

Quick Response Report #77 PSYCHOPHYSIOLOGICAL INDICATORS OF PTSD FOLLOWING HURRICANE INIKI: THE MULTI-SENSORY INTERVIEW

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ABSTRACT

This study assessed 24 victims of the 1992 Hurricane Iniki for PTSD symptoms and physiological reactivity, six to eight weeks following the storm. 47.8% of subjects met full PTSD criteria using the Clinician Administered PTSD Scale (CAPS-1), a DSM-III-R-based structured interview, 26.1% of subjects had partial PTSD, and 26.1% had no PTSD symptoms. A significant main effect (Skin Conductance by CAPS diagnosis) was found for portions of a Multi-Sensory Interview. Additional findings are discussed.

PSYCHOPHYSIOLOGICAL INDICATORS OF PTSD FOLLOWING HURRICANE INIKI: THE MULTI-SENSORY INTERVIEW

On Friday September 11, 1992, Hurricane Iniki swept across the island of Kauai leaving in its path the worst natural disaster in the history of the State of Hawaii. Sustained winds of 130 mph with gusts up to 200 mph caused great devastation to this small island. Early Red Cross reports indicated that approximately 1,600 homes were totally destroyed, and an additional 6,000 homes received major damage. 90% of telephone and

indicated that approximately 1,600 homes were totally destroyed, and an additional 6,000 homes received major damage. 90% of telephone and electrical lines on the island were damaged. Hurricane Iniki provided a unique opportunity to examine the occurrence of PTSD symptoms in the immediate aftermath of a natural disaster. Six weeks following the hurricane a team of researchers from the National Center for PTSD in Menlo Park, CA performed comprehensive paper and pencil and interview assessments with volunteers living in the town of Kilauea. During the assessment period, the community was still in the acute phase of clean-up and recovery from the hurricane. Power was still off for much of the island, and for the entire town of Kilauea. The only electrical power in town was provided by emergency generators, one of which had been provided by FEMA for the feeding station. There was no phone service in town except for an emergency phone bank set-up by the Red Cross near the post-office. Hundreds of hot meals were still being served at the feeding station as most people had no means of cooking or refrigeration.

Physiological arousal is one of the symptoms for post-traumatic stress disorder (PTSD) noted in DSM-III-R (American Psychiatric Association, 1987). The presence of distinct physiological reactions following severe trauma (most notably combat) has been observed for many years. Recent studies with a combat veteran population have demonstrated autonomic reactivity among PTSD subjects in the presence of salient traumatic cues. One major limitation of existing research is that physiological assessments of PTSD arousal symptoms have most frequently been undertaken many years following the traumatic event(s). In addition, nearly all the controlled studies of autonomic arousal in PTSD have used a male combat trauma population. Several previous studies have used videotaped stimuli to elicit heightened physiological reactivity in combat veterans with PTSD on heart rate (HR), skin conductance (SC), or electromyographic (EMG) measures (Drescher & Abueg, 1991; Foy et al., 1987; Foy et al., 1990; Keane & Kolb, 1989; Malloy et al., 1983). Other labs have found similar changes in autonomic reactivity with combat sounds (Blanchard et al., 1982; Blanchard et al., 1986; Gerardi et al., 1989; Blanchard et al., 1991; Pallmeyer et al., 1986;), and audiotaped individualized trauma scripts (Boudewyns & Hyer, 1990; Orr et al., 1993; Pitman et al., 1987; Pitman et al., 1990; Pitman et al., 1989). Some studies also report baseline HR differences (Pitman et al., 1987; Shalev et al., 1992). Only a few preliminary studies have assessed women with PTSD for the presence of physiological reactivity to salient traumatic cues (Drescher & Abueg, 1991; Kozak et al., 1988a; Kozak et al., 1988b; Hearst et al., 1992). One of the challenges of research in this area is that time required to develop standardized videotaped trauma cues for a particular disaster

One of the challenges of research in this area is that time required to develop standardized videotaped trauma cues for a particular disaster may prevent research teams from arriving in the field as quickly as they might like following a disaster. Individualized cue presentations such as those used by Pitman and Orr's lab (1987, 1989, 1990, 1993) can require significant stimulus preparation time for each subject while in the field. Our goal for this project was to assess the array of PTSD symptoms presented by subjects, and to evaluate the usefulness of a structured interview style physiological assessment which would examine PTSD arousal symptoms and which would have clinical relevance for debriefing teams in the immediate aftermath of a natural disaster.

