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Evaluation of Threat Assessment Training for School Personnel

Shelby Stohlman, Timothy Konold, and Dewey Cornell
University of Virginia

Despite the widespread use of threat assessment in K–12 schools, there is a dearth of research investigating the staff training process. We evaluated the effectiveness of day-long training on the Comprehensive Student Threat Assessment Guidelines (CSTAG) in a sample of 4,666 multidisciplinary school personnel from administration, law enforcement, mental health, teaching, and other groups. Across 100 workshops conducted by 9 trainers, all discipline groups showed large and statistically significant increases in their knowledge of threat assessment from pretest to posttest. On average, participants achieved threat classification accuracy scores of 75% after completing the workshop. Over 95% of participants provided positive evaluations of the workshop and highly endorsed motivation to implement threat assessment in their schools. Overall, these findings support the use of workshop training to prepare multidisciplinary school-based threat assessment teams.

Public Significance Statement
After completing a day-long training workshop, K–12 school personnel demonstrated high levels of threat assessment knowledge, threat classification accuracy, and motivation to use principles of threat assessment in their schools. All participants showed improvements regardless of demographic, trainer-related, or environmental differences. These results are promising, given the increased demand for high-quality threat assessment training that can be disseminated on a large scale.

Keywords: threat assessment, school safety, student threats, training

School threat assessment is becoming a standard safety practice in U.S. schools (Cornell et al., 2018). In 2013, Virginia became the first state to require all K–12 public schools to establish threat assessment teams (Threat Assessment Teams and Oversight Committees, 2013). In recent years, many other states have passed similar legislation (Erwin, 2019; Woitaszewski, Crepeau-Hobson, Conolly, & Cruz, 2018). By 2018, 44% of public schools reported using a threat assessment team (Diliberti, Jackson, Correa, & Padgett, 2019). In response to the 2018 school shooting in Parkland, Florida, Congress passed the STOP School Violence Act of 2018, which unequivocally encourages the adoption of threat assessment by providing schools with funding for threat assessment training.

Federal endorsement of school threat assessment and the increasing number of states that mandate its use have created a huge demand for professional in-service training. Reports by the National Threat Assessment Center (2018) and the Federal Commission on School Safety (2018) recommend that schools use behavioral threat assessment teams. However, reports recommending the use of threat assessment say very little about the training needed to imple-

Shelby Stohlman, Timothy Konold, and Dewey Cornell, Curry School of Education and Human Development, University of Virginia.

An abbreviated version of this article was presented as a poster at the American Psychological Association Annual Convention in 2019. Dewey Cornell is the primary developer of the CSTAG.

Correspondence concerning this article should be addressed to Shelby Stohlman, Curry School of Education and Human Development, University of Virginia, 417 Emmet Street South, P.O. Box 400270, Charlottesville, VA 22904-4270. E-mail: sls4cw@virginia.edu

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ment it. Two investigations of school shootings identified inadequate training of school personnel as a serious problem (Goodrum & Woodward, 2016; Marjory Stoneman Douglas High School Public Safety Commission, 2019).

A comprehensive report on the 2013 shooting at Arapahoe High School in Colorado concluded that a failure in the school's threat assessment process contributed to the shooting that resulted in the murder of a student. The student who committed the fatal shooting had been identified for a threat assessment, but there were many errors and inadequacies in the process the team followed (Goodrum, Thompson, Ward, & Woodward, 2018). Neither the principal nor the assistant principal who conducted the threat assessment had received training. Additionally, the report noted that the school's threat assessment training had lasted just 2 hr and included no role-playing or completion of a mock case. Among the report's recommendations was that schools adopt a formal training curriculum and that all staff members participate in a minimum of a 1-day program with a variety of training activities beyond a lecture (Goodrum & Woodward, 2016). The report specifically recommended that Colorado schools adopt a validated threat assessment process, such as the Virginia Student Threat Assessment Guidelines.

