Posttraumatic Stress Disorder and General Psychopathology in Children and Adolescents Following a Wildfire Disaster

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Objective: To report on the use of the Post Traumatic Stress Disorder Reaction Index (PTSD-R1) and the Strengths and Difficulties Questionnaire (SDQ) in identifying children and adolescents who may require psychological interventions following exposure to a wildfire disaster.

Method: Six months after a wildfire disaster, we conducted a school-based program to screen for wildfire-related events, such as exposure to and perception of threat, posttraumatic stress disorder (PTSD), and general psychopathology.

Results: The screening battery was completed by 222 children (mean age 12.5 years, SD 2.48; range 8 to 18 years). Severe or very severe PTSD was reported by 9.0% of students, while 22.6% scored in the abnormal range on the Emotional Symptoms subscale of the SDQ. Younger children and individuals with greater exposure to and perception of threat experienced higher levels of PTSD and general psychopathology. Female students reported a greater perception of threat but did not report higher levels of PTSD or other symptoms.

Conclusions: Screening was well received by students, parents, and staff and proved feasible in the postdisaster environment. The PTSD-R1 and SDQ demonstrated different individual risk associations and functioned as complementary measures within the screening battery. The identification of children at greatest risk of mental health morbidity enabled service providers to selectively target limited mental health resources.

Information on funding and support and author affiliations appears at the end of the article.

Clinical Implications
- Postdisaster screening is useful in a selective intervention strategy.
- Postdisaster screening clarifies the breadth of postdisaster psychopathology.
- Postdisaster screening can identify children and adolescents at risk for a mental health morbidity.

Limitations
- This study used one informant source (parents) to identify general psychopathology.
- Future research should also measure functional impairment.
- There was no measure of predisaster resilience and vulnerability factors.

Key Words: children, adolescents, posttraumatic stress disorder, psychopathology, selective intervention
Most vegetation types and ecosystems are susceptible to wildfires. In recent times, devastating fires in many countries have established this disaster as a global phenomenon. Some studies have begun to clarify the child and adolescent mental health sequelae of exposure to wildfire disasters. McFarlane reported that 13% of children experienced dreams or nightmares about the wildfire 8 months after the event and that one-third of children experienced persistent preoccupation with wildfire themes 26 months after the event (1). McDermott and Palmer reported that 12% of children and adolescents experience significant emotional distress even 6 months after a wildfire disaster (2). In a second paper, they identified relations among age, sex, trait anxiety, wildfire-related factors such as exposure, and death perception (3).

The Australian Capital Territory (ACT) experienced devastating wildfires in 1926, 1939, and 1952. However, the fires culminating in widespread destruction of homes and property in Canberra’s suburbs on January 18, 2003, were the worst in recorded history. For the preceding week, wildfires had burned in remote ACT national parks but had not threatened suburban areas. These fires were extensive, located in rugged settings, and difficult for firefighters to access. From mid-January, the situation deteriorated, principally because of weather conditions typically associated with wildfire disasters: high temperatures, low humidity, strong winds, and wind shifts that were difficult to predict. While the fire destroyed houses in many Canberra suburbs, one particular suburb suffered the greatest devastation, with the loss of nearly every home in several streets. During the disaster, 4 people were killed, 530 houses were destroyed, and many more were damaged. Infrastructure, including some school buildings, was also destroyed. The estimated insurance loss was A$250 million.

The postdisaster screening reported in this study aimed to respond to a school community that had requested assistance with the identification of children and adolescents experiencing significant postdisaster mental health morbidity and with the implementation of early intervention strategies. The research objectives were 1) to investigate with greater clarity wildfire-related factors and their relation to posttraumatic stress disorder (PTSD) and 2) to compare child and adolescent reports of PTSD with parent reports of child and adolescent postdisaster general psychopathology.

Method

The school-based screening protocol was developed from previous screening experience (2,3). Screening took place 6 months after the wildfire disaster. Two practitioners aided by teachers supervised the students’ completion of the screening questionnaires. Both practitioners were experienced in child and adolescent mental health, one being a psychologist and the other a child psychiatrist. All forms and procedures were standardized and followed a research protocol; each practitioner and teacher undertook prescreening training in their use.