The natural disaster literature has begun to suggest some commonality in the way that disaster victims present over time. Intrusive thoughts and memories of the trauma (DSM-III-R diagnostic category B), for example, seem to be the most frequently reported PTSD symptoms following natural disaster (McFarlane, 1992; Solomon & Canino, 1990; Madakasira & O'Brien, 1987). However, because of their frequency, the presence of these symptoms during the early phase may not predict particularly well the development of chronic PTSD. McFarlane (1988) reported that intrusive memories had a low specificity (63%) for a PTSD diagnosis, i.e., the presence of these symptoms did not predict strongly whether a person had PTSD or not.

Avoidance symptoms (DSM-III-R diagnostic category C)--feelings of numbness, social withdrawal and avoidance of trauma-relevant situations or reminders--tend to be less frequently reported than intrusive symptoms. Solomon and Canino (1990) report that this finding is uniquely apparent during the acute period following a disaster. However, they propose that measurement may be one reason for this finding. They suggest that certain PTSD instruments may underreport the presence of category C and D symptoms. McFarlane (1992) reported that avoidance had no significant relationship, either with exposure variables, or with predicting the development of PTSD. Shalev (1992) noted that in a group of survivors of a terrorist attack, avoidant symptoms tended to develop later than intrusive symptoms, suggesting that avoidance may be a way of coping with the presence of disturbing traumatic memories, a strategy which may be used increasingly over time.

Symptoms of arousal (DSM-III-R diagnostic category D) seem to be the least studied of PTSD symptoms in disaster samples, though increasingly researchers are suggesting that these may have more predictive value in identifying those at high risk for development of chronic PTSD after a trauma. Shalev (1992) notes that McFarlane's (1988) data indicate that arousal symptoms have a much better specificity (94-100%) than the intrusive symptoms.

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The present study has two primary purposes: 1) to examine the prevalence of PTSD symptoms and to look at the variation in the pattern of symptoms presented by subjects assessed shortly after a major natural disaster; 2) to assess for physiological arousal symptoms by measuring physiological responses during the administration of a structured debriefing interview, the Multi-Sensory Interview (MSEI).

Method

Subjects

Subjects were 24 consecutive volunteers who resided in the town of Kilauea. Subjects were recruited through signs posted at a Red Cross feeding station located at the local community center, in a local physicians office, and by word of mouth. The main criteria for participation spending time during the hurricane in a building that was severely damaged during the hurricane. Subjects were paid \$20.00 for their participation. Potentially, individuals would have been excluded from participation, if in the view of the primary investigators a participant was too decompensated to benefit from the assessment. However, no subjects were excluded on this basis. A follow-up referral for treatment was made for one subject at the end of the assessment. At the beginning of the screening process the entire project was explained to the subject and informed consent obtained. Subjects were then asked to complete a packet of questionnaire measures. To assess for current PTSD symptoms related to the hurricane an interviewer administered the CAPS-1 (Blake et al 1990). To assess for prior lifetime trauma experiences, subjects were administered the Lifetime Trauma Query (Abueg, & Drescher, 1992) which was developed for this project. The LTQ is a structured interview which elicits previous traumatic incidents and allows subjects to rate the degree of distress which they experienced following the incident. If a subject had a prior trauma where distress lasted for a period of 1 month, the CAPS-1 was re-administered to assess lifetime PTSD to the event the subject indicated was most distressing. Psychophysiological assessment was then performed using videotaped stimuli, and the Multi- Sensory Interview.

Subjects were assigned to groups on the basis of their current PTSD diagnostic status as indicated by the CAPS-1 interview. To be included in the Full PTSD symptom group the subject had to meet full diagnostic criteria for PTSD in categories A B, C, D, and E. 47.8 % of subjects met full PTSD criteria and were assigned to this group. The partial PTSD symptom group was defined as meeting full diagnostic criteria for PTSD in category A and E, and full criteria for two of the remaining three

symptom group was defined as meeting full diagnostic criteria for PTSD in category A and E, and full criteria for two of the remaining three categories B, C, or D. 26.1% of subjects were included in this group. The remaining subjects (26.1%) were assigned to the No PTSD symptom group. [Table 1](#) shows the means for demographic variables.

Instruments

Clinician Administered PTSD Scale (CAPS-1) (Blake, Weathers, Nagy, Kaloupek, Klauminzer, Charney, & Keane, 1991) - The CAPS-1 is a structured interview designed to assess the frequency and intensity of PTSD and related symptoms during the last month. Cutoffs for frequency and intensity are used to indicate the presence of a symptom. Presence of lifetime PTSD can also be assessed.

Impact of Events Scale (IES) - (Horowitz, Wilner, & Alvarez, 1979) This is a frequently used 15 item measure of intrusion and avoidance symptoms found in PTSD.

Keane MMPI-2 Scale (Keane, Malloy, & Fairbank, 1984) - This is a 46 item subscale of the MMPI-2 which is used as an indicator of PTSD symptoms. For this study the items were used independently, the entire MMPI was not administered. A cutoff score of 30 is frequently used to indicate PTSD.

