Trajectories of Posttraumatic Stress Disorder Following Myocardial Infarction: A Prospective Study

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Background: This study examines the trajectories of posttraumatic stress disorder (PTSD) following myocardial infarction (MI). More specifically, it has 2 aims: (1) to examine whether the trajectory of PTSD is predicted by level of threat and the nature of initial reactions and (2) to examine the associations between the trajectory of PTSD and anxiety, somatization, health-related quality of life, and hospitalization 7 months following MI.

Method: 116 MI patients were examined twice. At time 1, within a week of the patient's MI, acute stress disorder (ASD) was assessed and medical measures were obtained from patients' hospital records. At time 2, 7 months later, PTSD, anxiety, physical residuals, and health-related quality of life were assessed. Data were gathered in 1999.

Results: Six percent of the respondents had both ASD and PTSD, 10% did not have ASD but did have PTSD, and 12% had ASD but not PTSD. The trajectory of PTSD was associated with severity of anxiety, somatic complaints, and health-related quality of life. In addition, while the severity of MI did not predict the trajectory of PTSD, the perceived severity did. Patients without PTSD but with prior ASD did not differ in their initial reactions from those without ASD.

Conclusion: These findings provide support for the considerable variability in the trajectory of the development of PTSD and suggest that although ASD is associated with subsequent PTSD, the predictive role of initial reactions is limited.

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While acute stress disorder (ASD) is recognized as a risk factor for posttraumatic stress disorder (PTSD), the 2 disorders are distinct diagnostic entities, and there are differential trajectories of PTSD. According to the literature, about 60% of PTSD patients developed the syndrome following the onset of ASD in the immediate wake of a traumatic experience.[1] At the same time, while many ASD patients develop chronic PTSD, for many others ASD is a temporary condition. Some authors have reported that about half to three quarters of ASD patients develop PTSD[2–4]; others have reported that between 50% and 70% do not.[3,5,6] While the different trajectories of PTSD have been documented, less is known about the predictors of these trajectories and their implications.

Predictors of the Trajectories of PTSD

The DSM-IV[7] describes the level of exposure to traumatic stress as one of the most important risk factors for both ASD and PTSD. The level of exposure can be measured either objectively (e.g., the severity of physical injury, the physical proximity to the threat) or subjectively (e.g., the perceived threat of death). Findings indicate that while subjective measures of the level of exposure are associated with both ASD[8] and PTSD,[9,10] objective measures of threat are associated with neither ASD[11,12] nor PTSD.[9,13]

The picture with regard to the trajectory of PTSD is less clear. Blanchard et al.,[3] who examined motor vehicle accident victims twice (1–4 months after the accident and 6 months later), found that the more severe the physical injury, the less likely any remission of PTSD. In contrast, in a retrospective study of victims of physical and sexual assault, Dunmore et al.[14] found that the objective severity of the assault did not differentiate between those with persistent PTSD and those in remission, but that the level of perceived threat did: this level was higher among the victims with persistent PTSD than among those who had recovered. Dunmore and colleagues' findings, however, are open to interpretation: given the retrospective nature of the study, it is impossible to know whether the difference in perceived threat led to the differences in the persistence of PTSD or, conversely, the differences in perception stemmed from the difference in PTSD status.

Analyzing the power of the initial stress response, as manifested by the separate ASD symptom clusters, in predicting subsequent PTSD reveals inconclusive findings. Some studies that examined immediate responses to trauma have found that PTSD was predicted by the intensity of dissociation,[9,15–17] intrusion,[18,19] avoidance,[19,20] and hyperarousal symptoms[1,19] immediately after the traumatic exposure, while others found no relationship between PTSD and these symptoms (dissociation,[21] intrusion,[22,23] avoidance,[18,22] and hyperarousal[24]). In a study of rape victims, Rothbaum et al.[6] compared ASD subjects who recovered after 3 months and those who were diagnosed with PTSD at that time. They found that those who developed PTSD had experienced a significantly higher level of intrusion, but not avoidance, in the first week after their assault than those who recovered. These findings notwithstanding, the distinct contribution of each ASD symptom cluster to the trajectory of PTSD needs further examination.