Participants

The study population comprised all children in Grades 4 to 12 attending a nondenominational private school in the Canberra wildfire disaster area. This school was considered “wildfire affected”: there was direct wildfire damage to school buildings; obvious damage to nearby structures; extensive areas of blackened, fire-affected land that children had to pass going to and from school; and the student body included pupils whose homes had been either damaged or destroyed by the wildfire. The screen attempted to include all children who, in the estimation of parents and teachers, had the auditory, English-language, and intellectual capacities to understand the screening questions when read aloud and to record answers by placing a tick on the scoring sheet. Students in Grades 8 to 12 were provided with a written version of the screening instrument. Informed consent was obtained for all participants. No potential participant was excluded for any reason, and only 5 children or their parents (2.2%) chose not to participate.

A total of 222 children and adolescents participated in the study. Female students comprised 54.9% of the sample. Participants varied in age from 8 to 18 years (mean age 12.50 years, SD 2.48) and were enrolled in Grades 4 to 12. The number of participants drawn from each grade varied from 12 (Grade 12) to 45 (Grade 5). For all analyses, we combined school grades to form 3 categories: primary school (Grades 4, 5, and 6), junior high (Grades 7, 8, and 9), and senior high (Grades 10, 11, and 12).

Measures

The Post Traumatic Stress Disorder Reaction Index (PTSD-RI; 4; Frederick and others, unpublished) is a 20-item measure of PTSD in children and adolescents. Items are worded to include the name or description of the traumatic event of interest, in this case, wildfires. Responses to all items are recorded on 5-point Likert scales ranging from 0 (“none of the time”) to 4 (“most of the time”). Individual item scores are summed to obtain the total PTSD-RI score, which allows classification of individuals into doubtful, mild, moderate, severe, and very severe PTSD categories. For research purposes, the PTSD-RI possesses satisfactory internal consistency (5.6) and concurrent validity (4.7.8). The discriminant validity of the measure has also been confirmed (9).

The Strengths and Difficulties Questionnaire (SDQ; 10.11) is a brief screening questionnaire for child and adolescent psychopathology. There are parent, teacher, and self-report versions; we employed the parent-report version in this study. The SDQ comprises 25 questions on psychological attributes, divided into five 5-item symptom subscales: Emotional
Symptoms, Conduct Problems, Hyperactivity Inattention, Peer Relationships, and Prosocial Behaviour. Responses to the first 4 subscales are combined to create a total difficulties score. The SDQ total and subscale scores can be classified as normal, borderline, and abnormal. Published “caseness” definitions state that approximately 10% of scores from a child and adolescent community sample should be in the abnormal band and that a further 10% should be in the borderline band for the total and each of the subscale categories (see www.sdqinfo.com). The SDQ possesses good convergent (10.12) and discriminant (12.13) validity. The instrument’s factor structure has been confirmed by its author (11) and by independent analysis of a Swedish parent version (14). The SDQ is reported to have identified psychiatric diagnoses with a specificity of 94.6% and sensitivity of 63.3% and to possess adequate internal consistency for research use (15).

Tests of the internal reliability of the PTSD-R1, using results for the total sample (α = 0.91) and for each school grade category (primary school α = 0.91, junior high α = 0.88, and senior high α = 0.89), produced Cronbach’s alpha’s above the rigorous 0.80 criteria of Carmine and Zeller (16), signifying that this measure is suitable for research with this sample. Results of similar reliability tests conducted on the SDQ are more difficult to interpret. The SDQ total score proved to be reliable across the total sample (α = 0.84) and for each school grade category (primary school α = 0.86, junior high α = 0.78, and senior high α = 0.82). The Emotional Symptoms, Conduct Problems, Hyperactivity Inattention, and Prosocial Behaviour subscales were found to be moderately reliable across the total sample (α = 0.79, α = 0.70, α = 0.82, α = 0.76 respectively), as well as for each grade. However, the Peer Relationships subscale proved to have poor reliability across the total sample (α = 0.54) and, for each grade, obtained Cronbach’s alphas ranging from 0.62 to 0.20. This subscale, employed with this sample, appears to be unreliable, and results based on it should therefore be viewed with caution.

