

## RESEARCH ARTICLE

# Terror leaves adolescents behind: Identifying risk and protective factors for high-school completion among survivors of terrorism

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## Abstract

Terror exposure increases the risk of somatic and psychological health problems in survivors. Yet, knowledge of how such exposure affects survivors' ability to stay in school is lacking. This study examined whether exposure to the 2011 Utøya terrorist attack in Norway impacted survivors' ability to complete high school. Further, it aimed to identify important peri- and posttraumatic risk and protective factors. Interview data from the Utøya study, collected 4–5 months postterror, were linked to individual educational registry data for 265 survivors. Chi-square tests and ordinal logistic regression analyses were used to examine (a) high school completion among younger survivors ( $n = 185$ , age range: 13–18 years, 52.4% female) compared to both older survivors (i.e., who had the possibility of completing high school before the terror attacks;  $n = 80$ , age range: 19–21 years, 40.0% female) and the national average and (b) associations between high school completion and physical injury, posttraumatic stress symptoms (PTSS), somatic symptoms, and social support among younger survivors. Younger survivors were significantly less likely to complete high school on time. Among younger adolescents, physical injury,  $aOR = 0.36$ , 95% CI [0.16, 0.81]; higher-level PTSS,  $aOR = 0.54$ , 95% CI [0.33, 0.88]; and somatic symptoms,  $aOR = 0.51$ , 95% CI [0.29, 0.91], lowered the likelihood of on-time completion. Terror exposure in adolescence adversely affects long-term educational functioning in young survivors, which can severely hamper their future prospects. These findings reinforce the need for trauma-sensitive teaching and educator-provided support for adolescents exposed to trauma.

Experiencing terrorism in adolescence may have a detrimental impact on adolescents' cognition and learning (Pfefferbaum et al., 2016; Schultz & Skarstein, 2021; Shany,

2016; Stene et al., 2019; Strøm et al., 2016). More specifically, the development of posttraumatic stress disorder (PTSD) has been linked to cognitive deficits and disturbances,

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which can lead to poor cognitive functioning (Cisler & Heringa, 2021; Malarbi et al., 2016; Scott et al., 2015; Thompson et al., 2020). Adolescence is a crucial time when individuals begin to get established on their own and find their path in life. An impairment in one's educational trajectory during this period may hamper their future prospects (Bharadwaj et al., 2021; Cabral et al., 2021; Strøm et al., 2013). Knowledge about the impact of terrorism on school functioning among adolescent terror survivors is critical to prevent negative trajectories.

Terrorism can be defined as the unlawful use of, or threat of the use of, force or violence against persons and property in an attempt to put pressure on a country's authorities or population or society at large to achieve political, religious, or ideological goals (Politietts sikkerhetstjeneste, 2022; Organisation for Economic Co-operation and Development, 2022). A terrorist attack can be a mass shooting, like the 2011 Utøya attack in Norway, but a mass shooting is not always a terrorist attack. Studies focused on school functioning after traumatic events show poorer academic achievement among survivors (Perfect et al., 2016). A terrorist attack may produce different reactions and consequences than other forms of traumatic events, as they are commonly characterized by high numbers of severe injuries and deaths. The few studies conducted in this area have mainly focused on academic performance and specific cognitive functions, and the results have been mixed (Chemtob et al., 2009; Melinder et al., 2015; Pfefferbaum et al., 2016; Scrimin et al., 2006; Syed et al., 2017). Studies on school or mass shootings add to this literature and consistently show impaired academic performance among survivors (Beland & Kim, 2016; Cabral et al., 2021; Gershenson & Tekin, 2018; Levine & McKnight, 2021; Poutvaara & Ropponen, 2010). Studies on school functioning following the Utøya terror event have in line with this research, demonstrated impaired academic performance among survivors (Bharadwaj et al., 2021; Schultz & Skarstein, 2021; Stene et al., 2019; Strøm et al., 2016).

