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ORIGINAL PAPER

Risk Factors of Academic Performance: Experiences of School Violence, School Safety Concerns, and Depression by Gender

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Abstract

Background Experiencing school violence can have a detrimental effect on learning. However, it is unclear whether different types of school violence have different impacts based on gender. Moreover, there is insufficient understanding of the direct and indirect effects of experiencing school violence on academic performance through perceived school safety concerns and student depression.

Objective Drawing on ecological systems theory and adversity literature, this study examined the direct and indirect effects by gender of three forms of experiencing school violence (physical fighting, threats of weapon-related violence, and bullying), through school safety concerns and depression, on adolescent academic performance.

Methods Cross-sectional data were drawn from the 2015 Youth Risk Behavior System Survey, a national sample of students in grades 9–12. Multigroup path analysis was conducted to test direct and indirect associations and gender differences.

Results Fighting, threats, and bullying were significantly associated with higher levels of school safety concerns and depression for students, which led to lower academic performance for both females and males. The majority of the effects, in both direct and indirect associations, were significantly greater among female than male students.

Conclusions The results of this study provide important insight into the complex relationships between experiencing school violence, perceptions of school safety, sadness and hopelessness and their relationship to academic performance.

Keywords School violence · Victimization · Depression · Safety · Weapon related violence · Academic performance

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Introduction

Exposure to violence at school has increasingly exerted a strong influence on student academic performance (Fisher et al. 2018, 2016). However, the mechanisms by which this impact on academic performance occurs are not well understood, prompting calls to examine the dynamics surrounding school violence (Astor et al. 2010). The role of other factors, such as school safety concerns and depressive tendencies, in the overall academic performance of those affected is unclear. Nonetheless, the rates of students feeling unsafe, being exposed to weapons, and fighting at school have been consistent across the past decade, with boys carrying weapons and participating in fights at higher rates than girls, while girls are at a higher risk for victimization by both sexual partners and peers (Rajan et al. 2015; Walsh et al. 2013). Moreover, forms of school victimization such as bullying are also divided along gender lines in their direct effects on academic performance (Huesmann 1998). The gender divide is also observed in student's response to victimization. An analysis of the National Youth Risk Behavior Survey found that roughly one in five high school students reported being bullied at school in 2015, and among girls, approximately the same number experienced suicidal ideation (Kann et al. 2016). Although previous literature has focused on various modes of victimization and their impact on academic and health outcomes, evidence utilizing indirect effects in such relationships is severely lacking. Of particular significance here is the mediating role of depression among adolescents who have been subject to bullying and exposed to violence at school (Hammig and Jozkowski 2013). In addition, other potential mediators, specifically school safety concerns, may illuminate the association between school bullying victimization and depression, and the effect on academic performance. Moreover, given the current gender based academic achievement gap (Cook 2006; Diprete and Jennings 2012; Lavoie et al. 2019), it is important to understand the different ways that these factors may affect male and female students, potentially directing differential assessment and service provision.

We are guided by a combination of ecological systems theory (EST) and an understanding of the impact of adversity (Bronfenbrenner 1977; Felitti et al. 1998; Finkelhor et al. 2015). EST considers individuals in multiple contexts (e.g., family, peers, school, etc.), from the direct environment in which they grow (microsystem) to the larger social and structural settings (macrosystem) (Bronfenbrenner 1977). Bronfenbrenner contextualized this as an interrelated series of concentric rings each nested within the other beginning with those closest to the individual and expanding outwards into increasingly distal social structures such as family, school and society. Recognizing the interactive effect of the environment on an individual, specifically experiencing violence, threats or bullying, we hypothesized that the impact of experiencing school violence on educational attainment may be indirectly influenced by school safety concerns and depressive symptoms. Moreover, current research on adverse childhood experiences (ACEs) has expanded conventional ACEs (such as violence and abuse occurring in the home) to include experiencing violence at school (Cronholm et al. 2015; Finkelhor et al. 2015). Peer victimization, peer isolation/rejection and exposure to community violence are known to be strong predictors of psychological distress, including depression (Finkelhor et al. 2015). Exposure to violence is known to have a strong negative impact on academic outcomes (Beland and Kim 2016; Fry et al. 2018). This framework will guide our analysis of the relationship between students' environments—their exposure to adverse experiences, specifically fighting, weapons-related violence, and bullying—and their emotional states, sense of security in school, and ultimately, their academic performance.

Research consistently affirms that individuals exposed to adversity have a higher risk of depression (Giovanelli et al. 2016; Morrow and Villodas 2017). Emotional difficulties (including depression), potentially correlate with poor school attainment, and this association varies by gender (Riglin et al. 2014; Sörberg et al. 2019). The positive association between mental health and academic performance is well documented (Mitchell et al. 2018; Richardson et al. 2012; Riglin et al. 2014; Sörberg et al. 2019; Weidman et al. 2015). Undoubtedly, however, the effect of depressive symptoms on academic outcomes for students exposed to adversity and school-based victimization requires further research. For example, Morrow and Villodas (2017) found that internalizing symptoms (e.g., depression) were associated with lower risk of school dropout. Other researchers have found that internalizing symptoms corresponded to an increased risk of dropout (Chalita et al. 2012).