The Marjory Stoneman Douglas High School Public Safety Commission (2019) also identified failures in threat assessment as a factor contributing to the shooting deaths of 17 people at the high school in 2018. The former student who committed the shooting had been repeatedly identified as a person of concern for a potential school shooting, and the school district had a threat assessment protocol, but the commission's report concluded that school staff members were neither properly trained nor appropriately engaged in the threat assessment process. In response to the commission's report, Florida legislation (Office of Safe Schools, 2019) mandated that all its schools use a common standardized behavioral threat assessment instrument. In 2019, the Florida Department of Education adopted the Comprehensive School Threat Assessment Guidelines (CSTAG; formerly called the Virginia Student Threat Assessment Guidelines) for statewide use and established a group of trainers in this model to lead workshops for all schools (Oliva, 2019).

Given the increased demand for evidence-based threat assessment training, it is crucial to systematically evaluate training effectiveness. Authorities in program evaluation highlight the need to measure participant learning and perceptions of training, as well as trainer effectiveness (Bradley & Connors, 2007; Kirkpatrick & Kirkpatrick, 2016). In the context of threat assessment, effective training must be delivered in a manner that facilitates learning of threat assessment principles and guidelines and promotes positive attitudes toward its implementation across trainers.

Challenges of School Threat Assessment Training

There are multiple challenges specific to school threat assessment training. The first challenge is that threat assessment is a multidisciplinary process (National Threat Assessment Center, 2018). School threat assessment teams typically draw staff from administration, teaching, law enforcement, and mental health. Training must engage all personnel from these groups so that they can work together effectively while maintaining awareness of their roles in the threat assessment process (National Threat Assessment Center, 2018).

The second challenge is that many schools rely on disciplinary practices that fail to consider contextual factors surrounding threats. In the 1990s, many schools adopted a zero-tolerance approach in their response to student threats, and the use of these practices increased after the Columbine shooting (Skiba & Knesting, 2001). Zero tolerance relies on the use of exclusionary discipline practices, which are associated with worse academic outcomes and higher rates of school dropout (Maeng, Cornell, & Huang, 2019; Noltemeyer, Ward, & Mcloughlin, 2015).

A third challenge is that staff often overestimate the risk of a school shooting. Critics of threat assessment have raised concern that school authorities might misuse the threat assessment process to unfairly punish or stigmatize students (Swetlitz, 2019). To the contrary, with appropriate training, threat assessment gives school personnel an investigative process that can reduce overreactions to a student's misbehavior (Burnette, Datta, & Cornell, 2018). This process involves considering both contex-

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tual factors and developmental differences so that staff can respond appropriately to student threats of violence (Cornell, 2018).

Threat Assessment Training Research

Two prior studies provided limited evidence that day-long workshops for school personnel enhanced knowledge of threat assessment and school safety. The first study examined two threat assessment workshops for 351 multidisciplinary school personnel (Allen, Cornell, Lorek, & Sheras, 2008). The researchers found that school personnel across occupations showed substantial increases in threat assessment knowledge from pretest to posttest as well as a high degree of threat classification accuracy. Although most participants obtained high scores, there were statistically significant differences across occupational groups, with psychologists achieving the highest knowledge scores and law enforcement officers achieving the lowest knowledge scores. Over 90% of participants provided favorable evaluations of the workshop, acknowledging that they found the training helpful, practical, and useful in responding to student threats.

The second study examined the effects of threat assessment training for 142 school personnel across three workshops (Cornell, Gregory, & Fan, 2011). This study also found that participants had increased knowledge of threat assessment and were able to distinguish serious from not-serious threats. A randomized controlled study showed that schools trained in threat assessment had reduced rates of long-term suspensions and increased use of counseling services for students who threatened violence compared with schools without threat assessment training (Cornell et al., 2011).

Although these studies provide promising results, they were limited to five workshops that were all led by the same trainer. It is necessary to examine threat assessment training in a larger and more diverse sample and to investigate whether positive effects generalize across trainers. It is also important to consider a range of participant characteristics, including gender, occupation, years of experience working in schools, and prior training in threat assessment.

Training Environment

Research in professional development often focuses on structuring the content of training to be conducive to learning; however, it is also important to investigate environmental influences. Particularly in a full-day workshop with a large number of participants, there may be differences in learner engagement associated with seating (e.g., those seated in the rear of the room may be less engaged and learn less compared with those seated in the front). There also may be an effect of seat comfort and room temperature on learner engagement.

Multiple educational studies have investigated the relationship between classroom seat arrangement and student learning. They found that students who sat in the front of a classroom achieved better grades and were more motivated, confident, and engaged compared with students who sat in the back of the classroom (Benedict & Hoag, 2004; Burda & Brooks, 1996).

