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ADJUSTMENT AMONG CHILDREN WITH RELATIVES WHO PARTICIPATED IN THE MANHUNT FOLLOWING THE BOSTON MARATHON ATTACK

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Abstract

Background—Following the Boston Marathon attack, the extraordinary interagency manhunt and shelter-in-place made for a truly unprecedented experience for area families. Although research on Boston youth has found robust associations between manhunt-related experiences and post-attack functioning, such work does little to identify the specific needs of a particularly vulnerable population—i.e., children with a relative who participated in the manhunt. Understanding the adjustment of these youth is critical for informing clinical efforts.

Methods—Survey of Boston-area parents/caretakers (N = 460) reporting on their child's attack/manhunt-related experiences, as well as psychosocial functioning in the first six post-attack months; analyses compared youth with and without a relative in law enforcement or the armed services who participated in the manhunt.

Results—The proportion of youth with likely PTSD was 5.7 times higher among youth with relatives in the manhunt than among youth without. After accounting for child demographics, blast exposure, and children's own exposure to manhunt events (e.g., hearing/seeing gunfire/explosions, having officers enter/search home), having a relative in the manhunt significantly predicted child PTSD symptoms, emotional symptoms, and hyperactivity/inattention. Fear during the manhunt that a loved one could be hurt mediated relationships between having a relative in the manhunt and clinical outcomes; living within the zone of greatest manhunt activity did not moderate observed relationships.

Conclusions—Children with relatives called upon to participate in the unprecedented interagency manhunt following the Boston Marathon attack carried a particularly heavy mental health burden. Continued research is needed to clarify the clinical needs of youth with relatives in high-risk occupations.

Keywords

disasters; terrorism; first responders; PTSD; child

Every society is confronted with disasters that disrupt and overwhelm entire communities. Each year, these destructive occurrences collectively affect millions,^[1] and have considerable mental health effects on exposed youth.^[2–7] Although most research on disasters and youth has focused on exposure to core disaster events (e.g., exposure to terrorist blasts, tornado touch-downs), a growing literature has also begun to document how adverse disaster-related experiences extend beyond immediate exposure and include indirect experiences within the subsequently changed postdisaster ecology.^[8, 9]

Children's responses to the 2013 Boston Marathon bombing and its aftermath illustrate how events secondary to initial disasters can impose serious mental health consequences. In the days following the bombing, an extraordinary post-attack interagency show of force, a violent, highly publicized manhunt, and a temporary shelter-in-place warning made for a truly unprecedented and frightening experience in its own right for area children.^[10] After the initial attack, members of state and federal law enforcement and reserve military forces descended onto the region for an intense multi-day pursuit. The following days included the shutdown of public transportation and typically bustling streets, the killing of a uniformed officer, an armed carjacking with a hostage, a violent shootout in a typically quiet residential neighborhood in Watertown during which 300 rounds of ammunition were fired and crude bombs were thrown, a shelter-in-place warning issued for roughly one million Boston-area residents, door-to-door searches, and ultimately another intense shootout with explosions in the residential Watertown during which the second suspect was apprehended covered in blood.

Although research has highlighted the toll of the Marathon bombing on Boston-area youth, exposures to the subsequent manhunt have actually been *more* robustly associated than attack-related exposures with a range of psychosocial outcomes.^[10, 11] While such work clarifies the broad impact of manhunt-related experiences on Boston-area youth, it does little to inform our understanding of the specific clinical needs of a particularly vulnerable population: children with a relative in law enforcement or the armed services deployed in the manhunt. Research unrelated to disasters indicates individuals who work in high-risk occupations characterized by day-to-day confrontations with physical danger or extreme stress and involvement with traumatic incidents (e.g., policemen, firefighters, deployed military personnel) are at heightened risk for serious mental health problems,^[12–20] including PTSD, anxiety, depression, substance use, and suicidality. Given relationships between parental trauma and child psychopathology,^[21–23] it is not surprising that children with relatives in high-risk occupations show particularly elevated rates of mental health concerns.^[24–28]