Trajectories of PTSD and Adjustment Following Traumatic Events

Previous studies indicate that PTSD is often implicated in somatic and psychosocial difficulties. Findings show that PTSD subjects tend to report more somatic symptoms,[25–29] lower level of health-related quality of life,[30] and more referrals to hospital emergency rooms[31] than non-PTSD survivors of traumas, as well as greater difficulties in vocational,[31] social,[32] and familial[33] functioning. These findings were obtained following various types of traumatic events, including combat[25] and war captivity,[28] as well as a variety of physical injuries[30] and myocardial infarction (MI).[31]

Less is known about the association between the trajectory of PTSD and these adjustment difficulties; that is, do persons who develop PTSD following ASD suffer from more distress and poorer functioning than those who develop PTSD without prior ASD? How does the adjustment of persons who recover from an ASD compare with that of persons who had no immediate stress reaction to begin with? Barton et al.[34] found that PTSD survivors of motor vehicle accidents suffered similar levels of depression and anxiety whether or not they had experienced prior ASD.

The present study examined these issues prospectively among MI patients. More specifically, it assessed ASD among MI patients during hospitalization (time 1) and PTSD 7 months later (time 2) to determine (1) whether the objective and subjective severity of the stress and/or each of the initial responses as measured at time 1 predicted the trajectory of PTSD and (2) whether the severity of patients' anxiety, level of psychosocial adjustment, and physical residuals at time 2 were related to the trajectory of PTSD.

METHOD

Subjects and Study Design

The subjects were 116 MI patients, drawn from all of the patients who were admitted to the cardiac intensive care unit in 3 Israeli medical centers during data collection and met the following criteria: (1) presence of the MI diagnostic criteria: typical clinical symptomatology, electrocardiogram evidence of MI, and typically elevated serum levels of myocardial enzymes; (2) age up to 70 years; (3) Hebrew speaking; and (4) not suffering from any other major illness. In all, 245 patients met the criteria. Of these, 196 patients were assessed during their hospitalization (time 1; mean [SD] = 3.45 [2.32] days after admission; response rate = 80%). The second assessment (time 2) was conducted in the patients' homes around 7 months after their admission (mean [SD] = 7.06 [2.32] months). Four of the patients who participated at time 1 died before the second assessment, 23 were not located, and 53 refused to be interviewed. The data reported in this study were collected from the 116 patients who were assessed at both time 1 and time 2. Data were gathered in 1999.

To locate possible bias caused by selective attrition, we compared the persons who participated in the study at both time 1 and time 2 with those who participated at time 1 and then dropped out. The comparisons revealed no differences in sociodemographic background, clinical measures, or intensity of ASD.

Most of the subjects (N = 94; 81%) were male. Thirty percent (N = 35) were up to 50 years old, 42% (N = 49) were between 51 and 60 years old, and the rest (28%; N = 32) were between 61 and 70 years old. Forty-five percent (N = 52) were born in Israel, 32% (N = 37) were born in a North or South American or European country, and the rest (23%; N = 27) were born in an Asian or African country. Among the 113 patients for whom education data were available, 27% (N = 30) had fewer than 12

years of formal education, 29% (N = 33) had 12 years, and the rest (44%, N = 50) had more than 12 years.*

When asked about history of trauma, 14% (N = 16) of the subjects reported that they had experienced no previous traumatic life event, 38% (N = 44) reported 1 or 2 such events, and the rest (48%; N = 56) reported between 3 and 6. Finally, 42% (N = 49) participated in some kind of rehabilitation program.

At time 1, ASD and perceived severity of MI were measured. In addition, clinical measures were gathered from patients' hospital records. At time 2, PTSD, anxiety, physical residuals, and health-related quality of life were assessed.

The study was undertaken after institutional Helsinki committees approved the research design. Informed consent was obtained from all subjects at the first assessment.

Assessments

Objective and perceived severity of MI. Clinical data on the MI were gathered from the patients' hospital records. Four variables were chosen as indicators of the severity of MI: 2 dichotomous measures, occurrence of prior MI (yes/no) and location of MI (anterior/non-anterior MI), and 2 continuous variables, level of creatine phosphokinase (CPK) and number of days of hospitalization. Prior MI, anterior location of MI, higher levels of CPK, and more days of hospitalization were considered indicative of more severely impaired left ventricular function than first MI, non-anterior location, lower levels of CPK, and fewer days of hospitalization.