Feeling safe in school is an important aspect of school connection, and school connectedness is increasingly understood to play an important role in student success (Thapa et al. 2013). Students' positive perceptions of safety at their school were associated with higher academic achievement in reading and math, suggesting that students preoccupied with safety concerns are less able to focus on academics (Milam et al. 2010). Additionally, externalizing behaviors, such as physical fighting, have been associated with indicators of school safety, such as being threatened or injured with a weapon and having property stolen or intentionally damaged on school property (Rudatsikira et al. 2008). Prior research also indicates there can be direct relationships between adversity in the form of aggression and violence among students and school success (Giovanelli et al. 2016; Morrow and Villodas 2017; Bethell et al. 2014).

Therefore, the current study examined gender-based direct and indirect associations among experiencing school violence, school safety concerns, depressive symptoms, and adolescent academic performance. Particularly, we tested direct associations between three forms of experiencing school violence—physical fighting at school (PFS), weapon-related violence as a result of threats at school (TS), and school bullying victimization (SBV)—and academic performance (AP), and indirect associations through school safety concerns and depressive symptoms. If there are direct and indirect associations, are these associations different between male and female students? In examining this, we controlled for physical and sexual dating violence, a predominantly gender-based form of violence that may not have been captured in questions about experiencing school violence, yet is associated with academic performance (Brewer et al. 2018).

Method

Sample

This study was performed on a dataset that was extracted from the Centers for Disease Control and Prevention's (CDC's) 2015 National Youth Risk Behavior Survey (YRBS). No Institutional Review Board (IRB) ethics approval or informed consent were necessary for this study since we did not have direct contact with human participants but also analyzed de-identified secondary data that were extracted from the 2015 YRBS. The CDC's IRB approved the 2015 YRBS. Thus, another IRB approval was not required for this current study. There are no potential conflicts of interest present in the form of grants, employment by, consultancy for, shared ownership in or any close relationship with an organization

whose interests, financial or otherwise, that could be affected by the publication of this manuscript.

The participants in this YRBS consisted of a group of students who were in grades 9–12 in public and private schools (Kann et al. 2016). It was performed in a way that was specifically designed to access a population that was representative of US-based high school students by following the three-stage cluster sample approach that was stratified within the Market Data Retrieval database (CDC 2016). In 2015, 47 U.S. states and 21 large urban school districts completed YRBS (Kann et al. 2016). During the first phase of the three-stage cluster sampling, 1259 primary sampling units (PSUs) were identified. These consisted of counties, county clusters, and subareas of larger counties that were located close to each other. The selected PSUs were then further categorized into 16 groups that were defined according to the black-Hispanic student ratio and the status of the metropolitan statistical area; for instance, urban area. As a result of this exercise, 54 of the original 1259 PSUs underwent further sampling at a rate of probability that was proportional to the total number of students that enrolled in the school within that PSU. A total of 180 schools from within the selected 54 PSUs were sampled during the next stage. In sum, the research spanned 15,713 students who attended 125 public and private schools in the United States and completed the questionnaires, but 89 questionnaires were excluded when they failed quality control, resulting in 15,624 usable questionnaires. The final sample size was 13,119 after handling not applicable responses for analysis.

Of those who completed questionnaires, 51% were female respondents; and 26% were aged 16, 25% were 17, 24% were 15, 14% were 18 years or older, and 11% were 14 years or younger. In terms of race and ethnicity, 68% of the sample was White, 14% was Black or African American, and 18% consisted of students of other racial and ethnic groups. Characteristics of the study sample are provided in Table 1.

Measures

Experiences of School Violence Variables

Being in a physical fight, being threatened or injured with a weapon, and being bullied at school were exogenous variables in the path model. These three exogenous variables were ascertained from self-reported responses to the following questions: During the past 12 months, (1) how many times were you in a physical fight on school property? (2) how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property? and (3) have you ever been bullied on school property? Physical fighting with a weapon at school and being threatened or injured with a weapon were measured on an 8-point Likert scale ranging from 0 times to 12 or more times. School bullying victimization was a dichotomous variable (0 = no, 1 = yes). To compare the effect sizes of the exogenous variables, physical fighting with a weapon at school and being threatened or injured with a weapon were dichotomized (0 = no, 1 = yes).

Academic Performance

Academic performance was the endogenous variable, based on the question, "During the past 12 months, how would you describe your grades in school?" Response options were reverse coded for analysis, which ranged from 1 (mostly Fs) to 5 (mostly As).