Importantly, in addition to knowing that a relative was at risk, many children with relatives in the manhunt were likely exposed to frightening manhunt-related events themselves. It is unclear how such direct child exposure might interact with the effects of having a relative in a physically dangerous and stressful situation. Research on children with relatives in high-

risk occupations^[24–28] has either examined youth far removed from harm's way, or has failed to incorporate children's own exposure to the same events into analyses. Research examining children of deployed military personnel^[25, 28] is confounded by the impact of prolonged family separation. Moreover, previous work has only looked at the cumulative effects of having relatives in high-risk occupations, rather than examining the impact of a specific event or set of events on the family. It is rare for such a large number of law enforcement personnel to simultaneously respond to and experience the same physical danger and extreme stress, and the present events offer a unique opportunity to study children with relatives in high-risk occupations. Accordingly, research to date cannot fully speak to the experiences and adjustment of children with relatives assisting post-disaster response efforts.

The present study surveyed Boston-area caretakers in the first six post-attack months about their child's exposure to the events of the Marathon attack week, as well as their child's functioning, and compared youth with and without a relative who participated in the manhunt. We hypothesized that youth with family in the manhunt would show poorer functioning, and that associations would be particularly strong among youth dwelling in the zone of greatest manhunt activities. Given that research has yet to examine potential mechanisms of transmission of psychosocial problems to youth with family in high-risk occupations, we examined whether children's fear that a relative would sustain injuries during the manhunt mediated the relationship between having a relative in the manhunt and clinical outcomes.

MATERIAL AND METHODS

DESIGN AND PARTICIPANTS

Procedures were approved by the Boston University IRB. From 6/5/13 to 10/15/13 (2–6 months post-event), English-speaking, Boston-area caretakers of at least one child between 4 and 19 years dwelling <25 miles of the Marathon attack site and/or Watertown, MA were recruited to complete a 45 min online survey measuring child experiences during the week of the Marathon attack, as well as psychosocial functioning of the child. Recruitment efforts consisted of community-based, school-based, pediatrician-based, and media-based outreach.

Interested caretakers contacted study staff or visited a website for further information. 41.6% of 1,105 caretakers who initially contacted staff or visited the website to consider participation completed the survey ($N = 460$). Following informed consent, caretakers completed questionnaires via Qualtrics—a data-encrypted Internet-based survey program requiring server authentication. Respondents with >1 child within the study age range were directed to complete questionnaires about their oldest child in the study age range. Respondents were compensated \$30 and could elect to have their compensation donated to the One Fund Boston.

Respondents were asked “Does your family have any close relatives in law enforcement or the armed services who were called to assist in the manhunt?” Roughly 18% of respondents ($N = 83$) responded “yes.” Table 1 presents the demographic characteristics of participating families with and without a relative in the manhunt. The two groups did not differ with

regard to child age, caregiver age, race/ethnicity, household income, or caregiver education. Across groups, roughly one-fifth were racial/ethnic minorities, and roughly half lived in households making <\$100,000/year. Most respondents were college-educated, biological mothers. Thirty-five percent of families lived 5 miles of the final Watertown apprehension site. On average, families with a relative called to assist the manhunt lived 8 miles from the final apprehension site ($M = 8.23$, $SD = 7.3$) and families without a relative in the manhunt lived 9 miles away ($M = 9.17$, $SD = 7.2$), $t(445) = 1.07$, $P = .28$).

MEASURES

The *UCLA PTSD Reaction Index (RI)*, *Parent-Report Symptom Scale* was used to assess child PTSD symptoms. The PTSD-RI is the most frequently used assessment of children's postdisaster PTSD^[3] and has demonstrated excellent reliability ($\alpha = .88-.91$) and strong convergent validity;^[29] internal consistency was excellent in the present sample ($\alpha = .95$). Total scores offer a continuous measure of PTSD symptoms; scores 38 indicate "likely PTSD."

