

Acute Stress Disorder Following an Industrial Accident

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Acute stress disorder (ASD) was introduced as a new diagnostic category in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*; American Psychiatric Association, 1994). Despite some controversy regarding the symptom criteria of ASD, little empirical data have yet been published on this new category. The current research was designed to investigate the prevalence, course, and phenomenology of this disorder following an industrial accident. Acute stress reactions were investigated in 47 males following an explosion in an oil refinery. Assessments were conducted by experienced clinicians at two points in time (2 weeks and 3 months posttrauma). Measures included a standardised structured interview (SI-PTSD) and three self-report scales assessing traumatic stress (IES), anxiety (BAI), and depression (BDI). Six per cent of the sample met criteria for ASD at 2 weeks posttrauma. This lower-than-expected prevalence appeared to be a function of low levels of avoidance behaviour. Those people present at the time of the explosion scored higher than those who were not present on clinician-rated measures of symptom severity, but not on self-report measures. A significant reduction in symptoms occurred between 2 weeks and 3 months posttrauma, and no subjects went on to develop PTSD. While the current study largely supports the diagnostic criteria for ASD, considerable research remains to be done on this new category of traumatic stress reaction. In particular, the impact of early interventions in ameliorating the symptoms of acute stress disorder and preventing the progression to PTSD should be the focus of future research.

Considerable research in recent years has been devoted to the nature of human response to trauma. It is now widely accepted that a proportion of survivors will develop a characteristic constellation of symptoms following exposure to a potentially life-threatening incident. With publication of the revised third edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R)*; American Psychiatric Association [APA], 1987) came the requirement that symptoms must last for at least 1 month before a formal diagnosis of posttraumatic stress disorder (PTSD) can be made. While this change from the previous version may have served to "normalise" acute reactions to severe stressors (i.e., within the first few weeks), it left clinicians with no useful diagnosis for survivors presenting within 1 month

of the trauma. The *DSM-IV* (APA, 1994) sought to address this problem with the introduction of a new category of stress response, acute stress disorder (ASD). It is noted in the *DSM-IV* that this new category was included to assist early case finding and because ASD may predict the later development of PTSD.

The diagnostic criteria for ASD are comparable to those for PTSD, with the exception that ASD symptoms must be present for a minimum of 2 days and a maximum of 4 weeks. The wording of the stressor criterion is identical for both disorders. At least one symptom from each of the re-experiencing, avoidance and numbing, and hyperarousal clusters are required also for an ASD diagnosis. (This compares with one re-experiencing, three avoidance and numbing, and two hyperarousal symptoms for a diagnosis of PTSD). At first sight, it would appear that meeting criterion for just one symptom from each cluster would not be uncommon in the immediate aftermath of trauma. However, the major difference between ASD and PTSD is that the former includes criteria relating to dissociative experiences. The individual must report three or more of the following symptoms either during, or immediately following, the traumatic event: (a) a subjective sense of numbing, detachment, or absence of emotional responsiveness; (b) a reduction in awareness of one's surroundings (e.g., "being in a daze"); (c) derealisation; (d) depersonalisation; and (e) dissociative amnesia (i.e., inability to recall an important aspect of the trauma).

This emphasis on dissociative experiences in ASD is interesting, perhaps reflecting a particular theoretical slant. Indeed, the relationship between dissociation and PTSD has been the subject of considerable debate. On the one hand, dissociative symptoms frequently coexist with PTSD (Bremner et al., 1992; Bremner, Steinberg, Southwick, Johnson, & Charney, 1993; Hyer, Albrecht, Boudewyns, Woods, & Brandsma, 1993) and dissociation at the time of the trauma is thought to predict the subsequent development of PTSD (Bremner et al., 1992; Marmar et al., 1994). On the other hand, as pointed out by Davidson and Foa (1991), several lines of evidence raise questions about the relationship between these two constructs. Dissociation is not present in all PTSD sufferers and, when present, it tends to decrease over time (Davidson, Kudler, Saunders, & Smith, 1989). Dissociative phenomena may be best conceptualised as an avoidance strategy in response to the anxiety caused