Statistical Analysis
We analyzed age, total PTSD-R1 score, total SDQ score, and SDQ subscale scores as continuous variables. We also converted PTSD-R1 scores into “case” categories and analyzed them as ordinal data. We analyzed all other variables, including sex, as binary covariates. Analysis included bivariate statistical tests such as chi-square for 2-categorical variables and t tests when one variable was binary and the other continuous.

Results
Children and Adolescents’ Wildfire Experiences and Perceptions
Most students were close enough to the wildfire to see flames (60.2%); slightly more saw smoke near their home (69.5%). Significantly more male (80.8%) than female (60.2%) students reported seeing smoke ($X^2_{1,21} = 8.46, P < 0.01$). Few students (9.5%) stated that they were alone at home on the day of the wildfire. A minority of students’ homes were damaged (10.9%); fewer (8.4%) reported having to live elsewhere during the aftermath of the wildfire. Some students (11.1%) felt that they were in danger of dying during the wildfire. Many more (28.5%) were concerned that a family member might have died. Significantly more female (15.8%) than male students (5.3%) reported thinking that they were going to die during the wildfires ($X^2_{1,21} = 5.85, P < 0.05$). Similarly, significantly more female (35.0%) than male students (21.3%) reported thinking that a family member might die during the wildfires ($X^2_{1,21} = 4.81, P < 0.05$).

Postdisaster PTSD Symptoms
The mean PTSD-R1 score for the total sample was 16.36, SD 13.64. Applying the published cut-off scores for the PTSD-R1 classified 100 (50.2%) students with doubtful PTSD, 57 (28.6%) with mild PTSD, 24 (12.1%) with moderate PTSD, 15 (7.5%) with severe PTSD, and 3 (1.5%) with very severe PTSD. There was no statistically significant difference in PTSD-R1 scores between male students (mean 15.48, SD 13.04) and female students (mean 17.39, SD 14.14; $t_{144} = 0.91, n.s.$). There was a significant negative correlation between age and PTSD-R1 scores ($r_{144} = 0.32, P < 0.001$).

Mean PTSD-R1 scores differed significantly by grade ($F_{3,140} = 7.28, P < 0.001$). Scheffé post hoc analyses identified significant differences between the primary group (mean 19.69, SD 14.77) and both the junior (mean 13.87, SD 11.17; $P < 0.05$) and senior high (mean 11.26, SD 11.61; $P < 0.05$) groups. No significant difference was detected between the 2 high school groups.

Postdisaster PTSD Symptoms and Wildfire-Related Factors
Table 1 compares mean PTSD-R1 scores across groups who did or did not experience each of the wildfire-related events listed on the screening instrument. Statistically significant differences in mean PTSD-R1 scores were detected between groups for several events. PTSD-R1 scores were also positively correlated with a single-item, 10-point Likert scale measure of how frightening the day of the wildfires had been ($r_{146} = 0.42, P < 0.001$).

Postdisaster Parent Report of Children’s General Psychopathology Symptoms
Among the 3 school grade categories, parents’ reports showed no statistically significant differences in general psychopathology scores or psychopathology subscale scores, as measured by the SDQ. For the total sample, there were no sex differences either in total SDQ scores or in Emotional Symptoms, Conduct Problems, or Peer Relationships subscale scores. Boys (mean $3.38, SD 2.71$) scored significantly higher
Table 1: Wildfire-related factors and PTSD-RI