The Utøya terrorist attack took place on the small island of Utøya on July 22, 2011, where the Labor Party youth organization was hosting its annual summer camp. Upon reaching the island, the perpetrator began a massacre, which continued for more than an hour, killing 69 people and injuring many more (Dyb et al., 2014). All survivors heard gunshots, and most heard, saw, or knew someone who was killed. The school year started only 4 weeks after this attack took place.

The results of the longitudinal Utøya Study's first wave, conducted in the immediate aftermath of the massacre (i.e., 4–5 months postattack), showed that two thirds of participants reported impaired academic performance (Stene et al., 2019). This decreased over time, but when assessed 8 years after the attack, 1 in 3 survivors reported that they still experienced functional impairment in relation to school,

studies and work, and/or in relation to family (Glad et al., 2021). Other findings from the Utøya sample indicated that students' grades declined, and school absences increased following the attack (Strøm et al., 2016). Qualitative data from the study show that the majority of the students experienced negative changes in their academic performance, and many reported having difficulties concentrating in school and failing to remember what they had just learned (Schultz & Skarstein, 2021).

To prevent negative trajectories in mass shooting survivors' school functioning, it is imperative to identify peri- and posttraumatic risk and protective factors that can be targeted in outreach programs for survivors. Survivors of a terrorist attack can sustain severe physical injuries during the event, requiring them to undergo comprehensive medical treatment and long-term rehabilitation (Løvstad et al., 2020; Månnum et al., 2019). Physical injury may have detrimental effects on mental health outcomes, such as posttraumatic stress symptoms (PTSS) in the aftermath of such attacks (Brackbill et al., 2014; Bugge, 2020; Grieger et al., 2005; Lowell et al., 2018). Less is known about associations between trauma-related physical injuries and academic performance. In the aftermath of a traumatic event, PTSS may impair one's memory and make it difficult to concentrate in school (Malarbi et al., 2016; Scott et al., 2015). A review by Perfect et al. (2016) examining school-related outcomes among traumatized youth found significant associations between trauma exposure and subsequent PTSS, impaired cognitive functioning, lower academic performance, and social-emotional behavioral problems. Closely linked to PTSS are somatic complaints, which are common after experiencing terrorist attacks (Stensland et al., 2020) and may also interrupt school functioning (De Ridder et al., 2013; Jones et al., 2018; Vos et al., 2016). A previous study using data from the Utøya sample found that PTSS and somatic symptom levels were particularly high among survivors who reported impaired academic performance and lower well-being in school (Stene et al., 2019).

Equally important to identifying risk factors is the identification of protective factors that can help survivors thrive. Social support from friends and family is one of the most important protective factors following traumatic experiences (Braun-Lewensohn, 2015; Thoits, 2011; Thoresen et al., 2014). Belonging to a social group may give an individual a sense of predictability and stability and increase their feelings of self-worth and self-control, which may reduce psychological stress (Cohen et al., 2000). This is particularly important after an acute event, such as a terror attack, when the need for predictability and stability is crucial (Brymer et al., 2006). A recent review of the influence of social support on PTSS symptoms showed that there was a weak significant association between global social support and PTSS among children and

adolescents (Xiong et al., 2022). However, less is known about how social support affects learning and long-term school outcomes following terrorism.

Although there is increasing evidence that traumatic experiences in general, and terrorist attacks in particular, negatively impact academic performance in adolescent survivors, most studies have used self-report data on academic performance, which are vulnerable to information bias. The current study overcame this critical challenge by linking interview data with objective registry data on academic performance among terrorist attack survivors. Another critical challenge is to understand how to prevent negative academic trajectories in young people exposed to these brutal events. This study aimed to elucidate how to identify adolescents who are at particular risk and point to modifiable targets for intervention.

More specifically, we examined high school completion among survivors who finished or were eligible to finish high school after the Utøya attack, termed “younger survivors,” compared to those who had completed or were eligible to complete high school before the attack, termed “older survivors,” as well as to the national average. In addition, we investigated whether physical injury, PTSS, somatic symptoms, and social support were associated with high school completion among younger survivors.