Research in professional development has found that perceptions of seat comfort can influence training effectiveness and employee performance. A study by EL Hajjar and Alkhanaizi (2018) examined environmental effects on employee training outcomes and found that participant ratings of seat comfort were positively associated with training effectiveness. Another study found that workplace comfort influenced employee productivity and satisfaction (Maarleveld & De Been, 2011).

Other studies have investigated the effects of temperature on academic performance and employee productivity. They found that temperatures perceived as either too hot or too cold can have detrimental effects on employee performance and school achievement (Lan, Wargocki, & Lian, 2012; Wargocki & Wyon, 2007). Although these studies suggest that environmental factors can influence academic and work-related performance, it is unclear whether these results apply to the professional development of school personnel.

Current Study

There is relatively little research on threat assessment training and its impact on participants. The present study contributes to this effort by examining the effects of a day-long threat assessment training workshop for school

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personnel using the CSTAG. The study used a relatively large sample of 4,666 participants across 100 workshops delivered by nine different trainers between 2016 and 2019. The workshops took place in 28 states and one Canadian province.

The study outcome variables included knowledge of threat assessment, ability to classify threat assessment cases accurately, and participant evaluations of the workshop. The first research question was, "How does the workshop affect school personnel knowledge of threat assessment?" It was hypothesized that school personnel would achieve significant knowledge gains from pretest to posttest after completing the workshop. The second research question was, "How are school personnel characteristics of gender, occupation, work experience, and prior threat assessment training and experience associated with knowledge of threat assessment, threat classification accuracy, and evaluations of the workshop?" It is important to consider whether training results are consistent for participants of diverse occupations and backgrounds. The third research question was, "Are workshop effects comparable across different trainers?" This assessment is needed to show that the positive results of training are not limited to a single trainer and can be obtained by multiple trainers. The fourth research question was, "How do the environmental factors of seat location, seat comfort, and room temperature influence workshop experience?" This question has practical value to school systems as they try to ensure the best possible training experience for their staff members.

Method

Workshop

The day-long training workshops were designed to cover the content of the CSTAG manual (Cornell, 2018). This model was developed at the University of Virginia with the purpose of responding to threats of violence without resorting to exclusionary discipline (Cornell, 2018). This training is primarily focused on students, consistent with a statewide survey finding that the majority (98%) of school threats were made by currently enrolled students (Cornell, 2018). However, threats made by adults are also briefly covered in the workshop and manual. The CSTAG model uses a five-step decision tree that facilitates the consideration of contextual and developmental factors relevant to the student's behavior to help teams avoid both overreacting to student misbehavior that is not serious and underreacting to students who pose a serious threat of violence. This model distinguishes "transient" threats that are not serious from "substantive" threats that are serious and require protective action.

Each workshop was led by either the primary developer of the CSTAG model (Dewey Cornell) or one of eight psychologists who had been trained by the developer. All trainers delivered the same workshop with identical PowerPoint slides and handouts. These workshops were typically arranged by school authorities, such as school districts, intermediate districts, or the state department of education. In accordance with recommendations from professional development literature (e.g., Desimone, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Gast, Schildkamp, & van der Veen, 2017), trainers delivered content-focused information to bolster knowledge of threat assessment and school safety. Trainers used a variety of active learning techniques throughout the day, including team exercises using case vignettes, so that participants could practice conducting threat assessments.

Measures

Knowledge. Thirteen pretest/posttest knowledge questions (see Table 1) were chosen based on a content analysis of the CSTAG manual and were intended to reflect some of the key concepts covered in the workshop. Participants responded to statements on threat assessment (e.g., "About two-thirds of threats are transient, and one-third of threats are substantive") or general trends of school violence (e.g., "The probability that a student will be murdered at school is so low that the average school will experience it about once every 6,000 years") with one of three response options (true/agree, false/disagree, or do not know). Response options were then recoded as dichotomous (i.e., 1 = correct, 0 = incorrect/do not know). These 13 items had a Cronbach's alpha of .68 at pretest and .64 at posttest, which was considered adequate as an index that covered a variety of topics (Streiner, 2003).