School Safety Concerns and Depression

First, school safety concerns were measured as a continuous variable using the following question: "During the past 30 days, how many days did you not go to school because you felt you would be unsafe in school or on your way to or from school?" The variable was measured on a 5-point Likert scale ranging from 0 (0 times) to 4 (12 or more times). For this study, the variable was changed to a dichotomous variable (0 = no, 1— 4 = yes), to compare their effect sizes to other dichotomous variables. In addition, depression was operationalized using the following single variable, "During the past 12 months, did you ever feel so sad or hopeless almost every day for 2 weeks or more in a row that you stopped doing some usual activities? (0 = no, 1 = yes). The operationalization was based on previous research since these symptoms are the most commonly mentioned symptoms of depression (Yang et al. 2018; Wang et al. 2011).

Control Variables

The control variables were physical dating violence and sexual dating violence victimization. These variables were assessed with the following questions: During the past 12 months, (1) how many times did someone you were dating or going out with physically hurt you on purpose? and (2) how many times did someone you were dating or going out with force you to do sexual things that you did not want to do? The response questions were measured on a 6-point Likert scale, 1 (did not date) to 6 (6 or more times).

Data Analysis

For this study, descriptive and bivariate analyses (correlations and Chi squares) were performed using SPSS Version 24 (IBM Corp., 2016) followed by multigroup path analysis. All the variables had < 5% missing cases. This study addressed missing values via multiple imputations using a predictive mean matching algorithm available in SPSS 24 missing value analysis. When data have less than 5% of missing cases, almost any procedure for handling missing values produces similar results (Hair et al. 2006). First, the descriptive analysis calculated the frequencies and percentages for the categorical variables and the mean and standard deviation for the continuous variables. In addition, a correlation analysis was performed to determine the direction and strength of the relationships between the variables. A multigroup path analysis was then conducted using Mplus Version 7.4 (Muthén and Muthén 2015) to determine the direct and indirect effects of different forms of experiencing school violence on academic performance through school safety concerns and depression for male and female students. Specifically, a parameter comparison test was utilized to examine gender differences between the paths that could be observed among the primary study variables.

Results

Descriptive Information

Table 1 presents descriptive information about the study variables by gender as well as the results of the Chi square tests of differences between male and female students concerning

Table 1 Demographic Characteristics of the Sample (N = 13,119)

Variable	% (*n*)			χ^2
	Total	Female 50.5 (6623)	Male 49.5 (6496)	
Age				
14 years old or younger	11.2 (1465)	12.1 (798)	10.3 (667)	
15 years old	24.2 (3168)	24.3 (1609)	24.0 (1559)	
16 years old	25.8 (3377)	26.0 (1723)	25.5 (1654)	
17 years old	25.0 (3281)	25 (1655)	25.1 (1626)	
18 years old or older	13.9 (1818)	12.6 (836)	15.1 (982)	
Race				
White	68.1 (7571)	68.6 (3855)	67.6 (3716)	
Black	14.0 (1557)	13.8 (775)	14.2 (782)	
Other	17.9 (1987)	17.6 (986)	18.2 (1001)	
Physical fighting at school				
No	91.9 (12,054)	94.3 (6245)	89.4 (5809)	104.2***
Yes	8.1 (1065)	5.7 (378)	10.6 (687)	
Being bullied at school				
No	81.1 (10,637)	77.7 (5147)	84.5 (5490)	98.81***
Yes	18.9 (2482)	22.3 (1476)	15.5 (1006)	
Threatened with a weapon at school				
No	90.7 (11,893)	91.5 (6063)	89.7 (5830)	12.50***
Yes	9.3 (1226)	8.5 (560)	10.3 (666)	
School safety concerns				
No	94.2 (12,364)	93.5 (6190)	95.0 (6174)	15.11***
Yes	5.8 (755)	6.5 (433)	5.0 (322)	
Depression				
No	69.7 (9144)	59.9 (3965)	79.7 (5179)	612.40***
Yes	30.3 (3975)	40.1 (2658)	20.3 (1317)	
Academic performance				
Mostly F's	1.7 (221)	1.5 (102)	1.8 (119)	293.81***
Mostly D's	3.9 (517)	3.0 (196)	4.9 (321)	
Mostly C's	21.5 (2821)	17.4 (1150)	25.7 (1671)	
Mostly B's	40.1 (5255)	39.2 (2599)	40.9 (2656)	
Mostly A's	32.8 (4305)	38.9 (2576)	26.6 (1729)	
Victims of sexual dating violence				
No	92.8 (12,172)	89.1 (5902)	96.5 (6270)	268.66***
Yes	7.2 (947)	10.9 (721)	3.5 (226)	
Victims of physical dating violence				
No	93.1 (12,216)	91.2 (6037)	95.1 (6179)	80.56***
Yes	6.9 (903)	8.8 (586)	4.9 (317)	

