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ORIGINAL PAPER

Reducing the Risks of Firearm Violence in High Schools: Principals' Perceptions and Practices

James H. Price[1] · Jagdish Khubchandani[2] · Erica Payton[2] · Amy Thompson[1]

Abstract This study assessed the perceptions and practices of a national sample of secondary school principals regarding reducing firearm violence in high schools. Data were collected via three-wave postal mailings. A 59-item valid and reliable questionnaire was mailed to a national random sample of 800 secondary school principals. Of the 349 principals (46 %) that responded, 17 % reported a firearm incident at their school in the past 5 years. Principals perceived inadequate parental monitoring (70 %), inadequate mental health services (64 %), peer harassment/bullying (59 %), and easy access to firearms (50 %) as the main causes of firearm violence in schools. The three barriers to implementing firearm violence prevention practices were: lack of expertise as to which practices to implement (33 %), lack of time (30 %), and lack of research as to which practices are most effective (30 %). Less than half of schools trained school personnel regarding firearm violence issues. The findings indicate that firearm incidents at schools may be more common than previously thought. A significant portion of principals are at a loss as to what to implement because of a lack of empirical evidence on what is effective. More research is needed to find the most effective school interventions for reducing firearm violence.

Keywords Firearms · School violence · Guns · High schools · Principals

✉ Erica Payton
edpayton@bsu.edu

[1] Department of Health Professions, University of Toledo, Toledo, OH 43606, USA

[2] Department of Physiology and Health Science, Ball State University, Muncie, IN 47306, USA

Introduction

Firearm violence continues to be of significant concern in the United States. There are more firearms owned by American citizens than in any other country, estimated at 310 million firearms [1]. A recent national study of adolescents found that 29 % lived in a home that had one or more firearms in it [2]. They also found that 41 % reported they had easy access to the firearms and that adolescents with a history of mental illness or suicidality were as likely to report access to firearms as those without such histories. In 2011, the national Youth Risk Behavior Survey (YRBS) found that 5 % of youths 9–12th grades had carried a firearm at least one day in the past 30 days [3]. Firearm carrying students were six times more likely to have been males than females, and they were about 40 % more likely to have been Black than White males [3]. Additionally, the majority of the firearms that have been used in school-associated homicides and suicides were obtained primarily from the youth's homes or from their friends or relatives [4, 5]. The results of this widespread availability of firearms was that in 2013 there were 1410 youth firearm homicides, 877 youth firearm suicides, 124 youth accidental firearm deaths, 38 firearm deaths of youths of undetermined intent, and 20 deaths from legal interventions [6, 7]. In the same year there were about 15,576 nonfatal firearm injuries to youths, the majority were from assaults. That would be the equivalent of 125 classrooms of 20 children per room killed with firearms.

Youths most likely to die from fatal firearm trauma are: Black youths, males, older teens, and socioeconomically disadvantaged youths [7]. Black youths are 17 times more likely than White youths to die from firearm homicides, the leading type of firearm deaths in youths. Boys are nearly seven times more likely to be killed with firearms than are

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girls. Older teens (15–19 year olds) are almost 11 times more likely than 10–14 year olds to be killed with firearms. The majority of firearm deaths in youths also occur to those who are socioeconomically disadvantaged [7]. The aforementioned epidemiological parameters of firearm violence committed by youths should help focus educational interventions where they might help minimize firearm violence.

Violence is most disconcerting when it happens at schools because of the young age of the victims, the innocence associated with youths, and the perceived randomness of the killings. Fortunately, violent firearm deaths at schools are not common [8]. A comprehensive review of the literature on firearm violence found only one published study on secondary school principals' perceptions and practices concerning minimizing the potential harm from firearm violence in schools. A geographically limited study of 336 Texas middle and high school administrators examined changes in school policies in the past 5 years to reduce crime and firearm violence [9]. Four out of five schools had changed their policies. Almost one-third (31 %) of the policy changes regarding school safety were due to highly publicized media events of school violence. The vast majority (91 %) of schools had instituted zero tolerance policies for weapon possession. In addition, parental complaints and student perceptions of safety significantly affected changes in school policies regarding safety. Secondary school principals are the prime movers in curriculum change. A national assessment of secondary school principals' perceptions of violence in general in schools found that what prompted schools to implement or plan to implement violence prevention programs was that principals personally saw the need for such programs [10].

