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Abstract

School attacks are attracting increasing attention in aggression research. Recent systematic analyses provided new insights into offense and offender characteristics. Less is known about attacks in institutes of higher education (e.g., universities). It is therefore questionable whether the term “school attack” should be limited to institutions of general education or could be extended to institutions of higher education. Scientific literature is divided in distinguishing or unifying these two groups and reports similarities as well as differences. We researched 232 school attacks and 45 attacks in institutes of higher education throughout the world and conducted systematic comparisons between the two groups. The analyses yielded differences in offender (e.g., age, migration background) and offense characteristics (e.g., weapons, suicide rates), and some similarities (e.g., gender). Most differences can apparently be accounted for by offenders’ age and situational influences. We discuss the implications of our findings for future research and the development of preventative measures.

Keywords

school attack, IHE attack, rampage, higher education, characteristics, prevention

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In recent years, so-called school shootings have repeatedly raised attention. Because there is a large proportion of offenses that do not involve the use of firearms, we decided to use the term *school attack* instead. In the public discussion of causes, consequences, and possibilities of prevention, generally no differentiation is made between offenses in primary and secondary schools (e.g., Columbine), vocational schools (e.g., Kauhajoki), or universities (e.g., Blacksburg). Furthermore, definitions of school shootings or attacks generally do not address the forms of the educational settings that are subsumed under this term. Detached case studies and studies with small, non-representative samples yielded evidence for both differences and similarities between offenses in schools and those in institutes of higher education (IHE attacks). Large-scale studies providing reliable empirical evidence are still missing. Therefore, at present, it is unclear whether the two types of offenses should be treated rather as separate groups or as a homogeneous phenomenon.

Thus, we conducted a systematic study of school and IHE attacks worldwide to provide reliable information concerning the number of offenses and to test for differences between the two groups in a comprehensive and systematic sample. Based on these findings, future research might decide to combine offenses in different educational settings into one group or to treat them as two distinct phenomena. This might also influence future research on risk factors and warning signs as well as the planning of preventive measures and interventions.

To date, there is no consistent definition of the term *school shooting* or *attack* and no consensus on the most suitable term to describe the group of offenses that are generally agreed to include those by current or former students with intention to kill persons at their school (Bondü, Cornell, & Scheithauer, 2011). In the present study, we defined school attacks as planned offenses by current or former students of the school with potentially deadly weapons and with intention to kill single persons or groups of persons associated with the school. The school is consciously chosen as the site of offense and relates to the offenses' motives (Bondü, 2012). This definition includes offenses with weapons other than firearms and—in contrast to some other definitions—offenses against single students. However, offenses without intention to kill, offenses by teaching staff or persons who have never been students of the school, offenses for reasons that do not relate to the school context (e.g., terrorist attacks, financial motives, heartache), or suicides are not considered.

This definition can easily be transferred to similar offenses in IHEs such as vocational schools, colleges, polytechnics, and universities, resulting in a corresponding definition of an IHE attack. The definition thus encompasses that originally proposed by Drysdale, Modzeleski, and Simons (2010), who

included offenses outside the institutional property, offenses by employees, sexual violence, relationship-related offenses, suicides, and the like in their comprehensive and systematic study of 272 “campus attacks.”

Only a minority of these 272 offenses would apply to the definition of an IHE attack used in our study. Thus, the number of offenses in line with this definition worldwide remains unknown. In contrast, several researchers have tried to identify the number of school attacks worldwide. Robertz and Wickenhäuser (2007) reported 99 school attacks between 1974 and 2006; Bondü (2012) identified 187 offenses in line with the present definition of a school attack between 1966 and March 2009, and an additional 66 offenses that could not be unambiguously assigned to this category due to missing information.

Both studies cited focused on offenses in school settings, that is, primary, middle, and high schools, as did most other studies concerned with the identification of risk factors for school attacks (Bondü, 2012; Leary, Kowalski, Smith, & Philips, 2003; O’Toole, 1999; Verlinden, Hersen, & Thomas, 2000; Vossekuil, Fein, Reddy, Borum, & Modzeleski, 2002). Recently, however, Langman (2013) transferred his typology of psychopathic, psychotic, and traumatized school shooters to a sample of 35 offenders including some from IHEs (e.g., Blacksburg). Other authors also chose not to differentiate between educational settings (Klein, 2012).

This is plausible, because primary and secondary schools and IHEs closely resemble each other in many respects. For example, there are similarities in settings (large, amorphous buildings), aims (education, qualification for future profession), social structure (groups of students, hierarchic student–teacher relationship), and congruencies in the potential motives for offenses in these settings (bullying, perceptions of unfair treatment by teachers, failure in performance).