Table 1
Pretest and Posttest Knowledge of Threat Assessment

Questions	Pretest % correct	Posttest % correct
Violence in schools has increased over the past 10 years. (False)	14	75
A safety plan should be implemented for a transient threat. (False)	13	76
If a student threatens an act of violence, immediate suspension is necessary. (False)	62	89
When interviewing a student about an alleged threat, the student should be reassured that his/her statements are confidential. (False)	60	90
An angry student who says "I could kill him for that" should always be regarded as making a substantive threat. (False)	53	79
Mental health threat assessments are designed to predict violence. (False)	42	81
The probability that a student will be murdered at school is so low that the average school will experience it about once every 6,000 years. (True)	29	91
A student who writes an essay describing a violent event should be given a threat assessment. (False)	26	65
About two-thirds of threats are transient, and one-third of threats are substantive. (True)	43	90
The typical school violence prevention program can reduce fighting by 50%. (True)	45	85
Controlled studies have found that threat assessment reduces school suspensions. (True)	61	95
Zero tolerance is an effective way to maintain school safety. (False)	56	93
Until the law can be changed, federal law (Family Educational Rights and Privacy Act [FERPA]) prevents school officials from notifying parents of the name of the student who has threatened their child. (False)	17	81

Classification. Four posttest questions evaluated threat classification accuracy. Participants were asked to classify four common student threat situations with one of four response options (no threat, transient threat, serious substantive threat, or very serious substantive threat). Response options were recoded as dichotomous (1 = correct, 0 = incorrect).

Evaluations. Five posttest questions (see Table 2) investigated participant evaluations of the workshop. Statements such as, "This training improved my understanding of student violence," had four response options (1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, 4 = *strongly agree*). These five items had a Cronbach's alpha of .93.

Prior threat assessment experience. Participants indicated their experience working on a threat assessment team (none, <five cases, or five or more cases) and prior training in threat assessment (none, <5 hr, or 5 or more hours). These questions were moderately correlated ($\rho = .48$) and combined into a single item.

Workshop environment. Participants answered three questions regarding the comfort of their seating (very uncomfortable, uncomfortable, neither uncomfortable nor comfortable, comfortable, or very comfortable), seat location

Table 2
Participant Evaluations of the Threat Assessment Workshop

Evaluations	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)
This training improved my understanding of student violence.	1.8	1.5	44.9	51.8
I understand the basic concepts and guidelines for conducting a threat assessment.	1.5	0.2	43.0	55.3
The training contained the right amount of practical information.	1.7	2.8	45.7	49.8
This training will be helpful to me in responding to student threats of violence.	1.6	0.8	41.4	56.2
I am motivated to use principles of threat assessment in my school.	1.5	0.7	40.6	57.2

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(front third of room, middle third of room, or back third of room), and room temperature (too hot, too cold, or just right).

Participants

The project was approved by the University of Virginia Institutional Review Board. Participants answered demographic questions at pretest regarding gender, occupation, job experience, and threat assessment experience. The analytic sample consisted of 4,666 school personnel who attended one of 100 training workshops. When asked about gender, 69% of participants identified as female, and 31% identified as male. The disciplinary breakdown was 39% administration, 7% teaching, 5% law enforcement, 35% mental health/counseling, and 15% other (e.g., social worker, nurse, behavioral specialist). On average, participants had worked at their school for 15 years (range: 0–51 years). The majority of participants (62%) had no experience working on a threat assessment team; 21% had worked on fewer than five threat assessment cases, and 17% had worked on five or more threat assessment cases. When asked about threat assessment training, 41% indicated that they had no prior training, 37% had less than 5 hr, and 22% had more than 5 hr of training.

Data Analysis

Participant responses were included in the analyses if they answered at least 11 of the 13 pretest/posttest knowledge questions. Pretest and posttest knowledge variables were created by summing correctly answered items. The questions regarding seat location, seat comfort, and room temperature were added to the survey after 48 of the workshops had been conducted; data were obtained from a subgroup of 1,991 participants.

