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Effects of the medical investigation Bijlmermeer aviation disaster on health perception of residents and rescue workers

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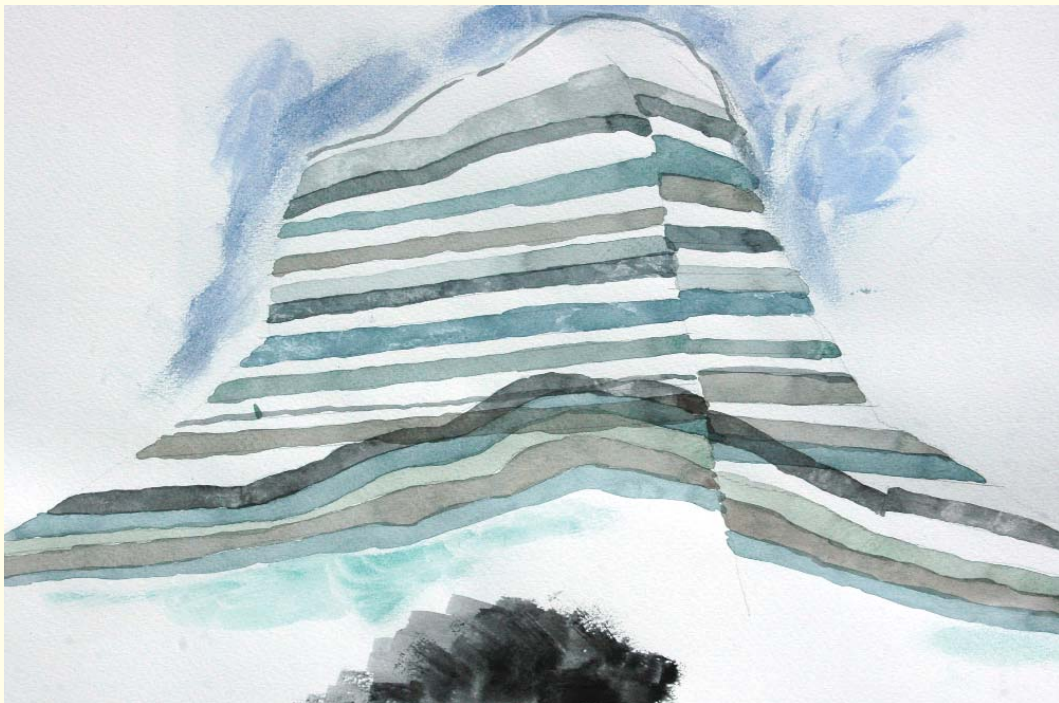
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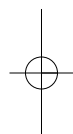
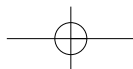
**Effects of the Medical Investigation
Bijlmermeer Aviation Disaster on health perception
of residents and rescue workers**



Effects of the Medical Investigation Bijlmermeer Aviation Disaster on health perception of residents and rescue workers



Margot J. Verschuur



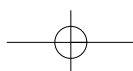
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Effects of the Medical Investigation Bijlmermeer Aviation
Disaster on health perception of residents and rescue workers

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ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
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volgens besluit van het College voor Promoties
te verdedigen op donderdag 15 oktober 2009
klokke 15.00 uur
door

Margot Jeannette Verschuur

geboren te Venlo in 1956

Promotiecommissie

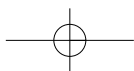
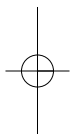
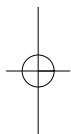
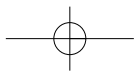
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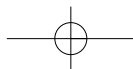
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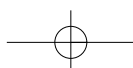
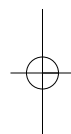
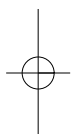
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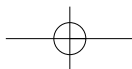




Chapter 1

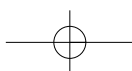
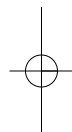
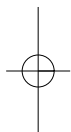
General introduction





Chapter 1

General introduction



Introduction

In the years following the Bijlmermeer aviation disaster on October 4th 1992, there was growing concern about the physical and psychological health of the residents and rescue workers exposed to the disaster. Persisting rumours about the cause of the crash, possible toxic exposure and health consequences led more than eight years later to the Medical Investigation Bijlmermeer Aviation Disaster (Dutch acronym: MOVB). The main aims of this investigation were to explore a possible association between health complaints of rescue workers and residents involved in the disaster and exposure to the disaster, and to reduce concerns and insecurities among those involved. The MOVB consisted of two main studies: an epidemiological investigation to assess the relationship between health complaints and exposure to the disaster and an individual medical examination for all individuals who considered themselves to be suffering from the consequences of the disaster. On top of these studies an examination of the effects of participation was carried out, specifically assessing a hoped-for decrease in health complaints and worries. The MOVB provided a unique opportunity to study these effects with appropriate, health-related measures. This thesis focuses on the short- and long-term effects of participation in the MOVB among residents and rescue workers involved in varying degrees in the Bijlmermeer Aviation Disaster. In this introduction an overview of the topic, and the aims and design of the study will be presented.

Health consequences of disasters

Attention for the health consequences of disasters has been growing during the last decades. Studies have shown that in a significant proportion of individuals psychopathological symptoms such as post-traumatic stress, anxiety, depression, substance abuse and physical (somatisation) symptoms may persist for years (see Foa, Stein & McFarlane (2006) for a review). Establishing a relationship between disaster exposure and persistently elevated levels of mental and physical dysfunction is complex, because it remains unclear whether the exposure to the disaster itself or the exposure to the long-term aftermath of the disaster, in particular public concern, is the primary causative factor (Boin, van Duin & Heyse, 2001; Havenaar, de Wilde, van den Bout, Drottz-Sjöberg & van den Brink, 2003; Vasterman, Yzermans & Dirkzwager, 2005; Yzermans & Gersons, 2002). This may be especially true with respect to disasters with real or alleged exposure to hazardous chemicals. Besides the biological effects of the exposure itself, this kind of disaster may have a long-lasting impact on the well-being of those involved because of the uncertainty about potential physical and mental health effects (Baum, Fleming & Davidson, 1983;

Havenaar & van den Brink, 1997).

Cognitive factors are important putative mediators between trauma exposure and persistent health problems. Havenaar et al. (2003) showed that cognitive variables such as risk perception and sense of control play an important role as mediating factors in the explanation of subjective health differences between exposed and non-exposed victims of the Chernobyl disaster. Also, in a study on self-reported health among residents of a chromium wasted area and a control group, McCarron, Harvey, Brogan and Peters (2000) found no evidence of harm to health from exposure to chromium. However, worse scores on self-reported health in participants who believed chromium to be harmful to health point to the potential importance of perception and possible health anxiety.

Interventions for post-disaster distress

The previous studies showed that illness cognitions attributing health complaints to disaster exposure are associated with health complaints and therefore are a promising target for interventions. However, little is known about the best strategy to modify these cognitions. In one of the few studies in this field, Prince-Embury (1992) investigated whether six years after the nuclear accident at Three Mile Island, Harrisburg, Pennsylvania a course designed to offer relevant, credible information on health issues of concern in the community affected the level of psychological symptoms and perception of control. It was observed that in a selected group of information seekers from the vicinity of the disaster site, greater understanding of the information and education provided was associated with only a slight decrease in psychological symptoms. Moreover, higher rated perceived reliability of course information that openly acknowledged conditions of uncertainty was associated with less perceived control.

As has become increasingly evident from studies in patients who present with symptoms that their physician cannot explain by a known somatic disease, reassurance about risk and disease is best accomplished in a face-to-face relationship in which the physician tries to provide tangible explanations that make sense to the patient and allow them to better manage the symptoms (Salmon, 2006). However, available studies also indicate that these positive reassuring effects may be short-lived and that after several weeks health anxiety may re-emerge especially in patients with high levels of health anxiety at baseline (Lucock, Morley, White & Peake, 1997; Rimes & Salkovskis, 2002). Generalizing these findings from primary and specialized medical care to the context of public health, one possible strategy is to reassure persons with long-standing symptoms after exposure to a disaster about their health on the basis of a medical examination addressing their health concerns

and anxieties. More specifically, it could be argued that a medical examination will have reassuring effects because persons can present their persistent symptoms, discuss their health anxieties, and after a medical examination will receive an individualized explanation for their symptoms and referral for further examination or treatment if necessary.

Effects of participation in trauma-focused studies

In recent years there has been growing attention to the emotional reactions of participants in trauma-focused studies. The risk of such research causing distress and having a negative impact on the mental state of participants has been assessed in several studies (e.g. Runeson & Beskow, 1991; Newman, Walker & Gefland, 1999; Boscarino et al., 2004). The prevalence of distress in trauma-focused studies is generally higher than in studies which focus on the participant's psychiatric state (Jorm, Kelly & Morgan, 2007). However, little indication was found for any long-term harm to participants.

In their review article on participant distress in psychiatric research Jorm et al. (2007) also report on the characteristics of participants who are most likely to become distressed. Generally, they are more likely to have mental disorders or symptoms, or have risk factors such as traumatic experiences. Post-traumatic stress symptoms were associated with distress due to study participation in several studies (e.g. Walker, Newman, Koss & Bernstein, 1997; Parslow, Jorm, O'Toole, Marshall & Grayson, 2000; Galea et al., 2005), as well as several socio-demographic variables such as age, sex and educational level.