A closer look, however, also reveals differences. Generally, primary and secondary schools have a tighter social network due to (a) the smaller numbers of buildings, students, and teachers; (b) limited access to school buildings; (c) stricter processes due to cohesive classes and constant time tables; and (d) closer contact between students and students and teachers. Consequently, lines of communication are shorter, students’ behavior is monitored more closely, and inappropriate behavior is more likely to be discovered early on. This simplifies subsequent prevention and intervention efforts (Drysedale et al., 2010). As opposed to institutions of higher education, schools are mostly not entirely self-chosen and cannot easily be changed. Absence from classes is more strictly monitored. IHEs lead to qualification for future professions and pose larger requirements to students with regard to forming new relationships, adapting to new environments, developing

self-organization and -responsibility, coping with pressure to perform, and in some cases the need to earn one's living alone.

Differences between offenses in schools and IHEs would also be likely to relate to the offenders' age. For example, persons of mature age can access firearms more easily, and typically, the use of firearms results in a higher number of victims. Furthermore, mental disorders may be more pronounced or obvious in adults and are likely to influence motives for and characteristics of offenses.

In line with this assumption, Newman and Fox (2009) found stronger evidence for mental disorders in five offenders in college than in four offenders in school. In addition, the offenders in colleges had purchased their weapons themselves, whereas the offenders in schools mainly took them from relatives. Offenders in colleges, but not in schools, often had a migration background. Furthermore, as opposed to offenders in schools, offenders in colleges seemed more detached from social bonds, thus conforming more closely to the typical picture of a loner (Newman & Fox, 2009). They also appeared less ambivalent with regard to their offenses and abstained from prior announcements (Newman & Fox, 2009). According to Fox and Savage (2009), there were differences in motives, with bullying as the primary motive for school attacks and pressure to perform and fear of failure as the primary motive for college attacks. The authors also noted a lower frequency of college attacks (De Haven, 2009). Both groups, however, resembled each other in their need for attention and the planning of the offenses.

Meloy et al. (2004) compared school attacks or juvenile mass murders in particular with adult mass murders in general, thus covering a broader scope of relevant offenses. Adult mass murderers covered a broader age range and displayed more evidence of mental disorders (also see Palermo & Ross, 1999), but a lower frequency of loners. Prior (particularly indirect) announcements of the offenses were more common among juvenile offenders (also cf. Mullen, 2004). The authors identified triggering events in 90% of the adult but only in 59% of the juvenile mass murders. They reported adult mass murderers to act more frequently in the morning (although in studies on school attacks, most offenses also occurred during morning hours; Vossekul et al., 2002), to bring larger numbers of weapons, and to cause larger numbers of victims. Juvenile mass murderers acted in pairs more frequently and knew all their victims personally (also cf. Hermanutz & Kersten, 2003). A lower rate of subsequent suicides among juvenile mass murderers (9% as compared with 53% in the adult sample according to Meloy et al., 2004; about 15% for school attacks according to Bondü, 2012, and Vossekul et al., 2002; 26% among offenders in IHE attacks according to Drysdale et al., 2010) has been interpreted as a sign of inadequate moral development or a lack of experience

with extreme violence in the juvenile group (Meloy et al., 2004; Palermo & Ross, 1999; Thompson & Kyle, 2005). Adult and juvenile mass murderers resembled each other in the occurrence of violent fantasies, previous violent behavior, interest in weapons, social withdrawal, and offense behaviors (Meloy et al., 2004). Finally, studies on school attacks or IHE attacks reported comparable proportions of female offenders of around 6% (Bondü, 2012; Drysdale et al., 2010).

In our study, we aimed at providing a more comprehensive database for comparisons between school and IHE attacks with regard to objective characteristics of offenders and offenses. Based on prior research findings and theoretical assumptions, we expected to find (a) larger numbers of school as opposed to IHE attacks due to the smaller number of IHEs and students than schools and pupils; (b) older offenders in IHE attacks; (c) similar proportions of female offenders; (d) more pairs or groups of offenders in school attacks; (e) higher proportions of offenders with migration background in IHE offenders; (f) similar proportions of offenses during morning hours; (g) higher proportions of firearm use in IHE attacks; (h) more wounded, dead, and total victims in IHE attacks due to a more frequent use of firearms; (i) higher proportions of dead victims as compared with the total victim number in IHE attacks; (j) higher proportions of offenses with teaching staff as dead victims in IHE attacks; and (k) higher proportions of suicides among IHE offenders.