The parent-report of the *Strengths and Difficulties Questionnaire (SDQ)*^[30] collected parent reports of children's: (1) emotional symptoms, (2) conduct problems, (3) hyperactivity/inattention, (4) peer problems, and (5) prosocial behavior. A total difficulties score is generated by adding subscales 1–4. Factor analytic work supports the distinctiveness of subscales.^[30, 31] The SDQ has demonstrated strong internal consistency ($\alpha = .73$), convergent validity, and predictive validity;^[30, 31] internal consistency was strong in the present sample ($\alpha = .86$).

The survey also collected data on children's presence at the finish line during the blast, as well as details of children's specific exposures to the subsequent manhunt. In addition to reporting whether a relative was in the manhunt, caretakers were asked whether the child: (a) was under the shelter-in-place warning, (b) saw a heavier police presence in his/her neighborhood during the manhunt, (c) saw uniformed persons in his/her neighborhood not typically seen in civilian areas (e.g., National Guard, Homeland Security), (d) saw officers with guns drawn related to the manhunt, (e) heard manhunt-related gunshots or explosions, (f) saw manhunt-related gunshots/explosions, (g) saw manhunt-related blood, (h) had an officer knock on their door as part of the manhunt, (i) had an officer enter/search their home, (j) knew the slain officer, and/or (k) knew the injured transit officer. Adding the number of endorsed items yielded a total *Manhunt Exposures Tally* ranging from 0 to 11. Further, we characterized children living 5 miles of the final apprehension site as living within the zone of greatest manhunt activity.

In addition, caretakers were asked: "To the best of your ability, using a 0-to-10 scale where 0 means "not at all afraid" and 10 means "completely terrified," how afraid was your child that someone he or she cared about would be seriously hurt or killed during the manhunt?"

DATA ANALYSIS

Two-tailed chi-square analyses and *t*-tests evaluated demographic differences across youth with and without a relative called upon to assist the manhunt. The proportion of youth who

experienced each of the 11 manhunt exposures was calculated separately for each group. Outcomes were computed separately for the two groups, and to examine associations between whether a child had a relative in the manhunt and clinical outcomes, ANCOVAs were conducted controlling for the four demographic variables.

To examine the *unique* contributions of having a relative assisting in the manhunt in predicting clinical outcomes after accounting for both Marathon blast exposure and total manhunt exposures, linear regressions were conducted for each outcome showing significance in the previous analyses. For each model, demographic characteristics, child presence at the blasts, manhunt exposures tally, and whether the child had a relative in the manhunt were simultaneously entered as predictors.

To examine whether a child's fear regarding a loved one sustaining serious injuries during the manhunt mediated observed relationships between having a relative in the manhunt and clinical outcomes, statistical mediation analyses^[32] were conducted using structural equation models (SEMs) in *Mplus* 6.^[33] In addition, the moderating impact of living within the zone of greatest manhunt activity on the effects of having a relative in the manhunt were assessed. Analyses were conducted for each clinical outcome significantly associated with relative participation in the manhunt. For each clinical outcome, a moderated mediation SEM was constructed as shown in Figure 1. Current recommendations for statistical mediation suggest that the mediated effect is best estimated as the product of the component regression coefficients and statistical significance is assessed using nonparametric bootstrap estimates of standard errors.^[34–36] The hypothesis that a child's fear during the manhunt that a loved one might get seriously hurt mediated observed relationships between having a relative in the manhunt and clinical outcomes were assessed by the significance of the mediated effect a^*b . The hypothesis that living within the zone of greatest manhunt activity moderated this effect was assessed by the significance of the mediated effect d^*b . The hypothesis that the effect of having a relative in the manhunt on clinical outcomes was moderated by living within the zone of greatest manhunt activity was assessed by the regression coefficient e (i.e., the product term of the predictors after controlling for the main effects of both predictors as well as demographics). Statistical significance was assessed using the *Mplus* bootstrap option with 1,000 replications.

