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The aftermath of an industrial disaster

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An explosion in a Danish supertanker under construction in 1994 caused the death of six workers and injured 15. Six months later 270 workers took part in this study, which analyses the relationships between objective stressors, the workers' own feelings and the reactions of their families after the explosion together with training, attitude to the workplace, general outlook, and received crisis help. Traumatisation, coping style and crisis support was assessed via the Impact of Event Scale (IES), the Coping Styles Questionnaire (CSQ) and the Crisis Support Scale (CSS). Emotionally, workers and their families were strongly affected by the explosion. The IES-score was 17.6 and the invasion score 9.1. The degree of traumatisation was higher in the group who had an 'audience position' than in the group who was directly hit by the explosion. Training in rescue work did not protect against adverse effects Rescue work had a strong impact on the involved Social support was a significant factor, that seems to buffer negative effects. High level of social integration, effective leadership in the situation, and professional crisis intervention characterised the disaster situation All the same, 41 per cent of the workers reached the caseness criteria by Horowitz (IES ≥19).

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The psychological sequelae of accidents at work

In 1994 there were 47,716 registered work-related accidents in Denmark (Danmarks Statistik, 1995) (1). The industry with most accidents was the manufacture of fabricated metal products, machinery and equipment with 7,462 accidents, resulting in nine deaths, compared to 75 deaths for all branches of industry.

The social welfare expenditure in connection with work-related accidents in Denmark in 1994 was 2,237 million Danish kroner. Approximately 12 per cent of this amount was spent on public inspection of workplaces and the remaining 88 per cent on work injury insurance (Danmarks Statistik, 1996) (2). For about two decades many investigations within occupational medicine have been carried out in Denmark, pointing out the disabilitating consequences of physical strenous and monotonous work, but without considering the psychological effects There have been no Danish studies of the psychological and social after-effects of work accidents, and the subject is not even mentioned in contemporary Danish textbooks of occupational psychology (Graversen, 1992 (3); Agervold & Kristensen, 1996 (4); Graversgård, 1995 (5)) with the exception of Graversgård who devotes one chapter to violence in the workplace.

From an international perspective a similar picture emerges. An illustration of this is found in the "International Handbook of Traumatic Stress Syndromes" by Wilson & Raphael (1993) (6), in which one chapter out of 84 is devoted to "Trauma in the Workplace" (Williams, 1993) (7). In this chapter there is no mention of any empirical research and the chapter deals with intervention and debriefing.

Studies of accidents and disasters in the workplace do exist, however. The Leopold & Dillon 1963 (8) study of a marine disaster, firemen fighting a bushfire (McFarlane, 1988) (9), and oil rig disaster (Holen, 1990) (10) are well-known examples within disaster psychology, but special conditions make it difficult to generalize the findings to ordinary workplaces. First of all, the workforce in the above-mentioned examples is dissolved after the disasters. Secondly, fire-fighters, policemen, military troops and rescue teams are in fact recruited to potentially dangerous work tasks.

Two minor studies based on clinical and forensic evidence have been published both using case examples. Pilowsky (1985) (11) calls attention to the fact that industrial accidents may often have been far more traumatic psychologically and emotionally than it appears at first sight. He coins the term 'crypto-trauma' to describe this hidden

'accident neurosis' and emphasises the need for a painstaking and unhurried analysis of all details of the accident to diagnose the condition, which often in the end will turn out to be post-traumatic stress disorder (PTSD). He points to the threat of annihilation as the precipitating agent and describes symptoms characteristic of the acute phase such as nightmares, reliving the experience, anxiety, fatigue, sensibility to noise and dizziness. In the chronic phase there is a personality change with irritability and the development of any of a number of neurotic symptoms and syndromes.

Due to the normative stressor criteria of the DSM-III-R (American Psychiatric Association, 1987) (12); Ravin & Boal (1989) (13) have accused it of failing to identify work-related problems causing PTSD. Their conviction is, that work and work-related trauma are the major causes of PTSD in America today' (p. 21). One might expect that the new DSM-IV (American Psychiatric Association, 1994) (14) stressor criteria based on fear of annihilation will lead to a more widespread and precise diagnosis of trauma caused by work-related accidents.

A tentative conclusion is that studies of the psychological impact of work-related accidents and disasters are rare. In the literature the only outstanding example is the Lars Weisæth study (1984) (15) of a Norwegian paint factory that exploded.

The Weisæth Study

In 1976 the production plant of Norway's largest paint factory with 400 employees was hit by a giant explosion, which made the building collapse and caused a fire that destroyed the plant and the warehouse. 30,000 square meters of building burnt down, creating flames to a height of 400 meters. The explosion and the fire caused the death of six workers and severely injured two others. 102 suffered serious injuries and 21 suffered minor injuries.

Following the explosion, all workers were guaranteed jobs and within two weeks all available work forces were working in improvised new jobs.

Weisæth followed 246 employees for four years, collecting health, interview and questionnaire data, and achieved very high response rates, e.g., 100% at seven months. The main results can be grouped as follows:

1) Distance to exposure has strong links to frequency and intensity of post-traumatic stress reactions. More than 80% of the workers, who were closest to the center of the explosion, reported anxiety reactions immediately after or within a few hours following the explosion. Depressive reactions, social withdrawal, guilt, shame and irritability were less frequent and appeared nearly always concomitant with anxiety symptoms (Weisæth, 1989a) (16).
2) After seven months, all 30 studied post-traumatic stress reactions were more frequent and severe among the workers who were close to the center of the explosion. Irritability was the only post-traumatic stress reaction out of 30 that increased in frequency and intensity (*ibid.*).
3) Post-traumatic stress reactions did diminish over a four-year-period, but if there was no clinical improvement within the first seven months the prognosis was poor (Weisæth, 1986) (17).
4) Training in and prior experiences with emergency situations were important protective factors (Weisæth, 1984) (15).
5) A third of the high stress exposure group did experience a near total loss of cognitive control right after the explosion, but in spite of this severe inadequate behavior did not occur (Weisæth, 1989b) (18).
6) Resistance towards the primary examination did relate to severity of exposure and was found to be related to psychological defenses such as avoidance against re-experiencing the trauma. If those who initially resisted had been lost, the response rate would have been 83 per cent at the seven month follow-up. By increasing the response rate to 100 percent the prevalence score of high post-traumatic stress-symptoms increased by 50 per cent. The potential loss would have included 42 per cent of the PTSD cases, and 64 per cent of the severe PTSD cases would have fallen out (Weisæth, 1989c) (19).

