

## ACUTE STRESS DISORDER, SUBSEQUENT POSTTRAUMATIC STRESS DISORDER AND DEPRESSION AFTER A SERIES OF TYPHOONS

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*From August to November 1992, five typhoons struck the U.S. Pacific island territory of Guam. Three hundred and twenty subjects exposed to all five typhoons participated in a population survey measuring their acute stress symptoms and subsequent diagnoses of posttraumatic stress disorder (PTSD) and depression. A 23-item scale approximating the new DSM-IV diagnosis of acute stress disorder (ASD) was used to classify subjects into three groups based on their symptoms one week after the first typhoon: (1) probable ASD, (2) an early traumatic stress response (ETSR) of fear, intrusion, avoidance, and arousal, without dissociation, and (3) no acute diagnosis. A multi-dimensional measure of PTSD and the Zung Self-Rating Depression Scale were used to assess PTSD and depression 8 months after the first storm. The point prevalence of ASD at one week was 7.2%. An additional 15% of subjects had ETSR. Subjects with probable ASD at one week had significantly increased rates of PTSD and somewhat higher rates of depression at 8 months than those without ASD. In contrast, subjects with ETSR at one week did not have a poorer outcome than those with no acute diagnosis. These findings suggest that ASD is prognostically important, but also indicate that all acute stress symptoms do not have the same discriminative value. In this study, the acute dissociative symptoms of emotional numbing and derealization differentiated highly symptomatic subjects at risk for subsequent psychopathology (ASD) from others who were highly symptomatic at one week, but then had a more benign, posttraumatic course (ETSR). Anxiety 2:219-225 (1996).*

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### INTRODUCTION

The diagnosis of acute stress disorder (ASD) was introduced in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, American Psychiatric Association, 1994). This diagnosis is made in individuals who respond to psychologically traumatic events with "intense fear, helplessness, or horror," experience dissociative phenomena during or following the events, and report intrusive, avoidant, and arousal symptoms lasting from 2 days to 4 weeks (American Psychiatric Association, 1994). Essentially, the DSM-IV definition of ASD adds a dissociation criterion to the posttraumatic stress symptoms of intrusion, avoidance, and arousal while defining an early onset and acute time course for all symptoms. The rationale for adding ASD to the diagnostic nomenclature included identifying those who may benefit from early intervention and the possibility that ASD may be

a harbinger of posttraumatic stress disorder (PTSD; Koopman et al., 1995).

Previous studies have investigated acute intrusion, avoidance, arousal, and dissociation following a wide variety of traumatic events (for reviews, Green, 1993;

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Koopman et al., 1995). However, there is no consensus as to which of these acute symptom(s), if any, predict later psychopathology. Feinstein and Dolan (1991) found that the severity of acute intrusion and avoidance was a better predictor of subsequent PTSD than the severity of injury in a series of accident victims. McFarlane (1992), studying survivors of the 1983 Ash Wednesday bushfires in Australia, found that intrusion predicted avoidance. Shalev (1992) found no consistent pattern in the intrusion and avoidance experienced by victims of a terrorist attack on a bus. He concluded that hyperarousal was the driving force behind his subjects' symptoms, although he did not measure arousal explicitly. Peritraumatic and posttraumatic dissociative symptoms have been studied in combat veterans (Solomon et al., 1989; Bremner et al., 1992; Marmar et al., 1994), genocide survivors (Carlson and Rosser-Hogan, 1991), earthquake (Cardeña and Spiegel, 1993) and firestorm victims (Koopman et al., 1994), and witnesses to an execution (Freinkel et al., 1994). These studies indicated that peritraumatic dissociation is related to the severity of the traumatic stressor (Bremner et al., 1992; Marmar et al., 1994; Koopman et al., 1994) and may predict the subsequent development of more severe, posttraumatic psychopathology (Solomon et al., 1989; Koopman et al., 1994).