Subjective perception of the MI was measured by a self-report questionnaire designed for the current study (unpublished questionnaire; available from the authors on request). This scale consists of 6 items tapping the perceived severity of the MI. Respondents were asked to rate, on a 4-point scale (on which 1 = not at all and 4 = extremely), the extent to which each item described their perception of the MI. Varimax rotated factor analysis yielded 2 factors, explaining 54% of the variance of perceived stress. The first factor, threat of death, consisted of 3 items (item loadings, 0.67–0.75), which explained 27% of the variance of perceived stress. These items were as follows: "I was under threat of death," "Currently I am under threat of death," and "During hospitalization, I saw people under the threat of death." The second factor, perceived severity of MI, consisted of 3 items (item loadings, 0.51–0.78), which explained an additional 27% of the variance of perceived stress. These items were as follows: "I am afraid that I will go through another MI," "I am afraid of recurrent chest pain," and "My illness is severe."†

Stanford Acute Stress Reaction Questionnaire. This self-report questionnaire[35] consists of 28 items describing dissociative, intrusive, avoidant, and hyperarousal symptoms. Respondents are asked to rate, on a 6-point Likert scale, the extent to which they suffer from each of the symptoms.

Subjects were identified as having full ASD according to the following criteria based on the DSM-IV[7]: (1) having experienced a traumatic event in the previous month (since the DSM-IV[7] included life-threatening illness as a potentially traumatic event, and prior studies documented PTSD among MI patients,[31,36] MI was considered a traumatic event); (2) endorsement of at least 3 dissociative symptoms; (3) at least 1 intrusive symptom; (4) at least 1 avoidant symptom; and (5) at least 1 hyperarousal symptom. In addition, this scale assesses the severity of ASD, calculated as the mean of the total score.

This questionnaire has been used to assess ASD in various populations[24,35] and possesses high test-retest reliability.[35] The Cronbach alpha for the current sample was high (0.93), indicating high internal consistency.

PTSD Inventory. PTSD was measured with the PTSD Inventory,[37] a self-report scale based on the DSM-IV.[7] The scale consists of 17 items describing intrusive, avoidant, and hyperarousal symptoms. Subjects are asked to indicate whether they had each symptom during the last month.

Subjects are identified as having full PTSD according to the following criteria based on the DSM-IV[7]: (1) having experienced a traumatic event at any time in the past (again, MI was considered a traumatic event); (2) endorsement of at least 1 intrusive symptom; (3) at least 3 avoidant symptoms; and (4) at least 2 hyperarousal symptoms. This scale also assesses the severity of PTSD, calculated as the number of symptoms endorsed.

This questionnaire has been used to assess PTSD in various populations, including MI patients.[31] Internal consistency among the 17 items was high (0.84) in the current

*In a comprehensive survey, Drory examined the sociodemographic characteristics of all MI patients under the age of 65 who were admitted to 8 Israeli medical centers in the central area of Israel, including those hospitals that were included in the current study, during 1 year (N = 1626). The survey revealed that 81% of the MI patients were male. Thirty-two percent were up to 50 years old, 40% were between 51 and 60 years old, and 27% were between 61 and 65 years old. Thirty-one percent were born in Israel, 38% were born in an American or European county, and the rest (30%) were born in an Asian or African country. Forty-eight percent had fewer than 12 years of formal education, 21% had 12 years, and 31% had more than 12 years. Comparisons between the current sample and Drory's suggest that the sample in the current study represents the population of MI patients in the central area of Israel with regard to gender, age, and country of origin, although is somewhat more educated. [Drory Y. Coronary Heart Disease in Women [in Hebrew]. Tel Aviv, Israel: Heiliger; 1998]

†A series of analyses indicated partial associations between the clinical data and the subjective perception of the MI. Perceived threat of death was associated with occurrence of prior MI ($t = 1.85$, $df = 106$, $p < .05$) and with number of days of hospitalization ($r = 0.22$, $p < .05$), but not with location of MI or level of CPK. Perceived severity of MI was associated with occurrence of prior MI ($t = 1.97$, $df = 109$, $p < .05$), location of MI ($t = 2.24$, $df = 107$, $p < .05$), and level of CPK ($r = 0.19$, $p < .05$). Perceived severity of MI was not associated with number of days of hospitalization.