The purpose of our national study was to assess high school principals' perceptions and practices regarding attempts to reduce firearm violence in high schools. More specifically, answers to the following questions were sought: What do principals perceive to be the causes of firearm violence in high schools? How likely do principals perceive it to be that their school will have a firearm incident in the next 3 years? Have recent firearm events in the national media influenced school policies or practices to reduce potential firearm violence? Have parents contacted high school administrators regarding school personnel carrying firearms in schools? What firearm violence prevention professional development programs have school administrators provided to their school personnel? What practices do principals believe would be effective in reducing school firearm violence? What do principals perceive to be the major barriers to implementing firearm violence prevention practices in their schools?

Methods

Subjects

From the list of US Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2012, a computerized national random sample of 800 principals was selected [11]. The national sample included members from all the states and represented both public and private secondary schools. A post hoc power analysis was conducted using the population of 25,550 high schools, with a margin of error of five percent, and a confidence level of 95 %. Using the response that 41 % of the principals perceived their schools as not susceptible or had low susceptibility to having a firearm incident in the next 3 years resulted in a required sample size of 349 to generalize the results to the entire population of high school principals [12].

Instrument

A 4-page booklet format questionnaire was developed for this study based on a comprehensive review of the literature on firearm violence to establish face validity of the items. Subsequently, it was sent to a panel ($n = 5$) of published authorities in firearm violence and survey research to establish content validity. Minor wording changes were incorporated in several items based on the experts' recommendations. None of the original items were deleted and no new items were added by the experts. The resulting questionnaire was comprised of seven firearm related items, 38 practices that could potentially impact firearm violence, and 14 demographic and background related items forming a four page booklet style questionnaire. Response formats for the various items included check all that apply, rating of effectiveness of practices to reduce firearm violence (very effective, somewhat effective, or not effective), and fill in the blanks. Having a firearm incident was defined as a student had a gun on them at school, a gun was found in a locker, or any school gun event with or without an actual shooting. Exploratory factor analysis using item loadings of 0.35 and varimax rotation indicated there were 3 factors (subscales) based on the scree plot and eigenvalues of 1.0 or greater. Internal reliability analysis for the 3 subscales found that for *perceived causes of potential firearm violence* Cronbach alpha was 0.72, for *perceived efficacy of various practices to prevent firearm violence* Cronbach alpha was 0.81, and for *current usage of various practices to prevent firearm violence* Kuder-Richarson formula 20 was 0.77.

Procedure

During the late spring of 2013, the high school principals were surveyed via postal mailings using a three-wave approach to maximize the response rate [13]. First, a cover letter ensuring confidentiality of responses, a copy of the survey, a return addressed envelope, and a one dollar cash incentive were sent to each potential respondent. Two weeks following the initial mailing a second mailing minus the monetary incentive was mailed to the non-respondents. Four weeks after the initial mailing, a third mailing just like the second mailing was sent to all non-respondents. Survey envelopes were coded to reduce the risk of receiving duplicate responses. The coded list of high schools was destroyed after the third mailing. The study protocol was approved by the University Human Subjects Committee.

Data Analysis

Survey data were entered into the computer using the SPSS for Windows statistical package 20.0 (SPSS, Chicago, IL.). Descriptive statistics (frequencies, range of scores, means, and standard deviations) were calculated to describe the principals' responses. A Spearman rank order correlation was calculated between how effective an intervention was perceived to be in deterring firearm violence and whether the practice was currently implemented. T-tests were used for bivariate analysis of parametric variables and chi-square tests and logistic regression with odds ratios (ORs) and 95 % confidence intervals (95 % CIs) were calculated for selected non-parametric data. Significance was established at $p \leq 0.05$.

Results

Demographic and Background Characteristics

Completed questionnaires were returned from 349 principals (46 % response rate), 44 questionnaires were non-deliverable. The majority of secondary school principals were: White (87 %), male (71 %), and had a master's degree (62 %) (Table 1). The schools of the principals were equally likely to be suburban (40 %) or rural (40 %) schools.