## METHOD

### Participants and procedure

Of the 332 Utøya Study respondents who participated at Time (T) 1, including 325 individuals who were on the island and seven who were on the mainland during the shooting, 79.8% ( $n = 265$ ) agreed to link their survey responses with educational registry data; these individuals represent the final sample for the present study. The findings from attrition analyses indicated that participants who consented to linking their data were significantly younger, were of higher socioeconomic status, were more likely to live with parents, and reported significantly higher levels of PTSS (see Supplementary Materials). The final sample was categorized into two groups based on educational status at the time of exposure. Older survivors were classified as those who were born between 1990 and 1992, ranged in age from 19 to 21 years, and were eligible to have completed high school when the attack occurred ( $n = 80$ ). Younger survivors were classified as those who were slated to start, continue, or complete middle or high school in the fall of 2011 (i.e., immediately after the terror attack); were born between 1993 and 1998; and were 13–18 years old at the time of the attack ( $n = 185$ ; see Supplementary Materials for cohort details).

## Procedure

Survivors who consented to link interview data with educational registries ( $n = 265$ ) were included. These survivors were sent postal invitations to participate in the Utøya Study 4–5 months after the event (i.e., T1). Survivors were interviewed face-to-face by trained health personnel. Participants' current health needs were assessed, and interviewers provided help in contacting the appropriate resources if needed. All participants provided written consent, and the study was approved by the Regional Committee for Medical and Health Research Ethics in Norway (for details, see Glad et al., 2021).

## Measures

### Dependent variable: High school completion

High school completion was assessed based on registry data from the National Education Database. Three hierarchically ordered mutually exclusive categories were created as follows: not completed (coded as 0); completed, but completion extended beyond the normative time frame (coded as 1); and completed within the normative time frame (coded as 2).

In Norway, high school completion within the normative time frame is defined as 3 years for general programs and 4 years for vocational programs; some vocational programs require apprenticeships that may take 4–5 years in total to complete. We accounted for these time variations when calculating normative completion for each respondent. Participants were classified as having completed high school beyond the normative time frame when completion took longer than typical for the program they attended but was attained within 5 years of starting high school for general programs and within 6 years for vocational programs. Participants were classified as not having completed high school if they (a) were still attending high school 5 years after starting for the general program and 6 years for vocational programs, (b) completed the last year of high school but failed their examination, or (c) dropped out of school before or during their final year of high school. These three categories were combined to constitute the “not completed” group due to the small number of participants in each group.

### Independent variables

All independent variables were assessed at the T1 survey (i.e., 4–5 months posttrauma).

**Physical injury.** Participants were asked to indicate whether they had sustained any physical injuries during the massacre by responding to the question, “Were you physically injured, and did you require medical help?” Answers were coded 0 for “no” and 1 for “yes.”

**PTSS.** Trauma-related symptoms were measured using a customized version of the UCLA PTSD Symptom Index for Children and Adolescents (Steinberg et al., 2004; Stensland et al., 2020) developed in collaboration with the measure’s authors to cover the 20 diagnostic criteria in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*; American Psychiatric Association, 2013). The instrument included five items related to intrusions and reexperiencing symptoms, two items related to avoidance symptoms, seven items related to negative alterations in cognition and mood, and six items related to alterations in arousal and reactivity. Participants were asked to rate how much they had been bothered by each symptom over the past month using a 5-point Likert scale ranging from 0 (*never*) to 4 (*almost all of the time*). Mean PTSS scores were computed. In the present sample, Cronbach’s alpha was .90.

**Somatic symptoms.** Somatic symptoms were assessed using the eight-item Children’s Somatic Symptoms Inventory (CSSI; Walker et al., 2016). Participants were asked to indicate how much they had been bothered by stomachaches, headaches, lumbar pain, pain in the arms or legs, faintness or dizziness, palpitations, nausea or upset stomach, and weakness during the past 2 weeks, rating responses on a scale of 1 (*not at all*) to 4 (*a whole lot*; Stensland et al., 2020). In the present sample, Cronbach’s alpha was .76.