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by the trauma and, as such, they are secondary symptoms (Davidson & Foa, 1991). Atchison and McFarlane (1994) postulate that the tendency to dissociate during a traumatic experience may relate either to a prior history of trauma or to a dispositional propensity towards dissociation (i.e., a "trait" characteristic). Either way, it appears that some individuals may be more likely to dissociate during a traumatic experience than others. The emphasis on dissociative symptoms in ASD raises questions regarding the validity of the diagnosis: it may, for example, result in "false negative" diagnoses among those individuals who have not developed a tendency to dissociate and whose symptoms at the time may be more dominated by acute anxiety and distress. Whether such individuals go on to develop a different PTSD profile, characterised more by anxiety and less by dissociation (as proposed by Atchison & McFarlane, 1994), is a matter for future research.

Whilst a large body of literature now exists describing psychological response to trauma, relatively few studies have assessed survivors within the first few weeks posttrauma. This is, perhaps, not surprising: such research is notoriously difficult to conduct for both ethical and practical reasons. Nevertheless, a few studies are available. Foa and Riggs (1993), for example, reported that 95% of rape victims met *DSM-III* criteria for PTSD within 2 weeks after the assault. This figure had dropped to 65% after 5 weeks and 47% after 3 months. In a recent review of acute stress disorder (Koopman, Classen, Cardena, & Spiegel, 1995), the authors were able to identify 15 published studies that reported on psychological reactions within the first month following a major traumatic event. While retrospective diagnosis of ASD was not possible from the available data, the authors noted relatively high prevalence rates of symptoms from each of the required clusters in the studies under review. Few of the published studies provided information on the duration of symptoms; nevertheless, the authors concluded that "ASD symptoms endure over a several-week period immediately following a traumatic event, diminishing gradually as the traumatic event recedes into the past" (Koopman et al., 1995, p. 38). Importantly, since the recognition of ASD in *DSM-IV*, almost no empirical data has been published regarding the nature and prevalence of this disorder; clearly, such research is of great importance in validating the construct. However, in one of the few published studies, Staab and colleagues (Staab, Grieger, Fullerton, & Ursano, 1996) investigated 320 survivors of a typhoon and found an ASD prevalence rate of 7.2% at 1 week posttrauma.

The current study was designed to investigate the prevalence, nature, and course of acute stress reactions in individuals exposed to an industrial accident. Data were collected at two points in time, approximately 2 weeks and 3 months posttrauma.

Method

The Incident

The incident under investigation was an explosion in the polypropylene plant of a large oil refinery. One employee was killed and another seriously injured in the explosion. It should be noted that counselling staff were on the scene within 3 hours of the explosion and several group debriefings were run on the day. Counselling staff worked intensively with management, advising on how best to respond to traumatised individuals and emphasising the importance of maintaining staff within the workplace. Individual counselling was made available to all staff over the next 2 weeks, and data for the current study were collected in the

context of individual sessions with each staff member. The extent to which these interventions may have ameliorated symptom levels can only be speculated on. Nevertheless, it is clear that the current data may not represent the natural course of acute stress reactions in this population. Ethical considerations precluded the possibility of obtaining such data in the absence of supportive counselling.

Subjects

Approximately 50 staff were routinely employed within the polypropylene plant at the refinery. A total of 47 staff were interviewed following the explosion. Of these, 25 (53%) were present at the time of the incident, 19 saw their deceased or injured colleagues, and 10 tried to provide assistance. Thus, subjects were exposed to a range of trauma severity. It should be noted that even those not present at the time of the explosion may still qualify for the stressor criterion of ASD, since it could be argued that they were "confronted with an event or events that involved actual or threatened death or serious injury" (APA, 1994, p. 431). Subjects were all male and most (70%) were married. The mean age of the sample was 40.9 years ($SD = 7.0$) and the mean length of employment with this company was 12.1 years ($SD = 7.3$). Thus, the sample would appear to be characterised as middle-aged males with relatively stable social and occupational functioning.