Acute stress disorder, with its combination of dissociation, intrusion, avoidance, and arousal, has not been studied in any detail. It is not known if the DSM-IV definition of ASD predicts subsequent psychopathology or if it is a better predictor of long-term outcome than any other conceptualization of acute stress symptoms. This study addresses these issues by investigating the psychological aftermath of a series of five typhoons that struck Guam in 1992. A 23-item measure of acute stress symptoms was developed to identify cases of probable ASD and a second, highly symptomatic state of acute fear, intrusion, avoidance, and arousal, without dissociation. This second acute stress state was similar to the original definition of acute onset PTSD (American Psychiatric Association, 1980). It was termed an early traumatic stress reaction (ETSR) in order to distinguish it from ASD and the DSM-IV diagnosis of PTSD, acute subtype. The study's hypothesis was that subjects with ASD or ETSR would be more likely than other exposed individuals to develop long-term, posttraumatic, psychopathology such as PTSD or depression. The point prevalences of ASD and ETSR were estimated in the community one week after the first storm. Then the rates of PTSD and depression at 8 months were examined in three groups of exposed subjects: (1) those with probable ASD, (2) those with ETSR, and (3) those with no acute diagnosis. This design permitted a direct comparison of the two definitions of acute, posttraumatic symptomatology as well as an evaluation of the specificity of these acute stress states for subsequent PTSD and depression.

## MATERIALS AND METHODS

On August 28, 1992, Typhoon Omar struck the western Pacific island of Guam with winds exceeding 150 mph. The U.S. military community on the island sustained \$300 million in damage. There were scattered, mostly minor injuries, but no deaths. Power and water outages lasted for 2 to 4 weeks. During the following 3 months, four typhoons with winds of 80–120 mph passed over or near Guam. Each of these storms disrupted school and work activities for several days, but caused less damage and fewer injuries than Typhoon Omar.

In April 1993, 3,394 junior enlisted personnel and spouses (56% of the junior enlisted community) were selected at random from housing lists to receive surveys about the typhoons. Due to normal military rotations, approximately 2,220 individuals who were exposed to the storms received questionnaires. To control for the level of disaster exposure, only subjects who experienced all five typhoons were included in the investigation. The nature of the study was explained to potential participants in a cover letter that accompanied the surveys. Subjects returned written, informed consent documents with their completed questionnaires. These procedures were approved in advance by the authors' Institutional Review Boards.

The surveys collected information about demographics and storm-related stressors, including damage claims, injuries to self, family, and friends, and whether subjects were separated from their family on the island due to duty obligations at the time of the storms. Financial loss was divided into quartiles (\$0, \$1–\$249, \$250–\$1,249, \$1,250+), other variables into two categories (e.g., injured or not). Using the instrument described below, acute stress symptoms were assessed retrospectively for the week after Typhoon Omar. Symptoms of PTSD and depression were measured at the time the surveys were completed, a median of 8 months after Typhoon Omar and 5 months after the last typhoon.

### MEASURE OF PROBABLE ASD

This study was undertaken in 1993, prior to the publication of the DSM-IV. Therefore, it originally was designed to investigate acute stress symptoms predating ASD. The Impact of Event Scale (IES, Horowitz et al., 1979), a well-established measure of intrusion and avoidance, was chosen to assess these two symptoms. A set of five anxiety/arousal questions and three questions about acute fear responses also were included in the questionnaire. Subjects were instructed to complete the IES plus the fear and arousal questions retrospectively for "the week after Typhoon Omar." Although the retrospective use of this measure had the potential to introduce recall bias, Norris and Kaniasty (1992) found "remarkable stability" in hurricane victims' self-reports over a 9-month interval, which is within the time frame of this study.

After the publication of the DSM-IV, a panel of eight psychiatrists and psychologists, experienced in the field of traumatic stress, independently matched the questions from the IES and the eight additional items to the diagnostic criteria for ASD as shown in Table 1. There was an 84% agreement between the raters for matching the 23 questions to the DSM-IV symptoms and a 96% agreement in assigning the questions to the five ASD criteria. The few differences were resolved by a consensus of the authors. Subjects were classified as positive or negative for each criterion. For criterion A(2), subjects having "a great deal" of fear on at least one of the three fear questions were considered positive. For criteria B through E, subjects reporting at least one symptom "often" or two symptoms "sometimes" were rated as positive. Those positive for all criteria were classified as probable ASD. Those meeting criteria A, C, D, and E (i.e., acute fear, intrusion, avoidance, and arousal, but not dissociation) were considered positive for the early traumatic stress response (ETSR). The remaining subjects had no acute diagnosis. The dichotomous nature of this measure focused on caseness, rather than symptoms, in order to examine the entities of ASD and ETSR.

