

# Effects of Exposure to Rocket Attacks on Adolescent Distress and Violence: A 4-Year Longitudinal Study

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**Objective:** The effects of Israeli adolescents' exposure to rocket attacks over time were examined, focusing on anxiety, depression, aggression, and violence commission. **Method:** A sample of 362 adolescents from southern Israel was followed from 2008 through 2011 with four annual assessments. Measures included exposure to rocket attacks (gauging whether children were affected by rocket attacks, both directly and indirectly, through friends and family), anxiety (items from the State Anxiety Inventory), depression (the Center for Epidemiological Studies Child Depression Scale), aggression (the Orpinas Aggression Scale), and violence commission (from the Social and Health Assessment). **Results:** Concurrent and longitudinal findings differed. Wave 1 exposure to rockets attacks was associated with Wave 1 anxiety, depression, and aggression. Longitudinal results evinced only modest effects of exposure on anxiety and depression, no effects on aggression, but robust effects on violence commission. Exposure to terror attacks before the study predicted increased odds of violence commission at the fourth and final wave, controlling for violence commission at the first, second, and third wave. Exposure to rocket attacks in the second wave predicted increased odds of violence commission at the third wave. **Conclusion:** This is the first longitudinal study attesting to the prospective longitudinal effect of exposure to terrorism on adolescent violence. Findings should serve as a red flag for health care practitioners working in civil areas afflicted by terrorism and political violence. *J. Am. Acad. Child Adolesc. Psychiatry*, 2013;52(6):619–627. **Key Words:** aggression, anxiety, depression, terrorism, violence

Exposure to terrorism and political violence is traumatic, precipitating serious physical and mental health problems.<sup>1-5</sup> However, the effects of terrorism and political violence on youth violent behavior are relatively understudied. Adolescent violence—from bullying to weapon use—is a serious public health problem. It is implicated in school absenteeism, increases in health care costs, decreased property values, disrupted social services, poor mental health outcomes, physical injuries, and murder.<sup>6-8</sup> The problem is felt worldwide.<sup>6,9</sup> For example, between 1990 and 2000, the number of juvenile delinquents caught by Israeli police grew by 38.5% (from 6,910 to 9,570), and the number of criminal files opened for minors (age 12–18 years) in 1998 was 10 times higher than in 1988 (11,060 versus 1,030).<sup>10</sup>

Studies explicitly examining the effects of exposure to terrorism and political violence on adolescent violence are scarce.<sup>11,12</sup> This dearth is puzzling. Research shows that stress has an impact on neurobiological circuitry involved in executive control,<sup>13</sup> which, in adolescence, is maturing and plays a role in externalizing problems, including violence.<sup>14</sup> Furthermore, social cognitive theory focuses on violence begetting violence through its impact on children's social cognitions, such as hostile attributions and beliefs about the efficacy of aggression to solve problems.<sup>15</sup> Theory is backed by empirical evidence whereby exposure to community or family violence predicts future violent behavior.<sup>16,17</sup> However, extant studies on exposure to terrorism and political violence are "one shot" cross-sectional designs, including a single concurrent assessment of exposure and adolescent violence.

This is the first report from a 4-year longitudinal study examining the effects of exposure to



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terrorism on Israeli adolescents' mental health. It builds from pilot research on adolescents from the Israeli Negev, documenting cross-sectional associations between exposure to rocket attacks and adolescent violence,<sup>12</sup> and small-scale longitudinal effects of different forms of terrorism on adolescent distress and depression.<sup>18-20</sup> Addressing previously mentioned limitations of terrorism-health research, this study prospectively examined the effects of exposure to rocket attacks launched from the Gaza Strip on four outcomes: depression, anxiety, aggression, and violence commission. Including these outcomes allows for a longitudinal examination of the mental health consequences of terrorism previously addressed in cross-sectional and short-term studies, in addition to expanding the focus on terrorism-related outcomes to aggression and violence. We hypothesized that greater exposure to rocket attacks and prior exposure to terrorism would be prospectively associated with increased distress and violence.

