

## Quick Response Report #132

# Effects of Wildfire on Adolescents in Volusia County Florida

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[Return to the Hazards Center Home Page](#)

[Return to the Quick Response Report Index](#)

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## INTRODUCTION

Recent studies of children and adolescents who had experienced a residential, industrial, or wildfire have suggested a causal link between fire disaster and Post-Traumatic Stress Disorder (PTSD) related psychological distress (Greenberg, 1994; Greenberg and Keane, 1997; Jones, Ribbe, and Cunningham, 1994; March, Amaya-Jackson, Terry, and Costanzo, 1997). The devastating consequences of fires and burns rank sixth among major causes of injury and death among infants to 19 year olds (Division of Injury Control, Center for Environmental Health and

Injury Control, Centers for Disease Control, 1990). Greenberg (1994) found that children as well as adults experienced distress and fear of recurrence after a fire. Once established, PTSD in children may be chronic and often debilitating (Green, Lindy, Grace, and Leonard, 1992; Nader, Pynoos, Fairbanks, and Frederick, 1990).

Not everyone, however, is equally affected by the stress of experiencing such an event, and understanding various risk and protective factors has become an important research issue. Exposure and loss are considered to be primary factors in the emergence of post-traumatic symptomatology in most disaster-response models (i.e., Freedy, Resnick, and Kilpatrick, 1992; March et al., 1997; Vernberg et al., 1996). Individual characteristics have also emerged as important moderators to consider (Shannon, Lonigan, Finch, and Taylor, 1991; Lonigan, Shannon, Finch, Daugherty, and Taylor, 1994). Given that coping efforts play important roles in the onset and maintenance of a wide range of psychological distress and psychopathology during childhood and adolescence (Compas, Orosan, and Grant, 1993), coping strategies are another likely source of youth's differential vulnerability to the effects of disaster. Research, however, has been negligent with respect to the inclusion of children's coping as a factor in disaster response. Studying the effect of coping efficacy and coping strategy as predictors of outcome after exposure to disaster may help to identify those children and adolescents who are most likely to experience post-traumatic distress symptoms (Green and Solomon, 1995). These variables may go a long way in clarifying the relationships between previously delineated explanatory factors and outcome symptomatology.

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## THE RESEARCH QUESTIONS

Thus, the central purposes of the current study were to a) test the overall explanatory power of the variables in a theoretically based hierarchical regression analysis for the current sample and b) to assess the direction and unique contribution of individual variables to variance accounted for in PTSD symptoms.

### *HYPOTHESES*

At the outset of this study, it was expected that:

1. The proposed variables would account for a significant amount of the variance in PTSD symptoms.
  2. Each set of variables would add a significant amount to the variance over and above that which was accounted for by previous steps, wherein higher levels of exposure, lower coping efficacy, and higher levels of reported coping strategies will be associated with higher PTSD symptomatology.
  3. In longitudinal analyses, coping strategies will have differential effects on outcome; that is, active, distraction, and support seeking coping will be negatively related to PTSD, while avoidant coping strategies will be positively related to PTSD.
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# THE WILDFIRES

During the summer of 1998, Florida witnessed its worst forest fires in recorded history. The flames raged through northern and central Florida starting on Memorial Day, 1998, and lasted through most of the summer. The fires made national headlines and involved nearly 10,000 fire fighters from multiple states. An estimated \$300 million worth of property damage, \$275 million worth of commercial timber, and \$135 million worth of crops were reportedly lost as a result of the fires. The most detrimental loss to individual Florida residents was evidenced by the nearly 400 homes that were destroyed in Volusia and its neighboring counties. Many residents of Volusia County were evacuated on more than one occasion during the blazes.

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## THE METHODOLOGY EMPLOYED

### *PARTICIPANTS*

Participants were 9<sup>th</sup> graders recruited from the Volusia County Public High School, which was severely affected by the wildfires. Permission was granted from the school board of the Volusia County School District. Subsequently, permission for participation was obtained from the principal of Mainland High School. Consent forms, accompanied by a letter from the principal, were sent home with 585 9<sup>th</sup> grade high school students. Two hundred and fifty three (43%) of these students participated in the first wave of data collection in November, 1998, approximately 3.5 months after the wildfires. Two hundred and six (81% of the original sample) participated in the second wave of data collection, approximately six months after the first wave and 10 months after the 1998 wildfires.