RESULTS

DESCRIPTIVE PORTRAIT OF MANHUNT EXPERIENCES AND CLINICAL OUTCOMES ACROSS YOUTH WITH AND WITHOUT A RELATIVE IN THE MANHUNT

Table 2 presents children's manhunt-related exposures and outcomes, broken down by whether the child had a relative in the manhunt. Analyses showed that higher proportions of youth with relatives in the manhunt saw uniformed persons not typically found in civilian neighborhoods, saw officers with guns drawn related to the manhunt, heard and saw manhunt-related gunshots/explosions, saw manhunt-related blood, had an officer knock on their door and enter/search their home, and knew the slain officer or injured transit officer. Roughly half of youth with relatives in the manhunt saw a heavier police presence in their neighborhood, as well as uniformed persons not typically found in civilian neighborhoods, whereas less than one-third of youth without relatives in the manhunt had such experiences.

The proportion of youth hearing or seeing manhunt-related gunshots/explosions, seeing manhunt-related blood, and having an officer knock on their door and enter/search their home was 3–5 times higher for youth with relatives in the manhunt. An ANCOVA accounting for demographics revealed that the Manhunt Exposures Tally was higher among youth with a relative in the manhunt ($M = 2.61$, $SD = 2.7$) than among youth without ($M = 1.45$, $SD = 1.7$), $F(1,441) = 24.05$, $P < .001$.

Clinical outcomes, on average, fell within normative ranges, although there was considerable variability, and children with relatives in the manhunt reported significantly greater posttraumatic stress, emotional symptoms, hyperactivity/inattention, and total difficulties than children without a relative in the manhunt. The proportion of youth with likely PTSD was 5.7 times higher among youth with relatives in the manhunt than youth without. Outcomes were not associated with participant survey completion order suggesting timing of assessment across the data collection period did not affect responses/outcomes. Among youth with relatives in the manhunt, the largest manhunt exposure effects on PTSD symptoms were for youth who knew the slain officer ($d = 3.43$), saw blood related to the manhunt ($d = 2.49$), or knew the injured transit officer ($d = 1.96$).

An ANCOVA accounting for demographics found child fear during the manhunt that a loved one might be seriously hurt was higher among youth with a relative in the manhunt ($M = 5.31$, $SD = .35$) than youth without ($M = 3.84$, $SD = .17$), $F(1,441) = 14.28$, $P < .001$.

THE UNIQUE RELATIONSHIP BETWEEN HAVING A RELATIVE IN THE MANHUNT AND CLINICAL OUTCOMES, AFTER ACCOUNTING FOR BLAST EXPOSURE, MANHUNT EXPOSURE, AND DEMOGRAPHICS

Table 3 presents results of the linear regression analyses examining the *unique* contributions of having a relative in the manhunt in predicting clinical outcomes (accounting for demographics, blast exposure, and manhunt exposure), for each outcome showing statistical significance in the previous analyses. In these models, having a relative in the manhunt retained significant predictive associations with PTSD symptoms, emotional symptoms, and hyperactivity/inattention, whereas it no longer showed a significant predictive association with total difficulties. Child age did not moderate any of the significant effects of having a relative in the manhunt.

THE MEDIATING ROLE OF FEAR THAT A LOVED ONE COULD BE SERIOUSLY HURT IN THE MANHUNT

The mediating effect of child fear during the manhunt that a relative could be hurt was assessed for each outcome within the moderated mediation SEM (Table 4). There was a mediation effect for PTSD symptoms ($a \times b = 1.984$, $SE = 0.826$, $z = 2.401$, $P < .05$), emotional symptoms ($a \times b = 0.217$, $SE = 0.102$, $z = 2.139$, $P < .05$), and total child difficulties ($a \times b = 0.490$, $SE = 0.237$, $z = 2.067$, $P < .05$), indicating that children with a relative in the manhunt expressed more fear that a loved one might be seriously hurt, and in turn displayed more PTSD symptoms, emotional problems, and total difficulties.