**Perceived social support.** The Functional Social Support Questionnaire (FSSQ; Broadhead et al., 1988) was used to assess participants’ perceived level of social support. The measure includes seven items related to getting attention, care, and support from close ones; being cared for when sick; getting advice and support from others on school, work, or personal matters; and being included in social activities with others. Respondents were asked to rate each statement on a 5-point Likert scale ranging from 1 (*much less than I would like*) to 5 (*as much as I would like*), with mean scores calculated (Thoresen et al., 2014). In the present sample, Cronbach’s alpha was .79.

## Control variables: Sociodemographic characteristics

Sociodemographic characteristics included sex and age, based on data from the Norwegian National Population Registry, and self-reported living situation, family income, and ethnicity (for more details, see Stensland et al., 2020). Ethnicity was measured by asking if the respondent had

parents who were born abroad; non-Norwegian origin was defined as both parents having been born abroad (Dzamarija, 2019).

## Data analysis

To examine whether the younger survivors were less likely to complete high school within the normative time frame compared to the older survivors and to evaluate the potential sociodemographic differences between the two groups, chi-square tests were performed. We computed *p* values for comparisons of normative completion between the younger and older survivors and with the national prevalence by inverting Blaker confidence intervals (CIs) for the sample proportions.

To examine whether peri- and posttraumatic risk and protective factors impacted completion among younger survivors, chi-square tests, analyses of variance (ANOVA), and subsequent ordinal logistic regression analyses were used. First, the unadjusted associations between completion status and physical injury, PTSS, somatic health, and social support were estimated. In the adjusted models, we adjusted for sociodemographic variables for each of the predictors separately (see Supplementary Materials for sociodemographic variable analyses). There were relatively few missing values ( $n = 10$ ), which were excluded from the adjusted analyses. We conducted a Brant test, with the results indicating that the proportional odds assumption was met (i.e., no significant difference in the coefficients between models); thus, ordinal logistic regression was deemed acceptable for the analyses. Some of the older adolescent survivors would not have been eligible to complete high school beyond the normative time frame prior to the 2011 attack (see Supplementary Materials). We accounted for this limitation by running sensitivity analyses (see the Supplementary Materials for details). IBM SPSS Statistics (Version 27), Stata (Version 16), and R (Version 4.1.2) were used for the analyses.

## RESULTS

### High school completion among younger and older adolescent survivors

The younger survivors who finished high school after the attack did not differ significantly from the older survivors in terms of sociodemographic background factors (Table 1). As expected, these groups differed regarding age and living situation, as older survivors were less likely to live with their parents.

As shown in Table 2, adolescents who were still in school following the attack (i.e., younger survivors) were significantly less likely to complete high school within the

**TABLE 1** Sociodemographic characteristics of younger and older adolescent survivors

Variable	Younger survivors ( <i>n</i> = 185)		Older survivors ( <i>n</i> = 80)		<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Age (years)	16.9	1.1	19.7	0.9	< .001
	<i>n</i>	%	<i>n</i>	%	
Female sex	97	52.4	32	40.0	.063
Low financial status <sup>a</sup>	32	17.4	20	25.3	.139
Non-Norwegian origin <sup>b</sup>	19	10.7	10	12.5	.668
Not living with parents <sup>c</sup>	24	13.0	42	52.5	< .001

Note. *N* = 265. Chi-square analyses were used for categorical variables. Analyses of variance were used for age (i.e., continuous variable).

<sup>a</sup>Missing: *n* = 2

<sup>b</sup>Missing: *n* = 7.

<sup>c</sup>Missing: *n* = 1.

normative time frame compared to older survivors. More specifically, 70.0% of the older survivors completed high school within the normative time frame compared to 54.1% of the younger survivors. Further, 25.4% of the younger survivors did not complete high school at all (i.e., within or beyond the normative time frame) compared to 20.0% of the older survivors.

The younger survivors were also significantly less likely to complete high school within the normative time frame compared to the national average. The national prevalence rate for the same birth cohort (i.e., born 1993–1998) was significantly higher (63.9%) than that of the younger survivors in this sample (54.1%). In contrast, the national prevalence rate for high school completion for the same birth cohort as the older survivors (i.e., born 1990–1992) was significantly lower (58.7%) than the prevalence for older survivors in the sample (70.0%).