Table 1. Distribution of Posttraumatic Stress Disorder (PTSD) According to Presence of Acute Stress Disorder (ASD) in Myocardial Infarction Patients

	PTSD (N = 18)		No PTSD (N = 98)	
Group	N	%	N	%
ASD (N = 21)	7	33.3	14	66.7
No ASD (N = 95)	11	11.6	84	88.4

sample, and the scale was found to have a high convergent validity when compared with diagnoses based on structured clinical interviews.[37]

Taylor Manifest Anxiety Scale. This scale[38] consists of 50 items describing emotional and behavioral expressions of anxiety. Respondents are asked to indicate whether they experienced each manifestation during the last 2 weeks. The mean score reflects the respondent's level of anxiety.

Cronbach alpha in the current sample was high (0.82), indicating high internal consistency.

Physical residuals. Physical residuals were assessed by 2 measures at time 2: number of days of hospitalization since time 1 (excluding days prior to the patient's discharge after the MI) and somatic complaints. For somatic complaints, subjects were presented with a list of 12 symptoms (e.g., chest pain, perspiration, exhaustion) and asked to indicate on a 4-point Likert scale (on which 1 = not at all and 4 = extremely) the extent to which they suffered from each. In addition, subjects were asked to indicate any other symptom they had. The mean score reflects the intensity of the person's somatic complaints.

Health-related quality of life. Health-related quality of life was measured using the Short Form Health Survey.[39] This scale consists of 36 items comprising 8 dimensions: physical functioning, social functioning, fulfillment of physical role, fulfillment of emotional role, mental health, vitality, bodily pain, and general health perceptions.

This widely used questionnaire has been shown to be valid and reliable across diverse outpatient groups.[40] Cronbach alphas for the current sample were high (0.87–0.99), indicating high internal consistency.

RESULTS

ASD and PTSD

Eighteen percent (N = 21) of MI patients were identified as having ASD at time 1, and 16% (N = 18) of the MI patients were identified as having PTSD at time 2. A chi-square analysis revealed a significant association between ASD and PTSD ($\chi^2 = 6.21$, df = 1, $p < .05$). Table 1 presents the distribution of PTSD among subjects with and without ASD. As can be seen, the risk for PTSD was 3 times higher among MI patients who had experienced full ASD (33%) than among those who had not had it (12%). However, two thirds of the ASD subjects did not develop subsequent PTSD.

Based on the trajectories of ASD and PTSD, MI patients were classified into 4 groups: (1) patients who had both ASD and PTSD (6%; N = 7); (2) patients who exhibited a pattern of deterioration, that is, who did not have ASD but did have PTSD (10%; N = 11); (3) patients who exhibited a pattern of remission, that is, who had ASD but not PTSD (12%; N = 14); and (4) patients who had neither ASD nor PTSD (72%; N = 84).

A series of analyses indicated that the trajectory of PTSD was not associated with gender, age, level of education, level of income, or participation in a rehabilitation program.

Predicting the Trajectory of PTSD

To examine whether the predictor variables assessed at time 1 (immediate reactions and objective and perceived severity of MI) predicted the trajectory of PTSD, a series of analyses of variance (ANOVAs) was conducted, followed by Duncan contrasts. Table 2 presents the results of these analyses, as well as the mean and standard deviation values of the predictor variables by the trajectory of PTSD.

As can be seen, the actual severity of MI, as determined by clinical indicators and the number of days of hospitalization, did not predict the trajectory of PTSD. On the other hand, perceived severity of MI differentiated those who had neither ASD nor PTSD and those who had both.

All of the immediate reactions were associated with the trajectory of PTSD. As can be seen in Table 2, persons who had both ASD and PTSD and those who had ASD and recovered had higher levels of dissociation, intrusion, avoidance, and hyperarousal than persons who had neither ASD nor PTSD and persons who had PTSD without prior ASD.