In most of the studies on participant distress the prevalence is assessed with one or a few questions asked at the end of an interview or survey study investigating other issues. The only standardized instrument used is (part of) the Reactions to Research Participation Questionnaire (Newman, Willard, Sinclair & Kaloupek, 2001). We have no knowledge of any studies in this area using specific standardized instruments to assess the reaction of the participants to the subject of the examination they take part in. Only a few studies used a pre-post design to assess longer-term effects (e.g. Parslow et al., 2000; Halek, Murdoch & Fortier, 2005), let alone that a control group was included (see Celio, Bryson, Killen & Barr Taylor, 2003 for a notable exception).

Aims of the study

The first aim of the present study was to investigate whether participation in an individual medical examination or a trauma-focused epidemiological study will reduce persistent anxiety about health among residents and rescue workers in varying degrees involved in the Bijlmermeer Aviation Disaster.

The second aim was to study the effect of participation on self-reported physical and psychological health complaints.

The third aim was to assess which risk factors are related to changes in perception of current health problems.

Procedure

The MOVB project consisted of several parts, which were described in detail elsewhere (Medical Investigation Bijlmermeer Aviation Disaster Website, 2002; Slottje et al., 2005). An epidemiological study was performed into medical and psychological outcomes contrasting rescue workers who were and who were not involved in the disaster. Residents involved in varying degrees in the aviation disaster also took part in the epidemiological study. All participants were invited to participate in this study. After announcing the investigation in, e.g., house organs, letters were sent to potential participants, followed by phone calls. The medical investigation took around two and a half hours and consisted of filling in questionnaires (assisted by medical assistants and professional interpreters), measuring of body height and weight, and collection of blood, saliva and urine samples. Participants in the epidemiological study did not receive any individual feedback on the results of their medical investigation, unless the investigation revealed that further medical examinations were necessary.

Rescue workers and residents involved in the disaster were also offered an individual medical examination. Participants in this part of the study were not invited, but took part on their own initiative. Once the participants had put their names forward for the examination, they were sent a written invitation and asked to confirm it by telephone. Here, the procedure consisted of a medical examination and six weeks later a consultation with the physician to discuss the results of the examination. The medical examination took around four hours and consisted of completion of questionnaires (assisted by medical assistants and by professional interpreters), an examination of lung function, collection of blood and urine samples and medical history taking and physical examination by a medical doctor. At the consultation six weeks later each participant was given specific advice based on the findings of the examination, for instance that no grounds had been found for further examination, that a

further physical examination by their family doctor was warranted or that the participant might benefit from the special aftercare services set up for this purpose. Medical assistants and physicians were specifically trained in discussing health worries and anxieties and in giving personalized feedback in this particular group of people involved in the disaster.

If participants took part in both the epidemiological study and the medical examination, they were included in the group of participants of the medical examination, since they received individual feedback from the physician as opposed to the participants of the epidemiological study. This involved 27.8% of the residents and 35.5% of the rescue workers in the medical examination.

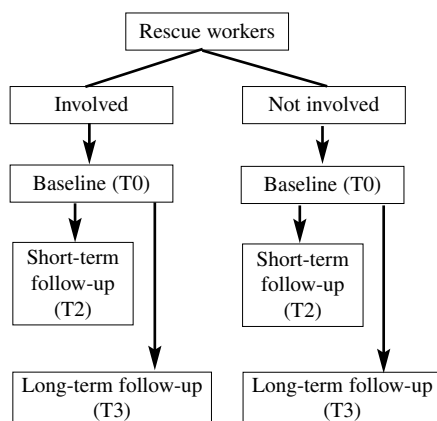
All participants received a public summary of the first results of the epidemiological study. More information was available on the website and in the newsletter of the project, and questions could be asked at meetings of the 'sounding-boards' of rescue workers and residents. The process of publicity was supervised by a communication expert.

Design

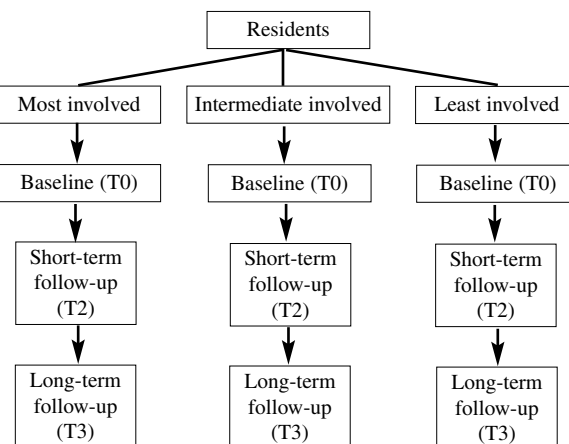
The present study is a prospective longitudinal study in both residents and rescue workers assessed at four time points: during the data collection of the epidemiological study and the individual medical examination (baseline), 6 weeks later during the consultation with a physician (post measurement, only in the medical examination), 12 weeks after the first examination (short-term follow-up) and six weeks after communication of the results of the epidemiological study among rescue workers (long-term follow-up), see Figure 1. All residents who completed the baseline assessment were also asked to complete both follow-up assessments, except for those dependent on interpreters. However, because of the large sample size a randomly selected subgroup of rescue workers who completed the baseline assessments was invited to complete either the short-term follow-up or the long-term follow-up assessments. Data collection took place eight years after the disaster at a general hospital in Amsterdam (baseline and post measurements) and by mail (short- and long-term follow-ups). The long-term follow-up measurement took place in April, 2003, at least one year after the baseline measurement which took place between December 2000 and March 2002. The research protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center and all participants gave written informed consent for the use of their data from the medical investigation and separately for our study on the effects of participation.

Figure 1. Design MOV B Effects study

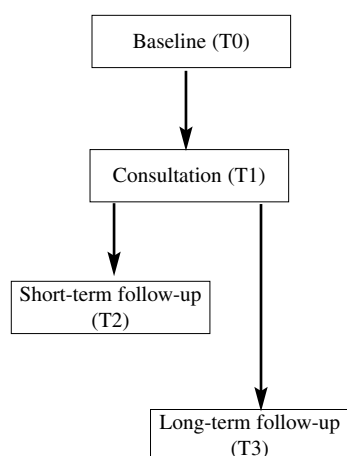
Rescue workers MOV B-Epidemiological



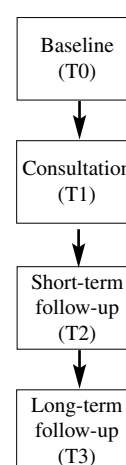
Residents MOV B-Epidemiological



Rescue workers MOV B-Individual



Residents MOV B-Individual



Participants

In the epidemiological study, the group of rescue workers consisted of professional fire-fighters employed in the Amsterdam fire department at the time of the disaster (almost all involved in the direct aftermath of the disaster) and a control group employed afterwards; police officers from the regional police force all employed on the date of the disaster and still employed at the start of this study; and accident and wreckage investigators both involved and not involved in the transport, security and sorting of the wreckage. At the time of the disaster, all residents eligible for the study were at least 16 years of age and registered as living in the Bijlmermeer district of the city of Amsterdam.

All individuals who considered themselves to be involved in the disaster or its aftermath (residents as well as rescue workers) could take part in the medical examination, on their own initiative. As such, the study sample of the individual medical examination consists of a self-selected group of persons concerned about their health.

Involvement in the disaster among rescue workers was assessed by having performed at least one of the following tasks: rescuing people, fire-extinguishing, providing security, providing first aid or support, cleaning up of destructed area, transport of injured, identification of victims, sorting of possible contaminated wreckage, transport of wreckage, burning of contaminated soil, or other disaster-related tasks (e.g. traffic management, or other tasks in hangar in the presence of the wreckage).

Residents were divided into three groups on the basis of the distance of their homes to the disaster site, as a proxy of their degree of involvement in the disaster. The residents who lived in one of the three struck apartment buildings were considered most involved. The second group of residents, while still living in the district, lived at maximum distance and outside the wind direction from the disaster site, and was considered least involved. The third group consisted of residents who lived in between the two other areas, and was considered to be intermediately involved. All three groups were similar with regard to ethnicity and social-cultural background.

Structure of the thesis

In Chapter 2 the results are described of a study that tested the hypothesis that a large-scale provision of an individual medical examination will reduce persistent anxiety about health and subjective health complaints after involvement in an aviation disaster with alleged exposure to hazardous chemicals. Changes in health experience between baseline, consultation and short-term follow-up were assessed.

The study presented in Chapter 3 investigated whether participation in a trauma-

focused epidemiological study reduced health complaints and concerns irrespective of trauma exposure. Changes in health experience of rescue workers and residents were assessed between baseline and short-term follow-up.

The study described in Chapter 4 investigates (a) the effectiveness of providing information on the health consequences of exposure to the aviation disaster to residents and rescue workers with varying degrees of exposure to the disaster and (b) individual characteristics which may moderate the effectiveness of the health information provided. This study assessed the long-term effects among participants of the individual medical examination and the epidemiological study.