The Weisæth study is outstanding and of a high methodological quality. It has contributed internationally to the knowledge of disaster behavior and the impact of disasters.

The event

In October 1994, there was an explosion on board a 300,000 tons supertanker, N149, under construction at the Odense Steel Shipyard, Denmark's largest shipyard. By mistake 900 litres of diesel oil leaked out and atomized in a 2,500 m^3 fuel tank, where four welders were working. At the explosion a spurt of flame swept through the tank and into the engine room, where 110 men were working. Four people died immediately, two in the course of the following days and 15 suffered from burns and asphyxiation.

The shipyard's own fire brigade was practicing

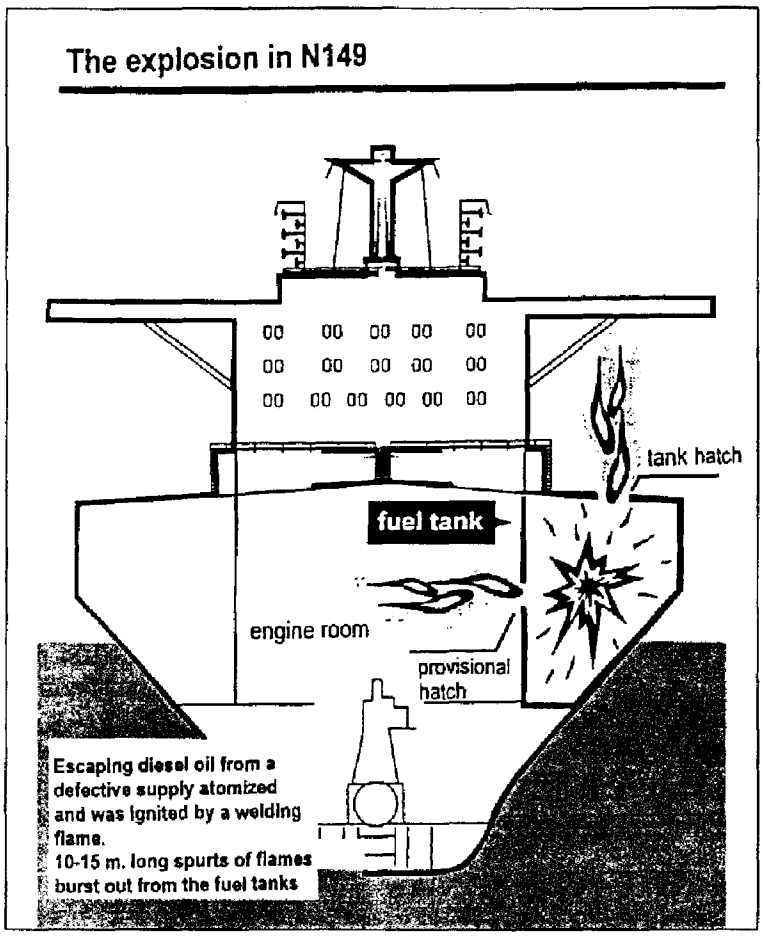

Fig. 1. A drawing of the explosion area.

when the explosion happened and arrived at N149 within few minutes. Fire divers from the company went into the engine room and the fuel tank to take out the injured persons and dead bodies. Dramatic scenes took place in front of many workers when persons whose clothes were on fire jumped into the water. Within a short period of time the news were out in the radio. Journalists and family members flocked to the shipyard, where they had to wait outside the gate. There were episodes between aggressive journalists and workers who did not allow them to enter the shipyard's area before the rescue operation was over. As an example of tactlessness or a kind of revenge, one tabloid paper printed a picture of the face of a charred dead worker on their placard the next morning.

The psychological crisis intervention was headed by 'Falck' rescue services, which has a network of psychologists providing assistance to victims of road accidents, groups who have shared a violent event or in the event of a disaster. Appendix 1 is a map covering the succession and types of interventions.

Aim and model of the study

The purpose of this study is to describe and analyse the significance of demographic factors, the extent of exposure to the explosion, degree of traumatization, social support, and coping responses. The elements of the study can be seen in Fig. 2.

Subjects

A total of 270 Ss took part in the study. 257 males and 12 females; the gender of one person is unknown. 80 per cent were married or co-habiting. The workers' age ranged from 19 to 62 years. Mean age was 42,3 years. The median was 45 years. The workers constituted a very stable work force with an average number at the shipyard of 17.1 years, the median age being 18 years. 90 workers (33 per cent) were working in the 'deckhouse group', 122 (45 per cent) were from the 'stern- and engine room group', and 58 (21 per cent) were a reference group, half of whom were

