Prevention of Targeted School Violence by Responding to Students' Psychosocial Crises: The NETWASS Program

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The standardized, indicated school-based prevention program "Networks Against School Shootings" combines a threat assessment approach with a general model of prevention of emergency situations in schools through early intervention in student psychosocial crises and training teachers to recognize warning signs of targeted school violence. An evaluation study in 98 German schools with 3,473 school staff participants (M_{age} = 46.2 years) used a quasi-experimental comparison group design with three measurement points (pre, post, and 7 months followup) with schools randomly allocated to implementation conditions. The study found increases in teachers' expertise and evaluation skills, enhanced abilities to identify students experiencing a psychosocial crisis, and positive secondary effects (e.g., teacher–student interaction, feelings of safety).

Within the last 15 years, student-perpetrated shootings at schools emerged as a worldwide phenomenon. With 14 incidents since 1999 (see Appendix S1), Germany has experienced more serious attacks targeting schools than any nation other than the United States (cf. Bondü, Cornell, & Scheithauer, 2011). School shootings or school attacks can be defined as planned violent acts at school by current or former students who intend to kill at least one person associated with the school (Bondü & Scheithauer, 2014a, 2014b). Dramatic cases in Germany (e.g., in 2002 in Erfurt; in 2009 in Winnenden) have generated great public concern. In addition, hundreds of threats of severe school violence each year in Germany have fostered the impression that schools are unsafe places and generated many proposals for preventive action. In response to school safety concerns, schools in Germany have implemented two main types of interventions: (a) universal measures such as antibullying programs and (b) emergency response plans. Neither type of intervention is concerned specifically with the prevention of severe acts of violence. However, law enforcement authorities and risk assessment experts have recommended the use of behavioral threat assessment as a specific violence prevention strategy for schools (Borum, Cornell, Modzeleski, & Jimerson, 2010; Cornell & Sheras, 2006; Fein et al., 2002; Mohandie, 2000; O'Toole, 1999). Threat assessment is a process of evaluating a threat and the attendant circumstances to uncover any facts or evidence that indicate the threat is likely to be carried out. Student threat assessment, like the Virginia Model (Cornell & Sheras, 2006), can be distinguished from profiling because the investigation is triggered by some form of student threat behavior rather than some unspecific risk profiles, warning signs, or a combination of demographic and personal characteristics of a student.

In a systematic review of the literature to detect threat assessment approaches suitable for schools, Apelt (2013) identified three structured U.S. systems: The Virginia Student Threat Assessment Guidelines (Cornell & Sheras, 2006), the Mid-Valley

Student Threat Assessment System (Van Dreal, 2011), and the Dallas Threat of Violence Risk Assessment (Ryan-Arredondo et al., 2001). However, due to organizational differences in national school systems, none of the U.S. prevention models seemed appropriate to copy in German schools without extensive modifications. As a result, the "Networks Against School Shootings (NETWASS)" program was developed (Leuschner et al., 2011; Scheithauer, Leuschner & NETWASS Research Group, 2014)—a threat assessment approach derived in part from the Virginia Student Threat Assessment Guidelines (Cornell & Sheras, 2006) with modifications to make it suitable for the legal and administrative circumstances in the German federal states. It combines the advantages of a threat assessment approach with a more general model of prevention for emergency situations in schools (e.g., targeted school violence) through early interventions with students experiencing a psychosocial crisis. The current article presents the theoretical background and methods of this program as well as selected results from a longitudinal evaluation study.

Prevention Implications From School Shooting Research

Cases of targeted school violence are not spontaneous, affect-driven acts resulting directly from the present situation but rather develop during an extended period of distress, deliberation, and planning. Although multiple developmental pathways have been identified, almost all appear to be spurred by a personal, psychosocial crisis (O'Toole, 1999; Verlinden, Hersen, & Thomas, 2000; Vossekuil, Fein, Reddy, Borum, & Modzeleski, 2002). Based on a series of German case studies (Bondü & Scheithauer, 2014a, 2014b) and several international studies, Scheithauer, Leuschner, and the NETWASS Research Group (2014) synthesized results into a dynamic developmental model, which asserted that the crisis itself could be compounded by stressful events that are closely linked to the motives for the violent acts, such as rejection by peers or conflicts with teachers.

Additionally, research suggested that perpetrators lacked the ability to cope adequately with stressors, or were highly vulnerable, for example, because of emotional disturbances or mental disorders (Hoffmann, Roshdi, & Robertz, 2009; Langman, 2009; Newman, Fox, Harding, Mehta, & Roth, 2004; Vossekuil et al., 2002). Due to this lack of adequate coping skills, perpetrators choose inappropriate ways to deal with their crisis and to express their feelings of despair, revenge, and anger. Cultural scripts such as past school shootings, media violence, and notions of masculinity provide powerful problem-solving models for perpetrators (Newman et al., 2004). The realization of the violent act is also facilitated by acute stressful events such as the loss of attachment figures or disappointment in future plans (Levin & Madfis, 2009). Thus, school shootings can be interpreted as the perpetrator's way of dealing with a personal psychosocial crisis. According to Filipp (1997), we define psychosocial crisis as an event or situation that triggers a threat to identity, loss of orientation, blockade of aims, or retraumatization resulting from an acute overload of the individual's usual system of coping. This personal psychosocial crisis is associated with certain observable warning behaviors, such as verbal or written threats, leakage of violent intentions, preoccupation with violence and weapons, or suicidal intentions (Meloy, Hoffmann, Guldiman, & James, 2012; Meloy & O'Toole, 2011). Particularly, the phenomenon of "leakage," defined as communication to a third party of intent to do harm to a target (Meloy & O'Toole, 2011, p. 514), seems to be a promising approach for prevention efforts. Leakage has been observed prior to every German school shooting analyzed to date (Bondü & Scheithauer, 2014a) and in many international cases (O'Toole, 1999; Vossekuil et al., 2002). Students may leak their violent intentions through boasting comments, essays, letters, Internet postings, or other forms of self-expression. Leakage can be an indicator of a personal psychosocial crisis with negative psychosocial, emotional, or developmental consequences. However, leakage does not necessarily lead to a violent act but presents an opportunity for detecting students who need attention and support, provided that significant persons in the student's environment recognize these warning behaviors and take appropriate action to investigate the situation and provide assistance (Leuschner et al., 2011).