## METHOD

### Study Sample

The Development Under Duress study was conducted in Southern Israel. Four annual assessment waves were used: May to June 2008, February 2009, March 2010, and February to March 2011. Participants were 362 Israeli adolescents from the seventh through tenth grade at the start of study (median grade = 8; median age = 14 years; age range = 12–16 years) who participated in at least one of the four assessment waves. Recruitments were made from a school in the towns of Sderot (36% of the sample) and one in Sha'ar-Hanegev (64%), two communities near the Gaza Strip, experiencing thousands of rocket attacks over the past decade.<sup>21</sup> A letter explaining the study was sent by homeroom teachers to all parents with a consent form. Students whose parents signed consent forms were briefed on the study and were asked if they wanted to take part in it. Those who agreed signed assent forms before filling out the surveys. The sample was 54% female, and 93% were Israeli-born. The demographics of the sample mirrored those of the overall student bodies of the two schools.

Attrition resulted in part from students moving away or being absent during survey administrations, but primarily from older students graduating and entering the military, and from security concerns that prevented data collection at one of the schools in the last year/wave of the study. The sample sizes with complete data were  $n = 315$  at Wave 1,  $n = 305$  at Wave 2 (including 31 students who had not participated in Wave 1),  $n = 263$  at Wave 3, and  $n = 173$  at Wave 4. Analyses conducted on the likelihood of attrition indicated that boys, older students, and participants who lived in Sderot were more likely to

be lost to attrition. These variables were included as covariates in the analyses.

### Ethics Approval

This study was approved by the Ethical Committee of the Department of Behavioral Sciences at Ben-Gurion University, as well as by the Chief Scientist of the Ministry of Education in Israel. Active consent from participants' parents and written assent from participants were secured before the beginning of the study. No adverse events were documented. Institutional review board approval was also obtained from Georgia State University.

### Measures

Participants completed an assessment battery at each wave during school. Protocols were group administered by trained research assistants. The measures that were included in these analyses, all self-report questionnaires, were administered in Hebrew. Those that had not been previously translated from English by other researchers (aggression and violence commission) were translated and back-translated. For this process, a bilingual research assistant translated the measures to Hebrew, and a second bilingual research assistant translated the Hebrew back to English. The authors then compared the original to the back-translation to make sure that they were similar.

*Exposure to Rocket Attack.* A scale adapted from previous research in Israel and used successfully in the population sampled for this study was used.<sup>22</sup> At each wave, participants were asked 6 yes/no questions about whether, in the past several months, they had been physically hurt in a rocket attack, experienced property damage from a rocket attack, had friends or family physically or mentally hurt by a rocket attack, or had property damage from a rocket attack. Answers were summed to create an exposure index (range = 0–6).

*Prior Exposure to Terror Attacks.* At the onset of the study, participants were asked whether they had ever been present during "a terror/rocket" attack, been injured in an attack, had close family injured in an attack, had close friends injured in an attack, or had acquaintances injured in an attack. Answers were summed to create an index of exposure to prior terror attacks ranging from 0 to 5 (mean = 1.82, SD = 1.21, median = 2).

*Depression.* Depression was assessed each wave with the Center for Epidemiological Studies–Child Depression Scale (CES-CD<sup>23</sup>), a 20-item measure of depressive symptoms with a widely used Israeli translation. Items (on a 0–3 scale) are summed to create the depression score ( $\alpha = 0.85$ – $0.89$ ).

*Anxiety.* Anxiety was assessed each wave using seven items, averaged to form a composite scale, from the Hebrew version of the extensively used State Anxiety Inventory (SAI<sup>24,25</sup>). These items adequately represent the entire scales' content and construct validity (e.g., "I am anxious";  $\alpha = 0.62$ – $0.65$ ).

**Aggression.** Aggression was assessed each wave with the 11-item Aggression Scale,<sup>26</sup> which measures aggressive behaviors (e.g., hitting, pushing, name calling, threatening) in the past week. The frequency of each item is measured on a scale from 0 to 6. Items were averaged to create an aggression scale score ( $\alpha = 0.87\text{--}0.89$ ). Aggression scale scores were positively skewed and kurtotic, so a square root transform was applied, resulting in a more normally distributed variable with scores that ranged from 1 to 2.65.