Method

Sample

To determine school and IHE attacks throughout the world, we reviewed existing literature on school and IHE attacks, followed accessible and readable media reports (i.e., media reports in European languages and Latin writ) on current offenses, and conducted a media research via the Internet, where attacks and other acts of violence at educational institutions are documented on special websites or lists (e.g., <http://www.columbine-angels.com>; http://en.wikipedia.org/wiki/School_shooting).

Offenses were included in our sample if they met the following criteria (Bondü, 2012): (a) The offender was a current or former student of the educational institution, (b) the educational institution or related places (school bus, gym, dormitory) were intentionally chosen as site of the offense, (c) the offense was planned, (d) the intended victims (not necessarily the real victims) related to the educational institution, (e) the offenders had the intention to kill (even if they did not succeed in doing so, that is, unfinished attacks or attacks without victims were included into our sample as well, if the offender

had started the offense and intended to kill at least one person), (f) the offender used weapons with likely potential to kill (e.g., we excluded offenses with pens from our sample), and (g) the offender committed the attack due to personal motives related to the educational institution.

We discussed every offense in detail, if it was questionable whether it should be included in the sample. We excluded offenses from our sample that did not fully meet the criteria mentioned above or missed relevant information. Offenses were not included (a) if the offender was unknown or no (former) student of the educational institution, (b) if the attack did not occur on the grounds of the educational institution, and (c) if the offender had no intention to kill (hostage taking, sexual offenses), did not plan the attack, did not use fatal weapons, or committed the attack due to motives not related to the educational institution (e.g., gang conflicts, drug trade activity, terrorism, interpersonal conflicts in romantic relationships).

We treated offenses in primary or secondary schools (e.g., primary, middle, high schools) as school attacks and offenses in IHEs or post-secondary schools (e.g., vocational schools, polytechnics, colleges, universities) as IHE attacks. We terminated our research for relevant offenses on September 22, 2012. In this way, we were able to identify 232 school attacks (250 offenders) from August 1886 to August 2012 and 45 IHE attacks (45 offenders) from June 1930 to April 2012, which met the criteria of our definitions of school and IHE attacks and were accordingly included in the analyses.

Procedure

To provide reliable information, we limited our further research on offense and offender characteristics to vastly objective characteristics and did not consider less objective ones such as offenders' mental disorders, announcements of offenses, or detailed motives for the offenses. Whenever available, we collected the following data for every incident: time (day, month, year, day of week, time of day) and location of the attack (country, continent), offender characteristics (number of offenders, age, sex, current/former student, migration background), and offense characteristics (kind of weapons used, number of casualties and injuries, group of victims, offender suicide). Whenever possible, we confirmed the data via different sources of information.

Due to multiple comparisons (13 comparisons) between school and IHE attacks, we adjusted the alpha level to .0038 via Bonferroni adjustment. When comparing frequencies, we used chi-square tests. Because of large differences in sample sizes and skewed distributions, we used *U* tests to test for differences in continuous variables.

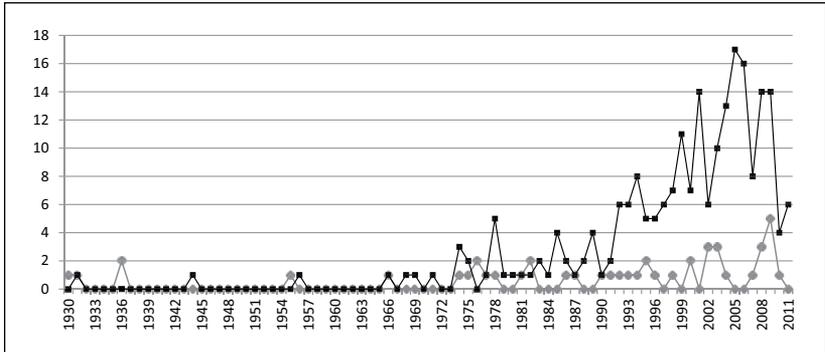


Figure 1. Number of school (black) and IHE attacks (gray) per year between 1930 and 2011.

Note. IHE = institute of higher education.

Results

Frequency and Spatial Distribution of Offenses

In line with our expectations, we identified a higher total number of school than of IHE attacks. As can be seen from Figure 1, attacks in educational institutions—especially school attacks—displayed stepwise increases in frequency after their first appearance. Within the United States, where most school (150 offenses, 64.7%, $n = 232$) and most IHE attacks (34 offenses, 75.6%, $n = 45$) occurred, and where information is available concerning the number of schools and IHEs, however, IHE attacks were significantly more frequent than school attacks when related to the total number of educational institutions, $\chi^2(df = 1) = 73.62, p < .001$, odds ratio (OR) = 4.44 (132,183 schools of primary and secondary education vs. 6,742 institutions of higher education; Snyder & Dillow, 2011).