School shootings are one possible, extreme endpoint of a critical, crisis-laden, individual development that cannot be explained by single causes. Rather, complex interactions of psychological, sociocultural, structural, and situational risk factors (e.g., peer rejection, lack of parental control, mental problems, easy access to weapons, fantasies of violence and revenge) must be taken into account (Rocque, 2012). None of these factors can be seen as sufficient conditions for school shootings, but in retrospect can be found in various combinations (Sommer, Leuschner, & Scheithauer, 2014). Although there is no consistent perpetrator profile, identification of these risk factors in combination with leakage and other forms of warning behavior offers a promising approach.

Schools as Targets and as Settings for Prevention

Schools are vulnerable targets for student attacks with institution-specific risk factors (Fox & Harding, 2005), but they provide valuable opportunities for prevention and intervention, because they are an environment where crisis symptoms and warning behavior become apparent. Adequate identification and evaluation of student crises is challenged by, first, a lack of knowledge of targeted school violence among school staff, as well as a lack of knowledge about violence-related warning behaviors and symptoms of psychosocial crisis (Leuschner et al., 2011). Second, a school culture that does not allow systematic and open exchange of information fosters information fragmentation and a code of silence among students (Fein et al., 2002; Syvertsen, Flanagan, & Stout, 2009; Vossekuil et al., 2002). Third, task segregation and insufficient cooperation between schools and law enforcement agencies or special education services (Harding, Fox, & Mehta, 2002) contribute to fragmentation of information.

In our view, programs that aim at preventing targeted school violence through identification and support of students in trouble must focus on five crucial goals: First, sensitize teachers to detect critical problems in an adolescent's development; second, organize effective avenues of communication about students in crisis; third, provide scientifically based criteria to assess the need for student support; fourth, train staff members in case management; and finally, build a cooperative professional network to provide counseling and sustainable interventions.

Furthermore, a program must adequately account for country-specific legal restrictions and community services, as well as differential offense patterns (e.g., German cases show a higher casualty rate for teachers than for students, Bondü & Scheithauer, 2014b). Because of the lack of multidisciplinary student support staff in German schools (i.e., school psychologists, school resource officers) in comparison to their American counterparts, the establishment of multidisciplinary threat assessment teams is less feasible. For that reason, the NETWASS program puts a main focus on teacher training and on networking with external partners rather than on school-based multidisciplinary teams.

The NETWASS Prevention Model for Targeted School Violence

Based on the research results and practical concerns delineated above, the NETWASS prevention model was developed as an intervention framework for schools (Scheithauer et al., 2014). NETWASS is a manualized, research-based, and developmentally informed prevention program. The core approach of the prevention model is to enable school staff to identify a student experiencing a psychosocial crisis that could lead to violence, to evaluate possible warning behaviors reliably, and to implement appropriate and supportive measures. The model consists of four process steps and works like a filter in which information is collected and reviewed with only the most serious cases passed on for consideration by a Crisis Prevention Team (CPT; Figure 1).

At the first stage of the model, school staff members notice a student engaging in warning behavior or showing crisis symptoms that raise concern. Warning behaviors are behaviors that may signal the research, planning, and implementation of a violent act (Meloy & O'Toole, 2011). If a warning behavior cannot be explained within the scope of the respective situation by the school staff (e.g., no trigger becomes apparent, teacher remains uncertain of consequences), observations should be forwarded to a central prevention appointee and a more in-depth assessment of the student's general situation may become necessary.

At the second stage, the prevention appointee is responsible for collecting further information about the student's situation from other sources (parents, other members of school staff, official documents) and bringing the information together for the CPT to review. An assessment by the CPT at the third stage defines the core of the NETWASS crisis prevention model. The CPT consists of the prevention appointee, the school principal, specially trained members of the school staff, the school's social worker, and the homeroom teacher of the student concerned. Their task is to discuss all the available information with the purpose of answering the central question: Is the student experiencing a psychosocial crisis that makes him or her at risk for violence? In order to answer this question, the CPT has to evaluate: (a) whether the student shows symptoms of a psychosocial crisis or serious warning behavior for targeted violence and (b) whether the student's overall situation reflects individual vulnerabilities and social strain factors; the CPT also considers individual resources and protective factors. After this evaluation, (c) the CPT will construct an intervention plan with appropriate interventions that will help the student to cope with the crisis and end a threatening situation by minimizing strains, and maximizing protective factors,
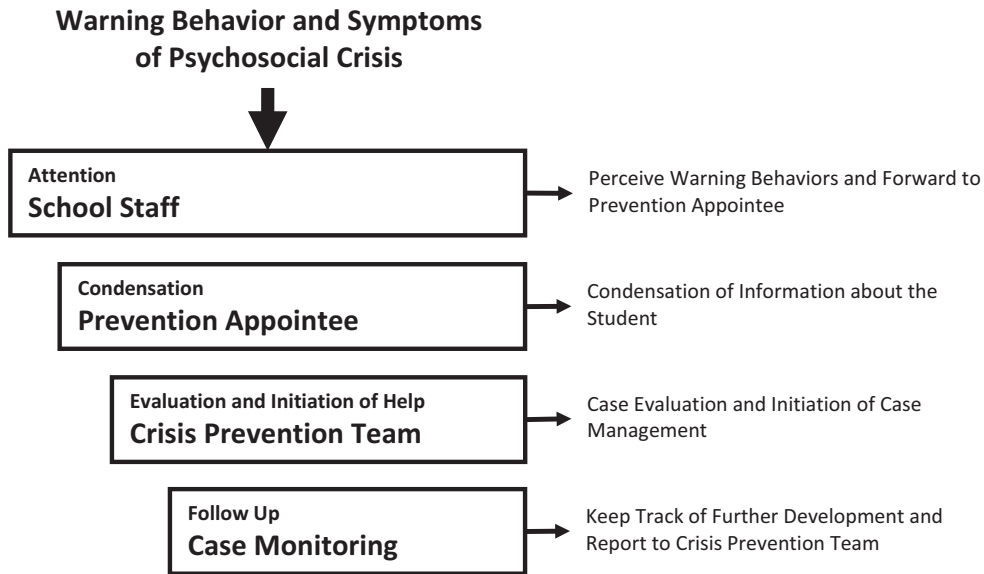
**Warning Behavior and Symptoms
of Psychosocial Crisis**

⬇

| Attention **School Staff** | → Perceive Warning Behaviors and Forward to Prevention Appointee |

| Condensation **Prevention Appointee** | → Condensation of Information about the Student |

| Evaluation and Initiation of Help **Crisis Prevention Team** | → Case Evaluation and Initiation of Case Management |

| Follow Up **Case Monitoring** | → Keep Track of Further Development and Report to Crisis Prevention Team |

Figure 1. The "Networks Against School Shootings" crisis prevention model for schools (Leuschner, Schroer-Hippel, Bondü, & Scheithauer, 2013).

depending on the individual case and available school resources. For every risk factor identified, an adequate measure should be found.

