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Adding Security, but Subtracting Safety? Exploring Schools' use of Multiple Visible Security Measures

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Abstract In response to continued concerns over crime and violence, schools are increasingly employing visible security measures such as cameras, metal detectors, and security personnel. These security measures are not mutually exclusive, but few studies have considered the relationship between the use of multiple forms of security and youth's exposure to drugs, fighting, property crime, and firearms at school. To address this issue, we analyzed nationally representative school administrator-reported data from the School Survey on Crime & Safety, using a quasi-experimental design with propensity scores to adjust for potential confounding factors. The results indicated that utilization of multiple security measures reduced the likelihood of exposure to property crime in high schools, but most other security utilization patterns were associated with poorer school safety outcomes. Our findings provide guidance to

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policymakers in considering whether to use – or expand – visible school security measures in schools.

Keywords School safety · School security · School surveillance · School violence

Despite the expectation that schools should provide students with safe learning environments, many youth are exposed to drugs, weapons, or violence at school. In 2013, approximately 22% of high school students had been offered, given, or sold drugs on school property, 8% had been in a fight, 22% had been bullied, and 7% had been threatened or injured with a weapon at school in the past year (Robers, Zhang, Morgan, & Musu-Gillette, 2015). Exposure to drugs, violence, and illegal behaviors at school correlates with numerous detrimental consequences, including school failure and dropout, mental and behavioral health problems, and future victimization (Gini & Pozzoli, 2013; Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002; Ttofi, Farrington, Lösel, & Loeber, 2011). In an effort to create and maintain safe learning environments, many schools have adopted various security measures.

Schools often consider using measures such as surveillance cameras, metal detectors, and security personnel based on a belief by administrators, parents, and youth that these measures promote school safety (Brown, 2005; Johnson, 1999; Madfis, 2016). These visible measures also provide a tangible policy response to school violence. Some scholars, though, have questioned this reaction and suggest that these security measures may negatively affect youth by promoting a culture of fear and creating negative expectancy effects whereby youth reproduce the very behaviors that were supposed to be prevented (Mayer & Leone, 1999). In practice, schools do not implement security measures in isolation, but rely on a mix of alternatives, which may have variable effects in different contexts. While a growing body of scholarship considers the effects of school security on crime as well as the school environment, an outstanding issue is whether the effects vary when schools use single versus multiple forms of security as few scholars have examined this issue. This study seeks to explore this issue by examining whether and how visible security utilization patterns affect youths' exposure to crime and violence at school. This study adds to the small but growing literature on this topic, and is one of the few studies to date to use a rigorous quasi-experimental research design to examine the associations between combinations of security measures used by schools and students' exposure to crime and violence.

Use of Visible Security Measures

School safety is an important social issue that has garnered extensive public attention, particularly following tragic school shootings (Addington, 2009). The mounting public concern over school safety became prominent following the shooting at Columbine High School in 1999 and more recently the shooting at Sandy Hook Elementary School. Although most violent crime victimization among youth happens outside of school (Gottfredson, Gottfredson, Payne, & Gottfredson, 2005), media coverage of school violence incidents often exacerbates fears about school safety (Addington, 2003; Kupchik & Bracy, 2009).

To prevent crime and violence, many U.S. schools have increased their use of visible security measures such as security personnel, cameras, and metal detectors. In the 2013–2014 school year, an estimated 89% of public high schools used security cameras to monitor the school; 43% reported the presence of one or more security guards, security personnel, school resource officers, or sworn law enforcement officers at least once a week; and 9% used random metal detector checks (Zhang, Musu-Gillette, & Oudekerk, 2016). Support for these measures implicitly relies on deterrence and routine activity theories of criminal behavior, such that youth should be deterred from engaging in criminal behavior if these policies increase the perceived risk of apprehension and punishment. This deterrence hypothesis is based on a rational choice theory of behavior, whereby the likelihood of criminal offending is a function of the perceived costs and benefits associated with committing a crime (Becker, 1968). Visible security measures are also expected to prevent crime and violence by offering a form of spatial guardianship (Burrow & Apel, 2008; Piro, 2008). Routine activity theory suggests that the presence of motivated offenders, suitable targets, and lack of capable guardians are necessary for a crime to occur (Cohen & Felson, 1979). Under routine activity theory, visible security measures would prevent crime and violence by minimizing the presence of motivated offenders (via deterrence) and increasing the presence of capable guardians (either physical guardians such as security personnel and metal detectors or virtual visible guardians such as security cameras). For instance, a school bully (motivated offender) may be less likely to physically attack a victim (suitable target) in the school hallway when a security officer (capable guardian) is present in a hallway, but more likely to attack a victim in a school bathroom where visible security measures and other guardians are absent.