The full measure of ASD showed a high degree of internal consistency (Cronbach's  $\alpha=0.90$ ) as did the intrusion ( $\alpha=0.86$ ), avoidance ( $\alpha=0.83$ ), and arousal

( $\alpha=0.88$ ) subscales. Consistency was less robust for the small number of fear ( $\alpha=0.67$ ) and dissociation ( $\alpha=0.54$ ) items, although these were significantly and positively correlated with each other and with the other items in the measure. The frequency of symptoms detected by the measure compared favorably with published data (Famularo et al., 1990; Feinstein and Dolan, 1991; McFarlane, 1992). Furthermore, in an ongoing study of disaster workers at an airline crash site, Grieger et al. (unpublished results) compared the measure of probable ASD to the Stanford Acute Stress Reaction Questionnaire (SASRQ, Cardeña et al., 1993). The current version of the SASRQ mirrors the DSM-IV criteria for ASD, but it has not been used in its entirety in any published studies to date. The two measures agreed on the classification of ASD in 40 of 43 disaster workers [interjudge agreement,  $\kappa=0.93$  (Hays, 1994)] and on the presence of dissociation in 35 of 43 ( $\kappa=0.81$ ). These observations indicate that the measure of probable ASD provided a reasonable index of the diagnosis.

#### MEASURE OF PROBABLE PTSD

A previously validated, multi-dimensional assessment of PTSD (Ursano et al., 1995), updated for the DSM-IV was used to identify cases of probable PTSD. The first part of the instrument measured the scope of

TABLE 1. Measure of acute stress disorder

Criterion A(2): <sup>a</sup>	Fear, helplessness, horror Fear:	afraid of dying concerned for my safety concerned for my family's safety
Criterion B:	Dissociative symptoms Derealization: Numbing:	felt Omar hadn't happened or wasn't real <sup>b</sup> feelings were numb <sup>b</sup>
Criterion C:	Intrusive/reexperiencing symptoms Emotions:  Dreams: Thoughts:	waves of strong feelings <sup>b</sup> reminders brought back feelings <sup>b</sup> dreams about Omar <sup>b</sup> thoughts I didn't mean <sup>b</sup> kept thinking about victims <sup>b</sup> pictures popped into my mind <sup>b</sup>
Criterion D:	Avoidance symptoms Feelings:  Thoughts:  Reminders:	avoided getting upset <sup>b</sup> aware of feelings, didn't deal with them <sup>b</sup> tried to remove memories <sup>b</sup> tried not to think about Omar <sup>b</sup> stayed away from reminders <sup>b</sup> tried not to talk about Omar <sup>b</sup>
Criterion E:	Anxiety/arousal symptoms Irritability:  Insomnia:  Restlessness:	was irritable felt critical of others couldn't sleep had trouble falling asleep or staying asleep <sup>b</sup> felt restless felt tense or keyed-up

<sup>a</sup>DSM-IV criteria for acute stress disorder (American Psychiatric Association, 1994).

<sup>b</sup>Items from the Impact of Event Scale (IES, Horowitz et al., 1979).

symptomatology by querying subjects about all symptoms in the intrusion, avoidance, and arousal criteria for PTSD. The second part measured severity of symptoms using the IES (a separate copy from the ASD measure). Subjects reporting "moderate," "quite a bit," or "extreme" discomfort from symptoms sufficient to meet the DSM-IV distribution requirements for PTSD and scoring greater than 19 on the eight month IES ("high" symptom level, Horowitz, 1982), were classified with probable PTSD. Subjects completed the PTSD measure based on their symptoms at the time of the survey.

### ASSESSMENT OF DEPRESSION

The Zung Self Rating Depression Scale (Zung, 1965) was used to classify subjects as depressed or not. Subjects with clinically significant depression (Zung score  $\geq 60$ , Zung, 1965) were considered depressed. Subjects rated their depressive symptoms for the week that they completed the survey.

### STATISTICAL ANALYSIS

The point prevalence of PTSD and depression in ASD-positive versus ASD-negative, ETSR-positive versus ETSR-negative, and ASD-positive versus ETSR-positive subjects were compared using the 2-tailed, Fisher exact test with a Bonferroni correction for multiple comparisons. These statistics and the Cronbach's alphas were calculated using SAS, version 6.08 software (SAS Institute, Inc., 1992).

## RESULTS

Three hundred and eighty-five (17.3%) subjects returned completed questionnaires, of whom 320 (83%) had experienced all five typhoons and were included in the data analysis. Participants included 255 (79.7%) active duty service members and 65 (20.3%) spouses. There were 189 (59.1%) men and 131 (40.9%) women. Among active duty subjects, 184 (72.2%) were men. Five (7.7%) spouses were men. One-third of the subjects were non-white (9.9% African American, 8.3% Asian or Pacific Islander, 6.0% Hispanic, 2.1% Chamoru (native Guamanian), 5.5% unspecified). The average

age was  $27.6 \pm 5.4$  years. All but five subjects graduated high school; 2.5% completed college. There were no differences in age, race, education, or reported stressors between active duty subjects and spouses, so all subjects were combined for further analysis.