Measures

The SI-PTSD (Davidson, Smith, & Kudler, 1989), administered by an experienced clinician, was used to assess PTSD symptomatology. This is a well-validated structured clinical interview comprising 17 questions (plus additional probes if required) inquiring about each PTSD symptom in turn. The severity of each symptom is rated by the clinician on a 5-point scale ranging from 0 (*absent*) to 4 (*severe*). As well as a categorical diagnosis, the SI-PTSD provides an overall symptom severity score by summing the ratings on all 17 items (Davidson et al., 1989). Additional questions were required for the five dissociative symptoms delineated in *DSM-IV* for ASD. Where possible, these were adapted from existing structured interviews such as the PTSD module of the Structured Clinical Interview for *DSM-III-R* (SCID-NP-V; Spitzer, Williams, & Gibbon, 1987). For each question, the wording began: "during or immediately after the incident ..." and continued with a description of the relevant symptom (e.g., "... did things around you seem unreal as though you were in a dream or watching a movie or a play?" or "... did you feel detached from your body, as if you were watching yourself or as if you were a robot or in a dream?"). For each question, descriptors were provided in line with the remainder of the SI-PTSD to assist the clinician in assigning an appropriate rating of symptom severity.

Three questionnaires were included also. The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) is a 21-item scale designed to measure a range of anxiety symptoms. The Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979) is a 21-item scale, widely used for the assessment of depression. The Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) is a 15-item scale designed to tap the two constructs of intrusion and avoidance in posttraumatic stress. All three scales are widely used research instruments and all have demonstrated good psychometric properties.

Procedure

As noted above, the first wave of data collection took place within 2 weeks following the explosion. As well as the structured interviews described above, a few questions were

added to cover demographics and experience of the trauma. Interviews were conducted by an experienced clinician, following which subjects were asked to complete the three questionnaires. This process was repeated at 3 months posttrauma.

Results

Of the 47 people interviewed at Time 1, a total of 3 (6%) met the criteria for a formal diagnosis of ASD. The numbers of subjects meeting criterion levels for each symptom are shown in Table 1. In terms of the dissociative symptoms delineated in the ASD criteria, 17 subjects reported one dissociative symptom of sufficient severity, a further 7 subjects had two symptoms, and 4 subjects had three dissociative symptoms.

In order to investigate the role of exposure in the development of acute symptoms, initial analysis of Time 1 measures was conducted separately for those subjects who were, and those who were not, present at the time of the explosion. Table 2 shows total scores on the SI-PTSD, BAI, BDI, and IES for each of those two groups.

Although there was a tendency for those who were present at the time to score higher on most measures, this difference only reached significance for the clinician-administered structured interview (SI-PTSD). Regrettably, 8 subjects from Time 1 were not available for follow-up at Time 2. In order to determine whether these drop-outs were atypical in terms of symptom severity, they were compared with those who remained in the study using a multivariate analysis of variance (MANOVA). All four symptom measures (SI-PTSD, BAI, BDI, and IES) were included as dependent variables. There was no difference in symptom severity between those who remained in the study and those who did not complete stage two, $F(4, 38) = 1.05, ns$. Subsequent univariate analyses confirmed that there were no significant differences on any single measure between these two groups. Thus, subsequent analyses were conducted only on those subjects who completed the research at both Time 1 and Time 2 ($N = 39$).