*** $p < 0.001$

experiencing school violence, school safety concerns, and academic performance, which were all significant at the $p < 0.001$ level. Nearly 6% of the female participants and 11% of the male participants revealed they had been involved in a physical fight at school. In

addition, 22% of females versus 16% of males revealed that they had experienced bullying at school. Conversely, 10% of males versus 8% of females had been threatened or injured with a weapon in the school setting. Approximately 30% of the U.S. adolescents in 2015, reported encountering feelings of sadness or hopelessness, as a proxy for depression. More females than males had school safety concerns (6% vs. 5%) and encountered depression (40% vs. 20%). With regard to academic performance, 39% of females achieved As mainly as compared to 27% of males. Lastly, a larger percentage of females reported experiencing physical dating violence than males (9% vs. 5%) and being a victim of sexual dating violence (11% vs. 4%).

Correlations

Table 2 presents the correlations among the study variables (i.e., physical fighting, threats of weapon-related violence, bullied at school, school safety concerns, feelings of sadness or hopelessness, academic performance, victim of sexual dating violence, and victim of physical dating violence), all of which were separated according to gender. For males and females, the overall correlations between all the variables were significant at the $p < 0.001$ level. Specifically, for male students, academic performance had negative and *moderate* correlations with physical fighting at school ($r = -0.12$), and depression ($r = -0.11$), while academic performance had negative and *weak* correlations with school bullying ($r = -0.05$), threaten with a weapon at school ($r = -0.04$), school safety concerns (r = -0.07), sexual dating violence ($r = -0.04$), and physical dating violence ($r = -0.04$).

In addition, for female students, academic performance had negative and *moderate* correlations with physical fighting at school ($r = -0.14$), school safety concerns ($r = -0.14$), depression ($r = -0.19$), and physical dating violence ($r = -0.11$), but academic performance had negative and *weak* correlations with school bullying ($r = -0.07$), threatened with weapon ($r = -0.07$), and sexual dating violence ($r = -0.06$).

Path Results–Gender Differences in Direct and Indirect Effects

Physical Fighting at School

Direct Effects As shown in Table 3 and Fig. 1, for both female and male students, physical fighting at school was positively and directly associated with school safety concerns (female: $\beta = 0.116$, male: $\beta = 0.115$) and depression (female: $\beta = 0.047$, male: $\beta = 0.068$), but it was negatively associated academic performance (female: $\beta = -0.114$, male: $\beta = -0.109$). School safety concerns were negatively associated with academic performance (female: $\beta = -0.108$, male: $\beta = -0.042$). Likewise, depression was negatively associated with academic performance (female: $\beta = -0.151$, male: $\beta = -0.090$).

Indirect Effects Indirect paths were also estimated, and the results were significant. First, the indirect effect of physical fighting at school on depression through school safety concerns was significant (female: $\beta = 0.14$, male: $\beta = 0.009$). Second, the indirect effect of physical fighting on academic performance through school safety concerns was also significant (female: $\beta = -0.013$, male: $\beta = -0.005$). Third, the indirect association between physical fighting at school and academic performance through depressive symptoms was significant (female: $\beta = -0.007$, male: $\beta = -0.006$). Lastly, the indirect association between

Table 2 Correlations

	1	2	3	4	5	6	7	8
1. Physical fighting at school		0.14***	0.23***	0.18***	0.12***	−0.12***	0.19***	0.19***
2. School bulling victimization	0.13***		0.17***	0.15***	0.19***	−0.05***	0.09***	0.09***
3. Threatened with a weapon at school	0.17***	0.13***		0.24***	0.12***	−0.04**	0.18***	0.20***
4. School safety concerns	0.16***	0.19***	0.19***		0.12***	−0.07***	0.24***	0.18***
5. Depression	0.10***	0.26***	0.09***	0.17***		−0.11***	0.11***	0.14***
6. Academic performance	− 0.14***	− 0.07***	− 0.07***	− 0.14***	− 0.19***		−0.04**	−0.04***
7. Victims of sexual dating violence	0.10***	0.21***	0.10***	0.15***	0.19***	− 0.06***		0.41***
8. Victims of physical dating violence	0.16***	0.16***	0.12***	0.15***	0.18***	−0.11***	0.38***	