Penn Inventory (Hammarberg, 1992) - This is a 26 item questionnaire designed to indicate the presence and severity of PTSD. This scale has been used with other disaster populations. Similar in format to the Beck Depression Inventory, respondents select one of four statements which best describes their current experience.

Dissociative Experiences Scale (Bernstein, & Putnam, 1986) - This is a 28 item scale which measures the degree to which an individual experiences dissociative events. Respondents mark a line indicating the percent of the time (0-100%) which they experience each symptom.

Sensory Exposure Checklist (Abueg, Drescher, Kubaney, 1992) - This is a 20 item index of degree of hurricane exposure which was developed for this study. Respondents use a 5 point scale to indicate the degree of exposure they experienced to each item. Scaling options range from "No exposure" to "Extreme exposure".

Lifetime Trauma Query (LTQ) (Drescher, Abueg, 1992) - The LTQ is a structured interview which assesses for the presence of a variety types of traumatic experiences during childhood, adolescence, and adulthood. Subjects rate the degree of perceived distress for each trauma.

Stimulus Cue Preparation

A standard hurricane videotape was prepared using segments of a news video about hurricane Iniki. The tape consisted of six 1-minute vignettes separated by a 20-second period for recording the subject's subjective

video about hurricane Iniki. The tape consisted of six 1-minute vignettes separated by a 20-second period for recording the subject's subjective level of distress (SUDS). Motion picture video was selected instead of slides as it was felt that motion was an essential part of the hurricane trauma. A neutral videotape used in a multi-site VA cooperative psychophysiology study of PTSD (Keane & Kolb, 1989) was used for neutral stimuli.

Data Collection Equipment

Physiological assessment sessions were conducted in a public health nurse's office in which the monitoring apparatus was located out of view of the subject. A computer monitor, and television screen were positioned in front of the subject. HR was measured by two electrodes attached to the subject's forearms. EMG measurement was obtained through three electrodes placed over the frontalis muscles. SC measurements were obtained through two electrodes placed on the palm of the subject's non-dominant hand. Analog data were digitized through a Coulbourn analog-to-digital converter. Data were sampled twice per second throughout the assessment. A laptop 386 computer was used to control sampling and store the physiologic data samples.

Multi-Sensory Interview

After being connected to HR, SC, and EMG electrodes, subjects were instructed to relax for three minutes while baseline physiological data was collected. After the baseline, subjects were asked to describe their experience of the "worst moments" of the hurricane related to each of their sensory domains, i.e. sight, sound, smell, taste, bodily sensations, sense of position/balance. For example, the researcher would say: "I would like you to imagine the hurricane as though you were there again. Tell me what are the things that you SEE around you. What sights stand out in your memory of the event." The sensory domains inquired about were sight, sound, smell, taste, touch, and balance. The individual sensory domains were queried randomly to control for order effects. SUDS was collected following each description. Physiological samples were collected twice per second and averaged into 5 second blocks. Length of the response was variable, though at least one-minute of physiological data was collected for each item. If the subject completed their description prior to one-minute, they were asked to continue thinking about that particular sensory domain. If the subject's description strayed away from the queried sensory domain, researchers redirected the subject back on track with prompts such as "Tell me more about the things you *heard!*"

Following the inquiry about the individual sensory domains, and after a baseline period where the subject was instructed to relax as much as

Following the inquiry about the individual sensory domains, and after a baseline period where the subject was instructed to relax as much as possible, each subject was asked to relate their experience of the hurricane in a narrative fashion. The researcher would say: "I just asked you to tell specific parts of your experience of the hurricane. Now I would like you to tell your story of the hurricane in your own words, from start to finish, focusing on the MOST traumatic or upsetting incidents. Take your time and tell me the whole story." HR, SC, and EMG was collected during this entire narrative period. Physiological samples were collected twice per second and averaged into 5 second blocks. SUDS was collected at the conclusion of the narrative.

Results

[Table 2](#) shows the group means for the exposure and PTSD measures. Examination of the Lifetime Trauma Survey and CAPS-1 data for lifetime experience of PTSD for a trauma prior to the hurricane indicates that 26.1% of this sample experienced met full PTSD criteria for a previous trauma and 13.0% met our definition for partial PTSD symptoms for a previous trauma. 54.2% of subjects reported multiple lifetime traumatic experiences.

Correlational analysis indicated significant correlations between severity of current Category B (re-experiencing) symptoms on the CAPS and Skin Conductance measures of the Multi-Sensory Interview.

Correlations were also indicated for total current CAPS severity and the subscales of the IES and the PENN inventory. Correlation matrixes for these and other scales are found in [Table 3](#).