<table>
<thead>
<tr>
<th>Wildfire experience</th>
<th>Yes* Mean (SD)</th>
<th>No* Mean (SD)</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thought self might die</td>
<td>32.85 (15.66)</td>
<td>14.52 (12.12)</td>
<td>6.21***</td>
<td>197</td>
</tr>
<tr>
<td>Thought family member might</td>
<td>25.27 (14.91)</td>
<td>12.80 (11.32)</td>
<td>5.60***</td>
<td>79</td>
</tr>
<tr>
<td>Close to flames</td>
<td>22.28 (17.89)</td>
<td>15.42 (12.53)</td>
<td>2.34*</td>
<td>82</td>
</tr>
<tr>
<td>Home alone</td>
<td>24.47 (15.69)</td>
<td>15.88 (13.89)</td>
<td>2.24*</td>
<td>151</td>
</tr>
<tr>
<td>Saw flames</td>
<td>18.52 (16.08)</td>
<td>14.02 (10.59)</td>
<td>2.08*</td>
<td>151</td>
</tr>
<tr>
<td>Home damage</td>
<td>20.50 (15.49)</td>
<td>15.80 (13.43)</td>
<td>1.51</td>
<td>193</td>
</tr>
<tr>
<td>Saw smoke</td>
<td>17.96 (14.46)</td>
<td>14.06 (12.75)</td>
<td>1.63</td>
<td>157</td>
</tr>
<tr>
<td>Live elsewhere</td>
<td>16.67 (12.82)</td>
<td>16.40 (13.81)</td>
<td>0.80</td>
<td>195</td>
</tr>
</tbody>
</table>

*P < 0.05, ***P < 0.001.
PTSD-RI = Posttraumatic Stress Disorder Reaction Index.
Yes = subject reported the specific wildfire experiences; No = subject did not report the specific wildfire experience.

on the Hyperactivity subscale than girls (mean 1.92, SD 1.99; t120 = 3.88, P < 0.001). The sex differences were most marked in the upper grades. Senior high boys (mean 4.55, SD 3.04) scored significantly higher than senior high girls (mean 1.46, SD 1.76; t62 = 2.96, P < 0.01), a pattern repeated for junior high boys (mean 3.04, SD 1.95) and girls (mean 1.53, SD 1.54; t62 = 2.82, P < 0.01). There was no sex difference in Hyperactivity subscale scores among primary students (t60 = 1.96, ns). However, primary school boys (mean 1.90, SD 2.04) did score significantly higher than primary school girls (mean 1.16, SD 1.53) on the Conduct Problems subscale (t62 = 2.04, P < 0.05).

Table 2 summarizes the abnormal case status for the primary school, junior high, and senior high groups, as well as for the total sample. Almost 1 in 4 of the total sample scored in the abnormal range of the Emotional Symptoms subscale. However, a smaller proportion than would be expected from a community sample scored in the abnormal category for the SDQ total score. There is considerable between-grades variability in the percentage of students scoring in the abnormal category on the SDQ Emotional Symptoms subscale. The percentage of primary school children scoring in the abnormal range of the Emotional Symptoms subscale is more than twice that of the senior high group.

Parent Report of Child General Psychopathology and Wildfire-Related Experiences

Table 3 displays the mean SDQ scores for the groups who had and had not experienced different aspects of the wildfire. We detected several between-group differences, as indicated. A weak correlation was observed between PTSD-RI scores and SDQ total scores (r120 = 0.22, P < 0.01).

**Discussion**

Natural disasters are frequent events, and global warming may lead to more frequent wildfire disasters. Research across a range of disaster types has identified adverse child and adolescent psychopathological responses suggesting that postdisaster psychological interventions are appropriate. Unfortunately, the postdisaster environment (which affects infrastructure and milieu) makes it difficult to provide mental health services: service providers already working at full capacity have limited ability to take on large numbers of distressed children at short notice.

We studied a proactive school-based screening program for psychopathology that was undertaken following a devastating Australian wildfire and followed up with a selective preventive intervention program. The screening program, which was implemented 6 months after the wildfire disaster, found that 12.1% of children and adolescents self-reported symptoms consistent with moderate PTSD and that 9% reported symptoms consistent with severe to very severe PTSD.