To investigate the first research question, a repeated-measures analysis of covariance (ANCOVA) examined differences between pretest and posttest knowledge, controlling for participant gender, occupation, work experience, trainer effects, and prior threat assessment experience in the model. The relations between participant characteristics and pretest knowledge were examined through multiple regression. Subsequently, Research Questions 2 and 3 focused on evaluating the relationships of participant and trainer characteristics with posttest knowledge, threat classification accuracy, and workshop evaluations through a series of three-step multiple regressions. In each model, Step 1 controlled for pretest knowledge. Step 2 evaluated and controlled for the nesting of participants within trainers through fixed-effect models with J-1 deviation-coded trainer variables. Step 3 included the substantive participant characteristics of gender, occupation, prior threat assessment experience, and years of work experience. The fourth research question focused on the environmental variables of seat comfort, seat location, and room temperature. These variables were entered at Step 4 in the subsample of 1,991 participants.

Results

Preliminary analysis revealed that individuals achieved an average gain of 5.72 correct answers from pretest (mean [M] = 4.44) to posttest, $M = 10.16$; $F(1, 4{,}333) = 1{,}368.39$, $p < .001$. Descriptive statistics for pretest and posttest knowledge, as well as workshop evaluations, can be found in Tables 1 and 2. The results from the stepwise regression models, described next, are presented in Table 3.

Multiple regression analysis revealed that participant characteristics accounted for 11% of the variability in pretest knowledge scores, $F(7, 4{,}378) = 77.37$, $p < .001$. After controlling for pretest knowledge and trainer effects, participant characteristics accounted for 1% of the variability in posttest knowledge scores $F(7, 4{,}332) = 8.33$, $p < .001$.

Participants with more threat assessment experience answered more questions correctly at pretest than those with less experience ($\beta = 0.29$, $p < .001$). However, these differences were no longer significant at posttest ($\beta = 0.01$, $p = .555$). Male participants answered more questions correctly at pretest in comparison to female participants ($\beta = 0.04$ $p = .015$). At posttest, male participants answered fewer questions correctly in comparison to female participants ($\beta = -0.04$, $p = .005$). There were no significant differences between years of schoolwork experience and scores at pretest ($\beta = -0.02$, $p = .219$) or posttest ($\beta = -0.02$, $p = .148$).

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Table 3
Standardized Regression Coefficients for Participant Characteristics

Predictors	Pretest knowledge[a]		Posttest knowledge			TA classification			Workshop evaluations		
	B	R^2	*B*	R^2	ΔR^2	*B*	R^2	ΔR^2	*B*	R^2	ΔR^2
Step 1											
Pretest			0.27***	.07			.02			.00	
Step 2											
Trainers				.11	.03***		.03	.01***		.03	.02***
Step 3											
Prior TA experience	0.29***		0.01			−0.00			−0.02		
Years	−0.02		−0.02			−0.06***			−0.01		
Gender[b]	0.04*		−0.04**			0.01			−0.03*		
Teaching[c]	−0.10***		−0.04**			−0.03			0.03*		
Law enforcement[c]	−0.08***		−0.06***			−0.00			−0.05**		
Mental health/Counseling[c]	0.05**		−0.02			0.02			0.03		
Other[c]	−0.01	.11***	−0.10***	.12	.01***	−0.03	.04	.01***	0.04*	.04	.01***

Note. TA = threat assessment.
[a] All predictors were entered simultaneously at pretest. [b] Female was used as the reference group. [c] Administration was used as the reference group.
* $p < .05$. ** $p < .01$. *** $p < .001$.

All occupational groups achieved between 26% and 36% accuracy at pretest and 74–78% accuracy at posttest. Using administration as the reference group, participants working in teaching achieved lower pretest scores ($\beta = -0.10$, $p < .001$), and these differences remained at posttest ($\beta = -0.04$, $p = .008$). Similarly, individuals working in law enforcement answered fewer questions correctly at pretest than individuals working in administration ($\beta = -0.08$, $p < .001$), and these differences persisted at posttest ($\beta = -0.06$, $p < .001$). Participants working in mental health/counseling scored higher than individuals working in administration at pretest ($\beta = 0.05$, $p = .004$), but these differences were no longer significant at posttest ($\beta = -0.02$, $p = .217$). Although there were no significant differences at pretest, individuals who identified their position as "other" scored significantly lower than individuals in administration at posttest ($\beta = -0.10$, $p < .001$).

The next hierarchical linear regression compared participant characteristics with threat classification accuracy. After controlling for pretest knowledge and trainer effects, participant characteristics accounted for a small but statistically significant amount of variation in classification scores, $F(7, 4{,}279) = 4.151$, $p < .001$, $\Delta R^2 = .01$. Participants with more work experience in their school had lower threat classification accuracy ($\beta = -0.06$, $p < .001$).