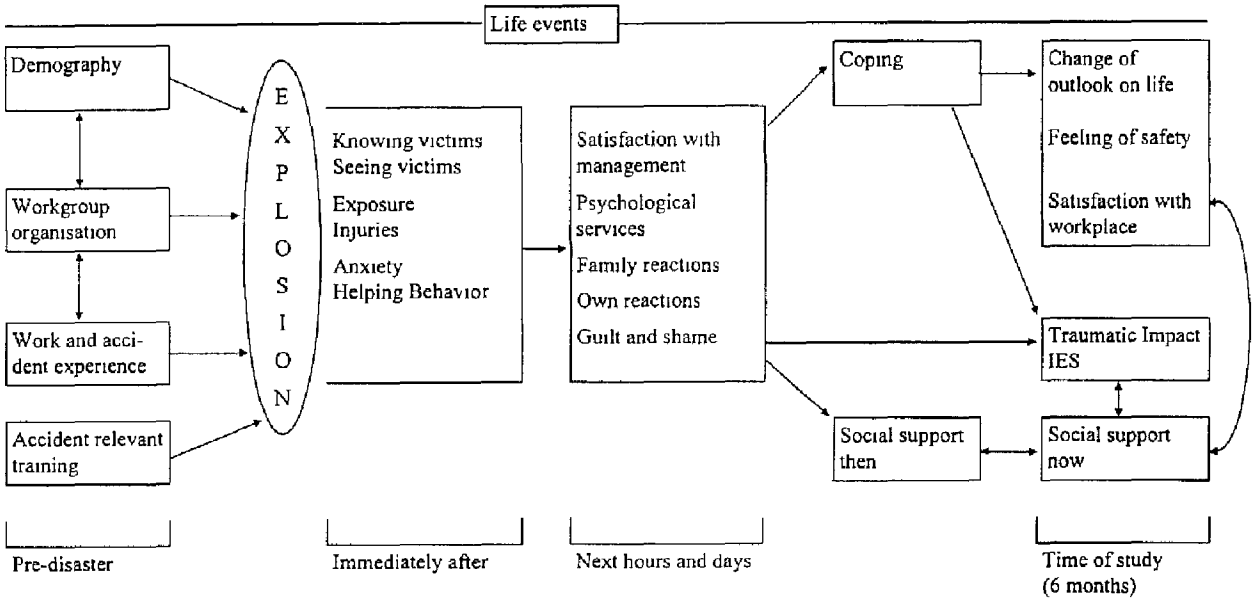

Fig. 2 A model of the study indicating central elements, supposed relationships and time perspective

from the administration and half from a production group. The reference group was working about a quarter of a mile away from the dock, where the explosion took place

Measures

1. A questionnaire

was constructed that covered the following areas (no. of questions in parenthesis):

demographics (5)
exposure to the disaster events (5)
feelings after the explosion (8)
training and use of skills (6)
satisfaction with the place of work and with the management after the explosion (2)
previous accidents at the shipyard and present safety feeling (2)
major life events within the last year (1)
the effects of the explosion on the family and on the respondents' general outlook on life (2)
session with a psychologist (1)

Most of the questions had a yes/no-format; five were seven-point Likert-scale questions. There were four open questions, including a final one, where we asked if there was anything they would like to add for us to be aware of.

2. Impact of Events Scale

by Horowitz et al. (1979) (20). IES is a 15-item scale that yields two subscale scores: Intrusive thoughts, ideas and images, and avoidance of thoughts, situations, and feelings. Each item is rated on a four point scale ranging from "not at all" (=0), "rarely" (=1), "sometimes" (=3), to "often" (=5). Thus, the invasion score has a possible range from 0 to 35, the avoidance score range from 0 to 40, and the total score range from 0 to 75.

3 Coping Style Questionnaire

by Joseph, Williams and Yule (1992a) (21) – a 30-item questionnaire using items selected from the COPE-questionnaire, developed by Carver, Scheier and Weintraub (1985) (22). Items were grouped into three broad coping subscales: task focused, emotion focused and avoidant coping. The task focused and the avoidance coping category had ten items each, and the emotion-focused category had nine items as we left out one of two questions on religious coping. The questions were related to the explosion and the days following the explosion, and answered on a three-point scale ranging from "yes", "to some degree" to "no". Thus, scores on each of the scales had a possible range of 10(9) to 30(27).

Besides the coping subscales already mentioned, two additional social coping subscales were created based on the COPE-questionnaire. "Soccop 1" covers five items of social behavior, two items with an instrumental focus, and three items with emotional focus. "Soccop 2" contains 'soccop 1' and two additional items of social behavior describing disengagement.

4. Crisis Support Scale

by Yule et al. (1990) (23), (cf. Joseph et al. 1992b) (24). This is a seven-item scale asking about support received from others immediately after the explosion and at the time of the study. Each item is rated on a seven-point scale ranging from never to 'always'. Thus, the two scores have a possible range of 7 to 49.

Procedure

The study took place on three separate days in May, 1995, 6 and a half months after the explosion.

The study had to be approved by both the management, who were anxious about the image of the company, and by the union representatives, who were worried about stirring up their colleagues' feelings. The groups were asked to participate by the union representatives and they filled out the questionnaire in a lunch break, that was extended with half an hour. The workers were paid for this half hour by means from a research grant.

The atmosphere at the lunch break was very intense due to relived emotions. Only two individuals returned an unanswered questionnaire. In addition six individuals did not participate because they had not been at the shipyard that day or because their lack of understanding Danish. The response rate of this study is 97 per cent.

Results

Where were you at the time of the explosion?

Table 1. Position at the explosion

	Number	Per cent
In the engine room or deckhouse	72	27
Elsewhere on the new ship	7	3
Elsewhere at the shipyard	159	60
Outside the shipyard	27	10

What was the distance to the center of the explosion?

Table 2 Distances to the explosion for the workers, who answered yes to the question above "elsewhere at the shipyard"

<50 meters	16%
<100 meters	14%
<200 meters	22%
<1500 meters	48%

The distances range from 10 to 1,500 meters. The median distance was 200 meters. 151 (out of 159) persons answered this question.

At the explosion were you afraid for your personal security?

Table 3 Percentage of workers being afraid for their security

No	2+3	Yes, some	5+6	Yes, very much
57%	19%	15%	5%	4%

Mean=2.14 (SD=1 66) n=256

Were you hurt at the explosion?

Fourteen (5 per cent) answered 'yes'. (n=265).

Most individuals suffered second-degree facial and hand burns.

Did you know any of the dead or injured?