The aim of the study reported on in Chapter 5 was to assess which risk factors are related to changes in perception of current health problems after participation in a trauma-focused study among rescue workers and residents in varying degrees involved in an aviation disaster. Prediction of short- and long-term changes was performed among participants of both the individual medical examination and the epidemiological study.

In Chapter 6 the results are shown of an investigation of the effect of cultural differences on the short-term effects of participation in the MOVb among residents of the Bijlmermeer district.

Chapter 7 provides a general discussion of the results with the main findings and suggestions for further research.

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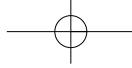
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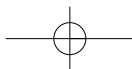
Chapter 2

Offering a medical examination following disaster exposure does not result in long-lasting reassurance about health complaints



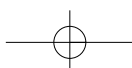
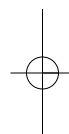
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Published in General Hospital Psychiatry 2008; 30: 200-207



Chapter 2

*Offering a medical examination following disaster exposure does not result
in long-lasting reassurance about health complaints*



Abstract

Objective This study tested the hypothesis that a large-scale provision of an individual medical examination will reduce persistent anxiety about health and subjective health complaints after involvement in an aviation disaster with alleged exposure to hazardous chemicals.

Method There were three measurements: during the medical examination, 6 weeks later during a consultation with the physician and 12 weeks after the first examination. 1736 rescue workers and 339 residents involved in the disaster participated. Standardized questionnaires on health complaints and concerns were administered.

Results Both groups reported increased health anxiety and somatic sensitivity after 12 weeks. Residents reported more post-traumatic stress symptoms, whereas rescue workers seem to have gained a better quality of life and were somewhat reassured. Participants that attended the consultation with the physician showed increased reassurance scores after six weeks, but at follow-up their worries had increased again. However, non-attendees reported more health anxiety at follow-up. More participants judged participation to have had a positive instead of negative impact on their health.

Conclusion Our study does not indicate that a large-scale medical examination offered after involvement in a disaster has long-lasting reassuring effects, and suggests that such examinations may have counterproductive effects by sensitizing participants for health complaints.

Introduction

The last decades there has been increasing attention for the health consequences of disasters and it has been consistently found that acute stress reactions are a normal and expected response to such a traumatic event [1]. However, it has also become clear that in a significant proportion of individuals psychopathological symptoms such as post-traumatic stress, anxiety, depression, substance abuse and physical (somatization) symptoms may persist for many years [2]. For example, recent studies have shown that the rates of (symptoms of) post-traumatic stress disorder more than one year after disasters range between 16% and 30% [3-7]. Disasters and the associated health consequences also constitute an occupational hazard for rescue workers. Although in general, rescue workers are reported to be relatively healthy (both mentally and physically) compared with other samples from the general population, recent studies have also found long-term health complaints in rescue workers exposed to a disaster in comparison to reference groups of non-exposed col-

leagues [8,9].

These results with respect to the long-term consequences of disasters in both victims and rescue workers underscore the need to develop interventions at disaster sites or in the direct aftermath of a disaster in order to prevent these long-term sequelae [10]. However, the vast majority of research on PTSD prevention up till now has yielded relatively little evidence for the efficacy of various preventive interventions such as psychological debriefing, treatment of acute stress disorder, stepped collaborative care, etc [11]. Even less clinical or empirical data are available about the optimal treatment strategy for victims of disasters or occupationally exposed rescue workers with long-standing mental and physical symptoms. It may be assumed that in these long-standing problems cognitive factors (such as risk perception or health anxiety) are important putative mediators between trauma exposure and persistent health problems [12], especially in toxicological disasters.

As has become increasingly evident from studies in patients who present with symptoms that their physician cannot explain by a known somatic disease, reassurance about risk and disease is best accomplished in a face-to-face relationship in which the physician tries to provide tangible explanations that make sense to the patients and allow them to better manage their symptoms [13]. However, available studies also indicate that these positive reassuring effects may be short lived and that after several weeks health anxiety may re-emerge especially in patients with high levels of health anxiety at baseline [14,15]. Generalizing these findings from primary and specialized medical care to the context of public health, one possible strategy could be to reassure persons with long-standing symptoms after exposure to a disaster about their health situation on the basis of a medical examination addressing their health concerns and anxieties. More specifically, it could be argued that a medical examination will have reassuring effects because persons can present their persistent symptoms, discuss their health anxieties, and after a medical examination will receive an individualized explanation for their symptoms and referral for further examination or treatment if necessary.

Background

On October 4th 1992 a freight Boeing 747 crashed in the Bijlmermeer district of Amsterdam, the Netherlands. The death count totaled 43 (including the plane's crew) and 266 apartments were destroyed. Discussions ensued about the health consequences for surviving residents and rescue workers, fuelled by speculations about the possible toxic cargo of the airplane. These growing uncertainties resembled the concerns among survivors of toxicological disasters [16]. In their article about toxic fear, Boin, van Duin and Heyse described how the Bijlmermeer air disaster developed into a public health crisis [17]. In the years following the crash, survivors began to link a stream of health complaints to the alleged toxic cargo of the plane.

The unusual long aftermath of speculations about the cause of the crash, the contents of the cargo, the potential hazardous materials, and its health consequences may have affected the psychological and physical well-being of residents and rescue workers [18]. The governmental reaction of crisis termination, combined with a collective underestimation of the possible effects of “toxic fear” resulted in a heightened sense of collective fear. In addition, extensive media coverage about unresolved issues, such as the disappearance of the depleted uranium used as balance weight in the aircraft created fertile ground for further rumors [19]. Instigated by a parliamentary inquiry, political pressure in January 2000 led to a large-scale medical examination for all individuals who considered themselves to be suffering from the consequences of the disaster; the Medical Investigation Bijlmermeer Aviation Disaster. The inquiry committee advised this investigation into possible health problems for residents and rescue workers, if only to quell public concerns created in the preceding eight years. One of the main goals of the project was to reassure those who were involved by offering more insight into their medical condition and into the health consequences of the disaster.

Purpose and research hypotheses

The Medical Investigation Bijlmermeer Aviation Disaster provided a unique opportunity to study whether providing individuals with the possibility of a medical examination indeed reduces anxiety about health as well as subjective complaints among rescue workers and residents. It was hypothesized that a medical examination during which participants could present their symptoms and discuss their concerns and anxieties followed by personalized feedback of a physician during a subsequent consultation would have reassuring effects both in residents and rescue workers. It was also hypothesized that this positive reassuring effect would be more pronounced directly after the medical consultation and would subside in the weeks following the consultation.

Methods

Design

The full project consisted of several studies of which the purpose and methods are described elsewhere [20,21]. Previous reports of the Medical Investigation Bijlmermeer Aviation Disaster have already shown that exposed rescue workers reported more subjective physical and psychological health complaints than non-exposed colleagues [8,9,22]. However, no consistent significant differences between exposed and non-exposed workers were found with regard to several clinical parameters in urine and blood samples.

The present study is a prospective longitudinal study in both residents and rescue workers assessed at three time points: during the medical examination (baseline), 6 weeks later during the consultation with a physician (post measurement), and 12 weeks after the first examination (follow-up measurement). The last measurement was executed by mail. The research protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center, and all participants gave written informed consent for the use of their data from the medical examination and separately for our study on the effects of participation.

Participants and procedure

The present study took place between December 2000 and April 2003. All individuals who were involved in the disaster (residents as well as rescue workers) could take part in a medical examination, on their own initiative. As such, the study sample consists of a self-selected group of persons concerned about their health. The medical examination consisted of an individual medical examination and a consultation with the physician to discuss the results. The medical examination took around four hours and consisted of filling in questionnaires (assisted by medical assistants and if necessary by professional interpreters), an examination of lung function (forced expiration spirometry), taking blood and urine samples and an anamnesis and physical examination by a doctor. At the consultation after approximately six weeks each participant was given a specific advice based on the findings of the examination, for instance that no grounds had been found for further examination, that a further physical examination by their family doctor was warranted or that the participant might benefit from the special aftercare services set up for this purpose. The examinations took place at a general hospital in Amsterdam. Medical assistants and physicians were specifically trained in discussing health worries and anxieties and giving personalized feedback in this particular group of people involved in the disaster.

Outcome measures

With regard to health concerns the following questionnaires were filled in. The Somatosensory Amplification Scale (SAS) (range 0-40) measures the tendency to experience somatic sensations as intense and harmful [23,24]. The 10-item SAS in this study had a Cronbach's α of .69. From the Illness Attitude Scales developed by Kellner, Abbott, Winslow and Pathak [25], the Health Anxiety subscale (HA) was used to study the degree of worry and anxiety about health [24]. Cronbach's α of the 11 items (range 0-44) in the present study was .90. To measure the extent to which a patient feels reassured by information provided by a physician the Reassurance Questionnaire (RQ) was administered [26]. The 10-item RQ (range 0-40) in this study had an α of .79. In the present study measurements of somatic sensitivity,

health anxiety and lack of reassurance by a physician constitute our operationalization of persistent health concerns.