**Violence Commission.** Violence commission was assessed each wave with four items from the Social and Health Assessment (SAHA) gauging commission of severe forms of community violence in the past year.<sup>12,16,27,28</sup> Items included having hurt someone badly in a physical fight that they had to seek medical treatment (endorsed by 9.7% of the sample at Wave 1), being involved in a gang fight (8.2% of the sample at Wave 1), being arrested by the police for a violent crime (6.4% of the sample at Wave 1), and having carried a weapon (8.4% of the sample at Wave 1). Versions of this measure have been used in several countries, including Israel, and all include the weapon-carrying item, which—even though it does not ask about committing violence per se—loads on the same factor with the other items. Each item was scored as not endorsed/committed (score of 0) or endorsed as committed one or more times (score of 1) and summed, so scores ranged from 0 (no commission) to 4 (committed all acts at least once). The majority of adolescents reported committing no violence. Because of this, the variable was recoded into a binary variable in which 0 = no violence commission and 1 = one or more types of violence commission.

### Data Analysis

First, we examined the concurrent effects of exposure to rocket attacks on adolescent distress and violence at Wave 1. Second, we conducted a series of regressions examining the longitudinal effects of exposure to rocket attacks on adolescent distress and violence at subsequent waves. Six sets of these longitudinal analyses were conducted: Wave 1 exposure predicting Wave 2 outcomes, Wave 1 exposure predicting Wave 3 outcomes, Wave 1 exposure predicting Wave 4 outcomes, Wave 2 exposure predicting Wave 3 outcomes, Wave 2 exposure predicting Wave 4 outcomes, and Wave 3

exposure predicting Wave 4 outcomes. In each model, the outcome was regressed on the prior wave of rocket attack exposure, adjusting for the prior wave's measure of the outcome. Thus, effects on each outcome are interpreted as residualized change scores.

Linear regression models were used for depression, anxiety, and aggression. Binary logistic regressions were used for violence commission. All models adjusted for gender, city of residence, grade level, and reports of prior exposure to terror attacks. Given previous findings of gender differences in the effects of exposure to terrorism,<sup>21</sup> we tested whether interactions between gender and rocket attack exposure explained additional variance in the linear regressions or improved model fit in the logistic regressions.

Power analyses indicated that, for Waves 1 through 3, there was sufficient statistical power for the linear and logistic regression models to detect small effects. For the smaller Wave 4, there was adequate power to detect moderate-sized effects.

## RESULTS

Descriptive statistics are presented in Table 1. The average depression score at each assessment wave was at or above 16, exceeding the clinical cutoff.<sup>23</sup> Anxiety symptoms were relatively low. The percentage of participants reporting violence commission in the past year varied by wave from a high of almost 18% at Wave 1 to a low of 11% at Wave 4.

### Concurrent Effects

Correlations among study variables at Wave 1 indicated that males were less depressed,  $r = -0.19$ ,  $p < .01$ , and less anxious,  $r = -0.21$ ,  $p < .01$ , more aggressive,  $r = 0.19$ ,  $p < .01$ , and more likely to commit violence,  $\tau\text{-}b = 0.28$ ,  $p < .01$ . Older students were more depressed,  $r = 0.19$ ,  $p < .01$ , and more anxious,  $r = 0.16$ ,  $p < .01$ . Adolescents who reported greater prior exposure to terror attacks were more depressed,  $r = 0.19$ ,  $p < .01$ , more anxious,  $r = 0.18$ ,  $p < .01$ , and more aggressive,  $r = 0.28$ ,  $p < .01$ . Adolescents who reported greater exposure to rocket attacks in the past several months were more depressed,  $r = 0.17$ ,  $p < .01$ , and more anxious,  $r = 0.28$ ,  $p < .01$ .