Table 4 Percentage of workers knowing the dead or injured

Not at all	2+3	Yes, some	5+6	Yes, very well
18%	11%	26%	11%	38%

Mean=4.45 (SD=2 24). n=267

Did you see any of the dead or injured?

114 (43 per cent) answered 'yes'. (n=264).

Describe how you felt after the explosion, until the assembly the next morning?

205 persons replied to this open question. The answers were categorized into six groups.

1. A *general,* broad description of a *negative* state using words like 'felt badly', 'no good', terrible', like Hell', etc.
2. *Shock,* shaking, strange, unreal, etc.
3. Afraid, nervous, insecure, tense, restless, etc. (the *anxious* group).
4. Sad, *depressed,* down, cried.
5. *Normal,* okay, all right, acceptable, not influenced.
6. *Miscellaneous:* Ruminating (6), stomach pressure (1), sleep problems (1), angry (3), got drunk (1), reliving scenes from the explosion (2), powerless (1), injured (1), worried about the injured (2), busy organising (1), etc.

Table 5 Feelings after the explosion

	No	Per cent
1 General negative state	80	39
2. Shock	39	19
3 Anxious	17	8
4 Depressed	20	10
5 Normal	17	8
6 Miscellaneous	32	16

n=205

31 persons have two answers in various categories, (Table 6) five persons have three or more answers.

Table 6 Combinations of answers (feelings after the explosion)

	2	3	4	5	6	Total
1	4	2			8	14
2			2		11	13
3				2		2
4						
5					2	2
Total	4	2	2	2	21	31

Table 6 shows the dominance of a few combinations of answers Almost half are combinations with the general category In the "2–6" – combination, about half is scored as shock, if that reaction seems to be the most predominant reaction.

Session with a psychologist?

25 persons (9 per cent) answered 'yes' to this question. 13 people specified the number of sessions. Seven had one session, three tract two sessions and three had three to five sessions.

Training and actual use of learned skills?

Table 7 Training and actual use of learned skills

	Training	Actual use
First aid	47% (n=245)	7% (n=206)
Fire	37% (n=220)	3% (n=175)
Other	11% (n=128)	5% (n=112)

Satisfaction with the management's information and the large debriefing assembly the morning following the explosion?

Table 8

very unsatisfied	2+3	Acceptable	5+6	Very satisfied
1%	6%	23%	34%	37%

Range 1–7 Mean=5 66 (SD=1 63) n=256

Feelings of guilt and blame?

Table 9 The extent of various kinds of guilt feelings

	Yes
Guilt about things you did	5%
Guilt about things you failed to do	5%
Guilt about staying alive, when so many died	7%
Felt that you let others down	7%
Felt that you let yourself down	8%
Blamed others	12%

n=236–261

Thirty persons commented on whom they were blaming. Half criticised the company and the management generally; few of them mentioned specifically lack of information and the tightly scheduled construction program. Twenty per cent blamed security procedures and lack of control of flammable gasses. Twenty per cent criticised the press, in particular one tabloid paper, whose front page the next day contained the face of a worker who had suffered severe burns and died, the journalists attacking the company, because they were refused admittance during the evacuation and the radio stations, because of a very early broadcast that alarmed tens of thousands of family members and friends in the neighborhood.

The six questions concerning guilt could be regarded as one scale. The internal consistency is good, Cronbach's alpha being 0.69, and the discriminatory power is also good with an inter-item correlation of 0.31. A correlational analysis of the six items is shown in Table 22.

How did the explosion affect your family?

The answers were categorized into eight groups:

1. *general negative state,* 'no good',
2. *shocked,* shaken
3. *anxious,* restless, nervous, worried, afraid, shivering, insecure, terrified, agitated,
4. *depressed,* sad, unhappy,
5. *relieved,* happy,
6. *impressed,* affected, influenced, 'very much'
7. *not influenced,* 'did not talk about it', 'don't know very much'
8. *caretaking,* sympathy, empathy, 'they called', 'we talked a lot', 'got a lot of attention'.

Table 10. Family reactions after the explosion

	No.	Per cent
1 General negative state	13	6
2 Shocked	38	19
3 Anxious	78	38
4 Depressed	8	4
5 Relieved	4	2
6 Impressed	25	12
7 Not influenced	12	6
8 Miscellaneous	25	12

n=203

16 persons have two answers in various categories (Table 11); two persons have three answers. Table 11 shows that one combination '3–8', is dominant. We chose to score those as 'anxiety'-responses.

Table 11 Combinations of answers (family reactions)

	2	3	4	5	6	7	8	
1	1				1			2
2		1					1	2
3			1		1		6	8
4				1				1
5						1		1
6							1	1
7							1	1
	1	1	1	1	2	1	9	16

Major life events within the last year?

Twenty-eight persons (12 per cent; n=227) answer 'yes' and mention illness, and death in the family (37 per cent), job change (23 per cent) change in family structure (20 per cent), and change in housing (20 per cent)

Prior experiences of accidents at the shipyard?

205 persons (79 per cent) answer 'yes' (n=261).

Actual feeling of safety at work?

Table 12

Afraid that new accidents can easily happen	2+3	4	5+6	Feel totally sure that there will be no more accidents
11%	22%	26%	31%	10%

Range 1–7 Mean 4 01 (SD 1 77) n=261

Satisfaction with place of work?

Table 13

Very unsatisfied	2+3	Acceptable	5+6	Very satisfied
0 4%	6%	18%	45%	31%

Range 1–7. Mean 5 50 (SD 1 33) n=266

Changes in general attitude to life?

This open question was answered by 175 person. The answers were categorized in three groups:

1) *Positive direction*
2) *No change*
3) *Worries* about security, ruminating about wages, first aid, affected by news about accidents and death
4) *Miscellaneous*. Thoughts of a very general nature.

Table 14 Changes in outlook

	No	Per cent
Positive	39	22
No change	68	39
Worries	54	31
Miscellaneous	14	8

Ten persons have two answers; in six cases a '1–3' combination, which has been scored as a worry.