The use of visible security measures in schools remains controversial and has led some researchers to call for administrators to reconsider their use (Addington, 2009), particularly security personnel such as school resource officers (Jackson, 2002; Kupchik, 2010) and metal detectors (Finley, 2006; Warnick, 2007). Indeed, scholars have debated whether such security measures violate youth's Fourth Amendment rights for protection from unreasonable search and seizure by a state actor (Blankenau & Leeper, 2003; Squelch & Squelch, 2005). Further, visible security measures may create a culture of criminalization and fear in schools (Hirschfield, 2008; Mayer & Leone, 1999). The criminalization of school discipline may elicit negative expectancy or self-fulfilling prophecy effects among students (Warnick, 2007; Watts & Erevelles, 2004) and degrade school climate (see Addington, 2009; Devine, 1995; Fisher, Gardella, & Tanner-Smith, 2016; Noguera, 1995; Theriot, 2016).

The increased use of visible security measures in schools reflects a growing tension between pedagogical and punitive approaches for managing student behavior (Kim, 2012). The shift toward a crime control approach conveys to the public that schools are taking issues of school safety seriously, but a byproduct of this normalization of crime control in schools may fundamentally alter the relationship between the school and the student (Ahrens, 2012). Rather than deterring criminal behavior in schools, security measures may instead increase problematic behavior via expectancy effects, increase the detection of problematic behavior (via net-widening effects), and increase the likelihood that such behavior is labeled "criminal" and worthy of sanction. Additionally, increased reliance on formal approaches to behavior management such as school security measures may reduce the effectiveness of traditional approaches to behavior management

such as increasing the students' sense of school connectedness (Theriot, 2016) or improving student-teacher relationships (Devine, 1996; Fisher et al., 2016).

Quasi-Experimental Research on the Effects of School Security Measures

Despite increased federal funding for school security measures in recent years (Casella, 2003; The White House, 2013), there is a notable lack of rigorous research examining the effects of visible security measures on youth crime and violence in school (Cook, Gottfredson, & Na, 2010; Skiba & Peterson, 2000). Given the ethical and practical barriers of randomizing schools to use different visible security measures, it is of little surprise that to date there are no randomized controlled trials on this topic. In this absence, quasi-experimental designs provide one of the strongest designs for examining these associations, by permitting comparisons of non-randomized groups while minimizing selection bias through covariate control and balancing procedures (see Shadish, Cook, & Campbell, 2002 for more detail on the strengths of quasi-experimental designs).

A handful of quasi-experimental studies have found that the presence of school security measures may have deleterious consequences for schools and students. One of the most rigorous controlled quasi-experimental studies to date was the evaluation of the New York City's Impact School program (Brady, Balmer, & Phenix, 2007), which found that schools receiving funds for additional security personnel fared worse than comparison schools on measures of school crime. Another rigorous controlled quasi-experimental study found that the presence of school resource officers was associated with an increase in arrests for disorderly conduct and students' exposure to drugs and weapons at school (Na & Gottfredson, 2013). A third controlled quasi-experimental study also found that the presence of school resource officers was associated with an increase in arrests for disorderly conduct, but a decrease in arrests for assault or weapon possession (Theriot, 2009). Other quasi-experimental studies, however, have reported no relationship between the presence of security personnel and school safety outcomes, including assaults, robberies, weapon possession, and alcohol or drug possession (Barnes, 2008; Wilkerson, 2001). All of the aforementioned studies focused on only one type of security measure (i.e., security personnel), however, and thus it is unclear whether these findings may hold for other types or patterns of visible security measures. Because most schools employ multiple types of school security measures simultaneously (Steinka-Fry, Fisher, & Tanner-Smith, 2016), focusing on the effect of a single security measure may not adequately capture the effect of security practices on school safety outcomes.

The inconsistencies in prior research findings may also be due in part to true variability in the effects of visible security measures on school safety across diverse school contexts. To date, however, few studies have examined the potential moderating role of school context on these relationships. One notable exception was in a controlled quasi-experimental evaluation of the effects of school resource officers, which found that the detrimental effect of school resource officers on students' disorderly conduct and assault was magnified in higher socioeconomic status schools (Theriot, 2009). In another controlled quasi-experimental study, however, there was no evidence that the relationship between school resource officer presence and student behavioral outcomes varied according to the percent of racial/ethnic minority or special education

students in the school (Na & Gottfredson, 2013). These results are therefore suggestive that the effects of visible security measures on school safety outcomes may vary across school contexts.

