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# VARIABLES AFFECTING DUTY-RELATED STRESS AFTER AN AIR CRASH DISASTER

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Abstract

This exploratory study examined variables that may contribute to the stress of emergency workers following a disaster. Data were obtained from field interviews with disaster workers, standard paper-and-pencil tests of stress, and an experimental questionnaire designed to evaluate subjects for symptoms of post-traumatic stress disorder.

The study found a wide range of stress responses for the 13 body recovery workers who were evaluated following a midair collision of aircraft over the Grand Canyon. The tragedy killed and badly burned all 25 persons aboard the two aircraft. One worker was extremely stressed, 3 experienced moderate stress, and 9 showed little or no stress. Unique hazards of exposure to this disaster, plus personal knowledge of victims, were identified as causes of worker stress. Variables that mitigate stress levels in workers were habituation to the body recovery work, a positive attitude about body recovery, and a personal philosophy about death. It appears inevitable that disaster workers will be exposed to the conditions that cause stress. In this particular incident, however, the conditions that caused the most stress could have been avoided by greater sensitivity on the part of supervisors to the psychological aspects of disaster work.

Emergency workers and public safety personnel have been identified as an at-risk population for psychological stress and its consequences following disasters (Hartsough & Myers, 1985). Disaster personnel who may be overlooked in mental health recovery efforts include police, fire-fighters, emergency medical personnel, morgue workers, rescue personnel, military personnel used as body recovery workers, and the like. Taylor and Frazer (1982) surveyed 180 members of a body recovery mission following a DC-10 crash on Mount Erebus in Antarctica. They found 81% reported sleep disturbances, 76% reported changes in appetite, and 49% noted changes in their own feelings. In spite of these admitted changes in their emotional and psychological status, only about 1 in 10 of these workers reported at follow-up that they had sought help in response to the incident. In brief, it is not unusual for emergency workers to resist the acknowledgement of psychological symptoms following disasters (Jones, 1985). The reluctance to perceive psychological problems is commonly attributed to a "mocho" worker image, but the more parsomonious explanation is that most workers do not develop severe stress after most disasters, even including events with significant levels of death and distruction. The research question of this study is how many workers do become stressed, and what variables bring this about?

The problem of worker stress has been recognized by mental health professionals and social scientists, and procedures have been developed for its mitigation (Mitchell, 1985) and prevention (Dunning, 1985). For example, Mitchell (1983) has proposed a technique for providing stress debriefings following a critical incident. There are, however, no empirically based guidelines for identifying which of the many hundreds of incidents that involve emergency workers and public safety personnel are critical incidents in terms of causing severe psychological stress. At present, supervisors and incident commanders in disaster relief and rescue organizations must resort to their own

experience and judgment in order to determine whether an incident is critical and whether stress debriefing may be necessary. This study examined worker responses to a body recovery incident in an effort to identify two types of variables: (a) ones that cause worker stress; (b) ones that prevent or mitigate worker stress.

The framework for this investigation was Hartsough's (1985) observation of 3 major sources of stress for disaster workers: emergency occupations, the events and hazards that confront workers in disasters, and the organizational and social context of the work they do. Also guiding this work was the observation of Kling, (1988) that civilian and worker survivors of a disaster are affected somewhat differently. Workers may experience greater or longer exposure to hazards and at times face more danger than civilians, but are also better prepared because of their skills and experience.

## Methods

The intent of the study was to provide differing perspectives on the sources of disaster worker stress. For purposes of this study, an event was identified that was likely (in the judgment of the investigator) to be stressful for some, but not all, of the workers involved. Participants were interviewed individually and also completed paper-and-pencil measures of psychological stress.

The event. The midair collision of a DeHaviland Twin Otter airplane and a Bell Jet Ranger helicopter occurred over the Grand Canyon on June 18, 1986. Both aircraft carried sightseers - all 22 passengers and 3 pilots were killed instantly. It was the worst aircraft disaster in the Grand Canyon in 30 years. There were no witnesses to the disaster, which was reported by a fire tower lookout and a local air tour operator. By the time the National Park Service arrived at the scene, both aircraft were fully involved in flames. The tragedy

took place 12 miles west of Grand Canyon Village in a rugged, remote area of the park. The wreckage was scattered over a 1/2 mile area on the Tonto Plateau at an elevation of approximately 4200 feet, about 2000 feet above the Colorado River and 4000 feet below the rim. It appeared to observers that both aircraft had burst into flames upon impact with the ground, and that there were no survivors.