** $p < 0.01$, *** $p < 0.001$

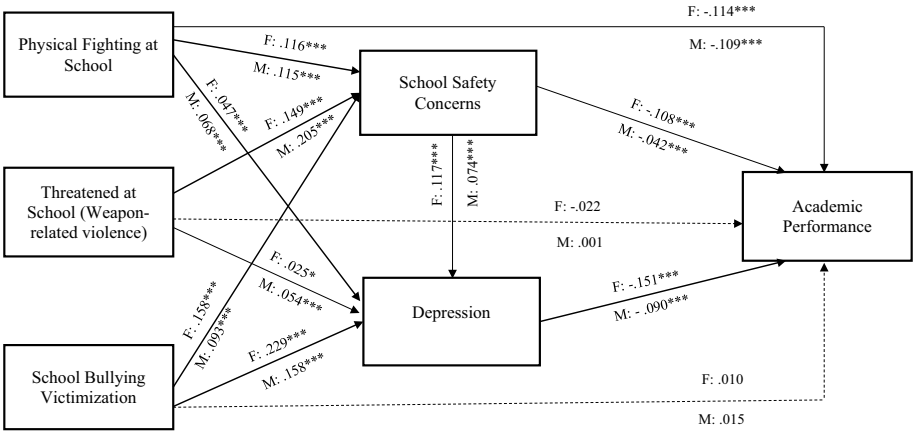
Table 3 Path Results by Gender

Path	Female				Male				Group invariance	
	β (SE)	*t*	*p*	R^2	β (SE)	*t*	*p*	R^2	*t*	*p*
Direct effect										
PFS → SSC	0.116	9.697	0.000	0.078***	0.115	9.417	0.000	0.085***	2.752	0.006
TS → SSC	0.149	12.541	0.000		0.205	16.986	0.000		–1.018	0.309
SBV → SSC	0.158	13.369	0.000		0.093	7.715	0.000		3.743	0.000
PFS → D	0.047	3.923	0.000	0.087***	0.068	5.465	0.000	0.053***	0.342	0.732
TS → D	0.025	2.087	0.037		0.054	4.261	0.000		− 1.013	0.311
SBV → D	0.229	19.446	0.000		0.158	12.934	0.000		4.738	0.000
SSC → D	0.117	9.616	0.000		0.074	5.917	0.000		2.785	0.005
PFS → AP	− 0.114	− 9.379	0.000	0.070***	− 0.109	− 8.511	0.000	0.030***	− 1.829	0.067
TS → AP	− 0.022	− 1.796	0.072		− 0.001	− 0.098	0.922		− 1.191	0.234
SBV → AP	0.010	0.757	0.449		− 0.015	− 1.207	0.227		1.412	0.158
SSC → AP	− 0.108	− 8.701	0.000		− 0.042	− 3.254	0.001		− 2.932	0.003
D → AP	− 0.151	− 2.160	0.000		− 0.090	− 7.186	0.000		− 1.824	0.068
Indirect effect										
PFS → SSC → D	0.014	6.809	0.000		0.009	5.003	0.000		3.656	0.000
TS → SSC → D	0.017	7.603	0.000		0.015	5.577	0.000		1.925	0.054
SBV → SSC → D	0.018	7.788	0.000		0.007	4.691	0.000		4.317	0.000
PFS → SSC → AP	− 0.013	− 6.464	0.000		− 0.005	− 3.074	0.002		− 3.787	0.000
TS → SSC → AP	− 0.016	− 7.126	0.000		− 0.009	− 3.194	0.001		− 2.287	0.022
SBV → SSC → AP	− 0.017	− 7.268	0.000		− 0.004	− 2.997	0.003		− 4.370	0.000
PFS → D → AP	− 0.007	− 3.733	0.000		− 0.006	− 4.346	0.000		− 1.042	298
TS → D → AP	− 0.004	− 2.057	0.040		− 0.005	− 3.662	0.000		0.378	0.705
SBV → D → AP	− 0.035	− 10.238	0.000		− 0.014	− 6.264	0.000		− 4.025	0.000
SSC → D → AP	− 0.018	− 7.524	0.000		− 0.007	− 4.562	0.000		− 3.315	0.001

Table 3 (continued)

Path	Female				Male				Group invariance	
	β (SE)	*t*	*p*	R^2	β (SE)	*t*	*p*	R^2	*t*	*p*
PFS → SSC → D → AP	− 0.002	− 5.935	0.000		− 0.001	− 4.102	0.000		− 3.838	0.000
TS → SSC → D → AP	− 0.003	− 6.435	0.000		− 0.001	− 4.400	0.000		− 2.608	0.009
SBV → SSC → D → AP	− 0.003	− 6.540	0.000		− 0.001	− 3.923	0.000		− 4.361	0.000

Note. 1) Physical Fighting at School, PFS; Threatened at School, TS; School Bullying Victimization, SBV; School Safety Concerns, SSC; Depression, D; Academic Performance, AP



* $p < .05$, ** $p < .01$, *** $p < .001$. F = female, M = male.

Fig. 1 Path Results

physical fighting and academic performance through school safety concerns and depression was also significant (female: $\beta = -0.002$, male: $\beta = -0.001$).