One week after Typhoon Omar, the point prevalence of probable ASD was 7.2% ( $n=23$ ). The rate of ETSR was 15.0% ( $n=48$ ). For the individual ASD criteria, 8.8% of the subjects endorsed dissociation, 32% intrusion, 30% avoidance, and 67% arousal. Eight months after Typhoon Omar, 5.9% ( $n=19$ ) of the population had probable PTSD and 10.9% ( $n=35$ ) reported clinically significant depression. Table 2 shows the relationships between ASD, ETSR, PTSD, and depression. Subjects with probable ASD had a higher point prevalence of PTSD at 8 months than subjects without ASD (Fisher's exact test, 2-tailed,  $p<0.0001$ ). They also had a higher rate of PTSD than the ETSR group (Fisher's exact test, 2-tailed,  $p<0.0054$ ). Both differences were statistically significant after Bonferroni correction for multiple comparisons ( $p<0.05/6=0.0083$ ). In contrast, the rate of PTSD at 8 months did not differ between the ETSR group and subjects without an acute diagnosis (Fisher's exact test, 2-tailed,  $p<0.88$ ). The 8-month point prevalence of depression was highest in the ASD group, next highest in the ETSR group, and lowest for those without an acute diagnosis. However, the only comparison that reached statistical significance was between subjects with and without ASD (Fisher's exact test, 2-tailed,  $p<0.023$ ). This finding was reduced to a trend after Bonferroni correction. Therefore, probable ASD at one week after the first storm was associated strongly with PTSD and somewhat with depression at 8 months. The ETSR subjects, who were highly symptomatic at one week but did not report acute numbing or derealization, had no greater prevalence of PTSD or depression at 8 months than those with fewer acute symptoms.

## DISCUSSION

In this study of the psychiatric sequelae of five typhoons, the point prevalence of ASD was 7.2% one week after the first storm. Fifteen percent of partici-

TABLE 2. The relationships of acute stress disorder and early traumatic stress response at one week post-disaster to PTSD and depression at eight months

Diagnoses at 8 months	Acute diagnoses			
	No acute diagnosis n=249	Early traumatic stress response ETSR n=48	Total of ETSR and no diagnosis ASD(-) n=297	Acute stress disorder ASD(+) n=23
PTSD n(%) <sup>a,b</sup>	10 (4.0)	2 (4.2)	12 (4.0)	7 (30.4)
Depression n(%) <sup>c</sup>	22 (8.8)	7 (14.6)	29 (9.8)	6 (26.1)

<sup>a</sup>ASD(-) vs. ASD(+):  $p<0.0001$ .

<sup>b</sup>ETSR vs. ASD(+):  $p<0.01$ .

<sup>c</sup>ASD(-) vs. ASD(+):  $p<0.05$ .

pants met the ETSR criteria of acute fear, intrusion, avoidance, and arousal, without dissociation and more than two-thirds of subjects were positive for at least one of the symptom criterion of ASD. At eight months, however, only subjects with probable ASD had an elevated point prevalence of PTSD and a strong trend toward increased rates of depression. Therefore, the construct of ASD, as measured in this study, successfully identified a group of subjects at risk for subsequent psychopathology from among all those reporting acute stress symptoms. This indicates that the diagnosis of ASD may have prognostic utility in discriminating an acute stress state with a negative long-term outcome from more benign acute stress responses. The data also suggest that ASD may have greater specificity for PTSD than for depression. Of course, all acute stress symptoms do not have the same discriminative value. In this study, the presence or absence of the acute dissociative symptoms of numbing and derealization distinguished between one group of highly symptomatic individuals with a good prognosis (ETSR) and another group with a poorer outcome (ASD).

The association between ASD and PTSD was strong, but ASD was not a certain precursor of later psychopathology. Most subjects with probable ASD did not have PTSD or depression at 8 months. Similarly, fewer than half of those with PTSD or depression were classified initially with ASD. This may be due, in part, to the limited assessment of dissociation in the measure of ASD. Koopman et al. (1996) found that three or more acute dissociative symptoms gave the best specificity for subsequent PTSD among survivors of the 1991 Oakland/Berkeley, California firestorms. Another possibility is that the current diagnostic criteria for ASD mix symptoms with high and low discriminative power, reducing the overall effectiveness of the diagnosis for identifying individuals prone to pathological responses to trauma. Future studies should examine a broader array of dissociative symptoms in order to compare the discriminative power of acute dissociation to that of other acute stress symptoms. The prognostic value of acute stress symptoms for other trauma-related psychiatric disorders such as depression, somatization, anxiety, and substance-related disorders (Davidson et al., 1991; Solomon, 1993; Ursano et al., 1995) also should be examined.