**TABLE 1** Longitudinal Demographic and Descriptive Data

	Wave 1 (n = 315)	Wave 2 (n = 305)	Wave 3 (n = 263)	Wave 4 (n = 173)
Gender, % male	46	49	48	53
Residence, % from Sderot	36	44	40	21
Grade, median (range)	8 (7–10)	9 (8–11)	10 (9–12)	11 (10–12)
Rocket attack exposure, mean (SD)	1.34 (1.39)	1.07 (1.22)	2.21 (0.4)	0.97 (1.20)
Depression, mean (SD)	16.85 (9.84)	16.93 (9.00)	17.04 (10.00)	16.64 (10.11)
Anxiety, mean (SD)	2.06 (0.77)	1.87 (0.63)	1.91 (0.71)	1.94 (0.73)
Aggression, mean (SD)	1.44 (0.36)	1.43 (0.34)	1.41 (0.33)	1.31 (0.30)
Violence commission, % yes	17.9	12.7	15.3	11.0

**TABLE 2** Wave 1 Findings for Depression, Anxiety, and Aggression: Linear Regressions (n = 315)

	Depression		Anxiety		Aggression	
	B	95% CI	B	95% CI	B	95% CI
Male	-3.53**	-5.65, -1.12	-0.30***	-0.46, -0.14	0.14***	0.06, 0.22
Sderot	-1.86	-4.02, 0.29	-0.02	-0.18, 0.15	-0.04	-0.12, 0.04
Grade	1.77**	0.62, 2.92	0.10*	0.02, 0.19	0.02	-0.02, 0.06
Past terror attacks	1.12*	0.12, 2.11	0.05	-0.03, 0.13	0.09***	0.06, 0.13
Rocket attack exposure	0.87*	0.04, 1.73	0.13***	0.07, 0.20	-0.01	-0.05, 0.02

Note: \*p < .05; \*\*p < .01; \*\*\*p < .001.

Results of the multiple regressions examining unique effects of predictors on outcomes are reported in Table 2 for depression, anxiety, and aggression and in Table 3 for violence commission. Greater rocket attack exposure was significantly associated with higher levels of depression and anxiety. These effects were relatively small, with squared semi-partial correlations ( $sr^2$ ), which indicate the proportion of variance in each outcome uniquely explained by exposure to rocket attacks, equaling 0.01 for depression and 0.04 for anxiety.

Prior exposure to terror attacks was significantly associated with higher levels of depression and aggression. The effect of prior exposure on depression was small ( $sr^2 = 0.01$ ), and for aggression was larger ( $sr^2 = 0.07$ ). There were also gender and age differences in each outcome: boys reported less depression and anxiety, and higher levels of aggression; older students were more depressed and anxious (Table 2).

Results for Wave 1 violence commission are reported in Table 3. Neither current rocket attack exposure nor prior terrorism exposure was found to be associated with the odds of committing violence. Boys were almost five times as likely as girls to report committing violence.

Although not reported in the tables, gender by rocket attack exposure interaction terms were added to each model. However, these terms explained a very small (<1%) and statistically

**TABLE 3** Wave 1 Findings for Violence Commission: Logistic Regression (n = 315)

Characteristic	Violence Commission	
	OR	95% CI
Male	4.85***	2.45, 9.44
Sderot	1.11	0.59, 2.10
Grade	1.43	0.99, 2.05
Past terror exposure	1.32	0.99, 1.76
Rocket attack exposure	0.80	0.62, 1.04

Note: OR = odds ratio.  
\*\*\*p < .001.

nonsignificant amount of variance in the linear regressions, and did not have a detectable impact on model fit in the logistic regression. To facilitate interpretation of the main effects, these interaction terms were removed from the models.

#### Longitudinal Effects

Results from the analysis of the longitudinal effects of rocket attack exposure on subsequent depression, anxiety, and aggression are presented in Table 4. There were only two statistically significant longitudinal effects of rocket attack exposure. Greater rocket attack exposure at Wave 2 predicted increased depression and anxiety at Wave 3, and these effects were small ( $sr^2 = 0.01$  and  $sr^2 = 0.02$ ).

Longitudinal effects of covariates were few and scattered. Boys reported increased aggression at Waves 3 and 4, controlling for prior waves. Sderot students also reported increased aggression at Wave 3, adjusting for Wave 2, and at Wave 4, adjusting for each prior wave.