The next hierarchical linear regression compared participant characteristics with participants' overall evaluations of the workshop. Participant characteristics accounted for a statistically significant amount of variation in workshop evaluation scores after controlling for pretest knowledge and trainer effects, $F(7, 4{,}220) = 5.55$, $p < .001$, $\Delta R^2 = .01$. There were no significant differences by prior threat assessment experience or years of schoolwork experience. Male participants had slightly lower evaluations of the workshop compared with female participants (97.0% positive vs. 97.3% positive; $\beta = -0.03$, $p = .038$). Participants in law enforcement had slightly lower evaluations of the workshop compared with individuals in administration ($\beta = -0.05$, $p = .003$). Using administration as the reference group, participants provided higher workshop ratings when they worked in teaching ($\beta = 0.03$ $p = .046$).

Analyses of trainer effects revealed statistically significant differences across trainers in posttest knowledge of threat assessment, threat classification accuracy, and workshop evaluations, after controlling for pretest knowledge scores. Participant posttest scores in workshops led by four of the trainers significantly deviated from the grand posttest mean across trainers, and trainers accounted for 3% of the variability in posttest scores, $F(8, 4{,}339) = 19.54$, $p < .001$. Participant evaluation ratings in workshops led by four of the

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trainers significantly deviated from the grand evaluation mean across trainers, and trainers accounted for 2% of the variability in workshop evaluation scores, $F(8, 4{,}227) = 13.14$, $p < .001$. Threat classification accuracy scores in workshops led by two of the trainers significantly deviated from the grand classification accuracy mean. Across all trainers, participants achieved averages between 71% and 77% in threat classification accuracy; trainers accounted for 1% of the variability in participant threat classification scores, $F(8, 4{,}286) = 7.72$, $p < .001$.

Secondary analyses on the subsample of 1,991 participants revealed that environmental variables had only a modest association with workshop evaluations. After controlling for pretest knowledge, trainer effects, and participant characteristics, the inclusion of seat location, seat comfort, and room temperature accounted for 1% of the variability in workshop evaluation scores, $F(5, 1{,}872) = 2.90$, $p = .013$. Individuals who perceived their seats as more comfortable provided higher evaluations of the workshop ($\beta = 0.08$, $p = .001$). There were no other significant associations between room temperature, seat comfort, or seat location and posttest knowledge, workshop evaluations, or threat classification accuracy (all ps $> .05$).

Discussion

This study demonstrated the effects of professional development training in threat assessment for a relatively large sample of workshops conducted by nine different trainers. Overall, participants demonstrated substantial gains in knowledge of threat assessment from pretest (34%) to posttest (78%) and demonstrated a high degree of threat classification accuracy (75%) after completing the CSTAG workshop. These results compare favorably to previous studies of professional development training in the criminal justice field; an examination of four different training programs found that participants scored 34% at pretest but only achieved 56% at posttest (Bradley & Connors, 2007).

Consistent with prior research (Allen et al., 2008), there were differences in threat assessment knowledge by occupation. Mental health/counseling staff had the highest levels of threat assessment knowledge at pretest (36%), followed by administrators (34%), other staff (34%), law enforcement officers (27%), and teachers (26%). Because threat assessment is conducted by multidisciplinary teams, it is important that training produces comparable effects across disciplines. Participants in different occupational groups likely have varying strengths and weaknesses in their threat assessment knowledge. For example, law enforcement officers may have a greater knowledge of the legal implications once a threat has been reported, whereas teachers may have a greater understanding of the developmental differences between students that can influence the seriousness of the threat. It is important that workshops effectively transmit knowledge across occupations and levels of experience to bridge gaps in knowledge.

Teachers and law enforcement officers demonstrated the highest knowledge gains from pretest to posttest. This is notable, given that they were the two lowest-scoring occupational groups at pretest. These higher gains enabled them to achieve posttest scores that were comparable to those of the other occupational groups. At pretest, there was a 10% range in knowledge scores across occupational groups; at posttest, this was reduced to a 4% range in knowledge scores. Although these differences were still statistically significant, the knowledge gap decreased from pretest to posttest. More importantly, these differences do not appear to be practically significant. All of these groups showed large gains, generally doubling their scores from pretest to posttest.