In the past 5 years, 17 % of the principals reported a firearm incident at their school. The majority (56 %) reported that recent firearm events in the national media had influenced their school district to make changes in school policies or practices to reduce firearm violence. There were three firearm violence prevention professional development programs offered to school personnel by more than one-third of the schools: bullying or violence prevention training (65 %), active shooter training (40 %), and identification of at-risk students (37 %). The principals were almost equally likely to be contacted by a minority of parents supporting school personnel not being permitted to carry firearms in schools (13 %) and supporting school personnel carrying firearms in schools (12 %). A firearm incident was reported in 19 % of schools that never provided school personnel with firearm prevention professional development programs. Whereas, 16 % of schools that provided training reported a firearm incident in the past 5 years. This difference was not statistically significant. The scores for perceived susceptibility to firearm incidents in the next 3 years were statistically significantly higher for principals in schools that did not provide any form of firearm prevention professional development programs for school personnel when compared to principals in schools that provided such programs ($M = 3.01$, $SD = \pm 1.05$ vs. $M = 2.00$, $SD = \pm 0.98$; $t = 2.70$, $p = 0.017$).

Perceived Susceptibility to Firearm Violence

A plurality (41 %) of the principals perceived their schools to be moderately susceptible (scored 3 on a 5 point scale) to a firearm incident in the next 3 years. In addition, 24 and 17 %, respectively, perceived their schools had low susceptibility or were not susceptible (scored 2 or 1, respectively) to a firearm incident occurring in the next 3 years. A logistic regression analysis of demographic and background variables of principals and their schools found that principals who perceived their school had high susceptibility to having a firearm incident in the next 3 years were significantly more likely than principals who did not believe they were highly susceptible to be non-white, older (>50 years of age), males, those with advanced education (greater than a master's degree), and who owned firearms (Table 2). Furthermore, principals in larger schools (>850 students), in schools with a greater portion of their students who were African American (>5 %), those who already had a firearm incident in the past 5 years, and those who had been contacted by parents supporting school personnel carrying firearms in school also perceived their schools were at a greater risk for having a firearm incident.

Etiology of School Firearm Violence

The principals were asked to rate eight potential causes of firearm violence in secondary schools and they were given a ninth option, "other", where they could write in other responses (Table 3). Four of the options were rated very important by 50 % or more of the principals: inadequate parental monitoring/rearing practices (70 %), inadequate

Table 1 Demographics and background characteristics of responding secondary principals

Item	n (%)
Sex	
Female	97 (28)
Male	249 (71)
Age (years)	
<30 years	3 (1)
30–39 years	62 (18)
40–49 years	130 (37)
50–59 years	107 (31)
60+ years	46 (13)
Race/ethnicity	
White	302 (87)
African American	24 (7)
Hispanic	11 (3)
Asian	4 (1)
Other	4 (1)
Highest level of education	
Bachelor	6 (2)
Masters	215 (62)
Specialist	67 (19)
Doctorate	57 (16)
Political affiliation	
Democrat	138 (40)
Republican	91 (26)
Independent	66 (19)
Libertarian	4 (1)
No affiliation	39 (11)
Location of school	
Suburban	140 (40)
Rural	138 (40)
Urban	66 (19)
Region of US location of school	
Midwest	121 (35)
South	97 (28)
Northeast	67 (19)
West	58 (17)
Do you own a firearm (yes)	167 (48)
Type of firearm owned	
Handgun	116 (33)
Rifle	122 (35)
Shotgun	124 (36)
Other (muzzleloader = 5)	12 (3)
Why do you own your gun	
Hunt/sport	128 (37)
Personal safety	85 (24)
Was a gift	46 (13)
Collect firearms	26 (7)
Other	19 (5)
Do you have a valid permit to carry a concealed handgun (yes)	42 (12)
Was there a firearm in your home when you were growing up (yes)	202 (58)
In the past 5 years have you had a firearm incident at your school (yes)	58 (17)
How many incidents in the past 5 years	
1	42 (12)
2	6 (2)
3	3 (1)
4+	4 (1)
Have recent firearm events in national media influenced your school district to make changes in school policies or practices to reduce firearm violence (yes)	197 (56)
Have parents contacted you regarding: support for *not* permitting school personnel to carry firearms (yes)	46 (13)
Support *for* permitting school personnel to carry firearms (yes)	43 (12)
How susceptible do you think your school is to having a firearm incident in the next 3 years?	
Very susceptible 5	14 (4)
4	43 (12)
3	144 (41)
2	83 (24)
Not susceptible 1	59 (17)
Firearm violence prevention professional development programs your school provided to their school personnel	
Bullying or violence prevention training	228 (65)
Active shooter training	139 (40)
Identification of at-risk students	128 (37)
Other (lock down drills = 6; police provided training = 5; mental health = 3; administration trained = 2)	46 (13)
Not yet provided any firearm violence prevention professional development	124 (36)