Gender by rocket attack exposure interaction terms were added to each model. For the most part, these terms explained a very small (<1%) and statistically nonsignificant amount of variance in the linear regressions. To facilitate interpretation of the main effects, these nonsignificant interaction terms were removed from the models and are not presented in the tables. There were two statistically significant gender by rocket attack exposure interactions (Table 4). The effect of rocket attack exposure at Wave 1 on Wave 2 anxiety was moderated by gender, although the effect was small ( $sr^2 = 0.01$ ). This interaction was probed by estimating the effect of rocket attack exposure for boys and girls separately. For girls, there was a marginally significant effect on increased anxiety ( $B = 0.07$ , 95% CI = -0.00, 0.07,  $p = .06$ ). For boys there was no effect detected ( $B = -0.04$ , 95% CI = -0.11, 0.03,  $p = .23$ ). There was also a statistically significant gender-by-rocket attack exposure interaction at Wave 3 predicting aggression at Wave 4; when probed by gender, it revealed effects

**TABLE 4** Longitudinal Findings for Depression, Anxiety, and Aggression: Linear Regressions

Waves 1→2	Depression (n = 258)		Anxiety (n = 258)		Aggression (n = 258)	
	B	95% CI	B	95% CI	B	95% CI
Outcome Wave 1	0.55***	0.45, 0.65	0.48***	0.40, 0.57	0.61***	0.51, 0.70
Male	-1.65	-3.43, 0.14	-0.09	-0.27, 0.08	0.07*	0.01, 0.14
Sderot	-2.25*	-4.06, -0.45	-0.02	-0.14, 0.11	-0.05	-0.12, 0.02
Grade	0.24	-0.73, 1.21	0.01	-0.06, 0.08	0.02	-0.02, 0.05
Past terror attacks	-0.20	-1.03, 0.64	0.01	-0.05, 0.07	-0.01	-0.04, 0.02
Rocket attack exposure	0.59	-0.15, 1.34	0.07	-0.04, 0.14	-0.003	-0.03, 0.02
Rocket attack by male interaction			-0.11*	-0.20, -0.02		
Waves 1→3	Depression (n = 219)		Anxiety (n = 219)		Aggression (n = 219)	
	B	95% CI	B	95% CI	B	95% CI
Outcome Wave 1	0.42***	0.29, 0.55	0.28***	0.16, 0.41	0.50***	0.39, 0.61
Male	-3.77**	-6.16, -1.39	-0.15	-0.33, 0.03	0.11**	0.04, 0.18
Sderot	-0.57	-3.00, 1.87	-0.01	-0.19, 0.17	0.06	-0.06, 0.44
Grade	-0.11	-1.43, 1.22	0.08	-0.03, 0.18	0.07	-0.02, 0.14
Past terror attacks	-0.49	-1.61, 0.63	-0.02	-0.10, 0.07	-0.02	-0.06, 0.02