Gender Differences The group invariance test demonstrated gender differences in the direct path of physical fighting on school safety concerns ($t = 2.752$, $p < 0.01$). The direct impact of physical fighting on school safety concerns was greater for female students ($\beta = 0.116$), than for male students ($\beta = 0.115$). Likewise, there were gender differences in indirect paths of (1) physical fighting to depression through school safety concerns ($t = 3.656$, $p < 0.001$), (2) physical fighting to academic performance through school safety concerns ($t = -3.787$, $p < 0.001$), and (3) physical fighting to academic performance through school safety concerns and depression ($t = -3.838$, $p < 0.001$). Overall, the results showed that the direct and indirect impacts on academic performance were greater for female students than for male students. Specifically, the impact of physical fighting at school on depression through school safety concerns was greater for female students ($\beta = 0.014$) than for male students ($\beta = 0.009$). Moreover, the impact of physical fighting on academic performance through school safety concerns was greater also for female students ($\beta = -0.013$) than for male students ($\beta = -0.005$). The impact of fighting on academic performance through school safety concerns and depression was also greater for female students ($\beta = -0.002$) than male students ($\beta = -0.001$).

Threatened or Injured with a Weapon at School

Direct effects Threatened or injured with a weapon at school was positively and directly associated with school safety concerns for both genders (female: $\beta = 0.149$, male: $\beta = 0.205$) and depression (female: $\beta = 0.025$, male: $\beta = 0.054$). In addition, school safety concerns were negatively associated with academic performance (female: $\beta = -0.108$, male: $\beta = -0.042$). Likewise, depression was negatively associated with academic performance (female: $\beta = -0.151$, male: $\beta = -0.090$). On the other hand, there was no direct association between being threatened at school and academic performance.

Indirect Effects With respect to indirect paths, we found several significant indirect effects. First, the indirect association between experience with being threatened

and depression through school safety concerns was significant (female: β = 0.17, male: β = 0.15). Second, the indirect impact of being threatened, through school safety concerns, on academic performance was significant (female: β = − 0.016, male: β = −0.009). Likewise, the indirect impact of being threatened, through depression, on academic performance was significant (female: β = − 0.004, male: β = − 0.005). Lastly, the indirect association between being threatened and academic performance through school safety concerns and depression was significant as well (female: β = − 0.003, male: β = −0.001).

Gender Differences The group invariance test demonstrated significant gender differences only in indirect paths of (1) being threatened or injured with a weapon to academic performance through school safety concerns ($t = -2.287$, $p < 0.05$) and (2) being threatened or injured with a weapon to academic performance, via school safety concerns and depression ($t = -2.608$, $p < 0.01$). Overall, the results showed that the indirect impacts on academic performance were greater for female students than for male students. Specifically, the impact of being threatened or injured with a weapon on academic performance through school safety concerns was greater for female students (β = − 0.016) than for male students (β = −0.009). Moreover, the impact of being threatened or injured with a weapon on academic performance through school safety concerns and depression was also greater for female (β = − 0.003) student than male students (β = − 0.001).

School Bullying Victimization

Direct Effects Being bullied at school was also positively and directly associated with school safety concerns (female: β = 0.158, male: β = 0.093) and depression (female: β = 0.229, male: β = 0.158), but it was not directly associated with academic performance. In addition, school safety concerns were negatively associated with academic performance (female: β = − 0.108, male: β = −0.042). Likewise, depression was negatively associated with academic performance (female: β = −0.151, male: β = − 0.090).

Indirect Effects As described in Table 3, results of the indirect effects were significant. First, the indirect impact of school bullying victimization, through school safety concerns, on depression was significant (female: β = 0.18, male: β = 0.007). Second, the indirect effect of school bullying victimization, through school safety concerns, on academic performance was significant (female: β = − 0.017, male: β = − 0.004). Third, the indirect association between school bullying victimization and academic performance via depression was significant (female: β = −0.035, male: β = − 0.014). Lastly, the indirect association between school bullying victimization and academic performance through school safety concerns and depression was significant (female: β = −0.002, male: β = −0.001).

Gender Differences The group invariance test demonstrated significant gender differences in the direct path of school bullying victimization on school safety concerns ($t = 3.743$, $p < 0.001$) and depression ($t = 4.738$, $p < 0.001$). The direct impact of school bullying victimization on school safety concerns was greater for female students (β = 0.158) than for male students (β = 0.093). Likewise, the direct impact of school bullying victimization on depression was greater for female students (β = 0.229) than for male students (β = 0.158). There were also significant gender differences in indirect paths of (1) school bullying victimization to depression through school safety concerns ($t = 4.317$, $p < 0.001$), (2) school bullying victimization to academic performance through school safety concerns ($t = -4.370$, $p < 0.001$), (3) school bullying victimization to academic performance through depression ($t = -4.025$, $p < 0.001$) and (4) school bullying victimization to academic performance through school safety concerns and depression ($t = -4.361$, $p < 0.001$). Overall, the

results showed that the indirect impacts on academic performance were greater for female students than for male students. Specifically, the impact of school victimization on depression was greater for female students (β = −0.018) than for male students (β = −0.007). Moreover, the impact of school bullying victimization on academic performance through school safety concerns was also greater for female (β = −0.017) students than male students (β = −0.004). Likewise, the impact of school bullying victimization on academic performance through depression was greater for female (β = −0.035) students than male students (β = −0.014). Lastly, the impact of school bullying victimization on academic performance through school safety concerns and depression was also greater for female (β = −0.003) students than male students (β = −0.001).