Both the National Park Service and the Sheriff's Office of Coconino County supplied workers for the investigation and body recovery operation conducted in the days following the midair collision. Because the Grand Canyon is in Coconino County, the two agencies had worked together frequently in incidents involving emergencies. According to jurisdictional agreements, the National Park Service was in command of rescue efforts, and the Coconino County Sheriff's Office was in command whenever a death had occurred. Although the Sheriff's Office provided incident command for this mission, the National Park Service supplied a helicopter pad and command post, support supplies, facilities for the hundreds of press personnel who flocked to the Grand Canyon, communications equipment, and personnel to assist in body recovery.

The 18 passengers on the airplane included 4 Americans, 11 Dutch, 2 Swiss, and 1 South African. The four passengers on the helicopter were Americans. The 3 pilots in both aircraft were local to the Grand Canyon area.

Subjects. There were 13 subjects who completed both the field interview and the written questionnaires; 6 were Rangers of the National Park Service, and 7 were officers to the Coconino County Sheriff's Office located in Flagstaff. The subjects from law enforcement were primarily from the Detective Division, including both the Supervisor and Captain of detectives. The National Park Service employees also included both frontline and supervisory personnel. All subjects were male and represented an age range from the late 20's to the middle 40's.

There was a range of exposure to the wreckage and bodies among the participants. Of the total, only 5 actually went into the canyon to investigate the crash and to remove bodies to a nearby helicopter. One ranger went into the canyon after the bodies had been recovered. The other participants did not go into the canyon, although several transferred bodies at the incident command post on the rim from the helicopter to a truck for transportation to the morgue in Flagstaff. Several participated further in body identification work after the body recovery phase had ended. Two Sheriff's Officers spent all of their time in Flagstaff establishing contact with families and using international resources to notify next of kin of foreign visitors.

Subjects for this study also included 23 judges who acted as raters of the interview material. Raters were clinical psychology graduate students, or undergraduate students taking a course in psychological aspects of disasters.

Research procedures. Each non-student subject agreed to participate in a field interview that focused on his actions and experiences during the incident, previous experiences in similar incidents, attitudes about working with dead people, and his personal philosophy toward death. The interview was semi-structured, following general topics and allowing the interviewee to contribute his own observations, attitudes and beliefs about emergency workers and critical incidents. (A sample interview report is appended.)

The study used 3 measures, each contributing a different perspective on stress. The Brief Symptom Inventory (BSI) is a shortened version of the Symptom Checklist, 90 (SCL-90), a measure widely used for outpatient and inpatient populations as a measure of current symptoms. The BSI consist of 53 items (e.g., "trouble falling asleep") that are rated by subjects on a 5-point scale to indicate the degree to which they have been stressed by that symptom in a specified period of time (commonly the last 7 days, including the day of

testing). Nine symptoms dimensions are scored: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. A General Severity Index reflecting both the number and intensity of symptoms is the primary outcome measure of the BSI, which correlates plus .89 with the SCL-90 (Derogaits, 1977). (A copy of the BSI is appended.) The Ways of Coping (WOC) is a measure developed by Folkman and Lazarus (1985) to measure how a person copes with a specific event. It is composed of a 24-item problem-focused coping scale and a 40-item emotion-focused coping scale. The primary use of the WOC for this study was as another indicator of stress, based on the repeated finding that the greater the stress that has been experienced, the more coping strategies are employed by disaster victims. (A copy is appended.)

The third measure was the Purdue PTSD scale (PPTSD). The PPTSD is an experimental instrument that reflects a respondent's tendency to have symptoms of post-traumatic stress. Items were designed to assess compliance with the criteria for post-traumatic stress disorder, as described in the Diagnostic and Statistical Manual, Volume III (APA, 1980). Symptoms of post traumatic stress disorder include re-experiencing of the trauma, psychological numbing or withdrawal of emotions, autonomic arousal, feelings of anxiety, and the increase of symptoms with reminders of the event. A 5-point scale is used to record reactions to each item. (A copy is appended.)

Procedures. Two trips were made to the Grand Canyon and Flagstaff to gather data. Trip #1 was arranged for early July so that I could attend an operational debriefing meeting scheduled for July 3. Unfortunately, this meeting was postponed due to a fire in the park, so that research materials were actually distributed by a ranger during the following week, when the meeting was held. Interviews were conducted during Trip #1, and I also became oriented to rescue procedures used by the National Park Service, and to body recovery and

identification procedures used by the Coconino County Sheriff's Office. Trip #2 took place in August, and the focus was to interview responders to the incident. One interview was conducted by telephone following Trip #2.