We determined school attacks in 32 countries on all continents and IHE attacks in 11 nations on 4 continents. Eight countries were affected by both school and IHE attacks (see Table 1).

Offender Characteristics

As to be expected, we found large group differences in terms of age: 88.4% offenders in schools were between 13 and 18 years old ($M = 15.87$, range = 9-45 years, $Mdn = 15.0$). IHE offenders covered a broader age range (38.1% between 22 and 25 years, $M = 30.29$, range = 18-62 years, $Mdn = 25.00$) and

Table 1. Number of School and IHE Attacks by Country.

Country	No. School Attacks	No. IHE Attacks
The United States	150 (64.7%)	34 (75.6%)
Germany	11 (4.7%)	1 (2.2%)
Canada	11 (4.7%)	
South Africa	8 (3.4%)	
China	7 (3.0%)	1 (2.2%)
Japan	4 (1.7 %)	
Austria	5 (2.2%)	1 (2.2%)
Great Britain	5 (2.2%)	1 (2.2%)
Brasilia, France	3 (1.3%)	
Finland	2 (0.9%)	1 (2.2%)
Argentina, Netherlands	2 (0.9%)	
Australia	1 (0.4%)	1 (2.2%)
Hungary	1 (0.4%)	1 (2.2%)
Bosnia-Herzegovina, Costa Rica, Czech Republic, Italy, Jamaica, Jugoslavia, Kenia, New Zealand, Norway, Papua New Guinea, Poland, Russia, Saudi Arabia, Sweden, Thailand, Turkey, United Arab Emirates	1 (0.4%)	
Greece		2 (4.4%)
Lebanon		1 (2.2%)
Denmark		1 (2.2%)

Note. IHE = Institute of Higher Education.

were significantly older ($U = 214.0$, $p < .001$, $r = .61$; Table 2 provides an overview of the results, including standard deviations, and sample sizes).

In both groups, most offenders were current students at the educational institution concerned (school: 90.3%, IHE: 80%). Furthermore, the percentage of female offenders in school (6.4%) and IHE attacks (6.7%) did not differ significantly, $\chi^2(df = 1) = 0.005$, $p = 1.0$. All IHE attacks were committed by single offenders, but 13 school attacks (5.6%) were perpetrated in collaboration between two (9 offenses, 3.9%), three (3 offenses, 1.3%), or four persons (1 offense, 0.4%). This difference, however, was not statistically significant, $\chi^2(df = 1) = 2.646$, $p = .137$.

Of the offenders in schools, only 7.2% had a migration background. They came from various countries in Asia (three offenders), Eastern Europe (four offenders), the Middle East (two offenders), and South America (two offenders). In contrast, nearly one third of the IHE offenders (31.7%) originated

Table 2. Comparison of School and IHE Attacks.

Variable	Total N (School/IHE Attacks)	School Attacks	IHE Attacks	Test Statistic	p Value	Effect Size†
Age	267 (225/42)	M = 15.87 (SD = 3.56) Mdn = 15.0	M = 30.29 (SD = 10.47) Mdn = 25.0	U = 214.0	<.001*	r = .61
Current students	292 (247/45)	n = 223 (90.3%)	n = 36 (80.0%)	$\chi^2(df=1) = 4.016$.069	
Female offenders	295 (250/45)	n = 16 (6.4%)	n = 3 (6.7%)	$\chi^2(df=1) = 0.005$	1.0	
Groups of offenders	277 (232/45)	n = 13 (5.6%)	n = 0 (0%)	$\chi^2(df=1) = 2.646$.137	
Migration background	194 (153/41)	n = 11 (7.2%)	n = 13 (31.7%)	$\chi^2(df=1) = 17.930$	<.001*	OR = 5.99
Offenses in the morning (6 a.m.-noon)	182 (156/26)	n = 98 (62.8%)	n = 15 (57.7%)	$\chi^2(df=1) = 0.249$.665	
Firearms as weapons	274 (229/45)	n = 153 (66.8%)	n = 39 (86.7%)	$\chi^2(df=1) = 7.070$.012	
Number of wounded victims	273 (229/44)	M = 2.54 (SD = 5.69) Mdn = 1.0	M = 2.68 (SD = 5.98) Mdn = 0.0	U = 4552.0	.296	
Number of dead victims	277 (232/45)	M = 1.21 (SD = 4.81) Mdn = 0.0	M = 2.62 (SD = 5.26) Mdn = 1.0	U = 3141.5	<.001*	r = .28
Proportion of dead victims	244 (204/40)	M = 0.38 (SD = 0.42) Mdn = 0.25	M = 0.65 (SD = 0.38) Mdn = 0.77	U = 2601.5	<.001*	r = .24
Total number of victims	273 (229/44)	M = 3.76 (SD = 8.55) Mdn = 1.0	M = 5.14 (SD = 10.21) Mdn = 2.0	U = 4107.0	.042	
Offenses with teachers as dead victims (yes/no)	246 (205/41)	n = 65 (31.7%)	n = 21 (51.2%)	$\chi^2(df=1) = 5.721$.020	
Suicide rates	284 (239/45)	n = 34 (14.2%)	n = 17 (37.8%)	$\chi^2(df=1) = 14.258$	<.001*	OR = 3.66