Research Questions

Despite the intuitive appeal of visible security measures for preventing crime and violence in schools, critical questions remain, especially with regard to using multiple forms of security. As such, this study seeks to examine the relationship of different combinations of visible security measures on crime and violence in schools. We rely on data collected from a nationally representative sample of school administrators to address two research questions. First, are the patterns of visible security measures used in U.S. middle and high schools associated with youth exposure to drugs, fighting, property crime, and firearms at school? Next, do school context characteristics moderate the relationships between visible security measure patterns and school safety outcomes?

Method

Sample

To answer these questions, we analyzed restricted use data from the School Survey on Crime & Safety (SSOCS). The SSOCS is a cross-sectional survey of principals and administrators of schools in the United States. The SSOCS uses a stratified random sampling design based on the Common Core of Data file to stratify on school level, locale, and enrollment size (Ruddy, Neiman, Bauer, Hryczaniuk, Thomas & Parmer, 2010). We used school administrator-reported data for all middle and high schools in the four most recent SSOCS surveys collected in 2003–2004, 2005–2006, 2007–2008, and 2009–2010 (Total number of schools = 10,340; Number of middle schools = 3820; Number of high schools = 6520).[1] We excluded elementary schools, given their low prevalence of security measures and school crime. The cross-sectional design of the SSOCS survey precluded longitudinal analyses with the majority of schools in the sample.[2] Therefore, we pooled cross-sectional data across the four survey years, and statistically controlled for survey year in all analyses to adjust for potential variation across years.

Measures

School Safety Outcomes We used four measures of school safety outcomes: exposure to drugs, fighting, property crime, and firearms at school. The outcome of *drugs* at school was operationalized as the suspension rate per 1000 students in the past year for

[1] Note that all sample sizes have been rounded to the nearest 10, as required by our restricted-use data license agreement with the Institute of Education Sciences.

[2] Although the SSOCS surveys include Common Core of Data identification numbers that allow linkage of SSOCS respondents (i.e., schools) longitudinally over time, the national sampling frame of the SSOCS surveys means that the probability is small for overlap of most schools across the four survey years.

illegal drug distribution, possession, or use (range 0–129). *Fighting* was measured as the suspension rate per 1000 students in the past year for student fighting (range 0–1104). *Property crime* was measured as the suspension rate per 1000 students in the past year for theft (range 0–467). The presence of *firearms* was measured as the suspension rate per 1000 students in the past year for firearm possession (range 0–110). Although the SSOCS includes other measures of school safety (such as violent or serious violent crime), we focused on these four measures given their prevalence in most schools (drugs, fighting, property crime) or policy relevance (firearm presence). We focused on suspension rates for each of these outcomes because they were presumed to have higher face validity and reliability than administrator reports of actual numbers of offenses, given that suspension rates are often required documentation for school reporting purposes (Krezmien, Leone, & Achilles, 2006).

Visible Security Measure Patterns The three visible security measures of interest were security personnel (which included security guards, school resource officers, or sworn law enforcement officers), surveillance cameras, and metal detectors used in schools. We measured these using three binary variables indicating their presence/absence in schools. Because we sought to examine the effects of different patterns of visible security measure utilization (versus the effects of any single security measure alone), we created a nominal eight category variable measuring the different possible combinations of security measures (i.e., *none, cameras only, metal detectors only, security personnel only, metal detectors & cameras, security personnel & cameras, security personnel & metal detectors, cameras & metal detectors & security personnel*).

School Context Moderators Given that the effects of visible security measures on school safety outcomes are likely to vary across school contexts, we examined five school contextual variables as potential moderators: percent of male students (0–100), percent of White students (0–100), percent of free/reduced price lunch students (0–100), school level (1 = *high school*; 0 = *middle school or mixed grades*), and an average scale ($\alpha = .74$) measuring parental/community involvement in school calculated from eight binary (agree, disagree) items regarding involvement of community groups to promote safe schools (parent groups, social services, juvenile justice, law enforcement, mental health, civic organizations, business, and religious organizations).

Controls All outcome models statistically controlled for the estimated propensity score and its squared and cubed terms (as described in greater detail below), as well as school neighborhood urbanicity (urban vs. not), student-teacher ratio (0.61–320), and survey year (2003, 2005, 2007, 2009).