Table 2 shows also the mean scores on each of the symptom measures at 2 weeks and 3 months posttrauma. (The dissociative symptoms were not assessed at 3 months

TABLE 1

Proportions of Subjects Meeting Criterion for ASD/PTSD Symptoms at 2 Weeks and 3 Months Posttrauma

Symptom	No. (%) meeting ASD symptom criterion at Time 1 ($N = 47$)	No. (%) meeting PTSD symptom criterion at Time 2 ($N = 39$)
Numbness	24 (51%)	
Dazed	7 (15%)	
Derealisation	9 (19%)	
Depersonalisation	3 (6%)	
Amnesia	0 (0%)	
Number meeting ASD criteria for dissociation:	4 (9%)	
Intrusive thoughts	25 (53%)	3 (8%)
Dreams	5 (11%)	1 (3%)
Flashbacks	10 (21%)	1 (3%)
Psychological distress	9 (19%)	2 (5%)
Physical reactivity	4 (9%)	1 (3%)
Number meeting ASD criteria for intrusion:	29 (62%)	
Avoid thoughts, feelings	3 (6%)	0 (0%)
Avoid activities	0 (0%)	1 (3%)
Amnesia	2 (4%)	1 (3%)
Loss of interest	2 (4%)	0 (0%)
Detachment	0 (0%)	0 (0%)
Restricted affect	2 (4%)	0 (0%)
Foreshortened future	0 (0%)	0 (0%)
Number meeting ASD criteria for avoidance:	6 (13%)	
Sleep problems	4 (9%)	0 (0%)
Anger	2 (4%)	0 (0%)
Poor concentration	7 (15%)	0 (0%)
Hypervigilance	6 (13%)	0 (0%)
Startle response	6 (13%)	1 (3%)
Number meeting ASD criteria for hyperarousal:	14 (30%)	
ASD/PTSD diagnosis:	3 (6%)	0 (0%)

TABLE 2

Means (*SDs*) for SI-PTSD Total, BAI, BDI, IES Intrusion and IES Avoidance for High and Low Exposure Groups at 2 Weeks Posttrauma and for Whole Group at 2 Weeks and 3 Months Posttrauma

	Time 1 (2 weeks posttrauma) by presence at time of explosion			Whole group at times 1 and 2 ($N = 39$)		
	Present ($n = 24$)	Not present ($n = 20$)	p	Time 1 (2 weeks posttrauma)	Time 2 (3 months posttrauma)	p
SI-PTSD total	9.41 (7.56)	4.53 (3.99)	.02	7.31 (6.85)	2.90 (3.51)	.001
BAI	3.91 (5.50)	1.73 (2.43)	.16	3.00 (4.57)	0.85 (2.02)	.002
BDI	2.76 (3.73)	1.93 (1.83)	.43	2.42 (3.07)	1.21 (2.13)	.002
IES Intrusion	4.48 (4.82)	4.33 (4.48)	.93	4.44 (4.60)	1.87 (3.61)	.001
IES Avoidance	8.29 (7.16)	8.13 (6.33)	.95	8.22 (6.74)	3.36 (4.32)	.001

since they are not part of the diagnostic criteria for PTSD and the maximum duration of ASD is 1 month posttrauma). Despite low initial symptoms levels, suggesting that a "floor" effect may occur, there was a significant reduction on all measures across this time period. No individuals assessed at Time 2 met the criteria for PTSD. Indeed, symptom levels by 3 months posttrauma indicate excellent recovery.

Discussion

It is reasonable to assume that the structured interview data represent the most valid and objective index of psychological adjustment. The level of psychopathology in the sample, as measured by the SI-PTSD, was relatively low, with only 6% meeting criteria for a formal diagnosis of ASD and no participants going on to develop PTSD. In interpreting the prevalence of ASD in the current research, several factors should be borne in mind. On the one hand, the incident was relatively severe, involving death of a colleague, serious injury, and significant threat to life. On the other, considerable organisational support and individual counselling had been provided and the response of the company in demonstrating concern and support for its staff should be mentioned also in this context. While the benefits of early intervention following trauma are by no means certain, it is reasonable to assume that they may have served to facilitate recovery. Further, there are indications that the participants in this study may have been a relatively highly functional group prior to the trauma; the majority were married, middle-aged males with a stable employment history. The fact that symptom levels continued to reduce over the first 3 months, and that no participants went on to develop PTSD, may be further testament both to the interventions provided and the pre-trauma functioning of the sample.