n = 349

Responses do not always add to 100 % due to missing data

Table 2 Logistic regression of variables that predict principals' perceptions of high susceptibility to firearm incidents in the next 3 years

Variable	Odds ratios (95 % CI)	*p* value
Gender		
Female	1.00 (Ref)	
Male	2.62 (1.14–6.03)	0.023
Race		
Whites	1.00 (Ref)	
Non-Whites	2.06 (1.03–5.02)	0.04
Age[a]		
<50 years	1.00 (Ref)	
>50 years	2.01 (0.83–4.05)	0.09
Education[a]		
≤Masters degree	1.00 (Ref)	
>Masters degree	2.00 (1.08–3.60)	0.029
Years experience[a]		
≤7 years	1.00 (Ref)	
>7 years	1.22 (0.63–2.35)	0.55
Firearm owned by principal		
No	1.00 (Ref)	
Yes	1.43 (1.18–5.40)	0.02
Political affiliation of principal		
Republican	1.00 (Ref)	
Democrat	1.08 (0.47–2.32)	0.81
Student population[a]		
≤5 % African American	1.00 (Ref)	
>5 % African American	2.81 (1.47–5.35)	0.002
≤3 % Hispanic	1.00 (Ref)	
>3 % Hispanic	1.23 (0.66–2.31)	0.50
School location		
Urban	1.00 (Ref)	
Suburban	0.86 (0.33–1.36)	0.10
Rural	0.63 (0.32–1.18)	0.08
Total student population[a]		
≤850	1.00 (Ref)	
>850	1.93 (1.08–3.64)	0.03
Firearm incidents in school within the past 5 years		
No	1.00 (Ref)	
Yes	2.73 (1.25–5.97)	0.01
Parents contacted school to support school personnel carrying firearms in school		
No	1.00 (Ref)	
Yes	2.84 (1.15–7.02)	0.02
Firearm prevention professional development programs provided for school personnel		
Yes	1.00 (Ref)	
No	2.21 (1.11–4.40)	0.02

N = 349

[a] Median split for these variables was the dividing point for analysis

mental health care services for youths (64 %), peer harassment and/or bullying (59 %), and easy access to firearms (50 %). The principals were least likely to believe (23 %) that a lack of school preparation for firearm violence was a very important cause of firearm violence in secondary schools.

Table 3 Perceived causes of firearm violence in secondary schools

Potential cause	Very important N (%)	Somewhat important N (%)	Not important N (%)
Inadequate parental monitoring/rearing practices	244 (70)	88 (25)	12 (3)
Inadequate mental health care services for youth	223 (64)	102 (29)	8 (5)
Peer harassment and/or bullying	207 (59)	129 (37)	7 (2)
Easy access to firearms	173 (50)	142 (41)	31 (9)
Amount of violence in the media	166 (48)	159 (46)	19 (5)
Drug activity	111 (32)	177 (51)	50 (14)
Gang activity	104 (30)	152 (44)	89 (26)
Lack of school preparation for gun violence	79 (23)	194 (56)	68 (20)
Other (poverty; media; violent games; violent music; NRA; lack of police support)	12 (3)	7 (2)	6 (2)

N = 349

[a] Percents may not add to 100 % due to missing data

Perceived Effectiveness and Current Use of Practices to Reduce Firearm Violence

A list of 38 potential practices were listed for the principals to rate their perceived effectiveness of the practices in reducing firearm violence. In addition, the principals were requested to indicate whether any of the practices were currently being employed by their school. Of the 38 potential practices 16 were perceived by at least 50 % of the principals as very effective in reducing school firearm violence (Table 4). School principals were less likely to perceive the following as very effective: provide violence prevention education in the school curriculum (24 %), install bullet proof glass (21 %) or metal detector systems (18 %), implement a policy allowing selected school personnel to carry firearms in schools (16 %) or to train key school personnel to carry firearms in schools (15 %), and train students to collectively attack and subdue an armed gunman (7 %).