At the fourth stage, the NETWASS crisis prevention model consists of case monitoring by one or more staff members to assure an effective and sustainable intervention. Staff members responsible for case monitoring should give feedback to the CPT whether measures have started, were rejected, canceled, or ended, or whether other important events have occurred that require a new assessment by the team.

The Present Study

In the present study, three main areas of program evaluation and levels of implementation were examined:

1. immediate and long-term training effectiveness on the individual teacher level and the school level,
2. desired program secondary effects, that is, improvements in school climate and feelings of safety (FOS) on the school level, and
3. case identification and case assessment.

The main research question concerns the program's effectiveness, which refers to the individual teacher's growing knowledge regarding school shootings as indicated by sensitization toward warning signs for potential violent acts, increased

skills to assess crisis symptoms, and ability to handle psychosocial crises adequately.

The following effectiveness hypotheses emerged from our theoretical NETWASS prevention model:

1. The implementation of the NETWASS program will lead to enhanced expertise regarding school shootings and to improved skills and confidence to assess threats and adolescent crises immediately after training at t2 (short-term effects), with effects still present at the 7-month followup (long-term effects).
2. The application of the NETWASS crisis prevention model will improve the internal organizational structure of schools by clearly defining assessment processes; it will lead to more confidence of school staff in internal school officials and in external partners like police or school psychologists at the 7-month followup.

A second aspect refers to program effects, which were not addressed specifically by defined program components, but were intended secondary effects.

3. Because the NETWASS program encourages larger organizational changes and improvement of communication procedures, there will be positive changes in school staff cohesion (SSC), teacher–student interaction (STI), and FOS among school staff at followup (long-term effect).

A further aim of the NETWASS program is to encourage school staff to identify and assist students experiencing a psychosocial crisis. The evaluation of case assessment is based on data from well-documented but anonymized records by school staff.

Method

Participants

Participants were recruited in a stratified cluster sample. Three German federal states were selected for the study: (a) Berlin, as the German capital, represents an urban setting with a large low-income and ethnically diverse population; (b) Brandenburg is a sparsely populated, rural state with a low- to middle-income, ethnically homogeneous population; and (c) Baden-Wurttemberg is a densely populated, rural/suburban state with a middle- to high-income population. In each federal state, we chose six heterogeneous school districts representing variations in population density, income, proportion of graduates, urbanicity, and ethnicity found in that state. Schools were selected based on official lists of public and private schools. The schools decided voluntarily to participate in the program, in consultation with their whole school council, which is the most important decision-making body within schools in Germany.

The recruitment process obtained a sample of 108 schools with 5,610 teachers. For the present evaluation study, we included 98 schools with 3,473 school staff members (teacher, social worker, and administration staff). Data were collected between October 2010 and January 2012. Ten schools used for a previous pilot study were excluded. Thirty-one schools were located in Berlin, 28 in Brandenburg, and 39 in Baden-Wurttemberg. On the individual level, 66.8% of school staff in the sample were women and the mean age was 46.2 years ($SD = 10.7$), which are comparable to the population of teachers in these three federal states ($N = 149,368$; 67.1% women; $M_{age} = 47.5$ years). The participation of teachers in each school was voluntary.

Intervention Procedures

The implementation of the NETWASS approach includes (a) establishing organizational structures in schools (e.g., introduction and implementation of a prevention appointee and CPT), (b) imparting knowledge (e.g., about warning behaviors, crisis symptoms, strain and protective factors) and evaluation skills (ES) to school staff (STAFF) and members of a CPT, and (c) training with CPT and school staff in order to reach agreement in case evaluations. In order to achieve these aims, we developed a 2-day training program for CPT members and a 2-hr training for school staff to be implemented at participating schools. Training was designed in accordance with principles of adult learning (Bryan, Kreuter, & Brownson, 2009).

For ethical reasons and due to restrictions by the federal Departments of Education, we decided against a control group design and investigated the program's effectiveness using a quasi-experimental comparison group design with participating schools randomly allocated to one of three different implementation conditions: (a) In the "extensive condition," the CPT consisting of 3 to 12 people underwent a 2-day training. Subsequently, the school staff received a 2-hr training. Psychologists of the NETWASS Research Team of Freie Universität Berlin provided both trainings. (b) In the multiplier condition, the CPT was instructed in a 2-day training either by school psychologists or by police officers who had received a specific NETWASS multiplier training. In contrast to the extensive condition, the school principal or another member of the CPT instructed their school staff by themselves. (c) The third, self-instruction condition consisted of a 2-hr briefing that introduced an information brochure to the school staff and to the CPT. In contrast to the other two implementation conditions, the CPT was trained at the same time like the school staff and received no separate or specific training. Due to this implementation design, it was possible to compare the effects of direct teaching models to train-the-trainer and self-instruction models. The extensive condition was held at 32 schools, 37 schools were instructed by external trainers, and at 29 schools the information brochure was introduced. Following the training of school staff, a 7-month period of project implementation followed. During this period, all participating schools could use telephone support offered by NETWASS Research Team members. Several strategies were used to ensure program fidelity, depending on the level of implementation: (a) Trainings were based on a standardized program manual followed by every trainer. Schools within a training group were provided with equal material, learning methods, and dosage. (b) Trainer qualification: Trainers were either psychologists from the research staff, school psychologists, or police officers. All trainers received standardized multiplier training and a

trainer manual. (c) Training acceptance and readiness for change were controlled by a 13-item training evaluation instrument ($\alpha = .95$) indicating high acceptance of the main intervention and a four-item instrument ($\alpha = .82$) indicating high readiness for change. (d) Implementation fidelity was promoted by the definition of program core components, continuous telephone support of schools by trained project staff, and items in the follow-up questionnaire covering adherence to the case management protocol.