Interview reports were constructed for each participant who was interviewed. The individual was identified only by a random number, agency affiliation, rank and function within the organization. The report of each interview included a detailed description of the respondent's participation in the event, effects of the participation, attitudes about recovery work, and interviewer observations. No attempt was made to assess participants for evidence of PTSD symptoms. Any problems or symptoms included in the interview report were those volunteered by the subject in response to general, open questions.

An interview rating form with a 5-point agree-disagree scale was developed so that judges could rate each interview report. The interview rating form included 5 questions about post-traumatic stress disorder and its symptoms, one item on positive coping style and a final item on beliefs about death. (A copy of the interview rating scale is appended.)

Data management. The 3 paper and pencil instruments (BSI, WOC and PPTSD) were scored according to standard procedures. A summary score for each measure was derived for each subject. In addition, each subject's interview report was rated by the 23 judges for evidence of post-traumatic stress symptoms, positive coping style, and beliefs about death. Of special interest were the two independent estimates of post-traumatic stress symptoms, one from the PPTSD and the other from the interview material. Correlations were obtained between the 3 paper and pencil measures and the 7 items on the interview rating scale.

## Results

The results are examined from 3 perspectives, group performance, individual performance, and relationships between the measures.

Group analysis. A wide range of stress scores is shown by the results. The BSI scores ranged from 0 (no symptoms at all) to 2.80 (a clinically stressed individual). The average BSI score was .47, or at the high end of the average range for normal populations, according to the manual (Derogatis, 1977). The WOC scores ranged 36-100 with an average of 54.77. There are currently no norms for the WOC, but it has been correlated in a number of studies with other stress scores. In this study the correlation between the WOC and the BSI was +.89, an indication that coping and stress symptoms were highly correlated in this study.

For the PPTSD, scores ranged from 19-54 with an average of 29.08. No norms are available currently for the PPTSD.

Another estimate of the stress of workers in this study was provided by the ratings of their interviews. Judges (n=23) used an interview rating form with 7 questions about various aspects of post-traumatic stress. The averages described below represent the mean ratings of all 23 raters on all 13 subjects for each item on the interview rating form. The rating form items were as follows:

1. This worker was exposed to stressors that would evoke significant symptoms of distress in almost everyone.

The mean was 1.87, an indication that raters tended to agree with the idea that workers had been exposed to stressors.

2. After the incident, this worker showed signs of re-experiencing the trauma in some way (example: recurrent dreams, intrusive recollections of the event).

The mean was 3.11, indicating that judges would neither agree nor disagree with the statement, but instead took a neutral position.

3. At some time after the trauma, this worker experienced diminished responsively to the external world. (Example: feeling detached from others, loss of interest in significant activities).

The mean was 3.76, an indication that judges tended to disagree with the statement that workers showed dimished responsiveness.

4. This worker experienced symptoms of excess autonomic arousal that were not present before the trauma (Example: hyperalertness, difficulty sleeping, trouble concentrating).

The mean was 3.31, an indication that judges would neither agree nor disagree with the statement, but instead took a neutral position.

5. This worker showed the symptoms necessary for a diagnosis of Post-traumatic Stress Disorder.

The mean was 3.90, which shows general disagreement with the statement.

6. This worker demonstrated a positive style of coping that would allow him to manage significant amounts of stress.

The mean was 2.41, an indication of general agreement with this statement.

7. This worker holds definite, well thought-out beliefs about death.

The average was 2.71, an indication of a neutral position on the part of judges.

In summary, this sample of disaster workers as a group demonstrated a range of stress responses to various measures of psychological stress. The group was judged to have been exposed to stressors that were significant, but it was also seen as resistant to the development of PTSD symptoms, and to have coped positively in the situation.

Individual analysis. Three groups could be identified by examining the individual scores on the PPTSD scale, and the interview rating scale question about the criteria for post-traumatic stress disorder. These groups may be

characterized as showing extreme stress (n=1), moderate stress (n=3), and low stress (n=9). For example, the individual who showed extreme stress scored 1.22 on question 5 of the interview rating scale, while the moderate stress individuals ranged from 2.30 to 3.30 and the low stress group ranged from 4.00 to 4.87 (a low score indicates agreement that the individual shows the symptoms of PTSD from the interview material). The PPTSD score for the extreme stress individual was 54, while those for the low stress group ranged from 19 to 32. The conditions that precipitated extreme stress in the single participant with extreme scores are described in the discussion.

Relations between measures. One of the goals of this study was to test the validity of an experimental scale (PPTSD) that could be used with disaster worker populations. Of special interest, therefore, was the correlation which the PPTSD had with other measures of psychological stress. The PPTSD was highly correlated with other, independent, measures of psychological stress, primarily those on the interview rating form. These were: symptoms necessary for a diagnosis of PTSD (+ .89); diminished responsiveness (+ .86); re-experiencing the trauma (+ .74); autonomic arousal (+ .70); and exposure to stressors ( + .65). Of special interest is the high correlation (+ .89) between the summary score of the PPTSD and the summary judgment of the evidence of post-traumatic stress from the interview, as judged by raters.