How, then, should the prevalence of ASD be interpreted? As noted above, there is insufficient published research at this stage to meaningfully anticipate prevalence rates for ASD following this kind of traumatic incident. Nevertheless, the figure of 6% obtained in the current study would seem to be comparable with the prevalence of 7.2% found by Staab et al. (1996) following a natural disaster. Such a figure is in line also with the estimated prevalence rates of PTSD following accidents, quoted at 6.3% by Kessler et al. (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Thus, it seems reasonable to propose a figure of 6 to 7% as an initial prevalence estimate of ASD in the first 2 weeks posttrauma. Clearly, considerable epidemiological research is required to determine the extent to which this rate may be generalisable to other traumatic incidents and populations. Regrettably, the low subject numbers and good recovery made by the study participants preclude the possibility of commenting on the course of this disorder in the absence of early treatment. It is worth noting, however, that the recovery that took place between 2 weeks and 3 months posttrauma is in line with the predictions of Koopman et al. (1995) noted above.

Interestingly, and contrary to our expectations, the relatively low prevalence rate of ASD was not a function of the requirement for three dissociative symptoms. Reducing the requirement to two, or even one, dissociative symptom did not increase the prevalence of ASD. That is, there were only three subjects who had at least one symptom in each of the other categories. It is clear from Table 1 that a low level of avoidance symptoms may be the explanation. While plenty of subjects met ASD criteria for intrusion and hyperarousal, only 6 met the requirement for avoidance. Again, this is likely to be a function of this particular sample and

their unique experiences; the provision of counselling and other organisational support strategies at the worksite may have minimised the development of avoidance behaviour. Nevertheless, it is possible also that 2 weeks posttrauma is a little too early for avoidance symptoms to develop. In line with findings from the structured interview, scores on the questionnaire measures were also surprisingly low, with scale means well within the normal range.

While those participants who were present at the time of the explosion generally obtained higher scores on the symptom measures, the difference only reached significance for the clinician ratings of symptom severity. It should be emphasised, of course, that this is a very gross measure of exposure to trauma and precludes the possibility of making definitive statements regarding the association between level of trauma and subsequent adjustment. Nevertheless, the finding highlights the importance of not relying exclusively on self-report data in assessing acute stress symptoms. While it needs to be acknowledged that the clinician was not "blind" to the subjects' trauma experiences, the use of a structured interview hopefully minimises any potential biases in ratings of symptom severity.

Of particular interest is the absence of any difference on the IES; being present at the time of the explosion did not seem to affect self-reports of intrusive or avoidance symptoms on this measure. This finding is surprising; despite the low symptom levels, a difference would be expected on this measure between those who were present when the explosion occurred and those who were not. The explanation for this apparent anomaly presumably lies in the nature of the measures. Questions on the SI-PTSD relate specifically to the symptoms defined by the diagnostic criteria; in addition, the interview allows for an element of clinical judgement. As such, the SI-PTSD (or, indeed, any other well-validated structured clinical interview for PTSD) would be seen as a close approximation of the "gold standard" for diagnostic purposes. The IES, on the other hand, was never intended as a diagnostic tool. Indeed, it was published prior to the recognition of PTSD as a diagnostic entity and the delineation of the criteria symptoms. Rather, the IES was designed by Horowitz as a measure of "current subjective distress, related to a specific event" (Horowitz et al., 1979, p. 209). The current findings may relate to the confusion that characterises posttraumatic adjustment between subjective distress (which is very common) and more serious psychopathology (which is very rare). The IES is designed to measure the former, the SI-PTSD the latter.

The fact that professional assistance was provided to survivors in this case precludes the possibility of generalising from the current data to the natural course of ASD. However, in view of the fact that such interventions following trauma are now almost routine in many occupational settings, the results provide an important first step in estimating the prevalence and phenomenology of acute stress disorder. Considerable research remains to be done on this new category of traumatic stress reaction. In particular, the impact of early interventions in ameliorating the symptoms of acute stress disorder and preventing the progression to PTSD should be the focus of future research.

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