THE MODERATING INFLUENCE OF LIVING WITHIN THE ZONE OF GREATEST MANHUNT ACTIVITY

The moderating effect of living in the zone of greatest manhunt activity was assessed for each outcome within the moderated mediation SEM (Table 4). Living in the zone of greatest manhunt activity had a significant main effect on fear of a loved one being hurt ($P < .05$ across models) and on PTSD symptoms ($P < .01$). However, it did not moderate effects of having a relative in the manhunt on outcomes (e path, $P > .10$ for all models) or effects of having a relative in the manhunt on fear of a loved one being hurt (d path, $P > .40$ for all models). Because the d path was not significant, living in the zone of greatest manhunt activity was also not able to moderate the mediated effect of having a relative in the manhunt on clinical outcomes via fear of a loved one being hurt (d^*b , $P > .40$ for all models).

DISCUSSION

Although previous work documents the mental health toll of the Boston Marathon bombing and its aftermath on many Boston-area children,^[10, 11] the present findings indicate that children with close relatives in law enforcement or the armed forces who participated in the unprecedented interagency manhunt carried a particularly heavy mental health burden. Although it has been estimated that only 0.4–1.5% of the general child population has severely impairing PTSD,^[37, 38] roughly one out of every nine children sampled with family in the manhunt had “likely PTSD.” Even after accounting for children’s initial Marathon blast exposure and children’s own manhunt exposure, having a relative participating in the manhunt was significantly linked with elevated PTSD symptoms, emotional symptoms, and hyperactivity/inattention. Findings add to a small but growing literature documenting mental health burdens among children with family members employed in occupations characterized by day-to-day confrontations with physical danger.^[24–28]

The present findings also add to a smaller literature specifically considering the adjustment of children with family members who respond to disasters. Research conducted after the 9/11 attacks found that NYC schoolchildren with first responders in their family showed elevated PTSD rates 6 months after the attacks—particularly those with family in emergency medical roles.^[26] Although Duarte and colleagues^[26] found that after 9/11 children with family in law enforcement showed no greater PTSD than children without family in law enforcement, the one-week post-event response differed dramatically between 9/11 and the Marathon bombing. After the first post-Marathon attack hour of immediate medical attention and triage, the bulk of responder activities entailed a violent, active law enforcement pursuit of unprecedented scope, whereas the far greater number of injured and dead in the 9/11 attacks—as well as the prolonged rescue effort and handling of dead bodies and body parts—placed a greater burden on medical first responders. Furthermore, post-9/11 research on children with first responder relatives did not evaluate whether the relative was actually involved in the 9/11 response. The present study was the first post-disaster study to evaluate the functioning of children with a responder relative who specifically assisted in the post-disaster response.

Although children with relatives in the manhunt showed greater problems than children without relatives in the manhunt, they did nonetheless—on average—exhibit normative functioning. Findings may speak to resiliency processes not presently examined, but importantly outcomes were heterogeneous, with many affected youth showing considerable problems—particularly those with higher levels of exposure and who feared during the manhunt that a relative could be hurt.

The range of mechanisms of transmission of psychosocial problems to youth with family in high-risk occupations remains unclear, but we found that associations were mediated by fear that a loved one would sustain injuries during the manhunt. Having a relative in the manhunt led to elevated fear during the manhunt that a relative could be hurt, which in turn was linked to poorer adjustment. Research unrelated to disasters examining mental health problems among children with traumatized relatives suggests that genetic factors, epigenetic factors, and exposure to maladaptive parenting behaviors and parental modeling of emotion dysregulation may also play meaningful roles.^[21–23]