The unadjusted ordinal logistic regression confirmed that the younger survivors had significantly lower odds of completing high school within the normative time frame, compared to the older survivors, odds ratio (*OR*) = 0.55, 95% CI [0.32, 0.95]. This was confirmed when adjusting for sociodemographic background, adjusted *OR* (*aOR*) = 0.52, 95% CI [0.29, 0.91]. The results of the sensitivity analyses run due to the ineligibility of some older survivors having the possibility to complete high school beyond the normative time frame before the terrorist attack confirmed these results (see Supplementary Materials for details).

### Associations between peri- and posttraumatic risk and protective factors and high school completion among younger survivors

Younger survivors injured during the massacre were less likely than their noninjured peers to complete high school (Table 3). Specifically, 27.7% of noncompleters reported

having physical injuries compared to only 11.0% of younger survivors who completed high school within the normative time frame, *p* = .031.

Younger survivors who experienced higher levels of PTSS and somatic symptoms in the early posttraumatic period (i.e., 4–5 months posttrauma) were less likely to complete high school within the normative time frame compared to their peers with lower symptom levels. Specifically, younger survivors who did not complete high school reported experiencing higher levels of somatic symptoms, avoidance, negative alterations in cognition and mood, and arousal and reactivity symptoms in the early aftermath of the attack as compared to those who completed high school on time.

The ordinal logistic regression analyses (Table 4) confirmed that physical injuries, higher levels of PTSS and somatic symptoms in the immediate aftermath of the attack significantly lowered younger survivors' likelihood of completing high school on time. Contrary to expectations, social support did not significantly increase high school completion within the normative time frame. Additional sensitivity analyses conducted to examine whether physical injuries accounted for the associations between PTSS, somatic symptoms, and high school completion showed that the association between PTSS and high school completion remained significant when also controlling for physical injuries, *aOR* = 0.59, 95% CI [0.36, 0.97]. The association between somatic symptoms and normative high school completion was no longer significant when controlling for physical injuries, *aOR* = 0.59, 95% CI [0.33, 1.08]; however, only 29 of 185 participants reported having physical injuries, so these results must be interpreted with caution.

## DISCUSSION

Younger survivors of the 2011 Utøya terrorist attack who were still in school when the attack occurred had a lower

TABLE 2 High school completion for younger and older adolescent survivors and the national prevalence for each cohort

High school completion status	Younger survivors ( <i>n</i> = 185) <sup>a</sup>			Older survivors ( <i>n</i> = 80) <sup>a</sup>			Younger cohort national prevalence ( <i>n</i> = 378,913) <sup>b</sup>			Older cohort national prevalence ( <i>n</i> = 188,632)		
	<i>n</i>	%	95% CI	<i>n</i>	%	95% CI	<i>n</i>	%	<i>p</i> <sup>c</sup>	<i>n</i>	%	<i>p</i> <sup>c</sup>
Normative time frame	100	54.1	[46.7, 61.1]	56	70.0	[58.9, 79.7]	242,062	63.9	.007	110,808	58.7	.041
Beyond normative time frame	38	20.5	[15.1, 26.9]	8	10.0	[4.4, 18.4]	55,478	14.6	.028	26,194	13.9	.340
Not completed	47	25.4	[19.3, 32.1]	16	20.0	[12.1, 30.4]	81,373	21.5	.210	51,630	27.4	.167

Note: *N* = 265. Chi-square analyses were used. CI = confidence interval.

<sup>a</sup>Cramer's *V* for comparison between older and younger survivors was 0.11.

<sup>b</sup>For the national prevalence rate, the option "completed planned basic competence within five/six years" (*n* = 8,094) was excluded from the total count, as the other groups did not have this information.