Rocket attack exposure	0.24	-0.69, 1.16	0.07	-0.00, 0.14	0.00	-0.03, 0.03
Waves 1→4	Depression (n = 140)		Anxiety (n = 140)		Aggression (n = 139)	
	B	95% CI	B	95% CI	B	95% CI
Outcome Wave 1	0.42***	0.25, 0.59	0.33***	0.17, 0.48	0.42***	0.29, 0.56
Male	-2.51	-5.75, 0.72	-0.32*	-0.55, -0.09	0.02	-0.06, 0.10
Sderot	0.66	-2.95, 4.27	0.09	-0.17, 0.34	0.16**	0.06, 0.25
Grade	-2.02*	-3.89, -0.16	-0.09	-0.22, 0.05	-0.01	-0.06, 0.04
Past terror attacks	-1.17	-2.67, 0.34	-0.03	-0.13, 0.07	-0.03	-0.07, 0.01
Rocket attack exposure	-0.03	-1.35, 1.29	-0.01	-0.11, 0.08	0.01	-0.03, 0.04
Waves 2→3	Depression (n = 232)		Anxiety (n = 232)		Aggression (n = 231)	
	B	95% CI	B	95% CI	B	95% CI
Outcome Wave 2	0.63***	0.50, 0.75	0.45***	0.31, 0.60	0.56***	0.45, 0.66
Male	-1.87	-4.06, 0.32	0.03	-0.15, 0.20	0.12**	0.05, 0.19
Sderot	-0.56	-2.80, 1.69	-0.02	-0.19, 0.16	0.10**	0.04, 0.18
Grade	0.39	-0.79, 1.57	0.09	-0.01, 0.18	-0.04	-0.07, 0.00
Past terror attacks	-0.71	-1.68, 0.27	-0.01	-0.9, 0.06	-0.02	-0.05, 0.01
Rocket attack exposure	1.01*	0.03, 1.98	0.10**	0.02, 0.18	-0.01	-0.04, 0.02
Waves 2→4	Depression (n = 155)		Anxiety (n = 154)		Aggression (n = 154)	
	B	95% CI	B	95% CI	B	95% CI
Outcome Wave 2	0.62***	0.44, 0.79	0.58***	0.38, 0.77	0.49***	0.36, 0.63
Male	-1.53	-4.52, 1.45	-0.15	-0.38, 0.09	0.06	-0.03, 0.14
Sderot	1.46	-2.04, 4.96	0.10	-0.16, 0.35	0.14**	0.04, 0.24
Grade	-1.21	-2.87, 0.45	0.01	-0.12, 0.13	-0.06*	-0.10, -0.01
Past terror attacks	-0.49	-1.80, 0.81	0.03	-0.07, 0.12	0.00	-0.04, 0.04
Rocket attack exposure	0.82	-0.59, 2.23	0.02	-0.08, 0.13	-0.01	-0.05, 0.03
Waves 3→4	Depression (n = 151)		Anxiety (n = 152)		Aggression (n = 151)	
	B	95% CI	B	95% CI	B	95% CI
Outcome Wave 3	0.67***	0.53, 0.81	0.53***	0.38, 0.69	0.60***	0.48, 0.72
Male	-1.97	-4.50, 0.55	-0.36***	-0.56, -0.16	-0.39*	-0.71, 0.06
Sderot	1.19	-1.72, 4.11	0.07	-0.17, 0.30	0.07	-0.01, 0.16
Grade	-0.95	-2.42, 0.51	-0.03	-0.15, 0.09	-0.03	-0.08, 0.01
Past terror attacks	-0.06	-1.11, 1.00	0.05	-0.04, 0.13	0.01	-0.02, 0.04
Rocket attack exposure	-2.35	-4.85, 0.15	-0.08	-0.28, 0.13	-0.11*	-0.22, -0.003
Rocket attack by male interaction					0.18*	0.04, 0.33