Discussion

Our study sought to examine the direct and indirect effects of three forms of experiencing school violence (physical fighting, threatened at school or weapon-related violence, and school bullying victimization) on adolescent academic performance through school safety concerns and depression. Drawing on ecological systems theory and adversity literature, our study aimed at establishing the best path model among female and male high school students. Previous literature suggests that school victimization has significant direct and indirect effects on safety concerns at school, depression, and academic performance (Fisher et al. 2016; Hammig and Jozkowski, 2013; Kosciw et al. 2013; Loveland et al. 2007). Our findings that nearly 6% of female participants and 11% of male participants had been involved in a physical fight at school are consistent if not slightly lower than rates found in other studies. For example, one in three students around the globe experience bullying, and safety concerns kept six percent of students in the U.S. away from school at least one day (UNICEF 2017). Since 2001 rates of experiencing school violence found in the YRBS have reduced from 13 to 9% (Musu-Gillette et al. 2019). Our finding that 30% of adolescents experienced depression is consistent with previous research using the Centre for Epidemiologic Studies-Depression Scale (Rushton et al. 2002; Youssef et al. 2008). The proportion of depressed adolescents in 2015 however, were higher than preceding YRBS cycles, a trend that has been found in other studies (Child Trends Databank 2014; Mojtabai et al. 2016).

We hypothesized that different types of experiencing school violence have a significant impact on academic performance through school safety concerns and depression. Overall, findings fully supported our hypothesis. The results showed that fighting, being threatened, and being bullied were significantly and directly associated with higher levels of school safety concerns and higher levels of depression for females and males, which in turn, were associated with lower academic performance. In terms of direct effects, only fighting was significantly associated with lower academic performance for female and male students. This is in concert with the literature that found that externalizing behaviors directly impact academic indicators such as grades while internalizing symptoms are considered a consequence of the difficulty (Sörberg et al. 2019).

Largely, female students had significantly greater effect sizes than male students in the following paths: school bullying on school safety concerns, school bullying on depression, physical fighting on academic performance, and school safety concerns on academics. This is consistent with the literature indicating that physical aggression accounts for variance in grade point average more significantly for females than for males (Hammig and Jozkowski,

2013; Schwartz et al. 2006). In addition, there were significant indirect effects of different types of experiencing school violence, through school safety concerns and depression, on academic performance for both genders. These findings reinforce the literature on the importance of school safety on academic performance, particularly for female students (Hammig and Jozkowski 2013).

Female students are overtly vulnerable, more likely to be concerned about school safety and feel sad or hopeless. Our sample was reflective of the gender difference in academic performance generally as a higher proportion of females reported earning A-grades than males (Buchmann and DiPrete 2006; Cook 2006; Diprete and Jennings 2012; Duzer 2006; Entwisle et al. 2007). Given our findings, specifically the relationships between victimization with school safety concerns and higher levels of depression for females and males, in turn, associated with lower academic performance, additional research is needed to fully understand the gender implications of these findings. For example, additional research is needed to understand why male students are less likely to be concerned about school safety, or to assert sadness or hopelessness. Our findings are consistent with extant literature identifying that males are more frequently involved in fighting and carrying weapons while females are more likely to report more emotional or internalizing symptoms (Walsh et al. 2013). Therefore, while males are less likely to identify concerns related to school safety, they are more likely to be involved in physical fighting, the only form of violence found to have a direct impact on academic performance.

Limitations

The utilization of self-reported data has continuously been a limitation, concern and a challenge to school-based research. Concerns related to untruthfulness or distorted perceptions (for example, under or over-reporting academic performance) in student response should not be under judged. However, Finn and Servoss (2014) found significant agreement between student self-report and teacher reports of misbehavior suggesting that while still a limitation, bias may be minimal in student self-reports (Finn and Servoss, 2014). Additionally, the cross-sectional nature of the data restricts causal interpretations of the direct and indirect paths. Furthermore, content validity was potentially a problem due to the fact that the constructs were measured using single items. Specifically, a single question was employed to operationalize depression; as such, many elements of depressive symptoms may not have been taken into consideration. Nevertheless, there are precedents in the literature to operationalize "sadness and hopelessness" as depression. Sadness and hopelessness are the most commonly cited symptoms associated with depression (Yang et al. 2018; Messias et al. 2014). Moreover, due to sampling limitations and confidentiality, the CDC does not provide details on the breakdown of public versus private schools that were included in their three-stage cluster sampling. Therefore, future research may need to consider testing whether the direct and indirect associations among experiencing school violence, internalizing symptoms, and academic performance differ between public and private school students. Last, in testing direct and indirect associations, we controlled for the two forms of violence that are not considered experiencing school violence: physical dating violence and sexual dating violence. However, about 20% of the students who answered they had experience with physical dating violence also answered "yes" to the experience of physical fighting at school, which means we may not totally avoid some overlapping cases that the physical fighting at school was with a dating partner. In addition, there can be more control