There is a high demand for quality threat assessment training that can be implemented on a large scale. Therefore, it is important that training is effective across participant differences. At pretest, men demonstrated slightly higher threat assessment knowledge (36% correct) than women (34% correct), but women had higher gains and moved slightly ahead at posttest (78% correct vs. 77% correct). Overall, these findings show that both men and women had significant knowledge gains after completing the workshop. Individuals who had higher levels of prior threat assessment experience had better pretest scores, but these differences were no longer significant at posttest. This shows that participants, regardless of prior experience, benefitted from completing this workshop. Furthermore, across occupations as well as differences in gender and experience, participants showed gains in threat assessment knowledge that reduced group variation and brought them to a common standard.

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Participants across trainers answered between 75% and 81% of questions correctly at posttest, showing that knowledge gains were not specific to a particular trainer. This is a notable finding; states are increasingly adopting threat assessment, and there is a high need for training that can be disseminated on a large scale. Because of the large number of schools that need training, many states—such as Arizona, Florida, Kentucky, New York, Pennsylvania, and Utah—are using train-the-trainer models to disseminate training. Although there were some small differences between trainers, all of the trainers in this study effectively provided education on threat assessment.

A core goal of threat assessment is to distinguish cases in which someone poses a serious threat from cases in which someone makes threats that are not serious. In the CSTAG model, this distinction is captured by the concepts of transient (not serious) and substantive (serious) threats. The ability to distinguish between transient and substantive threats is important to avoid overreacting to student threats and to facilitate interventions. The average threat classification accuracy for participants ranged between 71% and 77% across trainers. This accuracy rate is consistent with prior threat assessment training and coder reliability studies (Allen et al., 2008; Burnette et al., 2018).

Individuals with more schoolwork experience had slightly lower threat classification accuracy than those with less experience. However, it is important to note that they only significantly differed in their responses to one case vignette. This vignette described a child who was yelling obscenities at a teacher. Although the student did not make a threat of violence, individuals with more work experience tended to classify this situation as a threat, whereas those with less experience identified the situation as not being a threat. It is possible that individuals with more work experience may have a slight tendency to judge the student's behavior more seriously than less experienced individuals. It is also possible that this difference reflects a generational difference in reactions to student misbehavior, but the study did not have participant age as a variable to distinguish from years of work experience. There were no differences in threat classification accuracy by gender, occupation, or prior threat assessment experience. Overall, participants were able to achieve a high degree of threat classification accuracy after completing the workshop.

The National Threat Assessment Center (2018) published a series of recommendations on enhancing school safety using threat assessment. They indicate that threat assessment should be a multidisciplinary process and that staff members across occupations should receive training. This study provides a way for schools to attain these recommendations, showing that this day-long workshop is effective in transmitting threat assessment knowledge across multiple disciplines. Further, multidisciplinary school personnel reported that the training was practical and provided useful information in responding to student threats of violence.

Workshop Evaluations

One of the most widely used models for measuring training effectiveness is the Kirkpatrick four-level evaluation model (Kirkpatrick & Kirkpatrick, 2016). The first two steps of this model emphasize the need to gauge participant reactions to training as well as their perceptions of their learning experience. These components are crucial so that the last two steps of the model—behavior and results—can be assessed after the completion of training. If participants are not motivated to use the training principles and do not feel confident in their ability to use the techniques learned in training, it is unlikely they will apply this training in their jobs (Desimone, 2009; Kirkpatrick & Kirkpatrick, 2016).

After completing the workshop, school personnel across trainers had high evaluations of both the training and threat assessment. Over 95% of participants reported that the workshop improved their understanding of student violence and threat assessment and felt that the training contained the right amount of practical information. Approximately 98% of participants endorsed motivation to use threat assessment principles in their school. The findings from this study are consistent with the Allen et al. (2008) study showing that individuals who completed the workshop provided positive workshop evaluations and endorsed motivation to use these principles in school.

Overall, between 96.6% and 97.9% of participants across occupational groups provided positive evaluations of the workshop. Although this

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range is small, these differences were statistically significant. Teachers, mental health/counseling staff members, and other staff members gave the highest overall workshop ratings, followed by administrators and law enforcement officers. Law enforcement officers tended to provide the least positive evaluations of the workshop's ability to enhance their knowledge of student violence (95% positive) and the workshop's utility in responding to student threats of violence (96% positive) in comparison to the other occupational groups. Despite these slight differences, it is important to note that nearly all participants across occupational groups provided positive evaluations of the workshop.