Note: Rocket attack by gender interaction terms are included only in models for which their addition explained significantly more outcome variance.

\*p < .05; \*\*p < .01; \*\*\*p < .001.

of rocket attack exposure on decreased aggression for girls ( $B = -0.11$ , 95% CI =  $-0.22, -0.003$ ,  $p = .02$ ), but no effect was detected for boys ( $B = 0.08$ , 95% CI =  $-0.04, .019$ ,  $p = .19$ ).

The longitudinal results for violence commission are reported in Table 5. Of the 6 regression models, 4 revealed statistically significant longitudinal effects of either rocket attack exposure or prior terrorism exposure. Greater rocket attack exposure at Wave 2 predicted an increased odds of committing violence at Wave 3. The odds ratio (1.67) indicated that the each additional item endorsed in the Wave 2 rocket attack exposure index was associated with being more than 1.5 times as likely to commit violence at Wave 3, regardless of prior involvement in violence commission. Given the standard deviation of Wave 2 rocket attack exposure was 1.22, a 1-SD difference in amount of rocket attack exposure was associated with being more than twice as likely to commit subsequent violence ( $1.22 \times 1.67 = 2.04$ ).

Furthermore, reports of prior exposure to terror attacks robustly predicted increased odds of committing violence at Wave 4 across the series of regression models controlling for rocket attack exposure and violence commission at Waves 1, 2, and 3. Odds ratios indicated that these effects of prior exposure on violence commission were relatively large. For example, the odds ratio of prior exposure, controlling for Wave 1 rocket attack and violence commission variables was 2.46, indicating that each additional item in the exposure index endorsed was associated with being almost 2.5 times as likely to commit violence by Year 4, regardless of prior violence commission. Furthermore, given that the standard deviation of prior exposure was 1.21, a 1-SD difference in prior exposure was associated with being almost 3 times as likely to commit subsequent violence ( $1.21 \times 2.46 = 2.98$ ).

In all regressions predicting violence commission at Waves 3 and 4, males had increased odds of commission over time. Less consistent patterns were found for participants from Sderot to have increased odds and older participants to have decreased odds of commission over time. Gender-by-rocket attack exposure interaction terms were added to each model, but these were not statistically significant and had no detectable impact on model fit; thus they were removed from the models.

## DISCUSSION

To our knowledge, this is the first study to prospectively examine the effects of exposure to

**TABLE 5** Longitudinal Findings for Violence Commission: Logistic Regressions

Violence Commission (n = 251)		
Waves 1 → 2	OR	95% CI
Violence commission	4.83**	1.99, 11.75
Male	2.14	0.91, 5.05
Sderot	2.08	0.90, 4.81
Grade	0.80	0.52, 1.24
Past terror attacks exposure	0.99	0.70, 1.42
Rocket attack exposure	0.97	0.71, 1.32
Violence Commission (n = 215)		
Waves 1 → 3	OR	95% CI
Violence commission	4.61**	1.70, 12.54
Male	1.16	0.65, 3.91
Sderot	2.69*	1.12, 6.46
Grade	0.73	0.45, 1.16
Past terror attacks exposure	0.97	0.65, 1.43
Rocket attack exposure	0.98	0.72, 1.33
Violence Commission (n = 139)		
Waves 1 → 4	OR	95% CI
Violence commission	15.94**	2.51, 101.27
Male	23.23*	1.82, 296.22
Sderot	10.68*	1.57, 72.76
Grade	0.14*	0.03, 0.68
Past terror attacks exposure	2.46*	1.08, 5.61
Rocket attack exposure	0.75	0.42, 1.35
Violence Commission (n = 230)		
Waves 2 → 3	OR	95% CI
Violence commission	7.79***	2.89, 20.97
Male	3.68**	1.54, 8.81
Sderot	2.09	.089, 4.93
Grade	0.71	0.44, 1.13
Past terror attacks exposure	0.78	0.54, 1.13
Rocket attack exposure	1.67**	1.17, 2.37
Violence Commission (n = 155)		
Waves 2 → 4	OR	95% CI
Violence commission	6.36*	1.38, 29.30
Male	9.80**	2.06, 46.58
Sderot	3.21	0.88, 11.69
Grade	0.36*	0.16, 0.85
Past terror attacks exposure	1.72*	1.03, 2.87
Rocket attack exposure	1.02	0.61, 1.70
Violence Commission (n = 151)		
Waves 3 → 4	OR	95% CI
Violence commission	17.13***	3.65, 80.50
Male	11.45**	1.94, 67.52
Sderot	1.81	0.46, 7.06
Grade	0.40*	0.17, 0.99
Past terror attacks exposure	2.21*	1.20, 4.07
Rocket attack exposure	0.55	0.16, 1.92

Note: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

rocket attacks on both adolescents' internalizing and externalizing symptoms over the course of several years. Prior exposure to terror attacks was associated with higher levels of depression and aggression at Wave 1, and was associated with increased odds of violence commission over the course of the study. At Wave 1, the amount of exposure to rocket attacks in the past several months was associated with higher levels of depression and anxiety. For the most part, these effects were not detected longitudinally. However, the amount of exposure to rocket attacks at Wave 2 was associated with increased depression, anxiety and odds of violence commission at Wave 3. Notably, Wave 2 was conducted in February 2009, at the close a month-long escalation of hostilities during which Israeli forces staged air and ground attacks of Gaza in response to heightened rocket attacks of the Western Negev. It is possible that the salience of exposure to rocket attacks was heightened by the context of the war, or that the long-term effects were enhanced by the disappointing results of the Israeli operation, which ultimately proved ineffective at eliminating future rocket attacks.