Trajectory of PTSD and Adjustment Following MI

A series of ANOVAs was conducted to examine whether the trajectory of PTSD was related to the outcome measures at time 2. These analyses revealed a significant association between the trajectory of PTSD and anxiety, health-related quality of life, and somatic complaints. Table 3 presents the mean and standard deviation values of the adjustment measures by the trajectory of PTSD, as well as the results of the ANOVAs and the Duncan contrasts, conducted to ascertain the source of the group differences. As can be seen, the following pattern was revealed:

1. PTSD subjects, with and without prior ASD, reported higher levels of anxiety than the non-PTSD subjects.

Table 2. Variables Predicting the Trajectory of PTSD in Myocardial Infarction (MI) Patients

	ASD and PTSD (+ +) (N = 7)		No ASD but PTSD (– +) (N = 11)		ASD but no PTSD (+ –) (N = 14)		No ASD and no PTSD (– –) (N = 84)		
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F
Severity of MI[a]									
Creatine phosphokinase, U/L	1063	849	1649	1091	1342	1349	1368	1412	0.23
No. of days in hospital	9.71	3.55	10.78	5.65	8.67	3.06	9.13	5.42	0.35
Perception of MI									
Perceived threat of death	1.86	0.56	1.61	0.57	1.74	0.56	1.45	0.53	2.06
Perceived severity	2.43	0.94	2.67	0.63	3.17	0.68	2.58	0.78	2.64*
									– – < + +
Immediate reactions									
Dissociation	1.98	0.71	0.58	0.52	2.08	0.39	0.56	0.57	40.05**
									– –, – + < + +, + –
Intrusion	1.26	0.29	0.56	0.62	1.71	0.82	0.44	0.64	17.45**
									– –, – + < + +, + –
Avoidance	2.41	0.98	0.88	1.08	1.97	0.93	0.85	0.99	9.61**
									– –, – + < + –, + +
Hyperarousal	2.76	0.92	1.05	1.08	2.42	1.18	1.03	0.98	12.74**
									– –, – + < + –, + +

[a]Since 2 indicators of severity of MI are dichotomous variables (i.e., location of MI and occurrence of prior MI), we examined their association with trajectory of PTSD using chi-square tests. These analyses indicated that the groups did not differ in location of MI ($\chi^2 = 1.75$, df = 3) or in frequency of first MI ($\chi^2 = 5.81$, df = 3).
*p < .05.
**p < .001.
Abbreviations: ASD = acute stress disorder, PTSD = posttraumatic stress disorder.

2. Subjects who developed PTSD without prior ASD reported lower levels of vitality and mental health and perceived their fulfillment of emotional role and their general health as worse than subjects with neither ASD nor PTSD. Subjects who developed PTSD without prior ASD also reported higher levels of somatic complaints and poorer social functioning than those who had ASD but did not develop PTSD and those who sustained neither ASD nor PTSD, and a higher level of pain than the other 3 groups.
3. Subjects with neither ASD nor PTSD reported better social functioning, fulfillment of emotional role, and perceptions of general health than those with both ASD and PTSD, and better fulfillment of physical role than the other 3 groups.

DISCUSSION

The findings of this study support the view that ASD is a risk factor for PTSD. PTSD rates among the MI patients who had ASD were 3 times higher than among those who did not have ASD. At the same time, the findings provide yet further support for the considerable variability in the trajectory of PTSD. About two thirds of the MI patients with ASD did not develop PTSD. These findings are similar to previous reports indicating that more than half of ASD subjects exhibit partial or complete recovery over time[3,6] and that half of all PTSD patients had not sustained prior ASD.[1]

While immediate levels of intrusion, avoidance, hyperarousal, and dissociation were higher among the ASD subjects than the non-ASD subjects shortly after MI, no significant differences were found in the intensity of these responses between the ASD subjects who developed PTSD and those who did not. In other words, initial levels of intrusion, avoidance, hyperarousal, and dissociation did not predict the sequelae of ASD.

This tendency, also reflected in the finding that about two thirds of ASD subjects did not develop PTSD, supports the view of ASD and PTSD as distinct diagnostic entities, but also raises the question regarding the inclusion of ASD as a disorder. This issue is further underscored by the lack of significant differences in any area of adjustment between the PTSD patients with and without prior ASD. That is, among the MI patients who developed PTSD, whether they had prior ASD had no significant bearing on their adjustment.