variables such as socio-demographic variables (e.g., parents' education level) and socio-economic variables (e.g., parents' socioeconomic status) that were not available from the secondary data. These additional control variables can be included in a future study.

Implications

Generally, schools must aim for interventions that prevent or reduce experiencing school violence victimization, improve school safety, and mitigate depressive symptoms for all students. When violence occurs despite our best efforts, the findings in the current study can be used to guide targeted assessment and intervention. The first priority however, is to address students' ongoing physical safety needs. Next schools should assess ongoing psychological concerns related to depression and perceptions of school safety to foster long-term academic success. As suggested by others, because schools may be unaware of all incidents of ACEs, schools should carefully consider potential exposure to adversity whenever students are struggling academically (Hammig and Jozkowski, 2013; Bosworth et al. 2011).

Our findings that perceptions of school safety and internalizing symptoms related to depression often affect the relationship between experiencing school violence and school success, can direct school assessment and intervention efforts for all students. Moreover, the findings provide opportunities for intentional and specific school-wide prevention strategies for females due to their vulnerability. While it is concerning that female students are vulnerable to the impacts of adversity in the form of school violence, it is encouraging that they are likely to identify school safety concerns and depressive symptoms. This provides an opportunity for schools to assess the impact of experiencing school violence, particularly involving females. Knowing that negative perceptions of school safety and feelings of sadness and hopelessness following an adverse experience are more likely to compromise academic performance provides an opportunity to assess for these in female students and appropriately target intervention towards these factors when students are struggling.

Additional research is needed to understand the implications of adversity for male students related to academic performance. Students involved in child welfare investigations experience academic difficulties more often than any other concern related to child functioning, and being male was one of a number of characteristics that were particularly related to experiencing academic difficulties (Sanders and Fallon, 2018). While there is indication that females are more likely to be exposed to stressors in relationships with family or peers, males are more exposed to stressors related to school problems and conflicts with authority and boys are at increased risk of responding to such stressors in additionally externalizing ways such as dropping out of school (Lavoie et al. 2019). Additionally, males are more likely to be involved in externalizing behaviors such as fighting, which has a direct relationship with academic performance. Boys require support when involved in school violence regardless of self-reports of school safely concerns, sadness or hopelessness. More of our male participants had been involved in a physical fight at school and had been threatened or injured with a weapon at school, while females were more likely to identify having experienced bullying, to identify internalizing symptoms and to express school safety concerns. Therefore, while the results of our study point toward screening and intervention for safety concerns and indicators of depression for females, it is recommended that schools attend to incidents of exposure to violence, specifically physical fighting, for all students. Individuals who have experienced trauma and are demonstrating delinquent behaviors often do not meet criteria for post-traumatic stress disorder, or depression

(Ford et al. 2010). We concur with researchers who suggest these findings could reflect unmeasured gender-based factors perhaps associated with subclinical or undiagnosed concerns (Sörberg et al. 2019).

It is encouraging to note that school climate, perceived safety in-school and on the way to school, and staff actions can have a more significant impact on levels of school violence and academic achievement than neighborhood violence does (Milam et al. 2010; Bosworth et al. 2011). Schools are encouraged to consider the pervasive impact of adversity, to attend to perceptions of safety and internalizing symptoms as indicators of need and to recognize the direct impact of fighting on academic performance.

Conclusions

Consistent with prior research, our findings highlight the significant opportunities schools have to support students who have experienced an incident of violence, threat or bullying in schools and in turn their opportunities for academic success. The results of this study provide important insight into the complex relationships between experiencing school violence, perceptions of school safety, sadness and hopelessness and their relationship to academic performance. Knowing the type of school violence that is experienced, its ramifications, and recognizing that males and females may be impacted differently is vital when designing and implementing interventions necessary in maintaining overall wellbeing in schools.

Data Availability YRBSS is readily available and furnished through the U.S. Centers for Disease Control and Prevention (CDC). All authors equally take responsibility for the integrity and accuracy of the data analysis.

Compliance with Ethical Standards

Conflict of interest This study was not supported by any funding and the authors have no conflicts of interest to declare.

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