Data Collection and Validation

The prospective, longitudinal evaluation study included three points of measurement (t1: baseline, t2: postintervention, and t3: 7-month follow-up) using separate questionnaires for the principal, school staff, and CPT members. The questionnaires included vignettes of threats and psychosocial crises and options for action as well as a self-assessment of the teachers. In a multimethod design, qualitative interviews with the CPTs were conducted at the 7-month followup. Additionally, participating schools were instructed to document all cases treated with the crisis prevention model (event sampling design). Finally, protocols of the implementation process and case management were made available for qualitative analyses.

Outcome Measures

Because this is a new field of study and new intervention, there were no available outcome measures. We consulted with a group of experts in risk assessment and violence prevention, and devised our own measures to match the goals for our intervention. In some cases, the measures were based on single items because we had a narrow and specific interest in certain facts (such as whether a school staff member knew whom to contact concerning a student who seemed at risk for violence and whether the staff member trusted that school authorities would know how to respond). With further research, it should be possible to develop and test multi-item scales with adequate reliability and validity.

School Shooting Expertise

Based on current research, we developed a knowledge test with 11 statements (e.g., "Checklists are the best way to identify potential perpetrators") about school shootings and leaking, which were answered on a 4-point scale (from 1 [*disagree strongly*] to 4 [*agree strongly*]). Correct answers were assigned one point and summed so that a final index score could range from 0 to 11.

Evaluation Skills

Changes in objective ES were measured with a 16-item instrument based on four case scenarios derived from former school shootings and reviewed by school shooting experts. Each scenario measured teachers' diagnostic confidence and their situational assessment on a 5-point Likert scale from 1 (*disagree strongly*) to 5 (*agree strongly*). A total score was computed with values ranging from 16 (*low confidence*) to 80 (*high confidence*). Due to the scenario-driven nature of the instrument, a four-factor measurement structure was assumed, and McDonald's ω_t and ω_h (cf. Revelle & Zinbarg, 2009) were used as reliability estimates. These indicated suboptimal reliability for the general factor ($\omega_h = .41$) but adequate reliability of the overall measurement structure ($\omega_t = .83$).

Evaluation Certainty

The four case scenarios were also used to measure "evaluation certainty (EC)," which is the degree to which the participant felt confident in his or her answers regarding four items for each of the four case vignettes rated on a 5-point scale from 1 (*very uncertain*) to 5 (*very certain*). The total score ranged from 16 (*low certainty*) to 80 (*high certainty*). Consistent with the assumptions described for ES, McDonald's ω_t and ω_h were chosen as indicators of reliability and revealed good reliabilities concerning the general factor ($\omega_h = .76$) as well as the overall structure ($\omega_t = .95$).

Trust in Organizational Structures

Participants' trust in organizational structures (TOS) was measured on a 5-point Likert scale from 1 (*not at all*) to 5 (*very good*). We used a single item ("When there is a threat with a school shooting or with other forms of severe violence, the persons responsible at my school would know what to do") because we were not interested measuring other aspects of trust in the school's organizational structures.

Clarity of Responsible Persons of Contact

One item ("There are responsible persons of contact in our school, if I'm concerned about the

development of an individual student") seemed sufficient to capture our interest in whether the school staff member knew whom to contact if concerned about a student in crisis. This item was measured on a 5-point Likert scale from 1 (*do not agree*) to 4 (*totally agree*).

Teacher–Student Interaction

Participants completed part of the DIPF, BLK Evaluation (Gerecht, Steinert, Klieme, & Döbrich, 2007) for assessing STI, which is composed of three items (e.g., "If students are in trouble, they get support from their teacher") rated on a 4-point Likert scale ranging from 1 (*is not correct*) to 4 (*is correct*). Cronbach's alpha for this scale was .63.

Feelings of Safety

To assess FOS, the instrument SG-L-SS (Ahlig, Leuschner, & Scheithauer, 2016) was developed. We only used the affective scale, which consisted of four items (e.g., "Do you feel threatened personally by a potential incident of targeted school violence?"), rated on a 5-point Likert scale ranging from 1 (*not threatened*) to 5 (*very threatened*). Cronbach's alpha for this scale was .92.

School Staff Cohesion

SSC was measured using eight items from the Bugis questionnaire (Niedersächsisches Kultusministerium, 2004; e.g., "Within our staff, we support each other"). Items were rated on a 4-point Likert scale with 1 (*is not correct*) to 4 (*is correct*). Cronbach's alpha for this scale was .87.

Trust in External Partners

Trust in four school-related institutions (school psychological service, youth welfare office, law enforcement partners, scientific experts) was rated on a 5-point Likert scale with 1 (*do not trust at all*) to 5 (*very much trust*). A total score was calculated with a range of 1–20. Cronbach's alpha for this scale was .71.

CPT Adherence to Protocol

To assess adherence to the NETWASS protocol, CPT members answered a six-item adherence to protocol instrument (e.g., "Our CPT used the NETWASS crisis and threat assessment criteria to evaluate a student case") on a 4-point Likert scale with 1 (*not agree*)

to 4 (*totally agree*) as part of the follow-up questionnaire. Cronbach's alpha for this scale was .89.

Intervention Participation

Of the 98 schools in the evaluation study, 88 (89.9%) schools implemented the NETWASS crisis prevention model. For several reasons (workload, lack of necessity, other preferences), 10 schools decided against implementation after the training. Dropout rates differed among implementation conditions. In the extensive condition, 2 (6.8%) of the 32 schools; in the multiplier condition, 2 (5.7%) of the 37 schools; and in the self-instruction condition, 6 (20.7%) of the 29 schools decided against implementation. Dropout was also assessed for teacher participation: Of the original 3,473 participants in the first wave, 1,460 (42.0%) completed the second, and 1,036 (30.6%) the third wave survey. Tests for differential attrition showed no differences in age or gender between teachers who did and did not complete all three waves. In order to handle missing data, all statistical models used the full information maximum likelihood approach (Enders, 2010).

Data Analysis

To investigate the study hypotheses, multivariate two-level change models were estimated. Teachers (Level-1 units) were nested within schools (Level-2 units), and the three measurement occasions were represented using a multivariate approach. Each model considered the three dependent variables relevant to each of the three hypotheses simultaneously, totaling nine dependent variables within each model.