These findings may be considered in connection with the debate on the status of ASD as a distinct clinical entity. On the one hand, this diagnosis, introduced by the DSM-IV,[7] is based on a large set of data that demonstrate that initial stress reactions not only cause severe distress, but are also implicated in longer term adjustment difficulties (e.g., Solomon[32]). On the other hand, our study, like studies prior to it (e.g., Blanchard et al.,[3] Staab et al.,[5] and Rothbaum et al.[6]), shows that for many persons, ASD is a transient phenomenon. Since categorizing transient reactions as abnormal may lead to unnecessary labeling and pathologization, and in and of itself may impair adjustment,[41] the finding that ASD is often transient suggests that the classification of ASD as a mental health disorder should be reconsidered, in line with the ICD-10's use

Table 3. Outcome Measures at Time 2, According to the Trajectory of PTSD, in Myocardial Infarction Patients[a]

	ASD and PTSD (+ +) (N = 7)		No ASD but PTSD (– +) (N = 11)		ASD but no PTSD (+ –) (N = 14)		No ASD and no PTSD (– –) (N = 84)		
Measure	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F
Anxiety	1.50	0.15	1.48	0.15	1.35	0.14	1.25	0.15	12.16** – –, + – < + +, – +
Somatic complaints	2.86	3.98	4.82	3.03	1.79	2.78	1.62	2.32	5.35* – –, + – < – +
No. of days of hospitalization	0.29	0.70	1.00	1.79	0.86	1.66	0.89	2.82	0.50
Health-related quality of life									
Physical functioning	57.00	9.75	67.00	19.47	71.41	22.21	78.01	21.14	2.41
Social functioning	69.50	35.77	59.25	24.38	82.51	21.53	91.51	15.31	10.86** – + < + –, – – + + < – –
Physical role	30.00	32.60	17.50	33.44	45.83	41.06	78.00	35.21	11.98** – +, + +, + – < – –
Emotional role	46.67	50.55	26.67	40.98	56.41	49.79	82.46	31.96	8.92** – +, + + < – –
Mental health	61.60	15.13	59.60	26.16	67.25	21.98	78.62	17.25	4.73* – + < – –
Vitality	53.00	26.12	41.50	17.65	58.89	23.25	68.71	22.11	5.25** – + < – –
Pain	77.80	21.84	48.70	25.65	80.29	17.71	84.16	19.69	9.18** – + < + +, + –, – –
General health	54.40	7.02	54.60	14.61	61.68	22.12	82.53	16.40	5.65** + +, – + < – –

[a]Higher scores on anxiety, somatic complaints, and hospitalizations reflect more severe anxiety, more somatic complaints, and more days in the hospital. Higher scores on the health-related quality-of-life measures reflect better physical and social functioning, better physical- and emotional-role functioning, better mental health, higher vitality, less bodily pain, and better general health perception.
*p < .01.
**p < .001.
Abbreviations: ASD = acute stress disorder, PTSD = posttraumatic stress disorder.

of the term *acute stress reaction* instead of *acute stress disorder*.

This study also examined whether the level of threat and the intensity of each of the initial stress responses predicted the trajectory of PTSD. The findings indicate that perceived level of threat, measured immediately after the MI, partially predicts the trajectory of PTSD: MI patients with both ASD and PTSD were more inclined than those with neither ASD nor PTSD to have perceived their MI as severe, but they did not differ in their perception of themselves as being under threat of death. The findings also show that the trajectory of PTSD was not affected by the objective severity of patients' MI, as determined by clinical data. These findings are consistent with findings on casualties of other traumas, which similarly showed that the severity of physical injury did not predict the occurrence of ASD or PTSD.[9,13,22]

Why the objective severity of the MI did not affect the patients' subsequent adjustment is unclear. It may be that the patients were not aware of the severity of their MI, either because they were not given information about the severity of their illnesses or because they did not comprehend the information given. The study's findings do not support this hypothesis, however. Patients with prior MI, anterior MI, and high levels of CPK—all indicators of more severe MI—adequately perceived their condition as more severe than first-time MI patients and patients whose MIs were not anterior and who had lower levels of CPK; that is, in general, patients were aware of the objective severity of their MI. Michaels et al.[30] report a similar pattern among patients who suffered physical traumas: the objective severity of the injury was associated with perceived subjective severity, but only the perceived severity was associated with immediate stress reactions.