In addition, various aspects of participants' physical and psychological health were investigated. To measure the general level of psychopathology the 12-item version of the General Health Questionnaire (GHQ-12) was used [27,28]. Cronbach's α for the GHQ-12 (range 0-12) in the present study was .89. Post-traumatic stress symptoms related to the air disaster were investigated with the Impact of Event Scale (IES) [29,30]. The IES (range 0-75) is composed of 15 items on experiences of intrusion and avoidance commonly reported following traumatic events ($\alpha=.95$). The Checklist Individual Strength (CIS) measures several aspects of fatigue [31], including 'Subjective fatigue', 'Concentration', 'Motivation' and 'Activity' (range 20-140). For the current study we used the total score on the CIS (20 items, $\alpha=.95$), and the score on the subscale Subjective fatigue (8 items, $\alpha=.95$). Health-related quality of life was measured with the EQ-5D, developed by the EuroQol Group [32]. It consists of five dimensions of possible health problems, to be answered with 'no problems', 'some problems' and 'extreme problems'. The combination of answers on the dimensions leads to an index-score of quality of life between 0 (equal to death) and 1 (best imaginable health).

Finally, participants were asked two questions about the influence of participating in the examination on their psychological and physical condition at that moment (at baseline, post-test and follow-up). Answers were given on a 5-point Likert scale ranging from 1 'in a very negative way' to 5 'in a very positive way'.

Statistical analysis

To measure changes in health experience between baseline and follow-up measurements paired sample t-tests were performed. In the subgroup of participants who attended the consultation with a physician, changes in reassurance and in the impact on their condition between baseline, post-test and follow-up were analyzed with repeated measures analyses of variance. Differences in health experience at follow-up between participants that did or did not attend the consultation were assessed with analyses of covariance, correcting the follow-up scores for the baseline scores on each measure. In order to quantify the magnitude of changes standardized, within effect-sizes (Cohen's d) were calculated [33].

Results

Sample

1736 rescue workers participated in the present study: 103 fire-fighters, 1231 police officers, 128 accident and wreckage investigators and 274 other rescue workers. 97% of the rescue workers were involved in the disaster by having performed at least one of the following tasks: rescuing people, fire-extinguishing, providing security, providing first aid/support to the injured or workers, cleaning up of destructed area, transport of injured, identification of victims, sorting of wreckage or other tasks in hangar, transport of wreckage, burning of contaminated soil, or other disaster-related tasks. 339 residents who lived in the neighborhood during the disaster also participated. 87% of the residents were exposed to at least one of the following events: being present in struck apartments, witnessing dead or injured people, being in danger of life, becoming injured, having one's apartment damaged, having one's partner or children in danger of life, injured or died, or having other family members died. Of the potential participants in the follow-up measurement 81% ($n=951$) of the rescue workers and 59% ($n=168$) of the residents responded. Rescue workers were randomly selected to take part in this follow-up, while all residents except for those dependent on interpreters were invited. A description of the participants is shown in Table 1. The rescue workers were predominantly male, whereas among residents gender was more or less equally divided. Most rescue workers had completed secondary education, while residents reported more primary education. Almost all rescue workers were of a western ethnicity, whereas more than half of the residents were of a non-western background (mainly Ghanaian, Surinamese and Netherlands Antilles).

Table 1. Demographic characteristics of participants at baseline

	Rescue workers (<i>n</i> = 1736)	Residents (<i>n</i> = 339)
Age in years: Mean (SD)	44.9 (6.8)	41.4 (11.1)
Gender: No. (%)		
Male	1605 (92.5)	180 (53.1)
Female	131 (7.5)	159 (46.9)
Education ^a : No. (%)		
Primary	431 (26.4)	138 (43.1)
Secondary	827 (50.6)	98 (30.6)
Higher	375 (23.0)	84 (26.3)
Ethnicity ^a : No. (%)		
Western	1682 (97.4)	151 (44.9)
Non-western	45 (2.6)	185 (55.1)

^a Numbers do not add up because not all the respondents answered these questions, % are valid.

Changes in health experience

Table 2 shows the changes in health experience between the time of the medical examination (baseline) and 12 weeks later (follow-up). Both rescue workers and residents were more sensitive to somatic sensations (SAS) and became more anxious about their health (HA). In addition, residents reported more post-traumatic stress symptoms (IES) 12 weeks after the examination. On the other hand, rescue workers seem to have gained a better quality of life (EQ-5D) and were somewhat reassured (RQ), although they showed more symptoms of fatigue (CIS). All effect-sizes were small or negligible.

Table 2. Changes in health experience between time of examination (baseline) and 12 weeks later (follow-up)

	Rescue workers (n = 951)				Residents (n = 168)			
	baseline M (SD)	follow-up M (SD)	t (950)	d ^a	baseline M (SD)	follow-up M (SD)	t (167)	d ^a
GHQ	1.3 (2.4)	1.3 (2.6)	0.2	-.01	4.3 (3.8)	4.6 (4.3)	-1.1	.08
IES	3.4 (7.4)	3.2 (8.2)	0.8	.02	25.1 (19.3)	28.8 (21.1)	-3.1**	.18
CIS	52.1 (26.1)	53.4 (25.5)	-2.3*	.05	80.5 (28.3)	83.8 (27.0)	-1.9	.12
Fatigue	22.7 (13.4)	22.8 (12.2)	-0.3	.01	37.5 (12.9)	37.6 (12.8)	-0.2	.01
EQ-5D	0.86 (0.2)	0.89 (0.2)	-5.9***	.15	0.58 (0.3)	0.59 (0.3)	-0.5	.03
HA	6.4 (6.0)	6.8 (6.3)	-2.6*	.06	14.1 (9.8)	16.7 (10.6)	-3.8***	.25
RQ	7.8 (5.5)	7.0 (4.6)	4.0***	.15	15.6 (7.2)	14.5 (7.2)	1.8	.14
SAS	7.9 (4.3)	8.7 (4.0)	-7.2***	.20	14.7 (6.8)	16.9 (6.5)	-4.3***	.34

M = mean; SD = standard deviation; ^a d = effect-size. *p < .05; **p < .01; ***p < .001. GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; Fatigue = Checklist Individual Strength Subjective Fatigue; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale

Effect of consultation

During the consultation with the physician 6 weeks after the medical examination (post measurement), the participants had the opportunity to discuss the results of this examination with the doctor and if appropriate receive advice for further treatment. Approximately half of the participants that took part in the follow-up made use of this opportunity (44% (n=74) of the residents and 54% (n=514) of the rescue workers). Except for higher scores for somatosensory amplification at baseline no other biographical or clinical differences between participants who did or did not attend this consultation were observed.

As Table 3 shows, the main difference at follow-up between those who took part in the consultation and those who did not was, that non-attendees reported more health anxiety at follow-up. Rescue workers also showed less reassurance, and more somatic sensitivity and psychopathology.

Table 3. Differences in health experience at follow-up between participants that did or did not attend the consultation, corrected for baseline scores

	Rescue workers (n = 951)				Residents (n = 168)			
	attendees M (SE)	non-attendees M (SE)	F (1, 948)	d ^a	attendees M (SE)	non-attendees M (SE)	F (1, 165)	d ^a
GHQ	1.1 (0.10)	1.5 (0.10)	6.7*	.17	4.4 (0.41)	4.8 (0.36)	0.5	.11
IES	3.2 (0.28)	3.3 (0.31)	0.1	.01	27.7 (1.67)	29.7 (1.52)	0.8	.14
CIS	52.7 (0.72)	54.2 (0.78)	1.9	.09	82.8 (2.45)	84.6 (2.15)	0.3	.09
Fatigue	22.4 (0.36)	23.2 (0.39)	2.6	.11	37.0 (1.15)	38.2 (1.02)	0.6	.12
EQ-5D	0.89 (0.01)	0.88 (0.01)	0.4	.04	0.59 (0.03)	0.59 (0.03)	0.02	.02
HA	5.9 (0.19)	7.8 (0.21)	45.9***	.44	14.7 (0.94)	18.3 (0.84)	7.8**	.44
RQ	6.4 (0.19)	7.8 (0.21)	22.4***	.31	13.6 (0.73)	15.3 (0.67)	2.9	.27
SAS	8.2 (0.14)	9.3 (0.15)	28.6***	.35	16.9 (0.67)	16.9 (0.60)	0.0	.00

M = mean; SE = standard error; ^a d = effect-size. *p < .05; **p < .01; ***p < .001. GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; Fatigue = Checklist Individual Strength Subjective Fatigue; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale

A repeated measures analysis was executed to trace the effect of the consultation on changes in reassurance between baseline, post- and follow-up measurements among the subgroup of participants who took part in the post-measurement. The results show that while both residents and rescue workers reported increased reassurance scores (RQ) at the consultation after six weeks (Mean difference (SE): rescue workers 2.94(0.24); residents 4.62(0.83)), this effect was attenuated in the subsequent weeks, and at the follow-up measurement their worries had increased again (Mean difference (SE): rescue workers -1.47(0.16); residents -2.53(0.66)). All effect-sizes of the changes in reassurance were small to medium.