<sup>c</sup>Significance for population comparisons was calculated by inverting Blaker confidence intervals for sample proportions.

likelihood of completing high school within the normative time frame as compared with both older survivors who were eligible to complete high school before the terror attack and the general Norwegian population. More specifically, only about half of the younger survivors managed to finish high school on time compared with over two thirds of the older survivors. A disruption in one's educational trajectory may prevent the individual from attaining the skills they need to enter the labor market, thereby hampering their future prospects. High school completion is critical, as it increases human capital by providing adaptive skills and improved social identity and self-worth, which in turn, increases the chances of successful inclusion in the labor market (Falch & Nyhus, 2011; Riddell & Song, 2011; Strøm et al., 2013). These findings add to the current literature by underscoring the long-term effects of terrorism on school functioning.

To our knowledge, only one recent study has examined prospective educational outcomes in terrorism survivors (Bharadwaj et al., 2021). The authors compared educational trajectories and labor participation outcomes among Utøya survivors with a matched control group and found that survivors had substantially lower grade point averages. In addition, survivors had fewer years of schooling and lower degrees of work participation. Although this study also comprised survivors from the Utøya terrorist attack, the methodology differed in that the authors only used administrative data, which was matched with a control group from the general population. Our study is unique in that it followed each of the survivors, combining individual survey responses with objective educational data. By doing so, we were able to add insight into factors associated with a lower likelihood of high school completion. Furthermore, we were able to compare the younger survivors who were still in school with survivors who were eligible to complete high school before the attack and, as such, examine the impact of terrorism on school functioning. Still, the study findings align in that survivors were less likely to finish high school on time and had fewer years of schooling compared to controls (i.e., national prevalence). Further, the present results are in line with findings from studies on school shootings that have similarly found a lower likelihood of high school completion among survivors (Cabral et al., 2021; Levine & McKnight, 2021). For example, Cabral et al. (2021) found that exposure to a school shooting was associated with increased absences, grade repetition, a lower likelihood of graduating from high school and enrolling in or graduating from college, and lower levels of employment and earnings in young adulthood. However, a marginal portion of school shootings leads to fatalities (Cabral et al., 2021). Thus, many of the students included in these studies may not have witnessed the shooting or been at school at the time of the

**TABLE 3** Sociodemographic background, posttraumatic stress symptoms (PTSS), somatic symptoms, social support among younger adolescent survivors who were still in school when the terror attack occurred, by high school completion status

Variable	Total <i>n</i>	High school completion status						Beyond normative time frame ( <i>n</i> = 38)			Normative time frame ( <i>n</i> = 100)					
		Not completed ( <i>n</i> = 47)			Completed ( <i>n</i> = 100)			<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>n</i>	%									
Sociodemographic characteristics																
Age (years)	185	16.9	1.1	22	46.8	17.1	1.3	24	63.2	16.8	1.0	51	51.0	.451		
Female sex	185			12	25.5			6	15.8			14	14.1	.227		
Low financial status <sup>a</sup>	184			7	16.3			2	5.4			10	10.2	.284		
Non-Norwegian origin <sup>b</sup>	178			10	21.3			3	7.9			11	11.1	.134		
Not living with parents <sup>c</sup>	184			13	27.7			5	13.2			11	11.0	.031		
Physical Injuries	185															
PTSS <sup>e</sup>																
Total score	185	1.67	0.71			1.74	0.54			1.43	0.68			.025		
Reexperiencing	185	1.81	1.03			1.70	0.76			1.46	0.91			.077		
Avoidance	185	1.20	0.99			1.49	1.01			1.02	0.92			.040		
Cognition/mood	185	1.40	0.78			1.64	0.63			1.29	0.73			.043		
Arousal/reactivity	185	2.03	0.70			1.96	0.63			1.71	0.75			.023		
Somatic symptoms <sup>e</sup>	185	1.91	0.60			1.83	0.57			1.69	0.50			.056		
Social support <sup>d,e</sup>	184	4.56	0.46			4.50	0.65			4.59	0.51			.705		

Note: *n* = 185. Chi-square analyses were used for categorical variables. Analyses of variance were used for continuous variables.

<sup>a</sup>Missing: *n* = 1.

<sup>b</sup>Missing: *n* = 7.

<sup>c</sup>Missing: *n* = 1.

<sup>d</sup>Missing: *n* = 1.

<sup>e</sup>Mean score range: PTSS = 0–4, somatic symptoms = 1–4, social support = 1–5.