Note. IHE = Institute of Higher Education; OR = odds ratio.

†Only for significant test results. *Significant at $p = .0038$ (Bonferroni adjustment).

from foreign countries, the majority being from Asia (seven offenders), and also from the Middle East (three offenders), Africa (two offenders), and Eastern Europe (one offender). Thus, the proportion of offenders with migration background in IHE attacks was significantly higher than in school attacks, $\chi^2(df = 1) = 17.930, p < .001, OR = 5.99$.

Offense Characteristics

The monthly frequency of school attacks over the year displayed a wavelike pattern with peaks from February to May (105 offenses, 45.8%) and September to November (64 offenses, 27.9%), and strong declines during the summer months (June to August: 27 offenses, 11.8%). IHE attacks did not show such a clear pattern: Most offenses occurred in April (9, 20.0%, $n = 45$), February (6, 13.3%), June, and August (5 offenses each, 11.1%), but seldom in the remaining months.

Most offenses in both groups occurred on Mondays (school: 24%, IHE: 31.1%) and rarely on the weekend (school: 1.7%, IHE: 6.6%). Most school and IHE attacks were committed before noon. School attacks occurred most frequently between 6 a.m. and 10 a.m. (72 offenses, 46.2%) and most IHE attacks between 10 a.m. and 12 p.m. (10 offenses, 38.5%). The proportion of offenses in the morning hours between 6 a.m. and noon did not differ between school and IHE attacks, $\chi^2(df = 1) = 0.249, p = .665$.

Firearms were the most frequent weapons used in both groups of offenses (school: 66.8%, IHE: 86.7%, multiple responses possible), and they did not show a significant difference after application of the Bonferroni correction, $\chi^2(df = 1) = 7.070, p = .012$. Bladed weapons were often used in school attacks (64 offenses, 27.9%), but not in IHE attacks (6 offenses, 13.3%). Other weapons such as fire, explosive, or blunt weapons were rarely utilized in either group.

Taken together, school attacks claimed 281 dead and 581 wounded victims, whereas IHE attacks caused 118 fatalities and 118 injured. Both groups did not significantly differ in the number of wounded victims (school: $M = 2.54, Mdn = 1.0$; IHE: $M = 2.68, Mdn = 0.0$; $U = 4552.00, p = .296$). On average, IHE attacks claimed significantly more dead victims ($M = 2.62, range = 0-32, Mdn = 1.0$) than school attacks ($M = 1.21, range = 0-67, Mdn = 0.0$; $U = 3141.50, p < .001, r = .28$). The proportion of dead victims among all victims was also significantly higher in IHE attacks (school: $M = 0.38, Mdn = 0.25$; IHE: $M = 0.65, Mdn = 0.77$; $U = 2601.5, p < .001, r = .24$). On average, school attacks claimed 3.76 (range = 0-86, $Mdn = 1.0$) and IHE attacks 5.14 (range = 0-49, $Mdn = 2.0$) dead and wounded victims. This difference was not statistically significant ($U = 4107.0, p < .042$).

Students were the most frequent victims in school (181 killed, 64.4%; 422 injured, 72.6%) and in IHE attacks (69 killed, 58.5%; 51 injured, 43.2%). We found slightly higher proportions of teaching staff among all dead victims in school attacks (85 persons, 30.25%) than in IHE attacks (34 persons, 28.81%). Offenses with at least one dead teacher, however, were more frequent in IHE (51.2%) than in school attacks (31.7%), but again, this difference was not significant, $\chi^2(df=1) = 5.721, p = .020$.

IHE offenders displayed significantly higher suicide rates (37.8%) than offenders in schools (14.2%), $\chi^2(df=1) = 14.258, p < .001, OR = 3.66$.

Discussion

The aim of our study was to enhance knowledge concerning the frequency and the comparability of attacks in schools and in IHEs.