Comments and feedback

On the final open question where we asked for anything they wanted us to be aware of 48 persons gave an answer.

a) Positions

Ten persons almost 'made excuses' that they were not involved as they were in the periphery of the explosion on this major workplace. Six other persons discussed their positions and difficulties as firemen equipped with smoke masks, and as receptionists who should take care of hundreds of calls from agitated family members, etc.

b) Aftermath

Eight answers concerned sleeping problems, reliving problems (smells, sights, sounds), own injuries and burns, telling a family member in the shipyard about the death of a nephew, participating in a funeral, being forced by the family to talk about it, the heart-breaking sight of the many women who were assembled at the entrance to see if their husbands or sons were alive.

c) Suggested reforms and satisfaction with the management/public meetings

Twenty answers evaluated or dealt with improvements. Eight were not satisfied with security, or would like a better plan/training for accommodating the needs of the workers, their families and the press. Six were satisfied with the management, security and their efficient way of coping with the explosion and the aftermath.

Three commented on the crisis intervention. One was satisfied with the yield, two wanted a follow-up, where it will be possible to open up. Two criticised the press and one suggested the purchase of bath tubs for persons who have suffered burns.

d) The questionnaire

Four people praised the opportunity to express their feelings and opinions in the study.

Impact of events scale

Table 15 Means and SD for the IES-items

	Mean	SD
1 I thought about it when I didn't mean to	2.74	1 35
2 I avoided letting myself get upset when I thought about it or was reminded of it	1 68	1.53
3 I tried to remove it from my memory	1 54	1 79
4 I had trouble falling asleep or staying asleep, because of pictures or thoughts about it that came into my mind	0 70	1 16
5 I had waves of strong feelings about it	1.39	1 41
6 I had dreams about it	0 47	1.03
7 I stayed away from reminders of it	0 45	1 13
8 I felt as if it hadn't happened or it wasn't real	0 95	1.33
9 I tried not to talk about it	0 83	1 36
10 Pictures about it popped into my mind	1 31	1 51
11 Other things kept making me think about it	1 26	1.42
12 I was aware that I still had a lot of feelings about it, but I didn't deal with them	0.92	1 31
13 I tried not to think about it	1 23	1.67
14 Any reminder brought back feelings about it	1 44	1.57
15 My feelings about it were kind of numb	0.84	1 31

n=246–262

The invasion subscale ranges from 0 to 33. The mean is 9.1, the SD 6 77, and the median is 8.00. The avoidance subscale ranges from 0 to 32. The mean is 8.5, the SD 6 94, and the median is 7 00. The IES-total ranges from 0 to 63. The mean is 17.55, the SD is 11.54, and the median is 17.

With the Horowitz et al. (1979) (20) 'caseness'-criteria of ≥19 in mind, 41 per cent of the respondents reach this level The 'deckhouse group' has the highest IES-score (20.7), followed by the 'stern- and engine room group' (16.1) and the reference group (15.4). The invasion scores are not that different between the groups (9.7, 9.1 and 8.1 respectively), but the avoidance scores vary (10.8, 7.3 and 7.3 respectively). The group of people who were in close proximity to the center of the explosion seems to develop a much stronger traumatic response than those who are further away. This corroborates the finding of Elklit (1996) (25–27), in the study of the reactions to a shooting incident.

The internal consistency of the IES is high. Cronbach's alpha for the total score, and for the Invasion subscale is 0.84, while the avoidance subscale alpha is 0.74. The inter-item correlations are 0.26 for the IES total score, 0.44 for the invasive and 0.27 for the avoidance subscales. Values between 0.20 and 0.40 indicate a good discriminatory function.

Coping Style Questionnaire

Table 16 Means, SD and range for coping strategies

	No of items	Range	Mean	SD	Comparative mean
Active coping	2	2–8	4 40	3 96	2.20
Planning	2	2–6	2.70	1 26	1 35
Suppression of competitive activity	2	2–6	4 02	1 41	2 01
Restraint coping	2	2–6	3 21	1 20	1 61
Seeking social support for instrumental reasons	2	2–6	2.63	0.94	1.32
Seeking social support for emotional reasons	3	3–9	5 38	1 84	1 79
Turning to religion	1	1–3	1 14	0 44	1 14
Positive reinterpretation	1	1–3	1 51	0 74	1 51
Acceptance	1	1–3	2 52	0.63	2 52
Venting of emotions	3	3–9	4 59	1 30	1 53
Denial	3	3–9	4 60	1.39	1 53
Wishful thinking	1	1–3	1 98	0.83	1.98
Mental disengagement	2	2–6	2 87	0 90	1 48
Social (emotional) disengagement	2	2–6	3 19	1 08	1.60
Alcohol/drug disengagement	2	2–6	2 14	0 54	1 07

n=238–270

Table 17 Descriptive statistics for the coping subscales

	No. of items	Range	Mean	SD	Alpha	Inter-item
Problem-focused coping	10	10–28	15 78	4 47	0 81	0.30
Emotion-focused coping	9	9–23	15 10	3 18	0 68	0 16
Avoidant coping	10	10–23	14 74	2 79	0 52	0 09
Social support coping ("1")*	5	5–15	8.01	2.29	0 65	0 25
All social coping ("2")*	7	7–18	11 21	2 58	0.54	0.14

*) See page 4

The internal consistency of the five coping subscales, measured by Cronbach's alpha is shown in Table 17. The values range from 0.52 (avoidant coping) to 0.8/1 (Problem-focused coping). The values for avoidance and the 'all social' strategies are moderate

The most frequently used single coping strategy is 'acceptance' followed by 'active coping' and 'suppression of competing activities'. Problem-focused coping is the most common general approach followed by avoidant coping and emotional coping with means of 1.6, 1.5 and 1.4, respectively. The differences are not very large between the groups, however. Some coping strategies are seldom employed such as alcohol consumption, turning to religion, and seeking social support for instrumental reasons.

