

Children of terrorism survivors: Physiological reactions seven years following a terrorist incident

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Abstract

Objective: The aim of this study was to examine psychiatric illness and physiological indicators in the children of Oklahoma City bombing survivors seven years after the event.

Methods: A study of 17 Oklahoma City bombing survivors and their 21 adolescent and young-adult children conducted seven years after the disaster used structured diagnostic interviews to examine psychiatric outcomes. Physiological measurements included heart rate, systolic blood pressure, diastolic blood pressure, and physiological reactivity measured in response to a semi-structured bombing-reminder interview.

Results: Results revealed a statistically significant positive association between survivors and their children with respect to both post-disaster and current posttraumatic stress disorder (PTSD). Also, children whose parents met diagnostic criteria for either post-disaster or current major depression were more likely to meet criteria for a post-disaster behavior disorder and for any post-disaster psychiatric disorder than children whose parents did not meet criteria for post-disaster or current major depression. Survivors' children meeting criteria for any post-disaster psychiatric diagnosis had higher heart rates during the pre-test, test, and post-test periods than children who did not meet criteria for any disorder. Children whose survivor parents met criteria for bombing-related PTSD and for any post-disaster psychiatric disorder had greater heart rate reactivity than those whose parents did not.

Conclusion: Findings of this study support previous literature on the relationships between children's psychiatric illness and physiological reactions and suggest interactions between disaster survivors' psychiatric illness and their children's psychiatric and physiological status.

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1. Introduction

The 1995 bombing of the Federal Building in Oklahoma City was, at the time, the deadliest act of terrorism in U.S. history, killing 168 individuals and injuring more than 800 others. North and colleagues [1] found high rates of psychiatric disorders in a representative sample of directly-exposed survivors six months after the attack: 34% of the survivors met criteria for bombing-related posttraumatic stress disorder (PTSD), 23% met criteria for major depression, and 45% met criteria for a post-disaster psychiatric disorder. At seven-year

follow up, 26% of the sample met criteria for current PTSD and 10% met criteria for current major depression [2]. Tucker and colleagues [3] demonstrated physiological reactivity with increases in heart rate and blood pressure in response to a bombing reminder interview in a subgroup of the seven-year follow-up sample (which excluded survivors with unstable medical illnesses and those taking medications that might affect physiological assessment). Although posttraumatic stress symptoms were below levels considered clinically relevant, these survivors had significantly greater autonomic reactivity than unexposed age- and gender-matched community comparison participants [3].

Little is known about the psychological or physiological effects of terrorist events on the children of survivors. In a prior study of the children of bombing survivors examined seven years after the incident, we found physiological reactivity relative to an unexposed community comparison

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sample despite generally low levels of posttraumatic stress and depressive symptoms [4]. For this report, we examined survivors and their children comparing psychiatric diagnoses and physiological reactivity in the two groups.

2. Methods

The University of Oklahoma Health Sciences Center, Washington University School of Medicine, and University of Texas Southwestern Medical Center Institutional Review Boards approved the study. Adult participants provided informed consent. Participants under 18 years of age provided assent and their parents provided consent. Participants were paid \$125 for their time and effort.

2.1. Sample

Survivors in the Oklahoma City bombing study conducted six months after the event [1] were recruited by letter and/or telephone for the seven-year follow-up study [2]. Of 182 survivors who participated in the index study [1], 113 were seen in the follow-up study conducted between November 2001 and October 2002 [2]. The survivors' children were recruited through their bombing-survivor parent. None of the children were directly exposed to the bomb blast. The 113 participants in the seven-year follow-up study included 36 survivors who together had a total of 59 children less than 18 years of age at the time of the bombing. We excluded participants with unstable medical illnesses and those who were taking psychotropic or cardiovascular medications that might affect physiological assessment. From this group, we recruited 18 survivor families with 22 children for the current study. One family was excluded due to incomplete physiological data on the survivor's child, yielding 17 families with complete diagnostic and physiological data for 17 bombing survivors and 21 children. Children included four sibling pairs (2 children per family representing 8 of the 21 children in the sample) and 13 children from 13 other different families.

2.2. Procedures

Approximately seven years after the bombing (mean 82.6 months after the bombing ranging from 79 to 88 months), participants completed a physiological assessment and a diagnostic interview as described in prior publications [3,4].

2.3. Variables

Demographic variables were gender, age, and race/ethnicity.

Bombing-related PTSD was defined as meeting *DSM-IV-TR* [5] criteria A through F for PTSD related to the incident at any time since the bombing. Similarly, *DSM-IV-TR* [5] criteria were used to identify major depressive disorder, generalized anxiety disorder, panic disorder, alcohol abuse/

dependence, and drug abuse/dependence in all participants and oppositional defiant disorder and conduct disorder in the children. Any post-bombing disorder was defined as meeting criteria for any of the disorders at any time since the bombing.

Physiological measures included heart rate (bpm) and systolic and diastolic blood pressure in the pre-test, test, and post-test time periods.

2.4. Statistical analysis

We used nonparametric Cochran–Mantel–Haenszel (CMH) statistics based on ranks to determine whether parental post-disaster psychiatric disorders were associated with mental disorders in their children. Two sample *t* approximation Wilcoxon rank sum was used to determine if children's physiological responses and reactivity to the bombing reminder interview differed by their seven-year post-disaster psychiatric diagnosis (with and without a psychiatric disorder) and their parent's current and post-disaster psychiatric diagnoses.

We did not test children's physiological responses and reactivity to the bombing reminder interview in relation to their current psychiatric diagnosis because only one child was diagnosed with a current psychiatric disorder at the time of assessment. Means and standard deviations for each physiological variable – heart rate, systolic blood pressure, and diastolic blood pressure – were calculated for each group during the pre-test, test, and post-test phases. Measures of physiological reactivity were calculated by subtracting pre-test from test scores for heart rate, systolic blood pressure, and diastolic blood pressure.

Multivariable linear models were fitted to assess the relationship between children's physiological reactivity and parental bombing-related mental disorder. All models were adjusted for children's age and sex. The ordinary least squares method was used to estimate the effects of the covariates. The model assumptions of linearity, homoscedasticity, and normality were checked with the studentized residuals. Despite the relatively small sample size ($n = 21$), these assumptions did not appear to be violated. Type I error probability was set at 0.10. SAS version 9.3 (SAS Institute, Cary, NC) was used for data analysis.

3. Results

3.1. Demographics

Of 17 survivors, 9 (53%) were male and 8 (47%) were female. Their mean age at the time of the assessment was 47.9 years (standard deviation of 5.7 years) with a range between 38 and 57 years. Fifteen (88%) of the survivors were White, 1 (6%) was African American, and 1 (6%) was Asian American.

Of 21 children of survivors, 10 (48%) were adolescents under age 18 years of age (between 13 and 17 years) and 11 (52%) were young adults (between 18 and 25 years) at the

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