Evaluation of medical examination

The subjective evaluation of the medical examination by residents and rescue workers can be found in Table 4. Rescue workers judged the effects of participation in the examination on their psychological and physical health more positively at the 6-week visit (post measurement) than before (baseline) or afterwards (follow-up). After 12 weeks residents indicated that participating in the examination had negatively influenced their psychological and physical condition compared to the post measurements. All effect-sizes were small. No significant differences were found

between baseline and post-test among the residents.

Most of the participants did not indicate that the medical examination had any impact on their psychological or physical condition at baseline, and more participants judged participation to have had a positive instead of negative impact on their health. Of note is that at baseline only about 2.5% of the residents and about 0.3% of the rescue workers indicated that the examination had had a very negative impact on their mental and/ or physical well-being (results not shown).

Table 4. Impact of participating in examination on physical and psychological condition

	Baseline M (SD)	Post-test M (SD)	Follow-up M (SD)	<i>F</i> (df)	Sign. Post-hoc	Baseline - post <i>d</i> ^a	Post – FU ^b <i>d</i> ^a
Rescue workers (<i>n</i> = 514)				(2, 1018)			
Physical condition	3.13 (0.5)	3.27 (0.5)	3.17 (0.5)	14.8***	Post > Baseline, FU ^b	.28	.20
Psychological condition	3.17 (0.5)	3.29 (0.6)	3.16 (0.5)	14.4***	Post > Baseline, FU ^b	.22	.24
Residents (<i>n</i> = 74)				(2, 144)			
Physical condition	3.51 (1.0)	3.40 (1.0)	3.08 (1.0)	5.6**	Baseline, Post > FU ^b	.11	.32
Psychological condition	3.37 (0.9)	3.37 (0.9)	3.07 (1.0)	3.5*	Baseline, Post > FU ^b	.00	.32

M = mean; SD = standard deviation; ^a *d* = effect-size; ^b FU = Follow-up. **p* < .05; ***p* < .01; ****p* < .001.

Stability and validity

In the absence of a control group, observed effects could reflect time trends and regression to the mean rather than true effects of the intervention. We therefore investigated whether the results of the present study were affected by time effects or selection-bias by studying the stability of the measurements across different time periods. Participants were included in the present study over a period of approximately 15 months and the order of appointments for the medical examination was not systematically predetermined. Measurements at baseline were divided over four equal time periods of almost four months for the rescue workers and the residents. In this way it was possible to investigate whether any systematic trends over the var-

ious time periods of including study participants could be observed. During the second time episode of the baseline measurement the rescue workers scored higher on fatigue, health anxiety and sensitivity to somatic sensations than the rescue workers during the other three episodes. In addition, residents during the last time episode showed more post-traumatic stress symptoms than residents during the first three time episodes. On all other measures no significant differences between time periods were found, neither in residents nor in rescue workers. These results make it rather unlikely that the present study results are due to systematic trends over time (e.g. a systematic worsening of symptoms and health concerns over time).

Participation in our study was voluntary. 417 rescue workers (19%) and 550 residents (62%) did participate in the individual medical examination, but not in our study. The main reasons not to participate were that the participants were children or were dependent on an interpreter because they did not have sufficient mastery of either Dutch or English to fill in the questionnaires. Because the GHQ, IES, and CIS were also part of the medical examination we were able to compare participants and non-participants on these measures. Non-participants in our study showed more signs of fatigue (CIS), psychopathology (GHQ) and post-traumatic stress symptoms (IES) than participants at the time of the individual medical examination (effect-sizes were small to medium).

In addition, there was no selective loss to follow-up of participants. The only difference between those that took part in the follow-up measurement and those that did not, was that the residents from the latter group at the time of the medical examination had a somewhat better quality of life (EQ-5D) ($p=0.007$, $d=.33$).

Discussion

The main question of this study was whether the large-scale provision of a medical examination to those involved in an aviation disaster with alleged exposure to hazardous chemicals will reduce persistent anxiety about health and subjective health complaints. We studied 339 individuals who lived close to the disaster site, and 1736 rescue workers who were professionally involved in the disaster. Our results do not suggest that a medical examination consistently results in fewer health complaints and worries in the aftermath of trauma. In both groups higher scores for somatosensory amplification and health anxiety were observed at 12-week follow-up suggesting that a medical examination may increase self-awareness of current physical and mental status and may have counterproductive effects by sensitizing participants for health complaints [34]. In rescue workers scores for reassurance by a physician and health-related quality of life were more positive at follow-up, however a similar effect was not observed in residents. On the contrary, in residents scores for post-

traumatic stress symptoms at follow-up were even higher than at baseline.

Of note is that only about 50% of the participants made use of the possibility to discuss the results of their medical examination with the physician. In this subgroup scores for reassurance by medical information provided by a physician became more positive over time. However, as hypothesized this effect was more pronounced directly after the consultation and already had largely disappeared 6 weeks later. Nevertheless, health anxiety was more manifest at follow-up among participants that did not attend the consultation. Taken together, these data suggest that a medical examination in itself may not be very helpful. Without a vis-à-vis consultation, a medical examination may have the same inadvertent negative consequences as participation in an epidemiological study without seeing a physician may have [35].

The more positive results on reassurance in patients consulting a physician may be interpreted from what is known about the effects of consultations in medical practice. Results of studies in this area indicate that patients with medically unexplained physical symptoms need explanations for their symptoms rather than simple reassurance [13]. Possibly, the physicians in our study were successful in discussing the results of the medical examinations without reinforcing the opinion that complaints resulted from toxic exposure, while at the same time offering a more convincing alternative explanation (e.g. in terms of stress). Apparently undergoing a medical examination without this personal feedback is not as reassuring in itself.

The temporary nature of this reassuring effect resembles results of studies on medical screening. For example, Rimes and Salkovskis showed that women with a high level of health anxiety showed a short term decrease of anxiety after a favorable test result, but also that after three months health anxiety returned to the level of women with an unfavorable test result [15]. Earlier, in experimental as well as clinical studies it was already shown that participants with a high level of (health) anxiety react differently to reassurance or diagnostic feedback than participants with a low level of (health) anxiety [36,37]. This may also be the reason that overall residents were less reassured than rescue workers, because they manifested higher levels of (health) anxiety predictive of being less susceptible to reassuring medical information by physicians. A total of 63% of the residents and 26% of the rescue workers showed at baseline scores above the clinical cut-off value on the General Health Questionnaire, compared to approximately 27% in the normal population. Especially in residents with long-lasting health concerns and high levels of psychopathology more extensive and therapeutically oriented interventions based on cognitive-behavior therapy principles may be warranted [38,39].

Over the years considerable political and media attention was given to the disaster and its consequences, possibly continuously fuelling health anxiety and concerns [17]. During the examination participants were again confronted with the traumatic events that took place so many years ago and their sequelae. Directly after the med-

ical examination only a very small minority of residents and rescue workers however indicated that participation had had a very negative impact on their mental and physical functioning. Most of the participants were neutral or even moderately positive about their participation. We are not aware of previous studies assessing the impact of a medical examination on mental and physical well-being of disaster victims, but these results concur with results of studies of the risks and benefits of participating in trauma-focused research studies [e.g. 40,41]. These non-patient studies also show that only a small minority of participants do experience strong emotions or more distress than anticipated during the research protocol [42].

Strengths and limitations of the study

To our knowledge our study is unique in investigating the effects of a large-scale provision of a medical examination to people involved in an aviation disaster with alleged exposure to hazardous chemicals. Also, we were able to investigate two relatively large groups of rescue workers as well as residents living in the disaster area. Another strong point of the present study is its prospective design.

The time-lag of more than eight years between the disaster and the data-collection may raise questions concerning the relevance of the results. However, health concerns were still very prevalent [9,22], as has also been previously reported for survivors of (presumed) toxicological disasters [16]. On the other hand, because of the chronicity of the health complaints they may have been more difficult to influence, and it remains unknown what the results might have been if the intervention would have taken place earlier in time.

A second limitation is the uncontrolled nature of our study. In the absence of a control group all observed effects could reflect time trends and regression to the mean. We analyzed the possible influence of time trends by dividing baseline measurements in equal time periods however, and found no evidence for systematic changes in scores for anxiety about health or subjective complaints as a result of passage of time. Given the elevated or even higher scores for complaints and concerns at follow-up regression to the mean is also an unlikely alternative explanation of the present findings. As Norris et al. showed in a review study among 160 samples of disaster victims [1], the general rule was for samples to improve as time passed and symptoms predominantly declined, even with two to 15 years between the two measurements. This makes it likely that our study results can be attributed to participation in the medical examination, particularly because we found differences in outcome between participants that did and did not attend the consultation.

A final limitation concerns the fact that study participants volunteered to have their health checked by a medical doctor. As such, this self-selected group is likely biased because they were probably concerned about their health as a result of the disaster. In a recent study it was shown that the police officers who voluntarily

underwent the medical examination significantly more often reported health complaints and traumatic events than police officers who were invited to participate in an epidemiological study but did not take the medical examination [43]. Study results can therefore not be generalized to involved residents or rescue workers in general.

Conclusion

Offering a large-scale medical examination to people involved in a disaster does not result in long-lasting reassuring effects. Only those participants who personally discussed the results of their medical examination with a physician remained somewhat reassured. This underscores the potential value of a vis-à-vis consultation after a medical examination. Future studies must be more attentive to communication and interaction patterns between doctors and patients, which should promote a reattribution of symptoms and better tolerance for or management of symptoms.