Several limitations warrant comment. First, information was not presently collected on specific roles that relatives in the manhunt played nor the extent of actual physical danger—although a relative's specific role may not be important. Second, we did not assess the nature of the relationship between the child and relatives in the manhunt. Presumably, children with parents (vs. other relatives) in the manhunt would have been most affected, on average. Third, despite broad recruitment, findings may not generalize to the general population of youth with a relative in the manhunt, as population-based methods were not applied. Further, the survey was only available online and in English, restricting eligibility. Concerns about representativeness are somewhat tempered by the fact that the sample's demographic constitution is comparable to those areas most directly affected (e.g., 84.9 and 55.6% of Water-town residents, respectively, are White and earn less than \$100,000 annually).^[39, 40] Fourth, the participation rate was somewhat low (42%), although this participation rate may reflect unique challenges of studying postdisaster communities and is consistent with participation rates in related research.^[41, 42] Fifth, the present design cannot speak to prospective changes across time. Sixth, information on child gender was not collected, and thus the impact of gender cannot be assessed. Similarly, the present study was initiated after the bombing occurred and so data on child preattack psychopathology or traumatic exposure—both of which have been found to be associated with posttraumatic child functioning^[2, 4, 43]—were not collected. Seventh, although we assessed whether the child's relative participated in the manhunt, it is possible that associations simply reflect the stress of having relatives in law enforcement. Eighth, a single item was used to assess child fear that a relative would sustain injuries during the manhunt. Finally, data were exclusively collected from caretakers and it is possible other strategies could have yielded different findings (e.g., the present design cannot rule out the possibility that caretakers of youth with relatives in the manhunt may have simply been more attuned to their children's difficulties, rather than true differences existing).

Despite these limitations, the present work highlights a particularly stressed and historically understudied subgroup of affected youth in the aftermath of disasters. Surveys assessing children's mental health across entire disaster-affected regions e.g.,^[4, 10] are needed for

identifying the broad clinical needs of communities. At the same time, the present analysis underscores the critical need for continued postdisaster research and clinical efforts to specifically attend to subpopulations of youth with particularly elevated family involvement, to ensure that we are adequately responding to the diverse needs of all affected children. Specifically, the present findings suggest that clinical efforts and disaster response programs must—in addition to ensuring the availability of mental health services for directly exposed youth—maintain a focus on identifying and treating early signs of distress and dysfunction, and reduce barriers to effective care, in children with family members whose occupations put them in physical danger and under extreme stress in the aftermath of disaster events.

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Figure 1.

Moderated mediation model tested in the prediction of each of seven post-Marathon child outcomes: PTSD symptoms, total difficulties, emotional symptoms, conduct problems, hyperactivity/inattention, peer problems, prosocial behavior.

Note: The following demographic variables were controlled for in all models: child age, race/ethnicity, household income, caregiver education.

Demographic characteristics among Boston-area youth with and without a close relative in law enforcement or the armed forces who participated in the post-Marathon attack manhunt

TABLE 1

Demographic characteristic	Child has close relative called to assist the manhunt effort					
	No (N = 377)		Yes (N = 83)		Significance test	
	M	SD	M	SD		
Child age, years	11.0	3.9	11.2	3.6	$t(452) = 0.4, P = .67$	
Caregiver age, years	33.8	4.4	42.8	6.9	$t(412) = -1.2, P = .22$	
	N	%	N	%	Significance test	
Child race/ethnicity					$\chi^2(1, N = 460) = 0.03, P = .87$	
Non-Hispanic Caucasian	306	81.2	68	81.9		
Racial/ethnic minority	71	18.8	15	18.1		
Household income, USD					$\chi^2(4, N = 457) = 8.8, P = .18$	
<\$50,000	62	16.4	6	7.3		
\$50,000–74,999	34	9.1	11	13.4		
\$75,000–99,999	79	21.1	20	24.4		
\$100,000–\$199,999	148	39.5	36	43.9		
200,000	52	13.9	9	11.0		
Caregiver/respondent education					$\chi^2(1, N = 460) = 1.92, P = .17$	
Completed college	244	64.7	47	56.6		
Did not complete college	133	35.3	36	43.4		
Caregiver/respondent					$P = .72$, Fisher's Exact Test	
Biological mother	290	77.3	62	74.7		
Biological father	63	16.8	15	18.1		
Adoptive mother	15	4.0	3	3.6		
Relative/guardian	4	1.1	2	2.4		
Adoptive father	3	0.8	1	1.2		

Manhunt exposure and clinical outcomes among Boston-area youth with and without a close relative in law enforcement or the armed forces who participated in the post-Marathon attack manhunt

