyberbullied were 1.66 times (95 percent CI: 1.10–2.50) more likely to have carried a weapon compared with those who had not been cyberbullied. The association between weapon carrying and cyberbullying perpetration/victimization only approached significance (adjusted odds ratio = 1.65, $p = 0.10$, 95 percent CI: 0.92–2.97).

Cyberbullying predicting weapon carrying

Longitudinal analyses revealed that cyberbullying perpetrators were 1.97 times (95 percent CI: 1.05–3.70) and cyberbullying perpetrator/victims were 2.65 times (95 percent CI: 1.25–5.62) more likely to carry a weapon 1 year later compared with their noninvolved peers. However, for both, the associations were not significant at the 2- and 3-year followups. No significant longitudinal associations were identified for cyberbullying victimization (Table 3).

Weapon carrying predicting cyberbullying

Youth who reported carrying a weapon in the past year were 1.97 times (95 percent CI: 1.26–3.08) more likely to be victims of cyberbullying 1 year later, and 1.70 times (95 percent CI: 1.06–2.73) more likely to be victims of cyberbullying 2 years later, compared with their counterparts who did not carry a weapon. This longitudinal association attenuated over time and became nonsignificant at T4. For cyberbullying perpetration/victimization, only the association

Table 2. Cross-Sectional Multivariate Logistic Regression Results of Cyberbullying Predicting Weapon Carrying

	Weapon carrying T1		
	AOR [95 percent CI]		
Age	1.04 [0.82–1.31]	1.03 [0.82–1.31]	1.04 [0.82–1.31]
Gender			
Female	1.00	1.00	1.00
Male	3.61*** [2.54–5.14]	3.67*** [2.58–5.22]	3.56*** [2.50–5.05]
Race			
White	1.00	1.00	1.00
Hispanic	1.44 [0.91–2.27]	1.46 [0.93–2.29]	1.42 [0.90–2.23]
Black	1.03 [0.59–1.80]	1.05 [0.61–1.81]	1.02 [0.59–1.76]
Other	1.18 [0.62–2.23]	1.14 [0.61–2.14]	1.15 [0.61–2.16]
Cyberbullying perpetration T1	2.38*** [1.49–3.80]		
Cyberbullying victimization T1		1.66* [1.10–2.50]	
Cyberbullying perpetration/victimization T1			1.65† [0.92–2.97]

Note: *$p < 0.05$, ***$p < 0.001$, $^{\dagger}p = 0.10$.
AOR, adjusted odds ratio; CI, confidence interval.

between weapon carrying and T2 cyberbullying perpetration/victimization approached significance (adjusted odds ratio = 1.83, $p = 0.07$, 95 percent CI: 0.96–3.46). No significant longitudinal association was found for cyberbullying perpetration (Table 4).

Discussion

To the best of our knowledge, this is the first study to examine the associations between weapon carrying and different cyberbullying types (i.e., perpetration, victimization, and perpetration/victimization) and to examine their longitudinal associations. The cross-sectional findings indicated that individuals who were cyberbullying perpetrators or victims were more likely to carry a weapon compared with their noninvolved peers. This finding suggests that, similar to in-person bullying, cyberbullying tends to co-occur with weapon carrying, possibly as a means to intimidate others (perpetration) or for self-protection (victimization). This link may be due to the fact that both cyberbullying and weapon carrying are correlated with in-person bullying. Indeed, as many as 88 percent of cyberbullying victims or perpetrators are also in-person bullying victims or perpetrators.[12] Future research would benefit from examining the distinct effect of in-person versus cyberbullying.

Given these findings, coupled with existing research showing a link between cyberbullying victimization and weapon carrying,[33–35] it was surprising that cyberbullying victimization did not significantly predict weapon carrying over time. It is possible that the association only shows in the short term (i.e., cross-sectionally); that when adolescents were not actively threatened (i.e., not cyberbullied), they did not feel a need to continue carrying a weapon.

One important contribution of this study is the significant longitudinal finding that weapon carrying predicted cyberbullying victimization. Compared with their noninvolved counterparts, those who had carried a weapon were about two times more likely to be victims of cyberbullying 1 year later, and 1.70 times more likely to be cyberbullying victims 2 years later. It is possible that weapon carrying is negatively perceived by peers and although in in-person settings, carrying a weapon may have intimated others, in an online environment where individuals are protected by anonymity, adolescents who have carried a weapon are more prone to be criticized or harassment by others. Another possible explanation resides in the longitudinal link of cyberbullying itself. Since weapon carrying at an early age is associated with later weapon carrying,[8] cyberbullying victimization might also occur along the way. As shown in prior research,[40] adolescent who were cyberbullied were likely to be revictimized later. It is possible that adolescents who were cyberbullied at Time 2 were also victims of cyberbullying before baseline, which may have contributed to their baseline weapon carrying as well as later cyberbullying victimization.