The screening program identified several trends that are important for the identification of those children and adolescents most likely to suffer negative sequelae following a wildfire disaster. First, the results show an evident trend that individuals who were exposed to certain aspects of the wildfire or who reported feeling specific threats also experience higher levels of PTSD and emotional problems at follow-up. With respect to PTSD, students who thought that they or a family member might die, who were within 50 m of the flames, who saw flames, or who were home alone reported higher PTSD-RI scores. PTSD-RI scores were also positively correlated with the subjective measure of how frightening the
Table 2 Percentage of the sample scoring in the abnormal case range by grade

<table>
<thead>
<tr>
<th>SDQ subscale</th>
<th>Primary %</th>
<th>Junior %</th>
<th>Senior %</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional Symptoms</td>
<td>27.7</td>
<td>17.0</td>
<td>13.0</td>
<td>22.6</td>
</tr>
<tr>
<td>Conduct Problems</td>
<td>9.2</td>
<td>14.6</td>
<td>4.2</td>
<td>10.0</td>
</tr>
<tr>
<td>Hyperactivity—Inattention</td>
<td>12.6</td>
<td>0.0</td>
<td>12.5</td>
<td>9.0</td>
</tr>
<tr>
<td>Peer Relationships</td>
<td>10.4</td>
<td>6.4</td>
<td>8.3</td>
<td>9.0</td>
</tr>
<tr>
<td>Prosocial Behaviour</td>
<td>3.1</td>
<td>8.3</td>
<td>4.3</td>
<td>4.8</td>
</tr>
<tr>
<td>SDQ Total</td>
<td>7.8</td>
<td>4.3</td>
<td>8.7</td>
<td>6.9</td>
</tr>
</tbody>
</table>

SDQ = Strength and Difficulties Questionnaire.

The day of the wildfires had been. Similarly, those who saw smoke, who thought that they or a family member might die, whose homes were damaged in the fire, or who had to live elsewhere following the fire scored higher on components of the SDQ, most notably on the Emotional Problems subscale. Clearly, proximity and perceived threat are factors that affect stress and emotional well-being in child and adolescent wildfire victims.

A second factor was related to age. Primary school students recorded higher PTSD-R1 scores than their high school counterparts. Similarly, more primary school than high school students attained abnormal case status on the Emotional Problems subscale of the SDQ. This pattern of results indicates that younger children are more likely to suffer PTSD and emotional problems following exposure to a wildfire disaster.

A third factor was related to sex. More female than male students reported thinking that they were going to die or that a family member might die during the wildfire. While male students scored higher on the SDQ Hyperactivity and Conduct Problems subscales, there is no evidence to suggest that this was necessarily related to experience of the wildfire. There were no sex differences in terms of PTSD-R1 scores or overall SDQ scores. Essentially, these results suggest that, while female children and teens may experience greater levels of fear regarding their own safety and that of their family members, this does not lead to greater psychopathology among them after a wildfire disaster.

These findings used an instrument designed to be consistent with DSM-IV criteria for PTSD and to replicate the results of previous research (2,3). Specifically, they confirm the degree of postdisaster PTSD in children and adolescents and that younger children, those at home alone during the wildfire disaster, those whose homes were damaged, and those who perceived a threat to their life or to the lives of family members reported more PTSD symptoms. New findings indicate that, the closer children and adolescents were to the actual flames, the more PTSD symptoms they are likely to report. The present study also confirmed the value, as a measure of disaster impact, of asking children to score on a simple 10-item Likert scale how frightened they felt during the wildfires.

The results obtained in this study confirm the applicability and relevance of the PTSD-R1 and, to a lesser extent, the SDQ in postdisaster screening of children and adolescents. The PTSD-R1 identified students suffering PTSD symptoms following exposure to the wildfire disaster, while the SDQ Emotional Problems subscale identified students who suffered emotional sequelae. Consistent with the published community norms for the SDQ, approximately 10% of students scored in the abnormal range on the Hyperactivity, Conduct Problems, and Peer Relationships subscales. However, more than 20% of students scored in the abnormal range on the Emotional Problems subscale. The weak correlation between the PTSD-R1 and the SDQ indicates that the SDQ is not on its own a suitable measure for identifying trauma-related symptoms and should not be used in isolation to identify postdisaster trauma in children and adolescents. The difference in results obtained for internalizing symptoms with the self-report PTSD-R1 and the parent-report SDQ confirms previous findings showing low correlations for this domain across children and parents (17).