This study should be examined in light of its limitations, the most significant of which relates to the sample size. Although the imbalance in the proportion of the subjects in the 4 categories of trajectory of PTSD seems to reflect the natural distribution of this variable, some of the categories are too small. Moreover, further study is required to determine the generalizability of the findings to other types of stressors. MI is a specific event, and although the DSM-IV[7] defined life-threatening illnesses as potentially traumatic events and previous studies have shown that MI is a risk factor for PTSD (e.g., Kutz et al.,[31] Bennett and Brooke[36]), the study of ASD and PTSD following MI, as well as after medical events in general, is still limited. Further study examining the factors that relate to the trajectory of PTSD among larger samples following other traumatic events is needed.

REFERENCES

1. Brewin CP, Andrews B, Rose S, et al. Acute stress disorder and posttraumatic stress disorder in victims of violent crime. Am J Psychiatry

1999;156:360–366
2. Harvey AG, Bryant RA. Relationship of acute stress disorder and posttraumatic stress disorder following motor vehicle accidents. J Consult Clin Psychol 1998;66:507–512
3. Blanchard EB, Hickling EJ, Forneris CA, et al. Prediction of remission of acute posttraumatic stress disorder in motor vehicle accident victims. J Trauma Stress 1997;10:215–234
4. Holeva V, Tarrier N, Wells A. Prevalence and predictors of acute stress disorder and PTSD following road traffic accidents: thought control strategies and social support. Behav Ther 2001;32:65–83
5. Staab JP, Grieger TA, Fullerton CS, et al. Acute stress disorder, subsequent posttraumatic stress disorder and depression after a series of typhoons. Anxiety 1996;2:219–225
6. Rothbaum BA, Foa EB, Riggs DS, et al. A prospective examination of post-traumatic stress disorder in rape victims. J Trauma Stress 1992;5: 455–475
7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington DC: American Psychiatric Association; 1994
8. Griffin MG, Resick PA, Mechanic MB. Objective assessment of peritraumatic dissociation: psychophysiological indicators. Am J Psychiatry 1997;154:1081–1088
9. Ehlers A, Mayou RA, Bryant B. Psychological predictors of chronic posttraumatic stress disorder after motor vehicle accidents. J Abnorm Psychol 1998;107:508–519
10. Conlon L, Fahy TJ, Conroy R. PTSD in ambulant RTA victims: a randomized controlled trial of debriefing. J Psychosom Res 1999;46:37–44
11. Koopman C, Classen C, Cardena E, et al. When disaster strikes, acute stress disorder may follow. J Trauma Stress 1995;8:29–46
12. Fullerton CS, Ursano RJ, Epstein RS, et al. Peritraumatic dissociation following motor vehicle accidents: relationship to prior trauma and prior major depression. J Nerv Ment Dis 2000;188:267–272
13. Koren D, Arnon I, Klein E. Acute stress response and posttraumatic stress disorder in traffic accident victims: a one-year prospective, follow-up study. Am J Psychiatry 1999;156:367–373
14. Dunmore E, Clark DM, Ehlers A. Cognitive factors involved in the onset and maintenance of posttraumatic stress disorder (PTSD) after physical or sexual assault. Behav Res Ther 1999;37:809–829
15. Eriksson N-G, Lundin T. Early traumatic stress reactions among Swedish survivors of the m/s *Estonia* disaster. Br J Psychiatry 1996;169:713–716
16. Koopman C, Classen C, Spiegel D. Predictors of posttraumatic stress symptoms among survivors of the Oakland/Berkeley, Calif, firestorm. Am J Psychiatry 1994;151:888–894
17. Marmar CR, Weiss DS, Schlenger WE, et al. Posttraumatic dissociation and posttraumatic stress in male Vietnam theater veterans. Am J Psychiatry 1994;151:902–907