Analytic Strategies

Ordinary least squares regression models were used to predict the continuously scaled outcomes. To test for moderation effects, we used multiplicative interaction terms estimated as the product of the security utilization pattern dummy indicators and the moderators listed above. We examined the effect of one moderator at a time; because this involved seven interaction terms per

moderator, we used a Wald test to examine whether the seven interaction terms for each moderator were jointly equal to zero. We then probed any interactions with significant Wald tests using predicted values across values of the moderators. To adjust for the complex sampling design, we used a jackknife variance estimation method (Ruddy et al., 2010). Given the large analytic sample sizes, statistical significance was assessed at $\alpha = .01$ level, and standardized mean difference effect sizes (Cohen's *d*) were estimated to convey the magnitude of effects.

Propensity Score Estimation Because this study involved secondary data analysis, it was not possible to randomly assign schools to security utilization patterns. Instead we used propensity scores to balance respondents in schools using different security patterns (Guo & Fraser, 2009). Propensity score methods can be useful for reducing the impact of selection bias and confounding on estimated treatment effects in non-randomized observational studies by balancing groups on observed baseline characteristics (Tanner-Smith & Lipsey, 2014). The 'treatment' indicator in this study—security utilization pattern—was a nominal polytomous measure, so we used a generalized propensity score method for non-binary treatment indicators (Hirano & Imbens, 2004; Imai & Van Dyk, 2004). Propensity scores were estimated as the predicted probability of schools' observed security utilization pattern, based on a multinomial logistic regression model that included a wide range of potential confounders (see Appendix). By using a large set of potential confounding variables in the propensity score models, we attempted to minimize selection bias in the estimated effects of school security measures on school safety outcomes. Because certain types of schools may be more likely to invest in visible security measures (e.g., unsafe schools with histories of violence), we attempted to control for those characteristics through use of the propensity score.

Propensity score balancing techniques used for binary treatments (e.g., nearest neighbor matching, weighting) were not feasible to implement given the large number of treatment categories and the complex sampling designs of the survey. Therefore, we statistically controlled for the estimated propensity score and its squared and cubed terms in all outcome models. Although this quasi-experimental design does not permit causal inferences regarding the effects of security utilization patterns on exposure to crime and violence at school, it attempts to minimize the impact of selection bias and confounding on any observed effects.

Missing Data The SSOCS data files available from the National Center for Education Statistics (NCES) did not include missing data on any of the visible security or school safety measures; NCES imputed all missing values using aggregate proportions, best match, logical, and clerical imputation methods (see Ruddy et al., 2010 for additional details). One school context moderator and one control variable included missing data: percent of White students (missing for 10% of cases) and student-teacher ratio (missing for 25% of cases). We used multiple imputation (Graham, 2009; Schafer & Graham, 2002) to handle these missing data, which yields valid statistical inferences when data are

missing at random. We created 20 imputed datasets using all key variables of interest, and used standard procedures to pool results across imputed datasets using Rubin's rules (Rubin, 1987).

Results

Descriptive Statistics

Table 1 presents descriptive statistics and bivariate correlations. The pooled SSOCS sample across the 2003–2010 survey years included 10,340 public schools (average school composition: 50% male, 57% White, 48% FRPL, 15% high school only vs. middle or mixed grade span, $M_{Enrollment}$ = 591, $M_{Student\text{-}teacher\ ratio}$ = 18.89). The average suspension rates per 1000 students were 0.75 for drug-related offenses (*SD* = 4.75), 3.02 for fighting (*SD* = 23.39), 3.17 for property crime (*SD* = 13.03) and 0.07 for firearm possession (*SD* = 2.00).

Almost one-half of school administrators reported that their schools used security personnel (46%) and security cameras (49%); only 1% reported using metal detectors. As shown in Table 2, the most prevalent patterns were no cameras/no metal detectors/no personnel (32.6%), security cameras with personnel (26.5%), cameras only (21.6%), and security personnel only (18%). Notably, metal detectors were rarely used, and were almost always used in tandem with security cameras and personnel. This finding highlights the importance of examining patterns of school security utilization, given that certain visible security measures may rarely be used in isolation.

Main Effects of Visible Security Utilization Patterns

Exposure to Drugs Significant differences were observed in drug exposure across the different security utilization patterns (see Table 3). Namely, schools using no security measures (the reference group in the model) had significantly lower drug suspension rates than schools using security personnel only (b = −0.47, 99% CI [−0.85, −0.10], d = −0.10), cameras with security personnel (b = −0.96, 99% CI [−1.59, −0.34], d = −0.20), or all three types of security measures (b = −1.89, 99% CI [−3.31, −0.47], d = −0.40). Tests for the equality of coefficients also indicated that schools using only cameras had significantly lower drug suspension rates than schools using security personnel only (b = −0.37, 99% CI [−0.72, −0.03], d = −0.08), cameras with security personnel (b = −0.86, 99% CI [−1.62, −0.11], d = −0.18), or all three types of security measures (b = −1.80, 99% CI [−3.23, −0.36], d = −0.38). No other significant differences were observed across the visible security utilization patterns.