Frequency and Spatial Distribution of Offenses

Our analysis revealed higher numbers of school and IHE attacks than had been documented so far. The findings also contradict the notion that school and IHE attacks are solely phenomena of the recent past (e.g., Newman & Fox, 2009). We were able to research school and IHE attacks from the beginning of the 20th century. Our results point to increases in the frequency of offenses over time for both groups. It remains unclear whether these increases can be accounted for by real increases in the number of offenses (e.g., copy-cat effect, establishment of scripts for such offenses; Bondü, 2012; Fox & Savage, 2009) or are due to more extensive media coverage and faster dissemination of information via the Internet, which facilitates research for offenses in recent years. In line with our expectations, there was a higher total number of school than IHE attacks. When related to the number of students in schools and IHEs in the United States, however, IHE attacks were more frequent in that country than school attacks (however, primary schools are great in number, but only the site of school attacks in exceptional cases).

Both groups of offenses occurred predominantly in the United States, but other countries were affected as well. We researched school attacks in 32 and IHE attacks in 11 countries. Often, IHE attacks occurred in countries that had also experienced comparably high numbers of school attacks (the United States, Germany, Finland). Offenses mainly affected wealthy industrial nations. Offenses in these countries might be easier to research due to more comprehensive media coverage or lower barriers in language and writing. Furthermore, comparatively higher numbers of students and educational institutions (e.g., due to compulsory education) as well as high pressure to

perform might exacerbate the tendency for such offenses in wealthy nations in particular. Finally, copycat phenomena may be particularly potent in countries where other offenses have already occurred.

Taken together, school and IHE attacks were similar in frequency and spatial distribution.

Offender Characteristics

As to be expected, school and IHE offenders differed in age. Most offenders in schools were between 13 and 18 years old (cf. Bondü, 2012; Vossekui et al., 2002), thus mainly covering the typical age range of students in secondary schools. IHE offenders covered a much broader age range from 18 to 62 years. About one third exceeded the typical age range of a student in IHE by far (>30 years), although the proportions of current students were similar in both groups (around 90% or 80% respectively). These findings support the hypothesis that failure in performance might be a central trigger for IHE attacks in particular (Newman & Fox, 2009). Given that many IHE offenders have invested a great deal of money, time, and energy into their education (especially older ones) and are in danger of failing and lacking occupational prospects, this might be an exceptionally painful and fearful experience. Attributing failure to external causes might then be an effective means of self-protection and may provide a motive for revenge. It might also be argued, however, that persons who have thought about and planned an offense and maybe also their own death for a long time, failed because they did not put as much effort into their studies as other students do. In this case, the failure in performance would be the consequence of and not the reason for an offense.

Neither school nor IHE attacks are the sole domain of male offenders. In both groups, there were comparable proportions of female offenders of around 6% to 7%. As in most other serious offenses, male offenders were strongly overrepresented. Similarly, offenses in both groups were predominantly conducted by single offenders. All IHE offenders acted alone and only 10 school attacks were conducted by more than one offender. This might support the notion that IHE offenders conform more closely to the typical picture of a loner (Newman & Fox, 2009). The difference, however, was not statistically significant. Taken together, most school and IHE offenders were single male current students of the institution concerned.

Among IHE offenders, however, there were significantly larger numbers with migration background, mostly from Asian countries. This might indicate a particularly high pressure to perform together with shame in the face of failure among these students (Fox & Savage, 2009; Shon, 2011). Profound changes in cultural settings and the accompanying loss of social support,

increasing stress, and potential discrimination (Shon, 2011) can exacerbate existing fears and mental problems. Because a comparatively large proportion of IHE attacks has up to now been committed by students stemming from Asia, copycat phenomena may be particularly prevalent in migrant students from Asian countries. In addition, there might be closer connections to existing cultural scripts of suicide (Newman & Fox, 2009). Finally, integration into a new culture is probably easier for young persons. Thus, migration experiences might be perceived differently and not equally distressful by different age groups. Hence, a migration background, as well as the offender's age, is likely to influence mental disorders and motives for the offenses.

Offense Characteristics

As in prior research (Bondü, 2012; Robertz & Wickenhäuser, 2007), the monthly number of school attacks displayed a clear undulating course across the year with the highest numbers in spring and autumn and strong declines during the summer months (summer vacations) and somewhat weaker decreases in winter. This pattern was not as clear in IHE attacks, presumably due to smaller total numbers of offenses that might prevent clear patterns from emerging or as a result of the less restrictive processes in IHEs across the year than in schools.

Both groups of offenses rarely occurred at weekends and were somewhat more frequent on Mondays than on other days of the week, presumably due to more time for planning at the weekend.