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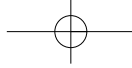
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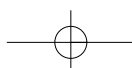
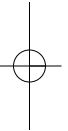
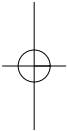
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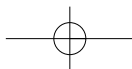


Chapter 2

*Offering a medical examination following disaster exposure does not result
in long-lasting reassurance about health complaints*

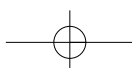
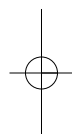
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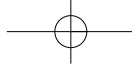




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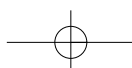
Chapter 3

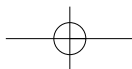
Participation in a trauma-focused epidemiological investigation may result in sensitization for current health problems



Margot J. Verschuur, Philip Spinhoven, Arnold A.P. van Emmerik,
Frits R. Rosendaal

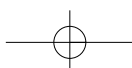
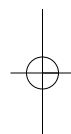
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Chapter 3

*Participation in a trauma-focused epidemiological investigation may result
in sensitization for current health problems*



Abstract

Objective Participation in health survey research may result in a worsening of self-assessed health status and enhanced service-use by increasing self-awareness of current health status. The present study investigated whether participation in a trauma-focused epidemiological study sensitized participants for health problems irrespective of trauma exposure.

Method 1019 rescue workers and 453 residents involved in varying degrees in a large scale aviation disaster participated. Data collection took place between December 2000 and April 2003. There were two measurements: one during the epidemiological investigation at a general hospital and one 12 weeks after the first measurement. Follow-up data were gathered in 80% of a randomly selected group of rescue workers and in 62% of the residents. Main outcome measures were: health anxiety, somatic sensitivity, the tendency to be reassured by a physician, psychopathology, post-traumatic stress symptoms, fatigue and quality of life.

Results Both rescue workers and residents reported less reassurance, and increased health anxiety and somatic sensitivity 12 weeks after the investigation compared to the first measurement. Exposure to the aviation disaster was not predictive of these changes in health perception, but higher levels of psychological and physical symptoms at baseline were. Only 0.2% to 1.6 % of the residents and rescue workers indicated at baseline that the investigation had had a very negative impact on their mental and/ or physical well-being. No evidence for systematic trends or changes in baseline scores for anxiety about health or subjective complaints during the 15 months inclusion period were found.

Conclusions Participation in an epidemiological study of the long term sequelae of disaster exposure does not lead to very strong negative reactions in most of the participants, but can result in an increased awareness of somatic sensations, enhancement of health worries and lowered reassurability by physicians, especially in participants with higher levels of psychological and physical symptoms at baseline. Future studies are needed to investigate the temporal stability of these inadvertent and unobtrusive negative consequences.

Introduction

In epidemiological studies on mental health, participants are questioned with the use of interviews or self-report scales about potentially sensitive aspects of their lives, which could result in distress, resentment and other negative feelings. Both ethical codes and government regulations require researchers to identify risks and benefits of participating in research so that potential participants can make an informed judg-

ment about participation based on knowledge of potential positive and negative consequences. Given the great relevance of this issue for mental health, it is striking that only very few studies have empirically investigated the effects of participating in health studies on the mental and physical well-being of study participants [e.g. 12, 14, 15, 22, 31]. The results of these studies suggest that although only a very small minority of approximately 5% of the participants report negative effects of completing questionnaires or interviews on their health status, participation may result in a worsening of self-assessed health status and increased service-use. Pre-existing childhood adversity, anxiety and dysfunctional personality characteristics may increase the likelihood of these negative reactions to study participation [12, 14, 31]. Possibly these risk factors predict adverse reactions to research participation because they all converge to an increased self-awareness of current physical and mental health problems [cp. 22]. Whether such an increased awareness indeed underlies negative reactions to participation in health surveys has never been systematically investigated however.

Specifying the risks associated with participation in trauma-focused studies is even more complicated, because this kind of research may cause additional distress to participants as a result of their being asked to recall details of their trauma [23]. In addition, potential participants may struggle with various psychological, medical, economic, and social difficulties secondary to the trauma [7, 20]. In a recent review on the risks and benefits of participating in trauma-focused research studies [20], it was concluded that the limited available evidence suggests that although a small subset of participants report strong negative emotions or unanticipated distress, the majority of these participants do not regret or negatively evaluate the overall experience of research participation.

Of the twelve studies reviewed by Newman and Kaloupek [20] only one study investigated the impact of research participation following exposure to a large-scale traumatic event. Galea et al. [8] surveyed 5,774 individuals of the general population in New York City 1 to 9 months after the terrorist attacks on September 11, 2001. The prevalence of upsetting emotional distress after the assessments conducted within a year of the terrorist attacks was relatively modest (13%) and negative reactions were short-lived and rarely persisted beyond the assessment itself. The following factors were predictive of being upset by the assessments: being aged 45-64, female gender, not being married, not having health insurance, being directly affected, having current mental health problems, and having mental health problems since the attacks. Up till now no studies exist which have investigated the impact of participation in research conducted in the long-term aftermath of large-scale disasters, although a large proportion of disaster research is conducted at substantial post-disaster time intervals [21].

On October 4th 1992 a freight Boeing 747 crashed in the Bijlmermeer district of

Amsterdam, the Netherlands. The death count totalled 43 (including the plane's crew) and 266 apartments were destroyed. Discussions ensued about the health consequences for surviving residents and rescue workers, fuelled by speculations about the possible toxic cargo of the airplane. These growing uncertainties resembled the concerns among survivors of toxicological disasters [10]. In their article about toxic fear, Boin, van Duin and Heyse described how the Bijlmermeer air disaster developed into a public health crisis [3]. The governmental reaction of crisis termination, combined with a collective underestimation of the possible effects of 'toxic fear' resulted in heightened public concern. Instigated by a Parliamentary Inquiry, political pressure in January 2000 led to a large-scale controlled epidemiological study, which had to investigate whether the long term health effects could be attributed to exposure to this disaster both in residents of the Bijlmermeer and in occupationally involved rescue workers.

The Medical Investigation Bijlmermeer Aviation Disaster project was executed more than 8 years after the aviation disaster. It therefore provided a unique opportunity to assess the impact of participating in an epidemiological study of the long term consequences of exposure to a large-scale disaster in both victims of this disaster and professionally involved rescue workers. The project enabled us to replicate previous findings on the impact on health functioning of participating in an epidemiological study of the short term consequences of trauma exposure in a study of the long term consequences of trauma exposure. In addition, it allowed us to expand previous knowledge by (a) using a prospective design to study possible longer lasting effects of research participation on psychological and physical health; (b) including residents with various degrees of disaster involvement as well as professionally involved rescue workers; (c) including a non-exposed reference group to investigate whether the impact of research participation depends on trauma exposure; and (d) including measures for increased self-awareness of health problems to investigate the mechanism underlying an adverse reaction to participation in trauma-focused epidemiological research. Based on Parslow et al. [22], discussed above, it was hypothesized that participation in an epidemiological study so many years after trauma exposure would result in an enhanced and persistent awareness of current psychological and physical health problems irrespective of (the degree of) disaster exposure. In addition, findings by Galea et al. [8] led to the second hypothesis that this effect would be more pronounced in participants with higher current levels of psychological and physical health problems.

Method

Overview

The full project consisted of several studies of which the purpose and methods are described elsewhere [19, 26]. Previous reports of the Medical Investigation Bijlmermeer Aviation Disaster have already shown that exposed rescue workers reported more subjective physical and psychological health complaints than non-exposed colleagues [25, 27, 35]. However, no consistent significant differences between exposed and non-exposed workers were found with regard to several clinical parameters in urine and blood samples, such as blood cell counts, creatinine clearance, and autoantibody serology.

The present study is a prospective longitudinal study in which both residents and rescue workers were assessed at two time points: during the medical investigation (baseline, between 8 and 10 years after the disaster) and 12 weeks after the first examination (follow-up measurement). The last measurement was executed by mail. The research protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center, and after having been informed about the purpose of the study and the (re-)assessments all participants gave written informed consent.

Participants and procedure

The present study took place between December 2000 and April 2003 at a general hospital in Amsterdam, the Netherlands. An epidemiological study was performed into medical and psychological outcomes in which rescue workers who were and who were not involved in the disaster were compared, as well as residents with varying involvement in the disaster. The group of rescue workers consisted of professional fire-fighters employed in the Amsterdam fire department at the time of the disaster (almost all involved) and a control group employed afterwards, police officers from the regional police force all employed on the date of the disaster and still employed at the start of this study, and accident and wreckage investigators both involved and not involved in the transport, security and sorting of the wreckage. At the time of the disaster, all residents were at least 16 years of age and registered as living in the Bijlmermeer district of the city of Amsterdam.