18. Shalev AY, Peri T, Canetti L, et al. Predictors of PTSD in injured trauma survivors: a prospective study. Am J Psychiatry 1996;153:219–225
19. Difede J, Ptacek JT, Roberts J, et al. Acute stress disorder after burn injury: a predictor of posttraumatic stress disorder? Psychosom Med 2002;64:826–834
20. Bryant RA, Harvey AG. Relationship between acute stress disorder and posttraumatic stress disorder following mild traumatic brain injury. Am J Psychiatry 1998;155:625–629
21. Shalev AY, Freedman S, Peri T, et al. Prospective study of posttraumatic stress disorder and depression following trauma. Am J Psychiatry 1998;155:630–637
22. Perry S, Difede J, Musngi G, et al. Predictors of posttraumatic stress disorder after burn injury. Am J Psychiatry 1992;149:931–935
23. Shalev AY. Posttraumatic stress disorder among injured survivors of a terrorist attack: predictive value of early intrusion and avoidance symptoms. J Nerv Ment Dis 1992;180:505–509
24. Classen C, Koopman C, Hales R, et al. Acute stress disorder as a predictor of posttraumatic stress symptoms. Am J Psychiatry 1998;155:620–624
25. Beckham JC, Moore SD, Feldman ME, et al. Health status, somatization, and severity of posttraumatic stress disorder in Vietnam combat veterans with posttraumatic stress disorder. Am J Psychiatry 1998;155:1565–1569
26. Kimerling R, Clum GA, Wolfe J. Relationships among trauma exposure, chronic posttraumatic stress disorder symptoms, and self-reported health in women: replication and extension. J Trauma Stress 2000;13:115–128
27. Ladwig K-H, Schoefinius A, Dammann G, et al. Long-acting psychotraumatic properties of a cardiac arrest experience. Am J Psychiatry 1999;156:912–919
28. Ohry A, Solomon Z, Neria Y, et al. The aftermath of captivity: an 18-year follow-up of Israeli ex-POWs. Behav Med 1994;20:27–33
29. Shalev AY, Bleich A, Ursano RJ. Posttraumatic stress disorder: somatic comorbidity and effort tolerance. Psychosomatics 1990;31:197–203
30. Michaels AJ, Michaels CE, Moon CH, et al. Posttraumatic stress disorder after injury: impact on general health outcome and early risk assessment. J Trauma 1999;47:460–467
31. Kutz I, Shabtai H, Solomon Z, et al. Post-traumatic stress disorder in myocardial infarction patients: prevalence study. Isr J Psychiatry Relat Sci 1994;31:48–56
32. Solomon Z. Combat Stress Reaction: The Enduring Toll of War. New York, NY: Plenum; 1993
33. Jordan BK, Marmar CR, Fairbank JA, et al. Problems in families of male Vietnam veterans with posttraumatic stress disorder. J Consult Clin Psychol 1992;60:916–926
34. Barton KA, Blanchard EB, Hickling EJ. Antecedents and consequences of acute stress disorder among motor vehicle accident victims. Behav Res Ther 1996;34:805–813
35. Cardena E. Psychometric review of the Stanford Acute Stress Reaction Questionnaire (SASRQ). In: Stamm BD, ed. Measurement of Stress, Trauma, and Adaptation. Lutherville, Md: Sidran Press; 1996:293–295
36. Bennett P, Brooke S. Intrusive memories, post-traumatic stress disorder and myocardial infarction. Br J Clin Psychol 1999;38:411–416
37. Solomon Z, Benbenishty R, Neria Y, et al. Assessment of PTSD: validation of the revised PTSD Inventory. Isr J Psychiatry Relat Sci 1993;30:110–115
38. Taylor JA. A personality scale of manifest anxiety. J Abnorm Soc Psychol 1953;48:285–290
39. Ware JE Jr, Sherbourne CD. The MOS 36-item Short Form Health Survey (SF-36), 1: conceptual framework and item selection. Med Care 1992;30: 473–483
40. McHorney CA, Ware JE, Lu JFR, et al. The MOS 36-item Short Form Health Survey (SF-36), 3: tests of data quality, scaling assumptions, and reliability across diverse patient groups. Med Care 1994;32:40–66
41. Kravetz S, Faust M, David M. Accepting the mental illness label, perceived control over the illness, and quality of life. Psychiatr Rehabil J 2000;23:323–332