In line with our hypothesis and in contrast to prior research (Meloy et al., 2004), school attacks predominantly occurred during the morning hours before 10 o'clock. In these morning hours, most people attend school and large numbers of potential victims are available. This pattern was not as pronounced in IHE attacks, where most offenses occurred after 10 o'clock. This seems plausible, because in IHEs, classes often start later in day at around 9 or 10 o'clock and also cover large parts of the afternoon or even evening hours. Thus, the time of offense is influenced by the temporal processes at the site of offense.

In both groups of offenses, firearms were the most frequent weapons used (Drysdale et al., 2010; Meloy et al., 2004; Vossekil et al., 2002). Although the difference was not significant after Bonferroni adjustment, the proportion of firearms in IHE attacks was clearly higher than in school attacks. This finding can be accounted for by differences in offenders' ages. Because most offenders in schools are below legal age, they can only obtain firearms illegally, for example, by taking them from family members. In contrast, IHE offenders, mainly of age, are able to purchase their weapons legally and without any

other hurdles such as questions by parents. Accordingly, the proportion of knives as the offense weapon was larger among offenders in schools. Thus, these offenders probably resort to the use of knives, which can be purchased or taken from the family kitchen if firearms are not available (Bondü, 2012).

The more frequent use of firearms is likely to increase the numbers of victims in IHE attacks. Both groups of offenses resembled each other in the number of wounded victims, but on average, IHE attacks claimed twice as many dead victims as school attacks. Consequently, the proportion of dead among all victims was also significantly higher in IHE attacks. Accordingly, there were clear—although after Bonferroni adjustment insignificant—differences in total victim numbers. Further considerations can account for these differences: About half of the offenders in schools aimed at only one specific person (single victim offenders) and terminated their offense after trying to reach this aim (Bondü, 2012; Bondü & Scheithauer, 2014). About two thirds of the IHE offenders, however, aimed to kill more than one person or even large numbers of persons (multiple victim offenders) and only curtailed the offense if forced to, or by committing suicide.

Contrary to our hypothesis, school and IHE attacks resembled each other in the number of teachers as dead victims. The proportion of offenses that claimed at least one dead teacher was higher in IHE than in school attacks although the difference was not significant. This indicates that there were more school attacks than IHE attacks that claimed large numbers of dead teachers (e.g., the offense in Erfurt, Germany). In both groups of offenses, other students were the most frequent victims. This indicates strong conflicts between offenders and their peers, independent of the offenders' age or educational setting. However, because the proportion of students among all attendants of an educational setting is much higher than that of teachers, the students are more likely to become victims by chance.

In line with our findings and with previous research results (Meloy et al., 2004), IHE offenders killed themselves significantly more often than offenders in schools. This finding has been explained by a lack of experience with violence (Meloy et al., 2004) and moral reasoning (Thompson & Kyle, 2005) in younger offenders. The difference might also be accounted for by higher rates of mental disorders, especially depressive symptoms, in older offenders (Newman & Fox, 2009). In addition, a large proportion of IHE offenders stemmed from Asian cultures where suicide might be regarded as an acceptable means of restoring reputation. Finally, offenders' suicide has been shown to be more frequent in multiple victim offenders (Bondü & Scheithauer, 2014), which were more common in IHE settings than in schools. Presumably, offenses with large numbers of victims closely correspond to the typical script of rampage attacks, which in turn is closely connected to offenders' suicide.

Taken together, there were several differences between school and IHE attacks in offense characteristics. However, most of these differences seem to depend on situational influences (time of offense during the year or the week) or relate to the offenders' age, which is likely to affect access to weapons (and thus higher numbers of victims in IHE attacks) and frequency of mental disorders in the offenders (which might result in higher proportions of suicide in IHE offenders). Thus, despite several differences in offender and offense characteristics, which mostly confirmed our hypotheses, both groups of offenses or offenders seem to resemble each other in many respects and in their basic manifestation.

Thus, it might be more useful to distinguish between single and multiple victim offenders than between attacks in different types of educational institutions. A recent study yielded evidence that single and multiple victim school offenders differed mainly in their motives for the offenses and offense behaviors, but less with regard to risk factors. For example, as with the IHE offenders in the present sample, multiple victim offenders were older than the single victim offenders, used weapons more frequently, succeeded in killing larger numbers of persons, and committed suicide more often (Bondü & Scheithauer, 2014). Accordingly, future research might investigate whether this distinction could be transferable to IHE offenders.