On level-1, the states at the first occasion as well as the changes between neighboring occasions were regressed on the school staff's status as either a member of the CPT or STAFF, with STAFF being the reference group. To investigate whether the effects of CPT membership varied across schools, random intercept and random slope models were estimated for each construct separately and compared using the strictly positive Satorra–Bentler chi-square (Satorra & Bentler, 2010) before combining constructs. For the combined analysis of school shooting expertise (SSE), ES, and EC, the analytical approach was extended by a multigroup component to investigate the differential effects of the three implementation conditions. Due to the skewness of some variables, the robust maximum likelihood estimator implemented in Mplus Version 7 (Muthén & Muthén, 1998–2012) was used.

For evaluation of case assessment, qualitative case reports were examined. Because schools were instructed to report all relevant cases treated with the crisis prevention model to the NETWASS staff, detailed information about the perceived cases was reported either in written documents, phone consultations, or interviews. Due to data protection rules, some schools refused to report or provide cases, which resulted in a convenience sample of cases. Nevertheless, the obtained sample of cases provided valuable qualitative information about the content of cases and the case assessment by school staff and CPT. Three researchers reviewed all case descriptions independently and coded relevant warning behaviors and risk factors, subsequently discussing the ratings until they reached consensus. Data were analyzed using one-way analyses of variance.

Results

School Shooting Expertise, Evaluation Skills, and Evaluation Certainty

For SSE ($\chi^2 = 0.447$, $df = 9$, $p = .999$) and ES ($\chi^2 = 2.961$, $df = 9$, $p = .966$) models comparisons deemed the inclusion of random slopes superfluous. In the case of EC, the model including random slopes did not converge within 10,000 iterations, leading to the acceptance of the random intercept model as adequate. Overall, variance attributable to the school level was minor, generating intraclass correlations (ICCs) between just .003 for EC at the baseline and .039 for ES at the follow-up. Table 1 shows the results of the model. For each construct, the baseline measurement of the STAFF served as the reference within each condition. Thus, the intercept of each of the changes represents the estimated change of the STAFF, whereas the regression weight of the CPT represents the difference between CPT and STAFF.

Globally (i.e., when disregarding the implementation condition), STAFF and CPT differed at the baseline with regard to their SSE ($\beta_1 = .245$, $SE = .079$, $p = .002$) and their EC ($\beta_1 = 2.277$, $SE = .586$, $p < .001$) but not with regard to their ES ($\beta_1 = .222$, $SE = .245$, $p = .366$). The results in Table 1 reveal that only SSE differed significantly in the extensive condition, whereas EC and ES differed significantly at the baseline in the multiplier as well as the self-instruction condition.

Concerning SSE, the change between the baseline and postintervention was significant and positive in all three implementation conditions and did not

differ between any of the groups. Effect sizes comparable to Cohen's d (denoted d') revealed the change between the first two occasions to be around 0.2 SD in all three conditions ($d'_{\text{extensive}} = .219$, $d'_{\text{multiplier}} = .221$, $d'_{\text{self}} = .184$). Being a member of the CPT did not have an effect on the changes of the SSE in any of the conditions. The change between postintervention and follow-up was negative in all conditions but did not reach statistical significance in the self-instruction condition ($d'_{\text{extensive}} = -.112$, $d'_{\text{multiplier}} = -.194$). However, comparisons between the conditions did not reveal statistical differences in these mean changes. Again, the CPT did not differ from STAFF in their changes.

As shown in Table 1, the change in ES between the baseline and postintervention was statistically significant in all three conditions ($d'_{\text{extensive}} = .409$, $d'_{\text{multiplier}} = .301$, $d'_{\text{self}} = .358$). Although the regression weight of CPT was positive in all three conditions, it reached statistical significance only in the multiplier condition. This implies that CPT profited more from the multiplier intervention than did the STAFF. The decrease in ES between the postintervention and follow-up reached statistical significance in both the extensive and the self-instruction condition ($d'_{\text{extensive}} = -.230$, $d'_{\text{self}} = -.186$).

EC results also showed significant increases between the baseline and postintervention in all three conditions ($d'_{\text{extensive}} = .32$, $d'_{\text{multiplier}} = .21$, $d'_{\text{self}} = .28$). However, there was a significant negative effect of CPT in the self-instruction condition, indicating that CPT profited significantly less from the intervention than did STAFF. In total, this change in the CPT was negative but did not significantly differ from 0 ($[\alpha_{2-1} + \beta_{2-1}] = -1.090$, $SE = 1.240$, $p = .379$), meaning that there was no significant change between the baseline and postintervention for CPT members in the self-instruction condition. However, CPT profited significantly more from the extensive condition compared to STAFF ($\beta_{2-1} = 1.984$, $SE = .872$, $p = .023$). The change between the postintervention and follow-up did not reach statistical significance in any of the conditions.

Trust in Organizational Structures, Clarity of Responsible Person of Contact, and Trust in External Partners

Results of the second model are presented in Table 2. The intercept represents the estimated change of the STAFF and the regression weight of the CPT represents the difference between CPT and

Table 1

Model 1 (SSE, ES, and EC Within Conditions)

	Extensive condition		Multiplier condition		Self-instruction condition	
	Estimate	SE	Estimate	SE	Estimate	SE
SSE						
State 1						
Intercept (α_1)	6.495***	0.057	6.500***	0.081	6.455***	0.066
CPT (β_1)	0.281*	0.116	0.208	0.113	0.257	0.316
Change 2-1						
Intercept (α_{2-1})	0.374***	0.063	0.400***	0.093	0.313***	0.080
CPT (β_{2-1})	0.239	0.166	0.073	0.190	−0.303	0.432
Change 3-2						
Intercept (α_{3-2})	−0.185*	0.087	−0.323***	0.098	−0.130	0.089
CPT (β_{3-2})	−0.086	0.182	0.187	0.240	0.054	0.437
ES						
State 1						
Intercept (α_1)	54.863***	0.167	54.531***	0.262	54.836***	0.199
CPT (β_1)	0.227	0.431	0.683*	0.333	−1.115*	0.487
Change 2-1						
Intercept (α_{2-1})	2.504***	0.263	1.625***	0.270	2.003***	0.423
CPT (β_{2-1})	0.847	0.638	1.215*	0.555	0.971	1.019
Change 3-2						
Intercept (α_{3-2})	−1.245***	0.313	−0.401	0.357	−1.001*	0.418
CPT (β_{3-2})	−0.047	0.582	−0.352	0.920	−1.204	1.002
EC						
State 1						
Intercept (α_1)	61.407***	0.286	60.280***	0.410	60.594***	0.378
CPT (β_1)	1.209	0.763	2.900**	1.001	4.196**	1.451
Change 2-1						
Intercept (α_{2-1})	2.896***	0.306	2.133**	0.768	2.898***	0.664
CPT (β_{2-1})	1.984*	0.872	1.328	1.490	−3.988***	1.205
Change 3-2						
Intercept (α_{3-2})	−1.019	0.610	−0.760	0.898	−0.939	0.554
CPT (β_{3-2})	−0.477	0.803	1.063	1.424	−1.660	2.213