The inter-item correlations of the five general strategies are also shown in Table 17. The values range between 0.09 and 0.30. The moderate values for avoidant, the emotion-focused, and 'all social' strategies indicate a discriminating function, which is a little below the optimal range.

Joseph et al. (1992b) (24) used the Coping Style Questionnaire in a study of a ferry disaster on an adult population 18 months after the event. Eighty per cent of the subjects were female. The descriptive statistics of their results are shown in Table 18.

Table 18 Descriptive statistics of Joseph et al (1992) (24) study concerning CSQ-subscales

	Range	Mean	SD	Alpha
Task-focused	11–32	25.18	±5 14	0 78
Emo -focused[1)]	13–37	25 24	±5.51	0 76
Avoidance	12–34	22 34	±5 26	0 77

[1)] based on 10 items. n=35

The ranges, the means and the standard deviations are much larger in the Joseph et al. (*ibid.*) study than in the present study. This could be due to differences in the situation, that is degree of experienced threat to life, or to differences in gender.

Crisis Support Scale

Table 19 Means and SD for the Crisis Support Scale

Variable	Mean	Std. Dev
SOC.SUPPORTTHEN		
1) Someone willing to listen?	5.97	1 33
2) Contact with survivors?	4 37	2 01
3) Able to express?	5 64	1 59
4) People sympathetic?	6.33	1 08
5) Received practical help?	3 41	2.15
6) Support make you feel worse?	5.48	1 49
7) Overall satisfaction?	5 95	1 27
SOC SUPPORTNOW		
1) Someone willing to listen?	5.55	1 55
2) Contact with survivors?	4.35	2.22
3) Able to express?	6.03	1.41
4) People sympathetic?	5 71	1 37
5) Received practical help?	3 30	2 16
6) Support makes you feel worse?	5 65	1 22
7) Overall satisfaction?	5 98	1 27

Range 1–7 n=213–253

The internal consistency of the Crisis Support Scale measured by Cronbach's alpha at the time right after the explosion (SOC.SUPPORTTHEN) is 0.69 and 0.66 at the time of the study (SOC.-SUPPORTNOW). The inter-item correlations are 0.28 and 0.26 respectively, indicating a good discriminating ability.

Joseph, et al. (1992a) (21) use the Crisis Support Scale in a study of a ferry disaster approx. 18 months after the event on an adult population of 35 survivors, 80 percent of whom were female. They use a six-itemscale, which is described in Joseph et al. (1992b) (24) as a seven-item scale. It is not possible to know which question is left out. One year after this ferry disaster Joseph et al. (*ibid*) used the Crisis Support Scale in a study of 23 victims from the same ferry disaster, 80 per cent of whom were female.

Table 20 Comparisons of the descriptive statistics on CSS from two studies

CSS-data	No of items	Range	Mean	SD	α
Joseph et al (1992a) (21) Joseph et al (1992b) (24)	6	20–42	31 36	±5 74	0 80
"SOC.SUPPORTTHEN"	6	*)	37 30	±4 28	0 67
"SOC SUPPORTNOW"	6	*)	31 70	±5 79	0 69
This study:					
SOC SUPPORTTHEN	6	6–42	31 36	±5 90	0.65
SOC SUPPORTNOW	6	13–42	30.67	±5.80	0 61
SOC SUPPORTTHEN	7	7–49	37 34	±6.55	0 69
SOC.SUPPORTNOW	7	19–49	36 67	±6 46	0.66
SOC SUPPORTALL	14	27–98	74.35	±12 00	0 81

*) not available

The Crisis Support Scale consists of seven items that are asked twice, first relating to the time of the accident and then relating to the present (cf. Table 19).

The first item concerns availability of somebody to talk to. The analysis of variance (cf. Table 21) shows that the perceived availability has decreased significantly since the time of the explosion. The second item deals with actual contact to survivors and the like. The amount of this contact has not changed, perhaps due to the stability of the work groups. The third question concerns ability to express thoughts and feelings. This ability has increased significantly since right after the disaster and the factor has the highest value of all social support variables at the time of the study.

The fourth item concerns the amount of received sympathy and support. The analysis shows a significant decrease with the course of time. The next item deals with practical help. These means are low perhaps due to the fact that very few had any need for practical help afterwards and there is no difference between the situation right after the disaster and six months later. The same is the case with the last two items which deal with the effect of actual support and general satisfaction with the support received.

Analysis of variance

Table 21 Paired differences for the Crisis Support Scale

	Mean	SD	t-value	2-tailed significance
SOC.SUPPORTTHEN 1 SOC SUPPORTNOW 1	0.44	1 39	4 88	0.000
SOC.SUPPORTTHEN 2 SOC SUPPORTNOW 2	0 03	1 69	0 31	0.757
SOC SUPPORTTHEN 3 SOC SUPPORTNOW 3	−0 37	1 67	−3 43	0 001
SOC SUPPORTTHEN 4 SOC.SUPPORTNOW 4	0.62	1 29	7.33	0 000
SOC SUPPORTTHEN 5 SOC SUPPORTNOW 5	0 19	2.35	1 18	0 238
SOC SUPPORTTHEN 6 SOC SUPPORTNOW 6	−0 15	1 44	−1.48	0 140
SOC.SUPPORTTHEN 7 SOC SUPPORTNOW 7	−0 01	1.36	−0 15	0 879

df (208–242)

Table 22. Correlation coefficients for items of guilt and blame

	GUILT things you did	GUILT things you did	GUILT staying alive	LETTING OTHERS DOWN	LETTING YOURSELF DOWN
Blame others	0 035	0 106	0 008	0.097	0 128[1)]
Guilt things you did		0 514[2)]	0 395[2)]	0.501[2)]	0 326[2)]
Guilt failed to do			0.317[2)]	0 652[2)]	0 415[2)]
Guilt staying alive				0 316[2)]	0 369[2)]
Letting others down					0 508[2)]

Pearson's correlation coefficients 2-tailed significance,
[1)] $P<0.05$, [2)] $P<0.000$ $n=230–252$

The relationships between independent variables and dependent after-effects are analyzed by a one-way ANOVA according to the succession shown in Figure 2.