The principals were also asked to indicate which of the 38 practices were currently implemented in their schools (Table 4). A total of 16 of the practices were implemented currently by 70 % or more of the high schools. There was a statistically significant Spearman rank order correlation ($rs = 0.84$, $p < 0.001$) between how effective a practice was perceived to be in deterring firearm violence and whether the practice was currently implemented.

Barriers to Implementing Firearm Violence Prevention Practices

There were 12 potential barriers and the option "other" listed that the principals were asked to identify as local barriers to implementing firearm violence prevention practices (Table 5). Forty percent of the principals claimed there were no barriers to implementing such practices. Three barriers were listed by about one-third of the respondents. The major barriers most often identified were: lack of expertise regarding which practices to implement (33 %), lack of time (30 %), and lack of research on the most effective firearm violence prevention practices (30 %).

A significant portion (14 %) of the principals selected "other" as a barrier and that selection was most often identified as budget issues. A Pearson product moment correlation coefficient was calculated for number of practices implemented to prevent firearm violence by number of perceived barriers. The greater the number of perceived barriers, the fewer the number of firearm violence prevention practices implemented ($r = -0.54$, $p < 0.001$). In addition, the scores for perceived susceptibility to a firearm incident in the next 3 years were statistically significantly lower for schools that did not perceive any barriers to implementing firearm prevention practices in schools compared to schools that perceived there to be barriers ($M = 2.19$, $SD = \pm 0.72$ vs. $M = 2.90$, $SD = \pm 0.90$; $t = 2.07$, $p = 0.036$). Also, barrier scores were significantly lower for schools that provided active shooter training to school personnel compared to those who did not provide such training ($M = 1.35$, $SD = \pm 0.45$ vs. $M = 1.98$, $SD = \pm 0.63$; $t = 3.60$, $p = 0.008$).

Discussion

The prevalence of firearm incidents (e.g. defined as a student had a gun on them at school, a gun was found in a locker, or any school gun event with or without an actual shooting) in a national sample of high schools has not been published previously. The 17 % rate found in the current

Table 4 Perceived effectiveness and current use of various practices to reduce firearm violence