Of the 206 students included in the current analyses, 60% were female and 40% male, with a mean age of 14 years 5 months (range 13 years 11 months to 16 years 0 months). Additionally, representative numbers of students from ethnic backgrounds represented in the county were included: approximately 60% were Caucasian, 30% African-American, 4% Hispanic, 3% Asian, and 3% biracial. In terms of socioeconomic status, as measured by parental occupation, the sample included 19% unskilled, 44% paraprofessional, 30% professional, and 7% unreported.

### *PROCEDURES*

The measures were administered at the high school by the author and advanced undergraduate research assistants with prior training in the study procedures. Data collection occurred in the school's auditorium. The students arrived at the auditorium during their 9<sup>th</sup> grade English class period and were scattered throughout the auditorium in small groups, seated every other seat and every other row. Prior to commencing, each child was handed and read an assent form. The measures were self-administered following an announcement of instructions over a microphone. There was one researcher for each group of 10-15 adolescents available to answer questions and proctor the administration. All materials were checked by a researcher before a student was

given a pass to return to class, in order to reduce missing data. All measures were completed within approximately 50 minutes.

## ***MEASURES***

The measures included: Fire-Related Traumatic Experiences (FRTE; Jones and Ollendick, 1996), Resource Loss Scale for Children (RLSC; Jones and Ollendick, 1994; modified for children from the Resources Questionnaire by Freedy, Shaw, Jarrell, and Masters, 1992), Child Coping Efficacy Scale (CCES; New Beginnings Codebook, 1992), Fire Aftermath Coping Efficacy Measure (FACEM; Langley and Jones, 1999), How I Coped Under Pressure Scale (HICUPS; Ayers, Sandler, West, and Roosa, 1994), Posttraumatic Stress Disorder Reaction Index for Adolescents (RI; Frederick, Pynoos, and Nader, 1992).

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## **FINDINGS**

### ***DESCRIPTIVE STATISTICS***

*Exposure and Loss.* When the wildfires were occurring, approximately 72% of participants were in their home, 15% were in a home in the same vicinity (i.e., visiting a friend or relative), and 13% were out of town. In terms of proximity and exposure to the fire, 70% of the participants saw the fire, 96% smelled the smoke, and 22% felt the fire, yet only 26% reported being somewhat close (21%) or very close (5%) to the fire, while 73% reported being at a safe distance. In terms of exposure to traumatic events, 63% of the sample reported 0 events, 31% reported 1 event, 4% reported 2 events, and the remaining 2% reported 3-7 events. The most frequently reported life-threatening events, endorsed by approximately 15-20% of the adolescents, were "thinking he/she might die" and "seeing someone else get hurt."

In terms of loss events, 72% reported 0 events, 22% reported 1 event, 3% reported 2 events, and the remaining 3% reported 3-10 events. The most frequently reported loss-disruption event, endorsed by 16% of the participating adolescents, was "having to live away from his/her parents for more than one day."

In terms of resource loss (which includes object as well as personal-social loss), the most frequently reported personal-social resource losses due to the wildfires were: "time to do normal everyday activities" (42%), "time to hang out with friends," "free time," "time for enough sleep" (35% each), and "a feeling that life is calm and peaceful" (30%). However, in terms of objective resource loss, the percentages were much lower: "furniture" (7%), "fun things" (9%), "personal things" (6%), "clothing" (8%), "a pet" (7%), "something else important to them" (8%).

*Coping Efficacy.* In response to the three questions on the CCES - "In the future, how good do you think you will be at handling your problems?"; "Overall, how good do you think you will be at MAKING THINGS BETTER when problems come up in the future?"; and, "Overall, how good do you think you will be at handling your FEELINGS when problems come up in the

future?" - mean scores indicated an average response of "pretty good" (a 3 on the 1-4 scale where 1=not at all good and 4=very good).