Note Extensive condition, $n = 1,399$; multiplier condition, $n = 1,029$; self-instruction condition, $n = 1,028$. Intercept (α_1) = STAFF mean; CPT (β_1) = difference between STAFF and CPT; Intercept (α_{2-1}) = change between t1 and t2 for STAFF; CPT (β_{2-1}) = difference between STAFF and CPT between t1 and t2; Intercept (α_{3-2}) = change between t2 and t3 for STAFF; CPT (β_{3-2}) = difference between STAFF and CPT between t2 and t3. CPT = crisis prevention team; SSE = school shooting expertise; ES = evaluation skills; EC = evaluation certainty.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

STAFF. The variance attributable to the school level was between .018 for trust in external partners (TEP) at the follow-up and .132 for TOS at the baseline. STAFF and CPT members differed at the baseline with regard to TEP but not with regard to clarity of responsible person of contact (CPC) and TOS. Moreover, the difference between STAFF and CPT members did not reach statistical significance for the changes between the baseline and postintervention, or the postintervention and followup, for all measures. Significant changes were found between baseline level and postintervention concerning TOS ($d'_{STAFF} = .351$; $d'_{CPT} = .470$), CPC ($d'_{STAFF} = .223$; $d'_{CPT} = .271$), and TEP

($d'_{STAFF} = -.046$) and between the postintervention and follow-up concerning TEP ($d'_{STAFF} = .248$).

Teacher–Student Interaction, School Staff Cohesion, and Feelings of Safety

Secondary effects of the intervention are reported in the third model (Table 2). All variables were measured only at the baseline and followup. The ICCs varied between .095 for TSI and .156 for SSC at the postintervention. STAFF and CPT members differed at the baseline with regard to TSI and FOS but not with regard to SSC. Moreover, the difference in change between STAFF and CPT members

Table 2

Estimates for Model 2 (TOS, CPC, and TEP) and Model 3 (TSI, SSC, and FOS)

	Estimate	SE	Effect size
TOS			
State 1			
Intercept (α_1)	3.332***	.041	
CPT (β_1)	−0.025	.048	
Change 2-1			
Intercept (α_{2-1})	0.349***	.034	.351
CPT (β_{2-1})	0.119	.076	.470
Change 3-2			
Intercept (α_{3-2})	0.047	.030	.056
CPT (β_{3-2})	0.083	.087	.156
CPC			
State 1			
Intercept (α_1)	2.913***	.036	
CPT (β_1)	0.088	.055	
Change 2-1			
Intercept (α_{2-1})	0.219***	.031	.223
CPT (β_{2-1})	0.047	.076	.271
Change 3-2			
Intercept (α_{3-2})	0.030	.032	.033
CPT (β_{3-2})	0.083	.087	.122
TEP			
State 1			
Intercept (α_1)	11.619***	.096	
CPT (β_1)	0.724***	.161	
Change 2-1			
Intercept (α_{2-1})	−0.140*	.069	−.046
CPT (β_{2-1})	.352	.956	.070
Change 3-2			
Intercept (α_{3-2})	0.711***	.089	.248
CPT (β_{3-2})	−0.480	.961	.081
TSI			
State 1			
Intercept (α_1)	3.048***	.013	
CPT (β_1)	−0.046*	.019	
Change 3-1			
Intercept (α_{3-1})	0.094***	.012	.271
CPT (β_{3-1})	−0.001	.038	.268
SSC			
State 1			
Intercept (α_1)	2.987***	.018	
CPT (β_1)	0.019	.022	
Change 3-1			
Intercept (α_{3-1})	0.077***	.013	.217
CPT (β_{3-1})	−0.019	.032	.164
FOS			
State 1			
Intercept (α_1)	1.893***	.036	
CPT (β_1)	−0.122***	.034	

did not show statistical significance for the follow-up. Significant changes between baseline and follow-up were found for TSI (d'_{STAFF} = .271;

Table 2

Continued

	Estimate	SE	Effect size
Change 3-1			
Intercept (α_{3-1})	−0.081***	.036	−.116
CPT (β_{3-1})	−0.029	.065	−.158

Note Intercept (α_1), CPT (β_1), Intercept (α_{2-1}), CPT (β_{2-1}); Intercept (α_{3-2}); CPT (β_{3-2}) analogous to Table 1. Model 2, n = 3,435; Model 3, n = 3,453. CPT = crisis prevention team; TOS = trust in organizational structures; CPC = clarity of responsible person of contact; TEP = trust in external partners; TSI = teacher–student interaction; SSC = school staff cohesion; FOS = feelings of safety. *p < .05. ***p < .001.

d'_{CPT} = .268), SSC (d'_{STAFF} = .217; d'_{CPT} = .164), and FOS (d'_{STAFF} = −.116; d'_{CPT} = −.158).

Case Identification and Case Assessment

At the 7-month follow-up, school staff evaluated the newly implemented structures as helpful (94.5% approval) and useful to assure that important information about students was shared (93.2% approval). CPT ratings indicated the appropriateness of the NETWASS program for structured threat assessment (92.8% approval) with assessment criteria being helpful to also identify students in crisis (88.9% approval) and the recommended team structure as suitable for case management (90.3% approval). More than 80% of CPT members stated the NETWASS program also facilitated the handling of typical, nonviolent problem behaviors of students.

At the followup, school staff from 85 (86.7%) schools reported that they assessed and forwarded cases to their crisis prevention appointee. In total, there were 241 cases. Schools reported an average of 2.6 cases (SD = 3.05) over a 7-month period, which seemed manageable with existing staff and did not substantially increase workload. No significant differences between implementation conditions were found. From all cases reported, we gained a sample of 99 case reports referred by 59 schools. In 82.8% of cases the students were male, all of them between 3rd and 12th grades (median = 8th grade).