TABLE 2

Manhunt exposures	Child has close relative called to assist the manhunt effort						Significance test ^d
	No (N = 377)			Yes (N = 83)			
	N	%	N	%	N	%	
Under shelter in place warning	Yes	188	50.8	50	60.2	Wald = 1.32, P = .25	
	No	182	49.2	33	39.8		
Saw heavier police presence in neighborhood	Yes	121	32.1	40	48.2	Wald = 2.62, P = .11	
	No	256	67.9	43	51.8		
Saw uniformed service persons not typically found in civilian neighborhoods ^b	Yes	108	28.6	40	48.2	Wald = 10.58, P < .001	
	No	269	71.4	43	51.8		
Saw officers with guns drawn related to manhunt	Yes	35	10.2	18	21.7	Wald = 7.92, P < .01	
	No	342	90.7	65	78.3		
Heard manhunt-related gunshots/explosions	Yes	27	7.2	18	21.7	Wald = 12.04, P < .001	
	No	350	92.8	65	78.3		
Saw manhunt-related gunshots/explosions	Yes	12	3.2	13	15.7	Wald = 16.57, P < .001	
	No	365	96.8	70	84.3		
Saw manhunt-related blood	Yes	8	2.1	8	9.6	Wald = 8.99, P < .01	
	No	369	96.3	75	9.0		
Had officer knock on door related to manhunt	Yes	17	4.5	10	12.0	Wald = 4.14, P < .05	
	No	360	95.5	73	88.0		
Had officer enter/search home	Yes	13	3.4	11	13.3	Wald = 11.15, P < .001	
	No	364	96.6	72	86.7		
Knew slain M.I.T. officer ^c	Yes	4	1.1	6	7.2	Wald = 8.77, P < .01	
	No	373	98.9	77	92.8		
Knew injured transit officer	Yes	4	1.1	6	7.2	Wald = 8.73, P < .01	
	No	373	98.9	77	92.8		
Clinical outcomes	N	%	N	%	N	%	Significance test ^d
Likely PTSD ^d	Yes	7	1.9	9	10.8	Wald = 12.33, P < .001	

Manhunt exposures	Child has close relative called to assist the manhunt effort							Significance test ^{e,f}
	No (N = 377)			Yes (N = 83)				
	N	%	SE	N	%	SE		
	No	370	98.1	74	89.2			
Posttraumatic stress		7.35	0.5	12.54	1.1		$F(1,445) = 16.87, P < .001$	
Total difficulties		7.42	0.3	9.37	0.7		$F(1,439) = 7.58, P < .01$	
Emotional symptoms		1.80	1.0	2.69	2.3		$F(1,440) = 12.86, P < .001$	
Conduct problems		1.26	0.1	1.37	1.6		$F(1,440) = 0.36, P = .55$	
Hyperactivity/Inattention		2.96	0.1	3.72	2.7		$F(1,439) = 6.57, P < .01$	
Peer problems		1.40	0.1	1.71	0.2		$F(1,440) = 2.10, P = .15$	
Prosocial behavior		7.92	0.1	8.36	0.2		$F(1,440) = 2.81, P = .09$	

^aLogistic regression controlling for household income, child age, race/ethnicity, and respondent education.

^be.g., National Guard, Homeland Security.

^cM.I.T. = Massachusetts Institute of Technology.

^dFor comparison purposes, roughly 0.4–1.5% of the general population meets full diagnostic criteria for PTSD [34,35]

^eANCOVAs controlling for household income, child age, race/ethnicity, and respondent education.

^fDue to the distributional properties of the clinical outcome variables (i.e., discrete, bounded at 0, skewed, and heteroscedastic), we also conducted all analyses using Poisson regression, which is more appropriate for count outcomes which typically display these properties. Both sets of analyses produced identical conclusions, so we have presented the standard linear results.