It is likely that the elevated SDQ total and Emotional Problems subscale scores identify wildfire-related negative emotions. Such emotions may include feelings of loss and grief arising from a child’s experience of home damage or destruction, separation from parents, and concerns that they or a family member might die. This is consistent with reports that depressive symptoms are a common feature of child and adolescent postdisaster psychopathology (2,3). The scores are also
consistent with the contention that diagnosis alone is not a sufficient indicator for mental health treatment (18). Further research should clarify the relations among postdisaster functional impairment and PTSD, depressive symptoms, and general psychopathology.

These results suggest several implications for postwildfire interventions. Individuals who experienced critical elements of the wildfire, who found the wildfire most frightening, or who feared most for their safety or the safety of family members are most likely to require postdisaster interventions for PTSD and emotional problems. Younger children, particularly those of primary school age, are also more likely to require such assistance.

This study has several limitations. Some children did not participate, and it is impossible to know whether this cohort possessed or demonstrated higher levels of psychopathology or dysfunction than the participants. Further, without a confirmatory assessment procedure, it is not possible to determine the level of false-positives associated with this screening procedure. Employing a gold standard semi-structured interview is a research challenge, given the postdisaster environment and the large number of potentially traumatized children. Future research should also incorporate tests of the concurrent, divergent, and predictive validity of the PTSD-R1 when used as a screening instrument with school age populations.

This study demonstrates that screening for PTSD and general psychopathology in children and adolescents who witness a disaster is feasible and facilitates the selective targeting of limited mental health intervention resources to those most in need. Administration of the PTSD-R1 to children and adolescents successfully identifies those experiencing postdisaster PTSD. While administration of the SDQ does not assist in identifying PTSD symptoms, the SDQ total score and Emotional Problems subscale may identify children with postdisaster non-PTSD anxiety and depressive symptoms. This client profile, with or without further information from PTSD or general psychopathology screening, will assist service providers to make evidence-based decisions about postdisaster service provision to children and adolescents.

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References
Récupération : Le syndrome de stress post-traumatique et la psychopahologie générale chez les enfants et les adolescents après un feu de forêt

Objectif : Commenter l’utilisation de l’indice de réaction du syndrome de stress post-traumatique (PTSD-R1) et du questionnaire des forces et difficultés (SDQ) pour identifier les enfants et les adolescents qui pourraient avoir besoin d’interventions psychologiques, par suite d’un feu de forêt catastrophe.

Méthode : Six mois après un feu de forêt, nous avons mené un programme scolaire pour dépister les suites d’un feu de forêt, comme l’exposition à une menace ou la perception de celle-ci, un syndrome de stress post-traumatique (SSPT) et une psychopathologie générale.

Résultats : Les tests de dépistage ont été remplis par 222 enfants (âge moyen 12,5 ans ET 2,48 ; de 8 à 18 ans). Un SSPT grave ou très grave a été déclaré par 9,0 % des élèves, tandis que 22,6 % ont eu des scores dans le segment anormal de la sous-échelle des symptômes émotionnels du SDQ. Les enfants plus jeunes et les personnes ayant été plus exposées à la menace ou l’ayant davantage perçue avaient des niveaux plus élevés de SSPT et de psychopathologie générale. Les élèves de sexe féminin déclaraient une perception accrue de menace mais ne déclaraient pas des niveaux plus élevés de SSPT ou d’autres symptômes.

Conclusions : Le dépistage a bien été reçu par les élèves, les parents et le personnel, et s’est avéré faisable dans un milieu de post-catastrophe. Le PTSD RI et le SDQ ont démontré différentes associations de risque individuel et fonctionnait comme des mesures complémentaires au sein de la batterie de dépistage. L’identification des enfants à risque accru de maladie mentale a permis aux fournisseurs de services de cibler de manière sélective les ressources limitées de santé mentale.