Exposure to Fighting Results were similar for the exposure to fighting outcome, such that schools using no security measures had significantly lower suspension rates than schools using any other pattern of security utilization (ds ranging from 0.10 to 0.56). Results also indicated that schools using only surveillance cameras had significantly lower suspension rates for fighting than schools using cameras with security personnel (b = −2.44, 99% CI [−4.50, −0.38], d = −0.10) or all three types of security measures

Table 1 Descriptive statistics and bivariate correlations for visible security measures, school safety outcomes, and school characteristics (n = 10,340)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Security personnel (SP)	1.00											
2. Metal detectors (MD)	.10	1.00										
3. Surveillance cameras (CAM)	.22	.07	1.00									
4. Drug suspension rate	.14	.04	.08	1.00								
5. Fighting suspension rate	.10	.08	.07	.15	1.00							
6. Property crime suspension rate	.12	−.01	.05	.17	.09	1.00						
7. Firearm suspension rate	.02	.04	.01	.01	.05	.03	1.00					
8. High school	.29	.08	.24	.23	.04	.16	.02	1.00				
9. % male	−.03	−.02	−.03	.02	−.01	.03	−.03	−.03	1.00			
10. % White	−.12	−.21	.05	.01	−.13	.00	−.04	.07	.03	1.00		
11. % FRPL	.04	.17	−.02	−.01	.15	.02	.02	−.18	.01	−.67	1.00	
12. Parental/comm. involvement	.08	.07	−.01	.08	.07	.06	.02	−.07	−.01	−.22	.15	1.00
Pooled Surveys *M*	.46	.01	.49	0.75	3.02	3.17	0.07	.15	49.61	57.10	48.05	.51
SD	0.48	0.15	0.49	4.75	23.39	13.03	2.00	0.48	9.21	31.65	27.50	0.27
Range	0–1	0–1	0–1	0–129	0–1104	0–467	0–110	0–1	0–100	0–100	0–100	0–1
2003–2004 Survey *M*	.47	.01	.37	0.65	2.96	2.65	0.08	.15	50.30	57.84	46.10	.53
SD	0.48	0.15	0.50	5.26	16.67	11.29	2.92	0.48	7.61	31.67	27.83	0.27
2005–2006 Survey *M*	.44	.01	.43	0.79	3.48	3.15	0.13	.15	50.10	59.11	46.53	.53
SD	0.48	0.14	0.50	4.75	19.03	10.35	4.88	0.48	8.38	31.16	27.30	0.27
2007–2008 Survey *M*	.48	.01	.56	0.73	2.84	3.55	0.04	.16	49.10	56.44	47.61	.51
SD	0.47	0.16	0.47	4.90	15.63	12.97	1.04	0.49	10.06	31.78	27.49	0.27
2009–2010 Survey *M*	.44	.01	.61	0.82	2.79	3.33	0.04	.16	48.93	55.03	51.84	.48
SD	0.48	0.15	0.44	6.55	23.53	14.12	2.02	0.48	10.56	31.91	26.99	0.28

FRPL – free/reduced price lunch. Bivariate correlations shown for sample pooled across five survey waves

Table 2 Unadjusted mean school safety outcomes across visible security utilization patterns (N = 10,340)

	None	CAM	MD	CAM + MD	SP	CAM + SP	MD + SP	CAM + MD + SP
% in category	32.6	21.6	0[a]	0[a]	18.0	26.5	0[a]	1.0
Exposure to drugs	0.28 (3.07)	0.49 (2.75)	-	-	0.93 (4.73)	1.87 (5.61)	-	2.99 (7.40)
Exposure to fighting	1.75 (11.53)	3.49 (14.14)	-	-	4.10 (17.94)	7.58 (27.55)	-	17.66 (70.83)
Exposure to property crime	2.92 (9.50)	4.08 (10.87)	-	-	6.09 (16.26)	7.45 (13.32)	-	6.32 (11.46)
Exposure to firearms	0.04 (0.99)	0.05 (7.20)	-	-	0.13 (0.99)	0.16 (2.31)	-	0.52 (8.05)