The PPTSD also correlated highly with the other two measures of psychological stress, the BSI (+ .81) and the WOC (+ .77). Finally, there was a + .90 correlation between items 6 and 7 on the interview rating form. This finding relates firmly held beliefs about death to positive coping style.

## Discussion

The framework for this study was the observation that disaster worker stress is caused by hazards of the disaster event, and by characteristics of the worker's occupation and his or her own organization. (Hartsough, 1985). The

study examined 13 workers exposed to a gruesome body recovery mission on a remote, flat plateau in the Grand Canyon. As a group, the worker sample did not show high levels of stress on standardized measures, nor was it judged, on the basis of interviews, to be suffering from post-traumatic stress symptoms. Yet, three members of the sample differed significantly from their peers. Two showed moderate stress, and one had become extremely distressed during and after the incident. This portion of the report will examine the variables that were most likely responsible for the wellness of the majority and the distress of the few. In keeping with the conceptual framework of the study, they are discussed as event, professional role (occupation), and organization variables.

Characteristics of the event. Stress factors were related to (a) no survivors, (b) terrain and weather, (c) the press, and (d) the bodies. Conditions that represent hazards for disaster workers vary with the nature of the disaster and its location. In the Grand Canyon potential hazards occur when victims must be rescued from dangerous terrain, such as steep canyon walls. The observation that there were no survivors of the midair collision removed the necessity for such an urgent rescue.

The two aircraft crashed on the Tonto Plateau, about one-half mile apart. The relatively flat terrain of the crash site provided a safe area in which to work, thus, nulifying a potential stressor. (Other rescues in the Grand Canyon have exposed rangers to steep canyons and hazardous climbs.)

On the down side, the hot, dry weather and the parched landscape were uncomfortable, especially when crews ran out of water. The media response to the crash was so overpowering that communication to and from the canyon was periodically cut off, a source of frustration for organizers. The ranger who

was first on the scene in the canyon for an initial overview of the crash was swamped by media representatives on his return to the rim. Because of his inexperience with press conferences, he found the encounter very distressing.

The major sources of psychological stress for the workers were the number of dead, and the badly burned condition of the bodies. The charred remains proved hard to identify. The age and sex of the body were sometimes impossible to determine, so that the location of the body in the wreckage and personal effects found on or near the corpse had to be carefully documented. Also, the bodies were odorous, and sometimes so hot that they melted the plastic body bags. The tasks of identification, bagging the bodies, and transporting them to waiting helicopters took approximately 6 hours. Some of the workers later returned to the scene to seek more evidence, and others assisted with work in the morgue. In summary, the major event characteristics of this disaster that caused worker distress were the number of dead, the condition of the bodies, and discomfort. For some workers, the media also became a source of tension associated with the crash site. Mitigating factors were the relative safety of the operation and not needing to conduct an emergency rescue.

Exposure to the trauma. The most direct, predictive measure of worker distress is exposure to the psychological hazards of the event. Common sense dictates that the longer a worker is exposed to the trauma of an incident, the greater the chance that stress will occur. Characteristics of the Grand Canyon crash site provided a unique opportunity for a direct test of this hypothesis. Because of logistical problems in transportation down into the Canyon, most of the personnel associated with this incident (for example, all of the media) did not actually journey to the immediate disaster scene, but instead stayed at the command headquarters on the South Rim of the Grand Canyon several miles away. Indeed, in the sample under study, only six workers were actually on-scene. The other seven workers were either stationed at the command headquarters, on in the

Sheriff's Office in Flagstaff, contacting relatives of the deceased victims. The sample, therefore, breaks conveniently into an in-canyon group (n=6) and a not-in-canyon group (n=7).

Workers who went into the canyon had much greater exposure to an contact with the bodies than those who did not, although some in the latter group did transport bodies (in body bags) after they arrived at command headquarters. In theory, the in-canyon group should register much higher stress levels than those who did not go into the canyon. Mean scores on the stress measures for the two groups support this conclusion. On the interview rating scale item referring to post-traumatic symptoms necessary for a diagnosis of PTSD, the in-canyon group scored 3.07 versus the other group's 4.62 (lower score means more symptoms). Results for the other measures also supported this conclusion. On the PPTSD, the in-canyon group scored 36.33 versus 22.86 for the not-in-canyon group. On the BSI, the in-canyon group had an average of .77, whereas the other group's average was .21. Finally, on the WOC the group that went into the canyon scored 63.00 as opposed to 47.71 for the group that stayed on the rim.