Both cross-sectional and longitudinal associations were identified for cyberbullying perpetration in that adolescents who have cyberbullied others were more likely to carry a weapon compared with their noninvolved peers. However, to

Table 3. Longitudinal Multivariate Logistic Regression Results of Cyberbullying Predicting Weapon Carrying

	Weapon carrying T2 AOR [95 percent CI]	*Weapon carrying T3 AOR [95 percent CI]*	*Weapon carrying T4 AOR [95 percent CI]*
Cyberbullying perpetration T1	1.97* [1.05–3.70]	1.17 [0.61–2.21]	1.43 [0.72–2.83]
Cyberbullying victimization T1	1.53 [0.87–2.69]	1.26 [0.73–2.16]	1.39 [0.76–2.55]
Cyberbullying perpetration/victimization T1	2.65* [1.25–5.62]	1.56 [0.71–3.46]	1.65 [0.70–3.91]

Note: Results are adjusted for age, gender, race, and T1 weapon carrying.
*$p < 0.05$.

Table 4. Longitudinal Multivariate Logistic Regression Results of Weapon Carrying Predicting Cyberbullying

	Weapon carrying T1	
	AOR	*95 percent CI*
Cyberbullying perpetration T2	1.57	0.90–2.74
Cyberbullying perpetration T3	1.32	0.72–2.41
Cyberbullying perpetration T4	.96	0.40–2.34
Cyberbullying victimization T2	1.97**	1.26–3.08
Cyberbullying victimization T3	1.70*	1.06–2.73
Cyberbullying victimization T4	1.61	0.86–3.00
Cyberbullying perpetration/victimization T2	1.83†	0.96–3.46
Cyberbullying perpetration/victimization T3	1.11	0.53–2.32
Cyberbullying perpetration/victimization T4	1.29	0.49–3.39

Note: Weapon carrying T1 is independent variable. Results are adjusted for age, gender, race, and baseline cyberbullying.
*$p < 0.05$, **$p < 0.01$, †$p = 0.07$.

our surprise, the cross-sectional association with cyberbullying perpetration/victimization only approached significance. This was counter to our expectation given previous research showing that in-person bully/victims were at heightened risk of negative outcomes compared with ''only'' perpetrators or victims.[9,41,42] Notably, despite a nonsignificant cross-sectional link, cyberbullying perpetration/victimization was significantly associated with weapon carrying 1 year later. One possible explanation is that cyberbullying perpetration/victimization may be indirectly associated with weapon carrying through in-person bully/victimization; thus, the effect of cyberbullying perpetration/victimization on weapon carrying does not emerge in the short term (cross-sectionally) but only after a period of time (1 year later). Future research should examine potential mediators to better understand the mechanisms underlying this relationship.

Finally, it is important to note that the longitudinal associations of cyberbullying perpetration and perpetration/victimization predicting weapon carrying were only significant 1 year later, and then disappeared at the 2- and 3-year followups. The effect size of weapon carrying predicting cyberbullying victimization also decreased from T2 to T3 and eventually became nonsignificant at T4. The long-term attenuation of longitudinal associations implies reduced effects of cyberbullying/weapon carrying, but it also can be due to aging of participants. Research has identified a general trend of reduced weapon carrying as adolescents age.[8,43] We also observed decreased cyberbullying prevalence in our data over the 4-year period. By Time 3, our participants were, on average, 17 years of age. It is possible that the associations between cyberbullying and weapon carrying may not be as strong as when the participants were younger.

Our results should be interpreted in light of several limitations. We did not distinguish weapon types, which limits exploration of possible different implications of carrying different weapons, such as a gun versus a knife. The use of single item to measure cyberbullying is another limitation. Kowalski et al. have noted in a review of cyberbullying research that a limitation of this research domain is the inconsistent use of cyberbullying measures, which may have contributed to the wide-ranging prevalence rate reports and varied research findings.[17] Although our study follows one of the commonly used ways by asking participants to indicate whether they have engaged in described cyberbullying behaviors,[17] whether our findings will hold with a different cyberbullying measure (e.g., a multi-item measure) warrants further investigation. Furthermore, participants were all from Texas, where the cultural meaning of weapons and weapon-related policies may differ from other regions in the United States. Thus, findings should be tested in other regions before generalizing. In addition, despite examining longitudinal associations, participants were about 15 years old when they completed the baseline survey. Future longitudinal research on cyberbullying would benefit by beginning at a younger age and following youth from early adolescence to young adulthood.

Conclusions

We identified a series of associations between cyberbullying and weapon carrying. Although some of the findings mirrored what we know about the link between in-person bullying and weapon carrying,[9,14] some differences emerged. These findings imply possible different dynamics between cyberbullying and in-person bullying, which calls for further investigation. The cross-sectional associations suggest that weapon carrying tends to co-occur with cyberbullying, suggesting that prevention programs should target both behaviors or identify and target shared risk and protective factors of both behaviors. The longitudinal association between weapon carrying and cyberbullying victimization identified in this study is novel and adds to our growing understanding of the consequences of cyberbullying victimization.[1,2,5] In addition, weapon carrying has been identified as a risk factor for emotional distress with the exact mechanism unknown.[2] Given the impact of cyberbullying on mental health,[18,19] it is plausible to speculate cyberbullying as a possible explanation for the link between weapon carrying and psychological distress, with further research needed to test this relationship. Finally, the finding that cyberbullying perpetration and perpetration/victimization predicts weapon carrying 1 year later highlights the importance of targeting adolescents who are cyberbullying others to prevent possible subsequent weapon-carrying behavior.

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Author Disclosure Statement

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