A broad spectrum of social strain factors, crisis symptoms, and individual vulnerabilities as well as specific warning behavior were found because the NETWASS model supports not only the detection of psychosocial crises associated with violent behavior but also helps school staff to recognize and evaluate student crises from a more general preventive perspective. According to school staff

observations, 73 students exhibited crisis symptoms (school failure, rejection of schooling, social withdrawal, self-injury, psychosomatic pain), and 63 students showed social strain (being a victim of bullying and other problematic peer relationships, conflicts with teachers, or experiences of unjust teacher behavior, family conflicts, experiences of loss). Forty-two students showed individual vulnerabilities (consumption of media with violent content, unstable self-esteem, emotional disturbances and mental disorders, dysfunctional coping). School staff reported warning behaviors specific for violence and leakage in 65 of the identified cases. These cases were classified as direct threats against the school or peers, announcements of violent intentions toward others, suicidal intentions, sudden changes of behavior, communication of violent fantasies, or an intense interest in previous school shootings, weapons, and death. In addition, 12 of the students identified by school staff were in possession of weapons, mostly knives or other blade weapons.

According to manual recommendations for case assessment (Scheithauer et al., 2014) derived from an examination of risk factors and leakage in German school shooters (e.g., Bondü & Scheithauer, 2014a), we defined different levels of risk for an act of targeted school violence. Three risk groups were distinguished: Students were classified as *low-risk* cases if they met any of the following conditions: (a) they solely included individual or social risk factors as well as crisis symptoms or (b) they exhibited violence-related warning behavior but without any indication of crisis symptoms, vulnerabilities, or social strain. Altogether, 48 cases met these conditions. The *specific risk* group consisted of 43 cases in which violence-motivated pathways in addition with other risk factors (e.g., individual vulnerabilities, social strain, crisis symptoms) were identified by school staff. Those cases implied that the student's development could potentially lead to an act of violence, but the psychosocial crisis was at an early stage. Eight students reported by the schools were labeled *high-risk* cases. These cases fit the criteria we formulated as escalation factors: In addition to crisis symptoms, and individual and social disturbances, the high-risk cases showed repeated violence-related behavior. Moreover, high-risk cases met all of the following three conditions: the student was in possession of lethal weapons, made concrete threats that mentioned the time and location of the attack, and named potential victims. In all of the eight cases, school staff and peers were highly frightened, because the CPT evaluation

concluded that the student was able to plan and commit a violent act at the school. A one-way analysis of variance (ANOVA) was employed to evaluate whether these risk groups differed in the number of risk factors (crisis symptoms, social strain factors, and individual vulnerabilities). There were significant differences in the number of risk factors for the three risk groups, $F(2, 96) = 20.52$, $p = .000$. Post hoc comparisons using the Duncan's test indicated that the mean score for *low-risk* cases ($M = 1.50$, $SD = 1.64$) was significantly different from *specific-risk* cases ($M = 3.44$, $SD = 2.05$) and their mean score was significantly different from *high-risk* cases ($M = 5.38$, $SD = 2.61$).

Schools reported a broad spectrum of interventions to address risk factors. Most interventions were applied in order to get more information (e.g., interviews with the student, parents, or classmates), to involve network partners (e.g., police, school psychology, social worker, therapists), to work with the class (e.g., antibullying program), or to work with the individual student by educational and disciplinary measures (e.g., individual education, special care, changing class). The student was removed from school or moved to a different school in only 9 of 99 cases (either at the student's request or at the instigation of the school).

In order to assess to a limited degree whether schools developed intervention plans consistent with the NETWASS instructions, we analyzed whether the CPT followed the recommendation to find adequate measures for responding to each identified risk factor. In this case, the number of measures implemented should correspond with increasing risk status and number of risk factors, respectively. Results of an ANOVA showed significant differences in the average number of measures between the three risk groups, $F(2, 96) = 8.595$, $p = .000$, *low-risk* group ($M = 2.63$), *specific-risk* group ($M = 3.19$), and *high-risk* group ($M = 5.13$). In addition to these results, analysis of the CPT adherence to protocol scale showed that the average rating ($M = 2.92$; $SD = 0.64$) was close to the scale maximum (max = 4).

Discussion

Using a quasi-experimental, comparison group design with three measurement points and schools randomly allocated to implementation conditions, we investigated the differential effectiveness of the NETWASS program in German schools under real-life conditions. Overall, results revealed (a) an

increase in school staff expertise and ES; (b) positive secondary effects including improved confidence in the school's organizational structure, TEP who work with schools, improved STI, and pronounced SSC and FOS; and (c) an improvement in school staff abilities to identify and assist students experiencing a crisis that could lead to targeted school violence. Each of these results will be discussed in more detail next.

School Shooting Expertise, Evaluation Skills, and Evaluation Certainty

As expected, the implementation of the NET-WASS program led to enhanced staff expertise on the topic of school shootings and to improved skills and confidence to assess threats and adolescent crises immediately after training at t2 (short-term effects). These effects were still present at follow-up, although follow-up effects were smaller than the postintervention effects. A decrease in effects from postintervention to followup appears to be typical for preventive interventions and can be found in several other evaluation studies (e.g., Beelmann & Raabe, 2009). These results are consistent with other studies of threat assessment. For example, evaluation studies of the Virginia Student Threat Assessment Guidelines in the United States have shown that 1-day staff training has a substantial effect on the attitudes and knowledge of school personnel across disciplines, including school principals, psychologists, counselors, social workers, and school-based police officers (Allen, Cornell, Lorek, & Sheras, 2008; Cornell, Allen, & Fan, 2012), including substantial changes in knowledge and attitudes regarding school violence, school discipline, and threat assessment.

School effects were small for all outcome variables. This is not unexpected, for several reasons: First, small to medium school effects are typical for preventive intervention studies in the school environment; second, most outcomes addressed the individual level and therefore we did not expect to find substantial school-level differences in staff expertise, skills, and trust; and third, small longitudinal school effects may be an indication of the high standardization level of the program and program implementation.