Professional role. Workers used several means to cope with the stressors they encountered, including gloves, protective clothing and surgical masks smeared with Vicks (for the odor). Some, who experienced nausea, took breaks or avoided contact with the corpses for a time. The workers who suffered fewer stress symptoms also seemed to identify strongly with their professional role during the different task. They emphasized that successfully recovering the remains and making sure of their proper identification were very important for

the relatives of the deceased, and for insurance claims. To these workers it was a matter of professional pride that these tasks were carried out properly, so that an accurate description could be given as to how and where the individual died. This cognitive framework allowed the workers to appraise the remains in terms of tasks to be completed, rather than as unsavory stimuli that would cause them distress. Thus, actively maintaining a strong personal commitment to ones' professional role proved an effective buffer to worker stress.

When the professional role of the disaster worker could not be maintained adequately, psychological stress was much more likely to develop. The usual reason for loss of professional role during the incident was personal acquaintance with one of the victims. Four members of the study sample were pilots, who knew one or more of the men piloting the aircraft which had crashed into the canyon. Only one of the four was in the low stress group, two were in the moderate stress group and the fourth was the individual who demonstrated extreme stress on the measures. Interviews with these participate revealed that knowing the pilots of the downed and burning aircraft made this a critical incident for them, especially if they had been sent into the canyon. These men said that, in contrast to their usual equanimity at the sight of badly mangled bodies, this incident had become very distressing because of their own, personal loss.

Organizational Errors. The worker's own agency can be a source of protection, comfort and support against the hazardous effects of disaster work. On the other hand, agencies may contribute to the stress of their workers through decisions or operational procedures that make workers more vulnerable to stress. It is important to study the organizational contributions to stress, because these are the ones that can be avoided in disaster work. One such example was provided by this incident.

The organizational error was to station a worker by himself, overnight, in

the canyon at the crash site - a worker who was personally acquainted with one of the men killed because they were both pilots. The decision was a mistake, but it was based on following standard procedure, and, therefore, an unintended mistake. The victim occupied a liason position between the two agencies, and had investigated citizen deaths in the Grand Canyon on previous occasions. He was ordered to say at the crash site in order to comply with a request from the National Transportation Safety Board for overnight security.

This officer's experience was described with great emotion during his interview. He tried to walk the one-half mile from the main recovery area to the helicopter, but, "I couldn't go near the helicopter because I knew and liked the pilot, a guy named John. Also, the wreckage was burning and so were the bodies. After the other people left, I went up toward the airplane, but the bodies were still hot, they were still bubbling. At that point I just sat down and cried, real hard."

"I just went and made a camp, and crawled in this sleeping bag and stayed there all night. But I didn't go to sleep until it was almost light the next morning. I thought a lot about death and ghosts. It was really spooky-it reminded me of the Italian crash (in the Canyon 3 or 4 years before). I knew the pilot, he was teaching me to fly. I investigated that one - it was really hard work, we were kicking bodies off of ledges to get them out. It took 4 days to get the bodies." "The next day, Thursday, I worked doing the recovery, but I wouldn't touch any of the bodies. I backed off, got away. When they were bagged, I helped load some of them and did help someone getting physical evidence. Once I got very upset during the body loading part and got away from it. I went back to the site 3 days later because they were having difficulty identifying one of the bodies and I thought I could help find more evidence. I looked for more evidence for one of the pilots, and found teeth and a jawbone."

The experience of this disaster worker vividly demonstrates the consequences of decisions that disregard the psychological aspects of disaster work. He was the lone worker who became extremely distressed because of his participation in this incident. He was exposed to a unique combination of traumatic stressors, many of which could have been avoided by a different decision on the part of his organization. The case of this individual is included because it shows how easily the psychological consequences of command decisions can be lost in procedural concerns, but how important they are to the worker.

## Lessons Learned

This study was undertaken to provide information about the extent of psychological stress in disaster workers. In this study, four of the 13 workers experienced at least moderate stress, or about 30%. One of the four experienced extreme stress due to a unique combination of factors that made an already vulnerable individual highly at-risk. The lesson to be learned from this study is that the majority of workers are unlikely to be unusually distressed, but that some individuals may become extremely upset.

Variables associated with the development of worker stress in this study were exposure to the trauma, a breakdown of professional role due to personal acquaintance with disaster victims, and organizational or supervisory errors that exposed workers to more trauma than was necessary.

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A copy of the sample interview report is available from author:

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