Analysis of Covariance indicates a significant main effect ($F=11.5$, $p=.001$) for both current CAPS diagnosis ($F=20.3$, $p=.000$) and Lifetime CAPS ($F=9.2$, $p=.005$) diagnosis on Skin Conductance (SC) measures for the Narrative portion of the Multi-Sensory Interview when covarying for Exposure ($F=17.3$, $p=.002$), and Baseline SC level ($F=98.9$, $p=.000$). An examination of the means for each group suggests that the Partial PTSD group had the highest SC levels, followed by the Full PTSD group.

Finally, analysis of variance indicates a main effect ($F=5.4$, $p=.017$) for multiple lifetime trauma experiences ($F=9.9$, $p=.007$) and gender ($F=0.3$, $p=ns$) significantly predicted the overall level of PTSD severity as measured by the CAPS-1 even after controlling for the degree of hurricane exposure ($F=0.9$, $p=ns$), and age ($F=0.8$, $p=ns$). There was also a significant 2-way interaction effect between the multiple trauma and

hurricane exposure ($F=0.9$, $p=ns$), and age ($F=0.8$, $p=ns$). There was also a significant 2-way interaction effect between the multiple trauma and gender variables ($F=4.6$, $p=.050$). Additional analyses indicated a main effect ($F=3.74$, $p=.049$) for multiple lifetime trauma experiences ($F=5.3$, $p=.037$) and gender ($F=1.4$, $p=ns$) for Category B symptoms (reexperiencing) as measured by the CAPS-1 even after controlling for the degree of hurricane exposure ($F=0.4$, $p=ns$), and age ($F=2.5$, $p=ns$). No group differences were noted for Category C or Category D symptoms.

Discussion

This study is important in that it provides a first look at physiological responses among hurricane survivors shortly after the disaster. The finding that a high percentage (73%) of subjects met full or partial criteria for a diagnosis of PTSD speaks to the devastation of the storm and the disruption of life which was still being experienced at the time of assessment. It is important to note the fact that a high percentage (39%) of these subjects also reported either full or partial lifetime PTSD symptoms to a previous trauma experience. This suggests a strong need to assess disaster victims for previous trauma experiences and their impact. Additional support for this view is the finding that the existence multiple lifetime traumatizations were significantly related to the current level of PTSD symptomatology even controlling for demographic differences and degree of exposure to the hurricane. The interaction between multiple trauma and gender suggests that attention be paid to gender differences in trauma assessment.

The finding that psychophysiological variables (skin conductance) were related to level of current PTSD diagnosis replicates and extends previous findings with a new protocol, the multi-sensory interview. Though it is at this point unclear why the partial PTSD subjects have the highest SC responses when describing their trauma experiences from a sensory standpoint, it at the very least is promising and suggests the need for further PTSD psychophysiological field research with disaster populations.

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Table 1

Sample Demographics

Sex	
- Male	25.0%
- Female	75.0%
Ethnicity	
- Caucasian	59.1%
- Asian/Pacific Islander	31.8%
- Filipino	9.1%
Marital Status	
- Single	18.2%
- Married	50.0%
- Separated	9.1%
- Divorced	13.6%
- Widowed	9.1%

Table 2

Mean Scores for PTSD Measures

SCALE	MEAN
SD	
-----	-----
--	
Keane	12.41
8.38	
IES - Intrusion	18.40
4.47	
IES - Avoidance	18.10
5.40	
Penn	27.27
9.21	
Exposure	34.64
11.31	
CAPS-Total	49.91
27.03	

Table 3

Correlations with Skin Conductance Measures

	CAPS	CAT B	FEEL	HEAR	SEE	
SMELL	TASTE	NARAT				
CAPS		1.00				
CAT B		.72**	1.00			
FEEL		.30	.53*	1.00		
HEAR		.36	.57*	.97**	1.00	
SEE		.27	.53*	.98**	.95**	1.00
SMELL		.22	.62**	.96**	.97**	.97**

HEAR			.36	.57*	.97**	1.00
SEE			.27	.53*	.98**	.95** 1.00
SMELL			.33	.63**	.96**	.97** .97**
1.00						
TASTE			.30	.57*	.94**	.97** .97**
.97**	1.00					
NARAT			.40	.62**	.94**	.95** .95**
.94**	.92**	1.00				

Correlations Among Psychometric Instruments

	CAPS	AVD	INTR	KEANE	PENN	EXP
CAPS	1.00					
AVD	.15	1.00				
INTR	.47*	.55*	1.00			
KEANE	.45*	.34	.33	1.00		
PENN	.49*	-.01	.30	.64**	1.00	
EXP	.17	.37	.31	-.06	.11	1.00

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

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