All participants were invited to participate in this study. The medical investigation took around two and a half hours and consisted of filling in questionnaires (if necessary assisted by professional interpreters and medical assistants), measurement of body height and weight, and collection of blood, saliva and urine samples. Because the last measurement was executed by mail, all participants that were unable to fill in Dutch or English versions of the questionnaires at baseline without assistance were excluded from this study. Most questionnaires are validated in both Dutch and English populations, except for the Reassurance Questionnaire and the

Checklist Individual Strength, which are only validated in Dutch. Only five (0.49%) rescue workers and one (0.22%) resident were English-speaking. The procedure of the medical investigation was described in more detail by Slottje, Huizink et al. [26]. Participants in the present study did not receive any individual feedback on the results of their medical investigation, unless the medical investigation revealed that further medical examinations were necessary.

Outcome measures

To measure awareness of current health status we used the Dutch version of the Somatosensory Amplification Scale [2,29] which measures the tendency to experience somatic sensations as intense and harmful; the Dutch version of the Health Anxiety subscale [29] adapted from the Illness Attitude Scales [16] to measure the degree of worry and anxiety about health; and the Reassurance Questionnaire to measure the extent to which a patient generally feels reassured by medical information provided by physicians [28].

Subjective complaints about physical and psychological health were investigated using the Dutch version of the General Health Questionnaire-12 to measure the general level of psychopathology [9,17]; the Dutch version of the Impact of Event Scale to assess post-traumatic intrusion and avoidance symptoms related to the air disaster [4, 13]; the total score on fatigue of the Checklist Individual Strength (CIS) [33]; and the EQ-5D, developed by the Euroqol Group [6] to measure health-related quality of life.

Rescue workers were considered involved in the disaster when they had performed at least one of the following tasks: rescuing people, fire-extinguishing, providing security, providing first aid or support, cleaning up of destructed area, transport of injured, identification of victims, sorting of possible contaminated wreckage, transport of wreckage, burning of contaminated soil, or other disaster-related tasks (e.g. traffic management, or other tasks in hangar in the presence of the wreckage). Residents were divided into three groups on the basis of the distance of their homes to the disaster site, as a proxy of their degree of involvement in the disaster. The residents who lived in one of the three struck apartment buildings were considered most involved. The second group of residents, while still living in the district, lived at maximum distance from the disaster site, and was considered least involved. The third group consisted of residents who lived in between the two other areas, and was considered to be intermediately involved.

In addition to this objective measure of involvement, residents were asked whether they had experienced one or more of the following events during the disaster: being present in struck apartments, witnessing dead or injured people, being in danger of life, becoming injured, having one's apartment damaged, having one's partner or children in danger of life, injured or died, or having other family mem-

bers died. These events are likely to meet criterion A1 of the diagnostic criteria for Post Traumatic Stress Disorder [1], which defines potentially traumatic events [26].

Finally, participants were asked two questions about the influence of participating in the investigation on their psychological and physical condition at baseline. Answers were given on a 5-point Likert scale ranging from 1 ('in a very negative way') to 5 ('in a very positive way').

Analyses

To measure changes in health experience between baseline and follow-up, repeated measures analyses of variance were performed with exposure to the disaster as between subjects variable and time as within subjects variable. In order to quantify the magnitude of changes, standardized effect-sizes (Cohen's *d*) were calculated. Cohen's *d* is the difference between pre and post means divided by the pooled standard deviation. Effect sizes $<.15$ are considered negligible, between $.15$ and $.40$ small, between $.40$ and $.75$ medium, and $\geq .75$ large [30].

Because it was hypothesized that changes in self-awareness of health status (as assessed with the SAS, HA subscale of the IAS and RQ) will be correlated, it was first investigated whether the changes on these variables could be transformed in one principal component accounting for as much of the variability in the data as possible. To this end a principal component analysis was conducted on the 12 week follow-up residualized change scores on these measures (obtained by statistically correcting the follow-up scores for any baseline differences on these measures). Next, using the regression method a composite factor score for change in self-awareness of current health problems was calculated. The association of this change score with demographic and clinical variables was investigated with Pearson correlation coefficients or *t*-tests for independent samples as appropriate. Finally, Chi-square analyses were performed to analyze in residents the association of our objective measure of trauma involvement (i.e. place of domicile) with subjective self-reports of trauma exposure.

Results

Study group

1019 rescue workers participated, including 143 fire-fighters, 685 police officers and 191 accident and wreckage investigators. 254 rescue workers (25.2%) were directly involved in the disaster by having performed disaster-related tasks. In addition, 453 residents who lived in the neighborhood during the disaster participated. The most involved group consisted of 195 residents (43.6%), the least involved group of 123 residents (27.5%) and the intermediately involved group of 129 resi-

dents (28.9%). Of the potential participants in the follow-up measurement, 501 (80%) of the randomly selected rescue workers and 278 (62%) of the residents responded. A description of the participants in valid percentages is shown in Table 1. The rescue workers were predominantly male, whereas among residents women were somewhat overrepresented. Most rescue workers had completed secondary education, while residents reported more primary as well as higher education. Almost all rescue workers were of a western ethnicity, whereas almost half of the residents were of a non-western background (mainly Dutch-speaking Surinamese and Netherlands Antilles).

Table 1. Demographic characteristics of participants

Characteristics	Rescue workers (<i>n</i> = 1019)	Residents (<i>n</i> = 453)
Age: mean (SD), years	43.6 (7.7)	42.3 (13.8)
Gender *:		
Men, No. (%)	923 (90.7)	188 (41.5)
Women, No. (%)	95 (9.3)	265 (58.5)
Education *:		
Primary, No. (%)	276 (28.7)	147 (34.0)
Secondary, No. (%)	496 (51.6)	133 (30.8)
Higher, No. (%)	189 (19.7)	152 (35.2)
Ethnicity *:		
Western, No. (%)	985 (97.1)	255 (56.8)
Non-western, No. (%)	29 (2.9)	194 (43.2)

*Numbers do not add up because not all the respondents answered these questions, % are valid.

Changes in health experience

Table 2 shows the changes in health experience of involved and not involved rescue workers between the time of the medical investigation (baseline) and 12 weeks later (follow-up). All rescue workers were more sensitive to somatic sensations (SAS), more anxious about their health (HA) and less reassured (RQ) 12 weeks after the examination than at baseline. In addition, they reported more symptoms of fatigue (CIS) and psychopathology (GHQ) than at baseline. All effect-sizes were small or

negligible, except for somatic sensitivity which showed a medium effect-size. There were no significant interaction effects between group and time, which shows that the change in health experience did not differ between involved and non-involved rescue workers. The only difference between the two groups of rescue workers, i.e., those who were involved and those who were not, was that the former group showed more post-traumatic stress symptoms at baseline and follow-up ($F(1)=6.3$, $p<.05$).

Table 2. Changes in health experience of rescue workers between time of examination (baseline) and 12 weeks later (follow-up)

	Involved ($n=123$)		Not involved ($n=370$)		$F(1, 491)$	$F(1, 491)$	d
	baseline	follow-up	baseline	follow-up	time	group x time	time
	M(SD)	M(SD)	M(SD)	M(SD)			
GHQ	0.7 (1.5)	1.1 (2.4)	0.9 (1.9)	1.0 (2.1)	5.1*	1.9	.09
IES	1.2 (3.3)	1.3 (3.7)	0.4 (2.7)	0.7 (3.2)	1.2	0.1	.07
CIS	39.9 (15.7)	45.0 (19.0)	42.2 (20.9)	46.5 (22.3)	33.7***	0.2	.22
EQ-5D	0.93 (0.1)	0.93 (0.1)	0.92 (0.1)	0.94 (0.1)	3.8	2.9	.20
HA	5.3 (5.1)	6.4 (6.7)	5.3 (5.3)	6.3 (5.9)	16.1***	0.0	.19
RQ	5.9 (4.4)	7.3 (5.1)	6.6 (4.9)	7.3 (5.4)	18.3***	2.2	.17
SAS	6.4 (3.7)	8.7 (4.0)	6.8 (4.0)	8.6 (3.8)	111.1***	2.3	.47

M = mean; SD = standard deviation; d = effect-size. * $p<.05$; ** $p<.01$; *** $p<.001$. GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale.

Twelve weeks after the first investigation residents also showed more signs of health anxiety and somatic sensitivity and less reassurance by physicians than at baseline (Table 3). However, they did not report an increase in subjective health complaints. On the contrary, self-reported quality of life somewhat improved. The effect-sizes were again small or negligible and there were no significant interaction effects between group and time, meaning that the change in health experience did not differ between residents varyingly involved in the disaster. The groups differed from each other regarding post-traumatic stress symptoms ($F(2)=4.6$, $p<.05$), fatigue ($F(2)=3.9$, $p<.05$), reassurance ($F(2)=3.3$, $p<.05$) and somatic sensitivity ($F(2)=4.2$,

$p < .05$), however. Residents who lived within the disaster area reported more concerns and complaints at baseline and at 12 weeks compared to residents who lived more remote from the disaster area.