As seen in Table 22 five items concerning feelings of guilt and letting down are so highly intercorrelated, that they must be regarded as one factor. 'Blaming others' has only one significant correlation and is thus relatively independent of the other items.

1 Demographics

In Table 23 the significant relationships among the demographic factors are shown.

Table 23. Comparative means with one-way ANOVA for demographic factors

Workgroup	Gender	Cohabitation	Age	Work years	Life events	Several accidents
Stern- and engine	1 08[a]	1 86	2 84	2 82	1 15	1.77
Deckhouse	1 01	1 87	3 28[c]	3.28[d]	1 11	1 81
Reference group	1 00	1 67[b]	2 60	2 60	1 07	1 79

a) More women in the stern- and engine room workgroup than in the deckhouse- and reference group ($P<0.01$)
b) More single persons in the reference group ($P<0.01$)
c) Deckhouse-workers are older than individuals in the reference group ($P<0.05$)
d) Deckhouse-workers have worked longer in the company than the two other groups ($P<0.01$)

2. Demographics ↔ after-effects

The following significant results were found as seen in Table 24:

a) Women suffer from more intrusive thoughts than men six months after the explosion.
b) Cohabiting employees are more satisfied with the information they received from the manage-

ment after the explosion than single living individuals.

c) Older workers suffer from more intrusive and avoidant thoughts and they use more avoidance coping strategies. They are also more satisfied with the place of work in general. The young workers more often have somebody who are willing to listen and they are more able to express their thoughts and feelings after the explosion. Feelings of letting others down, blaming others and the total amount of guilt feelings are most pronounced in the age group from 30–45 years. This age group has the highest score on the intrusion subscale. These results rest on Tukey's Honest Significance Difference (HSD) test.

d) Workers who predominantly belonged to the 'deckhouse group' suffered more avoidance behavior and had a higher IES-score than the 'stern and engine room group' and the reference group. The 'deckhouse group' also employed more avoidance coping strategies than the two other groups. The 'deckhouse group' received and receives less social support than the 'stern- and engine room group'. The reference group received more social support than the 'deckhouse group' and report having more contact with the survivors six moths after the explosion than the two other groups. The 'deckhouse' group has stronger feelings of having let themselves down than the two other groups. These results rest on Tukey's HSD test.

3 Life events ↔ after-effects

a) People who within the last year had experienced changes in their life situation made more use of emotional and social coping strategies. They received more sympathy and help right after the explosion, and they also received more help at the time of the study and report satisfaction with the help they got. They tended to be more worrisome

b) If the workers had experienced one or more accidents at the shipyard before the explosion, they suffered from more intrusive- and avoidance symptoms and they employed more avoidant and social coping strategies They also reported expressing their thoughts and feelings more at the time of the study than the workers who had not experienced an accident before

Table 24. Correlations between demographic and life event factors and after-effects Significance with one-way ANOVA, $p<$

	Gender	Cohabitation	Age	Work Group	Life events	Several accidents
INTRUSION	0 05		0 05			0.05
AVOIDANCE			0 01	0 005		0 05
IES TOTAL			0 05	0.05		0 01
RATCOP					0 10	
EMCOP					0 05	
AVCOP			0 01	0 05		0 05
SOCCOP 1					0 05	
SOCCOP 2					0 005	0 01
SOC SUPPORTTHEN 1 listen?			0 05	0 001		
SOC SUPPORTTHEN 2 survivors?				0.005		0 10
SOC SUPPORTTHEN 3 express?			0 01	0 10		
SOC.SUPPORTTHEN 4 sympathy?					0.05	
SOC SUPPORTTHEN 5 practical?					0 05	
SOC SUPPORTTHEN 6 feel worse?						
SOC SUPPORTTHEN 7 satisfaction?				0 005	0 10	
SOC.SUPPORTNOW 1 listen?			0 05	0 001		
SOC.SUPPORTNOW 2 survivors?				0 005		
SOC.SUPPORTNOW 3 express?						0.05
SOC.SUPPORTNOW 4 sympathy?						
SOC SUPPORTNOW 5 practical?					0 01	
SOC SUPPORTNOW 6 feel worse?				0 10		
SOC SUPPORTNOW 7 satisfaction?				0 05	0 05	
SOC.SUPPORTTHEN ALL			0 05	0 01		
SOC.SUPPORTNOW ALL				0 01		
PSYCHOLOGIST						
NO OF SESSIONS						
SATISFINF		0 05				
SATISFWORK		0 10	0 05			
SAFETY FEELING OUTLOOK					0 10	
GUILT things you did						
GUILT failed to do						
GUILT staying alive						
LETTING OTHERS DOWN			0 05			
LETTING YOURSELF DOWN		0 10		0 05		0 10
BLAMING OTHERS			0 005			
GUILT ALL			0 05			

4 Training and helping behavior ↔ after-effects

Table 25 shows the following significant effects of training and actual use of skills:

a) The group who had been trained in first aid used more problem-focused, emotional-focused, and social-coping strategies. After the explosion this group more often found someone willing to listen to them, they were more in contact with survivors, and were more able to express their thoughts and feelings than the workers not trained in first-aid skills. At the time of the study they also reported that they had more contact with survivors. The group trained in first aid tended to see a psychologist more frequently, and suffered from survival guilt.
b) The group that had been trained in fire extinguishing showed essentially the same pattern as the first-aid group with the following exceptions: 1) They did not suffer from survival guilt, 2) they did not have more people listening to them, and 3) they did not in the same degree express their thoughts and feelings after the explosion.
c) The small group that had special training such as "smoke diving" showed a similar pattern of response as the two groups above. Furthermore, they suffered from more invasive images, had more guilt feelings and used the psychologists significantly more.