Preventive Efforts

As our data show, preventive measures in primary and secondary schools and IHEs are equally necessary. Preventing such rare events as school and IHE attacks is hampered by diverse restrictions (e.g., low base rates, unspecific risk factors; Bondü, Scheithauer, Leuschner, & Cornell, 2013) but is crucial due to the massive negative impact of the offenses. Given that school and IHE attacks resemble each other, there is reason to expect similarities in risk factors, warning signs, and motives as well. Although this assumption requires confirmation by future studies, it carries implications for preventive measures in both educational settings. Thus, research findings on school attacks could be transposed to IHE attacks, and preventive measures should be similar as well.

For example, the early identification of mental problems is important not only in IHE but also in school offenders (Bondü, 2012). Educational staff should be able to identify and adequately respond to warning signs for an offense. Furthermore, students should have the opportunity to report alarming behavior by schoolmates. Threat assessment teams should be installed, not only to evaluate the potential risk a person might pose but also to react to other problematic situations and to provide adequate interventions (Fox &

Savage, 2009). Finally, to be prepared for serious situations, educational settings should have emergency response plans and communication systems in place and train staff and attendees to react properly in the case of an emergency (Bondü et al., 2013; Fox & Savage, 2009).

Even if preventive measures in both school and IHE contexts resemble each other, special characteristics of the settings and potential differences between school and university systems require consideration. For example, it seems particularly important to install permanent contact persons for students in IHEs, because typically, there is a high degree of anonymity and no such function as a class teacher in these settings. Contact persons can monitor the behavior and development of students and more easily detect early signs of maladaptation such as mental problems, adjustment difficulties after migration, or decreasing performance. To deal with problems of migrant students in particular, more opportunities to integrate into the new culture and the student body, as well as facilities to obtain help for mental and performance problems, should be established. In primary and secondary schools, only school staff should be educated in identifying risk factors and warning signs for such offenses (to avoid fear and interpersonal distrust among students), but IHEs might also consider training parts of the student body. Many primary and secondary schools are restrictive in their membership and in addition have limited the access to school buildings in reaction to previous attack incidents. This, however, can hardly be realized in IHEs, which often cover large and widespread campuses (Fox & Savage, 2009) and which are therefore accessible to people other than students and faculty. Although the participation in preventive measures need not be entirely voluntary for younger students, it may be harder to implement preventive measures in IHE settings including the voluntary participation of the students. Finally, many U.S. schools use school psychologists and special security staff. In other countries, this practice is less common and the availability of school psychologists is still in need of improvement.

Limitations and Outlook

Because media reports have often been shown to contain inaccurate and stereotypical data (Drysedale et al., 2010; Muschert & Larkin, 2007), we limited our research to fairly objective offense and offender characteristics. Our definition of relevant offenses, however, only comprised offenses that were committed due to motives related to the institute of education. Although the offenders' motives could be researched in most cases and although we excluded cases with unclear motives from our sample, the motive for an offense is not an objective factor.

Future research might also be interested in other risk factors and warning signs for school and IHE attacks, such as announcements of the offenses, offenders' mental disorders, or motives for the offenses. To gather reliable data on these factors, legal case files should be used as sources of information. These, however, are not easy to access and require much time for thorough analyses. Accordingly, at present, media research is the only way to obtain data on large numbers of relevant incidents.

Even with a focus on fairly objective data, there still is a danger of having to rely on distorted data due to mistakes in media reports. In many cases, it was also not possible to research all the relevant data, resulting in smaller sample sizes for most variables. For this reason, some incidents are probably underrepresented in our sample. This holds true for incidents without deaths and with small numbers of victims, failed offenses, offenses by very young offenders (in some countries, young offenders are protected by special laws), or offenses in countries with non-European languages and non-Latin writing (cf. Bondü, 2012).

Finally, for several reasons, we treated attacks in vocational schools ($n = 4$) as IHE attacks. First, as do other IHEs, vocational schools train students for their later professions. This indicates similarities in motive for the offenses. Furthermore, the four offenders concerned were in the upper age range of offenders in schools, were of legal age, and intended to kill as many victims as possible. The structure of vocational schools, however, often closely resembles that of primary and secondary schools with permanent classes and fixed schedules. Furthermore, the relevant offenders were in the lower age range of all IHE offenders. Thus, the question of which category vocational schools should be assigned to could be an interesting topic for future research.

Despite these limitations, our study provides a large and reliable database for the comparison of school and IHE attacks. Our data revealed several differences between the two groups of offenses, which seem to reflect situational dissimilarities and differences in the offenders' age rather than strong differences between the offenses and offenders. Thus, future research on homicidal offenses by students in educational settings can combine both groups (Langman, 2013) into one sample. This has the benefit of basing research findings on larger samples and hence on more reliable data. To account for further differences between the two groups, researchers should also consider the educational setting as a control variable.

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