Previous studies have attested to the effect of exposure to terrorism in general, and to rocket attacks in particular, on internalizing symptoms.<sup>1-5,18-20</sup> That we found stronger evidence for such effects in the concurrent analyses indicates that these effects on internalizing symptoms might be immediate and short-lived. Alternatively, these findings may speak to resilience in the youth participating in this study, developed after years of chronic exposure. Indeed, patterns of resilience in children exposed to terrorism, political violence, and war is only beginning to be understood.<sup>29</sup>

The findings regarding the prospective effect of terrorism exposure on increased risk for violence commission are of great importance given the dearth of longitudinal research and the medical and social toll taken by adolescent violence.<sup>6-9</sup> In particular, exposure to terror attacks prior to the start of the study placed adolescents at substantially higher risk for committing violent acts 4 years later, even after taking into account reports of violence commission earlier in the study. Thus, terrorism exposure may have chronic, long-term, albeit protracted effects on youth violence. Accordingly, exposure to terror attacks may have developmental consequences similar to those of other traumatic forms of victimization (e.g., child abuse), which have been shown to have long-term

impacts on violent behavior.<sup>17</sup> Further examination of how the long-term effects of exposure to terrorism are similar to and differ from other sources of victimization may boost understanding of sequelae, mechanisms and possibly mitigating factors underlying the effects of terrorism exposure on youth development.

Our findings are tempered by limitations common in large-scale longitudinal studies of high-risk populations, namely, attrition and reliance self-reports. Concern that attrition might have resulted from current levels of violence preventing some youth from continuing participation led to an analytic design broken down by wave. Reliance on self-reports raises concerns of recall bias affecting the validity of measures and may lead to an underestimation of the true effects of exposure. Furthermore, the correlational nature of the study limits inferences about the extent to which exposure to terrorism causes internalizing and externalizing problems; other unmeasured factors may confound the effects.

Nonetheless, these findings should serve as a red flag for health care practitioners working in civil areas afflicted by terrorism and political violence. These practitioners are encouraged to be on the lookout for teen violence. We recommend that child psychiatrists in these areas work closely with educators, school psychologists, and primary care physicians to routinely screen for violence, in addition to the more studied symptoms of traumatic stress and distress. In addition, child psychiatrists and mental health professionals are encouraged to launch community-based interventions aimed at preventing/minimizing adolescent violence. This should be done with caution, however, given that some previous attempts have been iatrogenic.<sup>30</sup> Moreover, community-based interventions must take into account the fact that the service providers implementing the intervention are likely to reside in afflicted areas, and are, in turn, themselves at risk and in need of support and guidance.<sup>31</sup>

Findings have potentially global public health implications for the healthy youth development in politically unstable regions, particularly for the Israeli-Palestinian context, which has been unfolding for several generations. Although Israeli adolescents are exposed repeatedly to rocket attacks, Palestinian youth in the Gaza Strip are also exposed to Israeli military attacks, which take their own toll.<sup>32</sup> This study's findings indicate that the cycle of terrorism and political violence that is so prevalent in this volatile region may compound over time. *ε*

**Clinical Guidance**

- Routinely assess adolescent violence commission. Clinicians working with children and adolescents afflicted by terrorism are likely to assess—and then treat—internalizing symptoms (i.e., posttraumatic stress disorder [PTSD], depression). However, the absence of these symptoms does not necessarily indicate the presence of health. Distress might be expressed via violence. An explicit, evidence-based assessment of violent behavior, even a full-fledged diagnosis of conduct disorder, is required.
- Assessment should include school personnel, who may be aware of different types of externalizing behaviors, as well as parents.
- Consider resilience. Many children and adolescents do not experience symptoms even in the face of sustained terror attacks, and the distress experienced by many might be short lived. Patterns of resilience among youth further highlight the need for a careful clinical assessment so as to differentiate between mild, transient distress and clinical levels of internalizing and externalizing symptoms.

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