Table 25 Correlations between training and helping behavior factors and after-effects Significance with one-way ANOVA; $p<$

	Trained first-aid	Trained fire brigade	Trained otherwise	Used first-aid	Used fire brigade	Used otherwise
INTRUSION			0 05	0.10		
AVOIDANCE						
IES TOTAL						
RATCOP	0 05	0 01	0 005	0 001	0 05	0 05
EMCOP	0 001	0 05	0 0001	0 05	0.005	0 0005
AVCOP						
SOCCOP 1	0 005	0 10	0 0001	0 005	0 01	0 005
SOCCOP 2	0 005		0 005	0 005	0 10	0.05
SOC SUPPORTTHEN 1 listen?	0 05					
SOC SUPPORTTHEN 2 survivors?	0 05	0 05		0.01		
SOC SUPPORTTHEN 3 express?	0 05					
SOC SUPPORTTHEN 4 sympathy?		0 10				
SOC SUPPORTTHEN 5 practical?						
SOC SUPPORTTHEN 6 feel worse?						
SOC SUPPORTTHEN 7 satisfaction?						
SOC SUPPORTNOW 1 listen?		0 10				
SOC SUPPORTNOW 2 survivors?	0 01	0 05		0 10	0 10	
SOC SUPPORTNOW 3 express?						
SOC SUPPORTNOW 4 sympathy?						
SOC SUPPORTNOW 5 practical?						
SOC SUPPORTNOW 6 feel worse?						
SOC SUPPORTNOW 7 satisfaction?						
SOC SUPPORTTHEN ALL						
SOC SUPPORTNOWALL						
PSYCHOLOGIST	0 10	0 10	0 01	0 01	0 0000	0 0000
NO OF SESSIONS		0 10	0 005		0.0001	0.0000
SATISFINF						
SATISFWORK					0 05	
SAFETY FEELING				0 05		
OUTLOOK					0 05	
GUILT things you did			0 10			
GUILT failed to do			0 10		0.05	
GUILT staying alive	0 05		0 05			
LETTING OTHERS DOWN				0 05		
LETTING YOURSELF DOWN			0 05	0 005	0.05	
BLAMING OTHERS						
GUILT ALL			0 10			

d) The group who had actually used their first-aid skills tended to suffer from more invasive images, employed more problem-focused, emotion-focused and social-coping strategies. In addition they had more contact with survivors, and they went more often to see a psychologist. Their present feeling of safety was higher than for the rest of the workers. They had strong feelings of having let others and themselves down
e) The group who had used their fire extinguishing skills showed essentially the same pattern of coping response as above. They were also more satisfied with their place of work and had achieved a more positive attitude to life after the explosion.
f) The group, who had employed their specialised skills, also showed the same general pattern of coping response as above. They did not distinguish themselves by any social support or guilt feeling variable.

5. Trauma situation factors ↔ after-effects

Table 26 demonstrates the following significant results:

a) The closer the workers had been to the center of the explosion, the more they made use of problem-focused, emotion-focused, and social-coping strategies, and the more frequently they had sessions with a psychologist. They suffered more extensively from feelings of guilt about things they did after the explosion, and they also suffered extensively from survival guilt.
b) The workers, who were most afraid right after the explosion score highest on the avoidance subscale of IES, followed by the group below the middle and the middle group (cf. fig. 3).

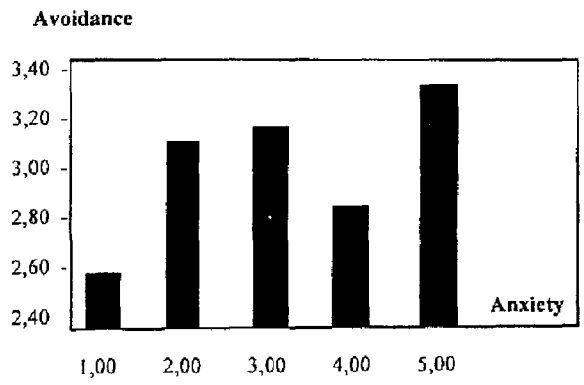

Fig 3 Bar chart Anxiety x Avoidance subscale of IES.

Use of emotional coping has approximately the same "festoon" shape. The group below the middle in anxiety scored highest on avoidance coping.

The reason for the "festoon" phenomenon is perhaps hidden in the social coping, as the group below the middle had the lowest score of all groups. The most frightened group made the most use of social coping strategies and they also suffered more survival guilt than those less frightened.

c) Being injured at the explosion meant higher avoidance scores and a tendency to higher invasion scores. The coping was predominantly emotion-focused and characterised by the use of social strategies. There was more contact with survivors right after the explosion and they still received help at the time of the study. They also attended more sessions with the psychologist.
d) Knowing the dead and injured colleagues personally meant more social-coping answers, which besides instrumental and emotional coping includes social withdrawal. Knowing the dead and injured also resulted in receiving more sympathy after the explosion and more contact with survivors six months later. It also influenced their use of the psychologist and meant more survivors with guilt feelings.
e) Seeing the dead and injured colleagues tended to give more invasive images and resulted in a pronounced use of problem-focused, emotion-focused and social-coping strategies together with more contact with survivors after the explosion and six months later. This also resulted in more sessions with the psychologist, and more guilt feelings.
f) The workers who described their feelings in the 18 hours following the explosion with a general negative statement, were more troubled with intrusive images than workers using other terms. They also had a higher total IES-score. The anxious group used the psychologist more than did the general negative group, the shocked group and the depressed group. This might indicate that other groups who also have psychological problems due to invasive images or depression were not attracted to the psychological intervention services.
g) The workers who described their families' reactions as 'impressed', had higher avoidance subscale and IES total scores, than the group who described their families' reactions as anxious. The psychologist was more often consulted by workers, whose families had reacted with depression or relief than workers whose families had had any other kind of reaction. The families that were reported to react with a general negative statement had a working member, who more often felt that he had let others down than