Type of practice	Very effective N (%)	Somewhat effective N (%)	Not effective N (%)	Currently used N (%)
Work with law enforcement to design and implement an emerging response plan	234 (67)	105 (30)	4 (1)	304 (87)
Require criminal background checks of all school personnel prior to hiring	216 (62)	111 (32)	15 (4)	325 (93)
Increase mental health counseling services	215 (62)	117 (34)	11 (3)	193 (55)
Require a School Resource Officer (SRO) in the school	211 (61)	110 (32)	16 (5)	207 (59)
Reduce school bullying through effective school programs	207 (59)	133 (38)	3 (1)	307 (88)
Install video cameras and close-circuit television systems throughout the school	201 (58)	124 (36)	15 (4)	286 (82)
School staff practice critical incident plan for active shooters on periodic basis	200 (57)	134 (38)	8 (2)	294 (84)
Create a comprehensive security plan	194 (56)	141 (40)	4 (1)	297 (85)
Implement formal programs and practices to create a nurturing school climate	195 (56)	129 (37)	15 (4)	262 (75)
Implement comprehensive school discipline policies	190 (54)	142 (41)	9 (3)	322 (92)
Implement an anonymous system for students to report peer concerns about potential violence to school officials	188 (54)	135 (40)	14 (4)	252 (72)
Install an alert system to notify school personnel of a potential emergency situation	187 (54)	140 (40)	8 (2)	247 (71)
Implement Zero tolerance discipline practices for weapon carrying or weapon related threats	182 (52)	122 (35)	40 (11)	278 (80)
Conduct a comprehensive security assessment of the school's emergency procedures	183 (52)	152 (44)	4 (1)	292 (84)
Conduct a comprehensive security assessment of the school's physical design	182 (52)	146 (42)	9 (3)	264 (76)
Conduct a comprehensive security assessment of the school's safety policies	177 (51)	152 (44)	9 (3)	282 (87)
Enforce a firearm-free campus policy	177 (51)	125 (36)	39 (11)	306 (88)
Install a communication system in each room in the school allowing school personnel to interact with one another	168 (48)	152 (44)	22 (6)	240 (69)
Establish a threat assessment team and protocol	143 (41)	179 (51)	13 (4)	190 (54)
Restrict access to school facilities with entry-control devices (e.g. "buzz-in system; electronic key cards, etc.)	139 (40)	173 (50)	29 (8)	173 (50)
Establish a closed campus policy that prohibits students from leaving campus during the school day	122 (35)	165 (47)	53 (15)	226 (65)
Formally communicate all firearm-related school policies to students	121 (35)	178 (51)	39 (11)	258 (74)
Conduct psychological assessments of students who fit a violence prone profile	118 (34)	170 (49)	42 (12)	96 (28)
Require staff and students to wear picture identification badges	102 (26)	166 (48)	74 (21)	190 (54)
Conduct random searches of backpacks or lockers	90 (26)	182 (52)	68 (20)	161 (46)
Establish and enforce a dress code for students	83 (24)	155 (44)	100 (29)	251 (72)
Provide violence prevention education in the school curriculum	82 (24)	215 (62)	38 (11)	142 (41)
Conduct an instant background check on all visitors to the school	80 (23)	151 (43)	96 (28)	51 (15)
Encourage parents to reduce the amount of time their child watches violent movies	75 (22)	172 (49)	88 (25)	42 (12)
Install bullet-proof glass in the entry ways of the school	72 (21)	157 (45)	97 (28)	16 (5)
Install metal detector systems at the school entrance	61 (18)	168 (48)	105 (30)	16 (5)
Encourage parents to reduce the use of violent video games by their child	60 (17)	169 (48)	99 (28)	32 (9)
Implement a policy to allow selected school personnel to carry firearms in school	56 (16)	106 (30)	162 (46)	21 (6)
Train key school personnel to carry firearms in the school	53 (15)	105 (30)	162 (46)	20 (6)
Train students to collectively attack and subdue an armed gunman	23 (7)	102 (29)	198 (57)	17 (5)
Require students to carry translucent backpacks	18 (5)	122 (35)	185 (53)	13 (4)
Require students to carry Kevlar-type backpacks	8 (2)	60 (17)	252 (72)	4 (1)

n = 349

Table 5 Major barriers to implementing firearm violence prevention practices

Barrier	N (%)
Lack of expertise regarding which practices to implement	116 (33)
Lack of time	104 (30)
Lack of research on the most effective firearm violence prevention practices.	103 (30)
There are other more important priorities	42 (12)
There is a lack of parent support for such activity	38 (11)
There is a lack of school staff support	33 (10)
Firearm violence is not that big a problem in schools	31 (9)
Lack of support from local law enforcement	20 (6)
Difficulty in enforcing additional firearm policies	20 (6)
Lack of school board support	15 (4)
Do not want to go against pro-gun groups	7 (2)
Do not want to violate the second amendment	7 (2)
Other (budget issues = 22; no policy from central office = 3; no School Resource Officer = 2)	49 (14)

60 % of school principals reported barriers

n = 349

study is much greater than the rate of firearm deaths in schools [8]. This may indicate that schools are doing a reasonably good job of intervening before students have a chance to use a firearm brought on to school grounds. Another possibility is that some students who bring firearms to school do so as a form of self- protection (defensive use) rather than with the intention to offensively use the firearm.

The data also indicate that the majority (60 %) of high schools have not taken any actions to provide professional development for school personnel regarding dealing with active shooters on their premises. Without practice and education school personnel may not respond to an active shooter in their building in the most effective manner. Furthermore, less than one-in-four principals believed lack of school preparation for potential firearm violence was a very important cause for school firearm violence. Public health professionals need to work with school administrators to help them identify evidence based cost-effective methods of reducing firearm violence in schools.