For fire-related coping efficacy, mean responses indicated that on a scale of 1-7 (1 being able to cope "not very well at all" and 7 being able to cope "very well") on average participants responded between "not too well" and "pretty well" at about the center of the scale (3.88). The lowest score indicated that participants would cope "not too well" with losing a pet, while the highest score indicated that participants would cope between "pretty well" and "very well" with having to get new neighbors.

*Coping.* Participating adolescents reported using distraction coping strategies most frequently, followed by avoidance coping, active coping, and support coping. The mean score for distraction fell between "a little" and "somewhat" points on the 4-point HICUPS scale, and the mean for avoidance and active coping at "a little." In contrast, the mean for support coping fell between "not at all" and "a little."

*Psychological Distress.* Using criteria for total PTSD symptom severity on the RI described earlier (Frederick et al., 1992), approximately 57% of the participants reported "doubtful" levels, 31% "mild," 10% "moderate," and 2% "severe." There were no reported scores in the "very severe" range. Overall, the mean level of PTSD symptoms was in the mild range. [Note: First wave (Time 1) PTSD symptoms indicated 33% doubtful, 54% mild, 11% moderate, 2% severe, and .5% very severe.]

## ***REGRESSION ANALYSES***

Hierarchical regression analyses were run using the Statistical Package for Social Sciences, version 8 (SPSS 8.0). Three such analyses were run. The first examined the relationship between demographic variables, exposure/loss, coping efficacy, coping strategy, and PTSD assessed at Time 1 (T1-T1); the second, demographics, exposure/loss, coping efficacy, and coping strategy, at Time 1, and PTSD assessed at Time 2 (T1-T2; longitudinal model originally proposed); and the third, demographics and exposure/loss, and coping efficacy, coping strategy, and PTSD at Time 2 (T2-T2). Zero-order correlations among all variables entered into the regression analyses are presented in [Tables 2](#), [3](#), and [4](#), respectively.

### *Time 1-Time 1 Regression Results*

Using all four sets in the conceptual model, as presented in [Table 5](#), approximately 51% of the variance in total PTSD symptoms was explained. The demographic variables did not account for a statistically significant amount of the variance in PTSD symptoms ( $R^2=.027$ ;  $F(4,169)=1.17$ ,  $p=.32$ ). The exposure/loss variables, entered as a set in the second step, accounted for a significant 31% of the variance ( $R^2$  change = .312;  $F(3,166)=26.083$ ,  $p<.01$ ) with increasing exposure/loss associated with higher PTSD scores. Adolescents' reported coping efficacy was entered as the third step, accounting for an additional statistically significant 6% of the variance in PTSD symptoms ( $R^2=.059$ ;  $F(2,164)=8.002$ ,  $p<.01$ ), with lower levels of coping efficacy associated with higher PTSD scores. Finally, adolescents' coping (active, avoidant, distraction, and support) was entered as a set on the final step, accounting for approximately 12% of the

additional variance in PTSD total symptoms ( $R^2 = .115$ ;  $F(4,160)=9.435$ ,  $p<.01$ ), with greater reported coping strategies associated with higher PTSD scores. Follow-up analyses revealed that active ( $t=2.339$ ;  $p=.02$ ) and avoidant ( $t=2.559$ ,  $p<.01$ ) coping strategies each accounted uniquely for a small but statistically significant amount (2% each) of the variance.

### *Time 1-Time 2 Regression Results*

Using all four sets in the conceptual model, 48% of the variance in total PTSD symptoms was explained. As shown in [Table 6](#), the demographic variables entered as the first set, accounted for a statistically significant 5% of the variance in PTSD symptoms ( $R^2 = .053$ ;  $F(4,172)=2.395$ ,  $p=.05$ ). Follow-up analyses indicated a statistically significant unique effect for ethnicity (unique  $R^2$  change=.04), with African American adolescents reporting more overall PTSD symptoms than Caucasian adolescents ( $t=2.60$ ,  $p=.01$ ). The exposure/loss variables, entered as a set in the second step, significantly accounted for an additional 33% of the variance ( $R^2$  change=.325;  $F(3,169)=29.421$ ,  $p<.01$ ) with increasing exposure/loss associated with higher PTSD scores. Adolescents' reported coping efficacy at Time 1, entered as the third step, did not account for a statistically significant amount of the additional variance in Time 2 PTSD symptoms ( $R^2=.019$ ;  $F(2,167)$ ,  $p=.071$ ). However, follow-up analyses indicated a small, but statistically significant unique effect of Fire-related Coping Efficacy ( $t=2.19$ ,  $p=.04$ ). Finally, adolescents' coping (active, avoidant, distraction, and support) was entered as a set on the final step, accounting for approximately 8% of the additional variance in PTSD total symptoms ( $R^2=.083$ ;  $F(4,163)=6.511$ ,  $p<.001$ ), with greater coping efforts associated with higher PTSD scores. Avoidant coping emerged with the only significant unique contribution ( $t=2.27$ ,  $p=.03$ ).