Standard deviations are presented in parentheses. Proportions across security pattern categories may not sum to 100% due to rounding

CAM surveillance cameras, *MD* metal detectors, *SP* security personnel

[a] Fewer than 1% of schools fell within these utilization pattern categories, and were combined into an infrequent utilization pattern category for subsequent outcome analyses

($b = -10.49$, 99% CI [−19.48, −1.50], $d = -0.45$). Finally, schools using only security personnel also had significantly lower suspension rates for fighting than schools using cameras with security personnel ($b = -2.64$, 99% CI [−4.37, −0.90], $d = -0.11$) or all three types of security measures ($b = -10.69$, 99% CI [−19.47, −1.90], $d = -0.46$). There were no other significant differences across the other visible security utilization patterns.

Exposure to Property Crime Schools using no security measures had significantly lower property crime suspension rates than schools using security personnel only ($b = -2.66$, 99% CI [−3.91, −1.42], $d = -0.20$) or cameras with security personnel ($b = -3.35$, 99% CI [−5.73, −0.96], $d = -0.26$). Exposure to property crime was significantly lower in schools using only surveillance cameras, relative to those using only security personnel ($b = -2.01$, 99% CI [−3.22, −0.81], $d = -0.15$) or all three types of security measures ($b = -2.69$, 99% CI [−5.34, −0.05], $d = -0.21$). There were no other significant differences across the other visible security utilization patterns.

Exposure to Firearms There was no evidence that exposure to firearms varied across schools using different visible security utilization patterns (see Table 3).

Moderating Effects of School Characteristics

There was no evidence that the school context characteristics moderated the effects of security patterns on the drug or firearm suspension outcomes (see Table 3). The results did indicate, however, that the relationship between visible security measures and fighting was moderated by the racial composition of the school ($F = 3.44$, $p = .004$) and the socioeconomic composition of the school ($F = 9.21$, $p < .001$). Further probing of these interactions indicated that the higher rates of suspension for fighting associated

Table 3 Effects of visible security utilization patterns on administrator-reported outcomes (N = 10,340)

	Drugs			Fighting			Property crime			Firearms		
	b	99% CI	*d*	*b*	99% CI	*d*	*b*	99% CI	*d*	*b*	99% CI	*d*
Security pattern												
None (ref)	-			-			-					
CAM	0.10	[−0.16, 0.36]	0.02	2.54*	[0.88, 4.19]	0.11	0.65	[−0.20, 1.50]	0.05	0.03	[−0.04, 0.11]	0.02
SP	0.47*	[0.10, 0.85]	0.10	2.34*	[0.75, 3.92]	0.10	2.66*	[1.42, 3.91]	0.20	0.08	[−0.08, 0.24]	0.04
CAM+ SP	0.96*	[0.34, 1.59]	0.20	4.98*	[2.80, 7.15]	0.21	3.35*	[0.96, 5.73]	0.26	0.10	[−0.01, 0.21]	0.05
CAM+ MD+ SP	1.89*	[0.47, 3.31]	0.40	13.02*	[4.09, 21.96]	0.56	0.93	[−1.65, 3.50]	0.07	0.37	[−0.54, 1.29]	0.19
Survey year	0.01	[−0.04, 0.05]		−0.26	[−0.53, 0.02]		−0.01	[−0.02, 0.01]		−0.01	[−0.02, 0.01]	
Urban	−0.21	[−0.55, 0.12]		0.78	[−0.81, 2.37]		0.02	[−0.05, 0.09]		0.02	[−0.05, 0.09]	
Moderator Tests	Wald *F*			Wald *F*			Wald *F*			Wald *F*		
Percent male	2.12			1.75			0.88			1.61		
Percent White	0.38			3.44*			1.38			1.55		
Percent FRPL	0.59			9.21*			3.02			0.63		
High school	2.89			2.33			8.10*			1.24		
Comm. inv.	1.03			1.35			0.88			0.61		

Pooled estimates from generalized linear models that account for the complex survey design; based on 20 multiply imputed datasets. Results for *b* are unstandardized OLS regression coefficients from models that adjusted for the propensity score and school context measures

CAM surveillance cameras, *MD* metal detectors, *SP* security personnel. *d* = standardized mean difference effect size

*$p < .01$

with attending schools using cameras with security personnel was magnified in schools with higher proportions of racial/ethnic minority students, and higher proportions of low socioeconomic status students. For instance, the effect size (*d*) indicating differences in fighting suspensions for students attending schools using cameras with security personnel versus no security measures was 0.15 for schools with 20% minority student composition versus 0.40 for schools with 80% minority student composition. Similarly, the effect size (*d*) indicating differences in fighting suspensions for students attending schools using cameras with security personnel versus no security measures was 0.18 for schools with 20% low socioeconomic status composition versus 0.51 for schools with 80% low socioeconomic status composition.