**TABLE 4** Ordinal logistic regression of the associations between posttraumatic stress symptoms (PTSS), somatic symptoms, social support, and the normative high-school completion time frame for younger survivors

Variable	Unadjusted analyses			Adjusted analyses <sup>a</sup>		
	OR	95% CI	<i>p</i>	aOR	95% CI	<i>p</i>
Physical injury	0.40	[0.19, 0.85]	.017	0.36	[0.16, 0.81]	.014
PTSS <sup>b</sup>	0.58	[0.38, 0.89]	.014	0.54	[0.33, 0.88]	.014
Somatic symptoms <sup>b</sup>	0.54	[0.33, 0.90]	.018	0.51	[0.29, 0.91]	.022
Social support <sup>b</sup>	1.13	[0.68, 1.86]	.641	0.99	[0.56, 1.75]	.977

Note: *n* = 185. Analyses were adjusted for sociodemographic variables (i.e., age, sex, financial status, ethnicity, and living situation). Sociodemographic background variables were all nonsignificant in the adjusted analyses (see Supplementary Materials for details). The highest variance inflation factor was 1.26 indicating no problems due to multicollinearity.

<sup>a</sup>Missing: *n* = 10.

<sup>b</sup>Mean score ranges were 0–4 for PTSS, 1–4 for somatic symptoms, and 1–5 for social support.

event, which is in stark contrast to the Utøya survivors, all of whom heard gunshots and most of whom heard, saw, or knew someone who was killed. This level of severity may explain why nearly half of the younger Utøya survivors in this sample who were still in school following the attack did not complete high school on time, although the results indicate that some of these individuals managed to complete high school over time, as 1 in 5 younger survivors completed high school beyond the normative time frame.

To our knowledge, this was the first study to use interview data linked with registry data to examine possible risk and protective factors to advance understanding of the association between terrorism exposure and subsequent academic impairment. The findings indicate that injuries sustained during the event, along with early PTSS and somatic symptoms (i.e., 4–5 months postattack), may have severe long-term effects on educational functioning. Previous research on injured survivors has emphasized that subsequent functional loss is linked to higher levels of psychological distress in survivors (Løvstad et al., 2020; McCarthy et al., 2003; Moergeli et al., 2012; Quale et al., 2009). Injured survivors of the Utøya terrorist attack experienced higher levels of early PTSS and somatic symptoms compared with their noninjured peers (Bugge, 2020). As psychological distress, headaches, and pain are known to commonly cause considerable functional impairment in youth (Vos et al., 2016), it is likely that high levels of such symptoms could hamper healthy recovery in injured survivors (Stensland et al., 2020). Studies of injured Utøya attack survivors indicate the undertreatment of pain conditions (Månnum et al., 2019) as well as unmet health care needs (Stene et al., 2016). Thus, there is a possibility that more proactive follow-up of psychological and somatic symptom levels among injured survivors beginning in the early posttraumatic phase could have made a difference, possibly better equipping youth to focus on their everyday developmental tasks, including education.

The findings of the negative impact of early trauma-related symptoms of avoidance, negative alterations in

cognition and mood, and arousal and reactivity on educational functioning align with the review by Perfect et al. (2016), who found impaired cognitive functioning and lower academic performance among traumatized youth. The present findings extend beyond the immediate academic impairment in the aftermath of traumatic experiences by highlighting how exposure can impact a survivor's ability to complete high school years after experiencing a terrorist attack.

Somatic symptoms have been less studied in relation to school functioning among terror survivors. Although a previous study found that somatic symptom levels were particularly high among survivors of the Utøya attack who reported impaired academic performance and lower well-being in school (Stene et al., 2019), the present findings further highlight the enduring impact of terrorism exposure on education and survivors' ability to complete high school. In line with research on physical injuries, previous studies have shown that Utøya survivors frequently report pain, fatigue, and headaches that are likely to cause functional impairment (Stensland et al., 2018, 2020; Vos et al., 2016). Further, these symptoms are closely intertwined with PTSS, which may amplify the negative consequences on education.