Limitations to this study included the relatively low response rate, the untested measure of probable ASD, and the retrospective reporting of acute stress symptoms. The low response rate was due to two major factors. The study site was quite distant from the principal investigators and Federal privacy laws limit the release of personal information about military service members without their prior consent. These circumstances severely restricted follow-up of non-responders in this highly mobile population.

The potential selection biases inherent in this low response rate were investigated in two ways. The demographics of the study's participants were compared

to the pool of potential subjects (U.S. Navy, 1995) and the prevalence of PTSD was compared with another hurricane study in which PTSD was assessed at approximately the same time after the disaster (Norris, 1992). Asian-Americans and Pacific Islanders are over-represented among military personnel and spouses on Guam because this choice of duty assignment puts them in close proximity to the Philippines and Asia. This over-representation was mirrored in the study population. The average age and educational attainment of the subjects were similar to all junior enlisted, U.S. military personnel (U.S. Navy, 1995). Therefore, there appeared to be no inherent demographic biases among the participants in this study. The 5.9% point prevalence of PTSD at 8 months after Typhoon Omar was nearly identical to the 4.9% rate of PTSD found by Norris (1992) in personal interviews of subjects 11 months after Hurricane Hugo. This suggests that those with psychiatric symptoms after the typhoons were not substantially over- or under-represented among the subjects of this investigation. Nevertheless, the low response rate limits the generalizability of the findings, so that the results must be considered tentative, pending additional investigations.

The measure of probable ASD had a high degree of internal consistency and reasonable external validity. The rank order of arousal, intrusion, and avoidance matched that of other studies reporting symptoms of less than 4 months duration (Famularo et al., 1990; Feinstein and Dolan, 1991; McFarlane, 1992). Specific symptom rates were similar to those found by Weisæth (1989) one week after an industrial explosion. With regard to dissociation, the measure of probable ASD had significant interjudge agreement ( $\kappa=0.81$ ) with the separately validated SASRQ (Grieger et al., unpublished results), an instrument in which 10 of 30 questions measure dissociative symptoms.

Although retrospective studies are common in disaster research, potential recall biases raise questions about the reliability of the data. Norris and Kaniasty (1992) found that the retrospective self-reports of disaster victims were valid, but MacFarlane (1988) noted that less symptomatic subjects under-reported their initial difficulties as time passed. In this study, the differences in outcome between subjects who were positive and negative for probable ASD might be exaggerated if subjects who were healthier at the time of the survey reported fewer acute stress symptoms, retrospectively. This possibility was examined in the ASD and ETSR groups by comparing their retrospective reports of storm-related stressors (e.g., injuries, financial loss). The subjects with ETSR actually described more stressors than those with ASD, indicating that they did not comparatively under-report their storm-related difficulties. Therefore, the poorer outcome of subjects with ASD, compared to those with ETSR, most likely was not due to the retrospective study design.

## CONCLUSIONS

This study examined the hypothesis that individuals with significant, early, traumatic stress symptoms following a series of typhoons would have a poorer, long-term outcome than less symptomatic persons. Two specific groups of highly symptomatic individuals were examined, those with a probable diagnosis of ASD and those with an early traumatic stress response consisting of acute fear, intrusion, avoidance, and arousal, without dissociation. Subjects with probable ASD were significantly more likely to develop PTSD at 8 months after the first typhoon and somewhat more likely to develop depression than other exposed individuals. Subjects with ETSR did not have a poorer outcome than their less symptomatic counterparts. Therefore, the study's hypothesis was supported for ASD, but not ETSR, indicating that all acute stress symptoms do not have the same prognostic value. In particular, the presence or absence of the acute dissociative symptoms of emotional numbing and derealization distinguished between the two groups of highly symptomatic subjects, one with a poorer long-term outcome (the ASD group) and one with a more benign, posttraumatic course (the ETSR group). As one of the first investigations of ASD, this study suggests that the diagnosis is a useful concept, but the relative value of its individual criteria and the potential for improving its sensitivity and specificity for subsequent PTSD and other trauma-induced, psychiatric disorders should be examined in future research. In particular, these results should be investigated prospectively across several types of traumatic events, using a more complete assessment of acute stress symptoms and long-term outcomes.

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