Using a comparative evaluation design, assignment to different training groups (STAFF and CPT) and different implementation conditions (extensive, multiplier, self-instruction) resulted in varying degrees of outcomes. As expected, better outcomes were achieved for extensive and multiplier conditions compared to the self-instruction condition. The smaller effects for the self-instruction condition are likely due to less structured input, training, and support prior and during implementation. Unexpectedly, CPT members in the multiplier condition showed better outcomes than those trained by project team members in the extensive condition. Multipliers (school psychologists, police officers) were well-known and trusted persons who were familiar with the regional network structures and contact persons at the respective school, which may have had a catalyzing effect on program implementation of CPT and STAFF. It is also noteworthy that school staff and CPT members differed at the baseline in most conditions concerning expertise, ES, and EC that can be explained by their previous work experiences and different typical responsibilities within school. This may also explain why CPT trainings did not have an effect on the changes of the SSE in any of the conditions, as CPT members started with generally superior baseline values, leaving less room for improvement. Also noteworthy is the significant negative effect of CPT's EC in the self-instruction condition. This effect may be explained by the fact that the CPT in this condition did not receive any additional training that increased their experiences of self-efficacy.

Trust in Organizational Structures, Clarity of Responsible Person of Contact, and Trust in External Partners

As expected, participants in both CPT and staff groups showed improved trust in the school's organizational structure and a clearer recognition of the responsible person to contact in the event of a student crisis. Specially, TOS improved from baseline to postintervention and followup and CPC from baseline to postintervention. We assume that no further significant positive change from postintervention to followup emerged because after training contact persons were familiar to everyone and thus there was little room for improvement. The differing baseline values between CPT and school staff regarding TEP may be explained by the greater familiarity of CPT members with external partners associated with different responsibilities. Although the intervention did not lead to improvements for CPT members, a positive change emerged for school staff from postintervention to follow-up that can be attributed to positive experiences with external partners during the 7-month implementation period (e.g., in the context of case work).

Teacher–Student Interaction, School Staff Cohesion, and Feelings of Safety

Some interesting positive secondary effects emerged at follow-up that were stronger than expected. Positive changes for TSI, SSC, and partly FOS emerged with effect sizes that were equal or higher than those found in evaluation studies of preventive interventions primarily designed for, for example, improvements in school climate (note that a positive TSI and SSC can be understood as important elements of school climate). Results regarding FOS were more complex: The positive effect of the intervention for CPT members, but not school staff members, might be explained by their comparatively more intense involvement in all elements of the program, including case management. Positive experiences with case management and resulting self-efficacy may have a positive impact on FOS. This hypothesized effect needs further investigation.

Case Identification and Case Assessment

As expected, program implementation led to the identification of students experiencing psychosocial crises and demonstrating warning behavior for targeted violence. A closer investigation of identified cases resulted in a clear differentiation between high- and low-risk cases. The percentage of threat cases found to be high risk (approximately 8%) was similar to the percentage that Cornell and Sheras (2006) identified as very serious substantive threats, the most serious category in their system. The content analysis of the reported cases suggested that violence-motivated pathways, usually accompanied by leakage, can be appropriately assessed and dealt with by the trained school staff. Additionally, in terms of early crisis prevention, trained school staff members were able to identify symptoms and vulnerabilities not necessarily connected to the threat of violence. Their interventions may have helped these troubled students before their thoughts turned to violent fantasies, plans, or behavior.

Limitations and Directions for Future Research

In the present study program, effectiveness under real-life conditions was examined using a randomized comparative design with a large sample of schools. The study is the first large-scale evaluation study of a threat assessment program in Europe using a teacher education approach. The advantages of evaluation studies under real-life conditions (e.g., high ecological validity) are countered by some specific limitations, which potentially result in study dropouts: Due to governmental requirements, it was not possible to provide participating schools with incentives. Moreover, the implementation of a new program in addition to day-to-day obligations without appropriate resource compensation enhances the risk of attrition. Because the schools participated voluntarily in the study, we cannot assume they are representative of all schools; nevertheless, the sample was similar in the distribution of age and sex to the general population in the three federal states.

Moreover, specific methodological challenges have to be considered in future studies: First, there is a need to develop improved measures of constructs like SSE, TOS, and CPC that use multiple items and have good reliability, but for purposes of this initial study we wanted only information on some specific points. Second, an important limitation of the present study is that all findings rely on staff self-reports. For several reasons (parents' consent, ethical and practical concerns), it was not possible to obtain data directly from students or to have research staff present to observe teacher interventions. However, we collected additional data using different methods that may be used to estimate congruency across data sources and methods; for example, qualitative interviews were conducted with CPTs to obtain information about program implementation and case management. In addition, our research team reviewed case management protocols to assess how well they reflected the program core components. In future work, we will examine evidence of implementation fidelity and its impact on effectiveness. Third, for ethical and motivational reasons and due to governmental requirements, it was not possible to compare intervention conditions with a nonintervention control group of schools. Fourth, the study design was limited to three survey waves. Although the present multilevel evaluation design enabled us to examine the program's effects in a reasonably accurate way, another measurement wave would have allowed us to go beyond an analysis of linear growth patterns.

Although evaluation of the quality of case management using selected and implemented measures for students was not within the scope of the present study, we can identify some basic limitations of the case data: In order to respect school staff's unwillingness to report some critical student cases to a university project, we had to rely on a convenience sample of case reports. Additionally, the criteria for the identification of cases with a higher risk for

targeted school violence are based exclusively on earlier retrospective case studies. There were no other opportunities to validate these criteria, as might be possible with prospective longitudinal studies. It should be noted that the percentage of cases (8%) that had been identified in the present study as high-risk cases may be overestimated considering that targeted school violence is such a rare phenomenon in schools (Borum et al., 2010). On the other hand, there are no systematic data on the number of averted cases.

Conclusions

Our results clearly indicate the practical feasibility and promise of effectiveness for the NETWASS program as a useful prevention method for schools. The program required only a moderate degree of staff training yet increased teachers' expertise and ES to identify and deal with students experiencing a psychosocial crisis that could lead to violence. We found that it was important to emphasize a fit between school needs and program components. For example, readiness for change and willingness to engage in implementation efforts were high in participating schools, which is commonly regarded as a key facilitator to introducing and consolidating institution-wide innovations. This study of NET-WASS represents the first evaluation of a manualized violence prevention program using a teacher education approach in Europe. These findings support the recommendations of scholars to use student threat assessment as an effective way of preventing targeted school violence. Schools, school administrators, and policymakers can contribute to healthy development of students by supporting the implementation of the NETWASS program as a standard educational and pedagogical practice.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Appendix S1. School Shootings in Germany