Consistent with the Allen et al. (2008) study, school personnel demonstrated a decrease in support for zero-tolerance disciplinary practices after workshop completion. Prior to workshop completion, 45% of participants believed that zero-tolerance disciplinary practices were effective in maintaining school safety; at posttest, this number dropped to 7%. This decrease in support is notable; studies have found that zero-tolerance disciplinary practices are ineffective and can lead to negative outcomes, such as increased rates of suspension (American Psychological Association Zero Tolerance Task Force, 2008). This supports the findings by Maeng et al. (2019) that schools using CSTAG have lower rates of suspension and expulsion compared with schools using an alternative model of threat assessment. Further, Heilbrun, Cornell, and Lovegrove (2015) found that principal endorsement of zero-tolerance disciplinary practices was associated with increased rates of suspension and exclusionary discipline. In contrast to zero tolerance, studies have shown that schools demonstrate decreases in suspension rates after implementing threat assessment (Cornell et al., 2011; Nekvasil & Cornell, 2015). This change in attitudes, coupled with the motivation to use principles of threat assessment in school, reflects a shift away from punitive disciplinary practices and toward the use of a problem-solving approach to violence prevention.

Environment

Environmental characteristics had only a minor effect on evaluations of the training. Seat comfort was positively associated with ratings of the workshop. This is consistent with prior studies finding that environmental characteristics, such as seat comfort, can have an impact on workshop experience (EL Hajjar & Alkhanaizi, 2018; Maarleveld & De Been, 2011).

In contrast with prior research (e.g., Benedict & Hoag, 2004; Lan et al., 2012; Wargocki & Wyon, 2007), we did not find that seat location or room temperature was significantly associated with workshop experience. On average, each workshop had 47 participants; there might be effects of seat location in larger groups. A future study should investigate whether there is an interaction effect between group size and seat location, seat comfort, and/or room temperature.

Limitations and Future Directions

A limitation of this study is that this assessment of learning was limited in scope and timeframe. The scope of knowledge was measured at the end of the day with 13 pretest/posttest items and 4 posttest-only items. A more extensive study would include many more items and test participant knowledge after a longer interval of time. The content of the pretest/posttest survey was not as comprehensive as the certified threat manager examination developed by the Association of Threat Assessment Professionals (n.d.; see Scalora, 2015).

Another limitation is that this study examined only one threat assessment model, the CSTAG, and used a group of nine experienced trainers. It would be important to show that training in other models can produce similar effects and that less experienced trainers, such as those recently completing a train-the-trainer program, can achieve comparable results. This study only considered in-person group training in which a single trainer presented to groups of school teams. The trainer was able to interact with the group and respond to questions, and the participants were able to work together as teams on practice exercises. In light of public health restrictions on group meetings, it is important to examine whether live or recorded online training would produce similar results.

Finally, there is a need to show that the positive effects obtained at the end of the workshop carry forward to school practices (Kirkpatrick & Kirkpatrick, 2016). A study of the German NETWASS threat assessment model found that training produced staff adherence to a case management protocol 7 months after training (Le-

uschner et al., 2017). Further work is also needed to show how much and what kind of training is needed to prepare team members to conduct threat assessments with high fidelity and positive student outcomes.

Conclusions

The Federal Bureau of Investigation, Secret Service, and Department of Homeland Security recommended training for school personnel conducting threat assessments to facilitate effective implementation (National Threat Assessment Center, 2018; O'Toole, 2000). Yet, there has been relatively little research on standards of training and evidence of training effectiveness. It is important that threat assessment training is useful for multidisciplinary staff members, can be implemented effectively across trainers, and includes methods to evaluate both participants' learning and their reactions to the training (Kirkpatrick & Kirkpatrick, 2016; National Threat Assessment Center, 2018). As threat assessment becomes more widespread, standards of training need to be established to provide schools with high-quality training that can be disseminated to multidisciplinary school personnel. Training should enable the threat assessment team to make high-quality assessments and develop effective interventions to maintain school safety and facilitate positive outcomes for students.

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