TABLE 3

Results of linear regression analyses predicting child outcomes among Boston-area youth ($N = 460$) following the Marathon bombing and subsequent manhunt: Examining the unique contributions of having a close relative participate in the manhunt, after accounting for child manhunt exposure and child presence at Marathon finish line blasts

	B	SE	Beta	<i>t</i>	Partial correlation	Model significance ^{a,b}
Predictors of posttraumatic stress						$F(7,439) = 20.33, P < .001; R^2 = 0.25$
Child at Marathon finish line	7.22	1.99	0.15	3.62***	0.17	
Child manhunt exposures tally ^c	1.93	0.24	0.36	8.19***	0.36	
Close relative participated in manhunt	2.99	1.18	0.11	2.53**	0.12	
Predictors of total difficulties						$F(7,433) = 5.25, P < .001; R^2 = 0.08$
Child at Marathon finish line	-0.03	1.20	-0.01	-0.02	-0.01	
Child manhunt exposures tally ^c	0.65	0.15	0.22	4.48***	0.21	
Close relative participated in manhunt	1.30	0.72	0.09	1.81	0.09	
Predictors of Emotional Symptoms						$F(7,434) = 4.69, P < .001; R^2 = 0.07$
Child at Marathon finish line	-0.18	0.43	-0.02	-0.43	-0.02	
Child manhunt exposures tally ^c	0.18	0.05	0.17	3.48***	0.17	
Close relative participated in manhunt	0.70	0.25	.13	2.76**	0.13	
Predictors of Hyperactivity/Inattention Problems						$F(7,433) = 3.72, P < .001; R^2 = 0.06$
Child at Marathon finish line	0.10	0.51	0.01	0.19	0.01	
Child manhunt exposures tally ^c	0.13	0.06	0.10	2.03*	0.10	
Close relative participated in manhunt	0.64	0.30	0.10	2.11*	0.10	

^a All regression models also control for household income, child age, race/ethnicity, and respondent education.

^b Because the dependent variables in these models could be construed as needing to be treated as count data given the properties of their distributions, we also ran Poisson regressions and conclusions were all identical.

^c See methods for definition of Child Manhunt Exposures Tally.

* $P < .05$;

** $P < .01$;

*** $P < .001$.

Note: Due to the distributional properties of the outcome variables (i.e., discrete, bounded at 0, skewed, and heteroscedastic), we also conducted all analyses using Poisson regression, which is more appropriate for count outcomes which typically display these properties. Both sets of analyses produced identical conclusions, so we have presented the standard linear regression results.

TABLE 4
Details of effects (i.e., regression coefficients) estimated in moderated mediation models predicting post-Marathon child outcomes

Outcome	a	b	c ³	d	e	f	g	Mediation (a × b)	Moderated mediation (d × b)
PTSD symptoms	1.32*	1.51***	2.06	0.67	2.45	0.67	-0.28*	1.98*	1.02
Emotional symptoms	1.33*	0.16***	0.81**	0.67	-0.50	0.72*	-0.07	0.22*	0.11
Conduct problems	1.28*	0.06*	0.03	0.68	-0.05	0.72*	-0.25*	0.08	0.04
Hyperactivity/inattention	1.30*	0.10*	0.62	0.63	-0.01	0.73*	-0.10	0.12	0.06
Peer problems	1.31*	0.06*	0.45	0.66	-0.74	0.74*	-0.17	0.08	0.04
Prosocial behavior	1.30*	0.01	0.29	0.61	0.44	0.73*	0.01	0.01	0.01
Total difficulties	1.30*	0.38***	1.75*	0.69	-1.13	0.72*	-0.13	0.49*	0.26

Note: See Figure 1 for depiction of the moderated mediation model used to predict each clinical outcome, and visual explanation of each of the following effects tested: a, b, c', d, e, f, g, a × b (mediation), and d × b (moderated mediation). All analyses controlled for the following demographic variables: child age, race/ethnicity, household income, and caregiver education. Due to the distributional properties of the outcome variables (i.e., discrete, bounded at 0, skewed, and heteroscedastic), we also conducted all analyses using Poisson regression, which is more appropriate for count outcomes which typically display these properties. Both sets of analyses produced identical conclusions, so we have presented the standard linear results.

* $P < .05$;

** $P < .01$;

*** $P < .001$.