The relationship between visible security measures and property crime exposure was also moderated by the grade level of the school ($F = 8.10$, $p < .001$). Namely, more extensive security utilization patterns were associated with significantly lower property crime exposure in high schools. For instance, the effect size (*d*) indicating differences in property crime exposure risk for students attending schools using cameras with security personnel versus no security measures was 0.30 for middle school/mixed grade schools versus −0.13 for high schools. Thus, for high school students, the use of multiple security measures may offer a protective effect against property crime exposure at school.

Discussion and Conclusion

This study examined whether the use of various visible security measures singly or in combination was associated with youth exposure to drugs, fighting, property crime, and firearms. We also examined whether these relationships varied across different school characteristics. Overall, the results indicated that some patterns of school security utilization were associated with increased exposure to crime and violence at school. We found no evidence that any pattern of visible security measure utilization was consistently associated with reduced exposure to crime or violence at school. Indeed, the only potential protective effect observed indicated that the utilization of multiple security measures may protect against exposure to property crime in high schools. Thus, these findings provided little support for predictions based on routine activity theory that visible security measures will reduce school crime by deterring motivated offenders and increasing the presence of capable guardians.

The results indicated that schools using security personnel alone or in combination with cameras, or both cameras and metal detectors, were associated with greater exposure to drugs. We found that all four security utilization patterns were associated with greater exposure to fighting, particularly in schools with high proportions of racial/ethnic minority and low socioeconomic status students. With regard to property crime, security personnel were associated with greater exposure, but their use in combination with cameras and/or metal detectors was associated with decreased property crime in high schools. Finally, results overwhelmingly indicated that the utilization of all three types of security measures was associated with greater exposure to drugs and fighting. These findings may be attributable to unmeasured differences between these schools or differences in the detection of these behaviors. One explanation for this finding may be the different physical and social dynamics of these hyper-securitized schools in comparison to those where security is less intense (Bracy, 2011; Fuentes, 2011). Another

potential explanation is that these schools have comparable underlying behaviors to schools that use fewer (or no) visible security measures but that detection is greater when more surveillance is used.

The current study used a rigorous quasi-experimental design in an attempt to minimize possible selection bias. Nonetheless, a primary limitation of this study was the use of cross-sectional survey data, which inherently limited our ability to make causal inferences about the associations between visible security measures and school safety outcomes. Visible security measures are endogenous variables, and likely a function of prior school crime and safety (e.g., see Irwin, Davidson, & Hall-Sanchez, 2013; Kupchik & Ward, 2014). Cross-sectional data sources preclude causal inferences about the directionality of effects, highlighting the need for more rigorous longitudinal designs examining both the directionality and mechanisms underlying the relationships between school security measures and school safety. Despite the limitations of the data used in the current study, our results provide an important initial examination of these relationships, which can be useful in guiding the small but growing body of empirical research on school security.

For instance, more research is needed to explicate whether schools' utilization of different security patterns actually changes youth behaviors, or simply increases the likelihood of detection; both explanations are plausible and may vary in importance across different school contexts. Prior research on school resource officers indicates that their roles in schools vary widely depending on the particular needs of the school, the personality of the officer, and a host of other characteristics (Finn, McDevitt, Lassiter, Shively, & Rich, 2005; Kupchik, 2010). This variability in roles indicates that there may also be considerable variability in the relationship between visible school security measures and exposure to crime and violence at school (Devlin & Gottfredson, 2016). Although we attempted to address these explanations by examining potential moderating effects of school characteristics, other unmeasured characteristics might help explain these relationships. The literature needs more rigorous empirical research (both quantitative and qualitative) utilizing longitudinal study designs to help disentangle these relationships.

Another limitation of the current study was our operationalization of school safety using school administrator-reported suspension rates. Given recent evidence of disproportionate suspension and exclusionary discipline rates for racial/ethnic minority youth and students from lower socioeconomic status backgrounds (Hirschfield, 2008; Kim, Losen, & Hewitt, 2010; Simon, 2007), future studies should attempt to replicate our findings using other measures of behavior incidents, including student-reported measures of behavior, that may not be as sensitive to biases or differences in detection. Furthermore, although this study analyzed data from a nationally representative sample of public U.S. middle and high schools, these results may not generalize to other school settings (private schools, elementary schools, or schools outside the United States). Future research is needed to examine these relationships in other school settings.