### *Time 2-Time 2 Regression Results*

As depicted in [Table 7](#), using all four sets in the conceptual model, approximately 61% of the variance in total PTSD symptoms at Time 2 was explained. Similar to the Time 1 cross-sectional analysis, the demographic variables entered as the first set did not account for a statistically significant amount of the variance in PTSD symptoms ( $R^2 = .046$ ;  $F(4,178)=2.162$ ,  $p=.07$ ). However, similar to the T1-T2 longitudinal regression, follow-up analyses indicated a statistically significant unique effect (unique  $R^2$  change=.03) for ethnicity, with African American adolescents reporting more overall PTSD symptoms than Caucasian adolescents ( $t=2.16$ ,  $p<.01$ ). The exposure/loss variables, entered as a set in the second step, significantly accounted for an additional 32% of the variance ( $R^2$  change=.320;  $F(3,175)=29.479$ ,  $p<.01$ ), with higher exposure/loss scores associated with greater PTSD scores. Adolescents' reported coping efficacy at Time 2, entered as the third step, accounted for a statistically significant 8% of the additional variance in Time 2 PTSD symptoms ( $R^2=.078$ ;  $F(2,173)$ ,  $p<.01$ ) with an inverse relationship between coping efficacy and PTSD scores. Finally, adolescents' coping (active, avoidant, distraction, and support) was entered as a set on the final step, accounting for approximately 16% of the additional variance in PTSD total symptoms ( $R^2=.162$ ;  $F(4,169)=17.324$ ,  $p<.01$ ), with greater reported coping scores associated with higher scores on the PTSD Reaction Index. However, most of this effect was due to the unique contribution (4% of the variance) of avoidant coping strategies ( $t=4.266$ ,  $p<.01$ ).

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## DISCUSSION

The current study revealed several important findings. Regression analyses, both cross-sectional and longitudinal, indicated that the overall model explained a significant amount of the variance in PTSD symptomatology, with exposure/loss, coping efficacy, and coping strategy each adding a significant portion to the variance captured. Additionally, the ability to examine each of these variables over time provided some information that has rarely been available in this line of research.

Descriptively, it is interesting to note changes and consistencies apparent over time. For example, the means for coping efficacy and coping strategy remained consistent from Time 1 to Time 2. Distraction coping strategies were the most frequently reported, followed by avoidant and active strategies, with support coping being the least reported strategy. Average coping efficacy scores also remained consistent and high across assessment waves. The prevalence of PTSD symptomatology, however, demonstrated a change across time. That is, from three months to 10 months after the fire, many adolescents in the current sample (approximately 20%) moved from the mild level of post traumatic distress to the doubtful level. During the same period, however, the same percentage of adolescents scoring in the moderate and severe range of post traumatic distress three months post-fires remained at those levels 10 months after the wildfires occurred. This suggests that those youth who are most affected initially, continue to show prolonged effects and may not recover either spontaneously or as rapidly as those with milder initial symptoms of distress.

Overall, the regression analyses supported the utility of the proposed variables for explaining children's reactions over the 10 months following a wildfire. The current investigation, then, represents a further step toward including factors that may be essential for understanding adolescent's differential reactions after such disasters as wildfires. Moreover, the current analyses provide information about the role of these variables in possible changes in PTSD symptomatology over time.

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[Return to Top](#)

[Return to the Hazards Center Home Page](#)

[Return to the Quick Response Report Index](#)

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