Social support was not significantly associated with a higher likelihood of high school completion among survivors. A review by Xiong et al. (2022) highlighted the importance of specifying the type of support measured, (e.g., family support showed a consistent protective effect on posttraumatic distress, whereas the impact of peer support was not as clear). Further, the review emphasized that social support needs to be measured over time, as the protective effect may not be immediate. This may explain why social support did not appear to impact high school completion in the present study. The measure of social support did not specify support type, and social support was only measured in the immediate aftermath of the terrorist attack, which may not reflect continuous support over time and its possible protective effect on high school



completion. Alternatively, social support may diminish over time, thereby increasing the risk an individual will not complete high school. More studies are needed to explore this further.

These findings have crucial implications for interventions following trauma exposure, as they can help target survivors who are at particular risk of educational disruption or termination. This is particularly relevant considering the increase in school shootings in the United States over the last decade (Irwin et al., 2021). Several studies have noted teachers' uncertainty about their own role and how to support and teach traumatized students (Alisic, 2012; Alisic et al., 2012; Røkholt et al., 2016). Qualitative research from the Utøya study indicates that teachers succeeded in ensuring the students' psychosocial needs following the attack but did not manage to follow up with adapted educational efforts to ensure academic progress (Schultz & Skarstein, 2021). Further, in line with our findings on PTSS, survivors reported that previously used study techniques were less effective or inadequate following the attack. Many survivors ruminated on and worried about their impaired academic functioning but did not report or discuss these concerns with their teachers. Thus, students were left largely on their own in their struggle to make sense of the complicated concept of PTSD-related cognitive impairment. Given the long-term disruption and impairment to survivors' educational trajectories, increased educational follow-up from teachers may offer a good point of intervention with these traumatized students (Schultz & Skarstein, 2021). In addition to considering mental health problems, special attention needs to be directed toward injured survivors and individuals experiencing somatic symptoms, such as pain, headaches, and fatigue. Given the long-term educational implications of these immediate injuries and high levels of psychological and somatic symptoms, it is crucial for interventions to focus on adapted educational efforts that take these factors and their impact on learning into consideration. Further, as prior findings indicate that some survivors report unmet health care needs for both psychological and physical problems (Stene et al., 2016), it is possible that school functioning among some survivors could have improved with better health care follow-up.

Some study limitations should be discussed. Ideally, it would have been possible for older survivors to complete high school beyond the normative time frame before the attack occurred (Supplementary Materials). As the observation period extended beyond when the attack occurred, for some of these individuals, estimates should be interpreted with caution. A potential bias is that the older survivors were stronger academically compared to the national average. Separating younger survivors based on

grade levels would have strengthened the findings, but this was not possible due to the small sample size. Other limitations include the use of a self-report measure of physical injury; our inability to account for other educational experiences, such as grade repetition, attendance, and test scores; and lack of exploration into sex differences in greater detail.

Additional prospective studies are needed to establish the associations between peri- and posttraumatic risk and protective factors and high school completion among terrorism survivors. In particular, physical injury and educational outcomes need further exploration. Moreover, few studies have focused on teacher support and its impact on PTSS and somatic symptoms (Xiong et al., 2022) and subsequent educational outcomes. Additionally, studies are needed to examine the educational support provided by teachers to compensate for cognitive dysfunction and learning loss. This is a largely unexplored area, yet it is critical to the development of effective educational adaptations to compensate for trauma-related learning loss. Finally, more studies are needed to explore a possible link between unmet health care needs and school dropout.

Terrorism leaves adolescents behind by disrupting their educational trajectory and their ability to complete high school on time. Physical injury sustained during traumatic events and higher levels of PTSS and somatic symptoms in the immediate aftermath of a terrorist attack further lower the likelihood of on-time high school completion. This may, in turn, severely hamper young survivors' future prospects. The present findings reinforce the need for early targeted interventions following mass shootings and encourage trauma-sensitive teaching for educators to support adolescents exposed to trauma.

## OPEN PRACTICES STATEMENT

The study reported in this article was not formally pre-registered. The data have not been made available on a permanent third-party archive due to privacy or ethical restrictions.

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