A final limitation of this study was our focus on visible school security measures, defined broadly as surveillance technologies or strategies that visibly monitor the movements and behaviors of students in an effort to prevent or interrupt problem behavior. We elected to focus on visible security measures because (1) prior research had highlighted the increased use of these measures in school safety initiatives (e.g., Addington, 2009) and (2) theoretical expectations suggest that visible security measures may serve as physical and virtual guardians intended to deter criminal behavior. Not all school security measures

may be visible, however, so additional research is needed to investigate how less visible or unobtrusive security measures (e.g., locked doors, visitor sign-in procedures, threat reporting systems) may be related to school safety.

Implications for School Safety Policy

Despite the intuitive appeal and increased federal funding for visible school security measures in recent decades, the current study found no evidence that school security measures—either alone or in combination with others—consistently reduced exposure to crime and violence at school. Rather, findings indicated that visible security measures might actually have detrimental effects on several of these measures, although additional rigorous experimental research is needed to support this claim. Visible security measures implemented in a punitive manner guided solely by the intent to control crime, rather than promote student learning and growth, may have unintended detrimental effects. By criminalizing student problem behavior, these security measures may ultimately erode student trust, create negative expectancy effects, and create jail-like learning environments that fail to provide the safe and supportive learning environments that all students deserve.

Thus, as policymakers seek to find ways to keep schools safe, relying on visible security measures alone does not appear to be sufficient, given that the root causes of school crime and violence occur at multiple ecological levels (Henry, 2009). As such, interventions and policies aimed at reducing school crime and violence should operate at multiple levels, incorporating individual youth, schools, families, neighborhoods, and other social institutions. Schools with visible security measures already in place (or those considering implementing them) may be able to engage students in democratic processes for implementing and/or utilizing them, potentially mitigating some of their negative effects. For instance, Warnick (2007) suggests that the principles of minimization, openness, empowerment, transparency, and erasure should govern the use of security cameras in schools, but these principles could readily extend to other forms of visible security. Other promising initiatives include those that foster trusting relationships between students and adults in school (Bryk & Schneider, 2002); enact and enforce clear, fair, and supportive discipline policies (Gottfredson, 2001); and keep youth academically engaged and challenged (Yeager & Dweck, 2012). Such strength-based (versus deficit-based) approaches may provide students with some agency in reducing crime and violence in schools, thereby reducing any potential detrimental effects associated with visible school security measures that may be seen as top-down, criminalizing school policies.

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Compliance with Ethical Standards

Conflict of Interest All authors have no conflicts of interest to disclose.

Appendix

Table 4 Variables used in propensity score estimation model

School Practices and Programs
Provide two-way radios to staff (yes/no)
Provide lockers to students (yes/no)
Provide an anonymous threat reporting system (yes/no)
Require drug testing for any students (yes/no)
Has a written plan for bomb threats (yes/no)
Disaster preparedness scale (five item scale; α = .79)
Violent prevention policies scale (eight item scale; α = .63)
Parent involvement in maintaining school discipline policies (yes/no)
Parent volunteers on school committees (percent of parents)
Parental/community involvement scale (eight item scale; α = .74)
Staff training activities scale (five item scale; α = .69)
School Climate
Student bullying frequency (1 = never, 5 = happens daily)
Student racial/ethnic tensions (1 = never, 5 = happens daily)
Student verbal abuse of teachers (1 = never, 5 = happens daily)
Student disrespect of teacher (1 = never, 5 = happens daily)
Widespread classroom disorder (1 = never, 5 = happens daily)
Gang activity frequency (1 = never, 5 = happens daily)
Cult or extremist group activity frequency (1 = never, 5 = happens daily)
Number of factors perceived to limit school crime reduction efforts
Number of gang-related crime incidents in the past year
Number of hate-related crime incidents in the past year
School Structural Characteristics
Type (regular, charter, religious)
Grade level (high school, middle school)
Administrator years of experience at current school
Number of paid full time teachers
Number of full time special education teachers
Student-teacher ratio
Title I eligible (yes, no)
Percent English language learner students
Percent special education students
School enrollment size
Percent free and reduced-price lunch students
Percent male students
Percent White students
Survey year (2003–2009)
School Neighborhood Characteristics

Table 4 (continued)

Percent urban land use in school zip code region
Population density in school zip code region
Size of school zip code region, square miles
Median household income in school zip code region
Urban neighborhood (yes/no)
Crime levels in areas where students live

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