Two of the four leading perceived causes of school firearm violence were related to parent issues (parent rearing practices and easy access to firearms). Thus, it may be that principals perceived student homes as playing a larger role than schools in reducing school firearm violence. If so, this may be one of the reasons why more schools have not been proactive in implementing practices to reduce firearm violence. Also, part of the problem faced by school administrators in attempting to minimize school firearm violence is the lack of empirical evidence to indicate which firearm violence prevention actions are the most effective. Much of the publications on interventions to reduce firearm violence are anecdotal, case studies, and opinion pieces based on comments in the popular press. The limited number of publications on firearm violence and youths is, in part, the direct result of the National Rifle Association (NRA) pressures on congress and congresses' subsequent restriction on the US Centers for Disease Control and Prevention (CDC) restricting injury prevention research funds so that they could not be used for advocacy or promotion of firearm control [14].

The attempts to reduce firearm violence in the current study are different than what was found in the study of Texas administrators [9]. In the current study, zero tolerance for weapons possession was less (80 vs. 91 %), as was use of metal detectors (5 vs. 14 %). Our study sample of administrators was more likely to form a partnership with local law enforcement (87 vs. 81 %), have installed video cameras (82 vs. 32 %), and locked building doors and monitored their exits (50 vs. 40 %). These differences may be attributed to the studies being conducted over a decade apart and the previous study was of one southwestern state while the current study was national. It should also be noted that a study of 800 National Education Association (NEA) members found that only 22 % favored allowing teachers or other school employees to carry firearms in schools [15]. This confirms the wide spread disagreement with one of the NRA proposed solutions to school firearm violence, namely, arming school personnel.

The school administrators in our study were found to more likely adopt the interventions they thought were most likely to be effective. This may indicate that if more empirical evidence was brought forth by public health researchers regarding effective strategies to reduce firearm violence in schools then school administrators would likely adopt them, especially if they were not too cost prohibitive.

One of the more controversial practices to reducing firearm violence in schools, namely having school personnel carry firearms, was supported by only 16 % of the principals. In addition, just one in eight principals reported being contacted by parents who were in favor or were not in favor of school personnel carrying firearms. The majority of both groups may have realized that having a concealed carry permit for a firearm does not mean that the permit holder can accurately hit the target at which they are shooting. This skill is not required to obtain a permit for a concealed carry weapon.

There are a number of potential limitations to our study. First, the response rate (46 %) was better than the Texas study (42 %), but the results could still have limited external validity. The respondents were homogenous in their demographic characteristics (87 % White, 71 % males, and 62 % had masters degrees). A recent report from the National Center for Education Statistics reported that 83 % of public high school principals are White, 70 % are males, and 58 % had master's degrees. Thus, the principals seem to approximate the national characteristics of public high school principals [16]. Second, this study is a cross sectional study and thus, cause and effect relationships should not be drawn. Third, the questionnaire was monothematic. This may have caused some administrators to think about school firearm violence issues in a unique way. If so, this could be a threat to the internal validity of the findings. The data were collected through a self-report questionnaire. Thus, some respondents may have felt the need to give socially acceptable responses to some items. In fact, a study of New York state schools found that one-third of schools failed to report approximately 80 % of violent incidents [17]. If such under-reporting occurred in the current study, this too would be a threat to the internal validity of the findings. Finally, to better understand the thinking of the school administrators regarding firearm trauma prevention practices, a mixed-methods assessment (qualitative and quantitative) may have provided greater insights into the issues [18].

Conclusions

In conclusion, our findings underscore the fact that a large portion of high school administrators have adopted a range of firearm violence prevention interventions that they believe reduces their chances of experiencing a firearm incident. Unfortunately, due to very limited empirical evidence on effective interventions schools may inadvertently be taken in by organizations selling questionably effective interventions. Further research on firearm violence prevention interventions that are effective could help remove the leading barriers to schools implementing more effective methods of protecting adolescents from firearm violence. Finally, similar research should be conducted with a national sample of parents of adolescents. By examining parents' perceptions of what schools should do to reduce firearm violence, school administrators would have additional insights into what interventions would at least be politically expedient to adopt if the interventions were not truly effective.

Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest to declare.

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