Table 3. Changes in health experience of residents between time of examination (baseline) and 12 weeks later (follow-up)

	Most involved ($n=111$)		Intermediate ($n=85$)		Least involved ($n=78$)		$F(1, 271)$	$F(2, 271)$	d
	baseline	follow-up	baseline	follow-up	baseline	follow-up	time	group x time	time
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)			
GHQ	2.9(3.7)	3.0(3.9)	2.3(3.3)	2.5(3.4)	1.8(3.3)	2.6(3.4)	3.1	1.3	.01
IES	12.7(17.9)	14.7(18.9)	9.2(13.4)	7.9(12.1)	7.5(15.1)	8.0(13.9)	0.4	2.2	.04
CIS	69.4(30.1)	68.0(30.3)	59.4(27.3)	60.4(27.9)	56.8(28.2)	59.6(29.0)	0.4	1.0	.02
EQ-5D	0.75(0.3)	0.76(0.3)	0.77(0.2)	0.83(0.2)	0.82(0.2)	0.84(0.2)	6.1*	1.0	.14
HA	10.7(8.7)	12.6(9.5)	8.5(8.2)	10.8(8.5)	8.9(8.2)	10.5(8.6)	25.2***	0.3	.22
RQ	10.8(7.0)	11.7(7.1)	8.8(7.0)	10.2(7.5)	8.3(6.7)	9.2(7.5)	11.1**	0.4	.14
SAS	12.5(6.1)	14.8(6.4)	10.8(5.6)	12.2(5.7)	11.0(5.9)	13.1(6.0)	38.4***	0.8	.32

M = mean; SD = standard deviation; d = effect-size. * $p < .05$; ** $p < .01$; *** $p < .001$. GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale.

Prediction of increased self-awareness of health problems

A principal component analysis (PCA) on the residualized gain scores on the SAS, HA subscale and RQ in rescue workers clearly yielded a one-factor solution (eigenvalue 1.6) accounting for 54.1% of the variance. Factor loadings were high (respectively 0.53, 0.84 and 0.80). A PCA in residents yielded similar results: a one-factor solution (eigenvalue 1.8) accounting for 58.9% of the variance with high factor loadings (respectively 0.72, 0.80 and 0.78).

Of the investigated predictive demographic and clinical risk factors (age, gender, ethnicity, education, trauma exposure, GHQ, IES, CIS, and EQ-5D), in rescue workers, besides gender ($t(1)=2.3$, $p < .05$), also the measurements for severity of fatigue and psychopathology were predictive of changes in the self-awareness of mental

health problems (see Table 4). In residents, besides ethnicity ($t(1)=-2.6$, $p<.01$) and education ($F(2,234)=10.0$, $p<.001$), all of the scores for mental and physical health were predictive of changes in self-awareness of health status. These results clearly indicate that participants with higher levels of psychological and physical symptoms are more prone to increased self-awareness of their current health status. The same holds true for male rescue workers and residents of a non-western ethnicity and a lower level of education.

Table 4. Prediction of increased self-awareness of health problems

	Composite factor score for change	
	Rescue workers	Residents
GHQ	.13*	.17**
IES	.05	.15*
CIS	.24***	.22***
EQ-5D	-.11	-.16*

Pearson correlation coefficients. * $p<.05$; ** $p<.01$; *** $p<.001$. GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; EQ-5D = EuroQol-5 Dimensions

Evaluation of medical investigation

The subjective evaluation of the medical investigation by residents and rescue workers can be found in Table 5. Most of the participants did not indicate that the medical investigation had any impact on their psychological or physical condition and more participants judged participation to have had a positive instead of negative impact on their health. Of note is that only about 0.2 to 1.6% of the residents and rescue workers indicated that the investigation had had a very negative impact on their mental and/ or physical well-being.

Table 5. Impact of participating in investigation on psychological and physical condition

Impact, No.(%)	Rescue workers		Residents	
	Psychological condition	Physical condition	Psychological condition	Physical condition
Very negative	3(0.3)	4(0.4)	7(1.6)	1(0.2)
Negative	11(1.1)	9(0.9)	34(7.6)	25(5.5)
No influence	864(85.4)	873(86.3)	276(61.3)	310(68.4)
Positive	108(10.7)	98(9.7)	105(23.3)	87(19.2)
Very positive	26(2.6)	28(2.8)	28(6.2)	30(6.6)

Relation between involvement of residents and self-reported exposure to trauma

To assess whether the division of the residents in three groups according to their place of domicile concurred with self-reported trauma exposure, we compared the groups on the traumatic events they had experienced at the time of the disaster. Results are shown in Table 6. Twice as many residents from the disaster area reported having experienced at least one traumatic event when compared to the least involved group of residents. The intermediately involved group mostly reported percentages that lay in between the two other groups.

Table 6. Number and percentage of residents reporting traumatic events by degree of involvement

Traumatic event, No. (%)	Most involved (n=195)	Intermediate (n=129)	Least involved (n=123)	$\chi^2(2)$
Present in struck apartments	116 (60.7)	62 (50.0)	42 (34.4)	20.6***
Seen dead/injured	66 (37.5)	19 (19.6)	21 (25.6)	10.5**
Been in danger of life	34 (17.8)	9 (7.0)	6 (4.9)	15.7***
Became injured	5 (2.6)	1 (0.8)	0 (0.0)	4.2
Apartment damaged	39 (20.3)	2 (1.6)	0 (0.0)	49.5***
Partner/children in danger of life	34 (17.7)	7 (5.5)	4 (3.3)	21.4***
Partner/children injured	5 (2.6)	0 (0.0)	0 (0.0)	6.6*
Partner/children died	2 (1.0)	0 (0.0)	0 (0.0)	2.7
Other family members died	4 (2.1)	2 (1.6)	0 (0.0)	2.5
At least one of these events	157 (80.5)	72 (55.8)	49 (39.8)	56.2***

*p<.05; **p<.01; ***p<.001.

Stability and validity

We investigated whether the present results were affected by time effects or selection-bias. The stability of the measurements was studied by comparing scores obtained in different time periods. Participants were included over a period of approximately 15 months and the order of appointments for the medical investigation was not systematically predetermined. Measurements at baseline were divided over four equal time periods for the rescue workers and two equal time periods for the residents (because the epidemiological study among residents was cancelled after these two periods). During the first time period of the baseline measurements the rescue workers as well as the residents scored lower on sensitivity to somatic sensations than during other episodes. No other indications for systematic trends over time were found, neither in residents nor in rescue workers. It is therefore unlikely that the present study results are due to systematic trends over time (e.g. a systematic worsening of symptoms and health concerns over time).

269 rescue workers (21%) and 384 residents (46%) participated in the epidemiological study itself, but not in our study on its effects. Because the GHQ, IES, and CIS were also administered in the medical investigation we were able to compare participants and non-participants on these measures. Non-participating residents

reported higher levels of physical and psychological complaints than participating residents at the time of the medical investigation (baseline); specifically, they showed more signs of fatigue (CIS), psychopathology (GHQ-12) and post-traumatic stress (IES) ($p < .01$, effect-sizes were small to medium). No differences between participating and non-participating rescue workers were present on these measures. Residents and rescue workers that did not participate were more often of a non-western ethnicity than participants in our study ($p < .01$). In addition, there was no selective drop-out of participants. The only difference between those that took part in the last measurement (follow-up) and those that did not was that dropouts (residents and rescue workers) showed more post-traumatic symptoms at the time of the medical investigation than completers ($p < .05$, effect-sizes were small).

Discussion

The main aim of this study was to evaluate the effects of participating in an epidemiological investigation on concerns about health and subjective complaints among rescue workers and residents. Both groups reported less reassurance, and increased health anxiety and somatic sensitivity 12 weeks after participating in a trauma-focused epidemiological research study. Rescue workers also reported elevated levels of psychopathology and fatigue whereas residents indicated an improved quality of life. Although the reported significant changes have a small to medium effect size and denote deteriorations of only modest clinical importance, the effects are remarkably consistent and clearly suggest that participation in an epidemiological investigation may have unobtrusive and pervasive effects. Irrespective of the degree of involvement in the disaster, residents as well as rescue workers showed more concerns about their health at the follow-up at 12 weeks than at the time of the examination. However, only a very small minority of the participants indicated that participating in the research study has had a very negative effect on their psychological or physical well-being. Hence, after participation in the epidemiological investigation, even among rescue workers who were in no way involved in the disaster, more signs of health anxiety, somatic sensitivity, and feelings of being less reassured by medical information of a physician were reported.

These results replicate and extend previous study results in participants of health surveys in general [e.g. 12, 14, 15, 22, 31] and of trauma-related surveys in particular [20]. Although only a very small minority of participants indicated very strong negative reactions, a more unobtrusive effect of participating in health surveys may be the enhanced awareness of current health problems. Although this possibility has been suggested by several authors as a putative mechanism accounting for a worsened self-assessed health status and service use following participation in a health

survey [22] no studies up till now had empirically investigated this possible risk mechanism. On the basis of our study results it may be concluded that a health survey intensifies the attention for somatic sensations, enhances worries about health and even reduces the confidence of participants in medical information provided by physicians. These results are in accordance with the cognitive-behavioral model of health anxiety [24]. This model predicts that directing attention to bodily sensations and providing reassurance to patients preoccupied with their health, will result in a higher need of reassurance, stronger illness beliefs and higher levels of health anxiety.

Interestingly, this effect of participating in a trauma-focused epidemiological study was found to be independent of (degree of) trauma exposure. This is in contrast to the results of previous studies in which trauma exposure was positively associated with adverse reactions to study participation [e.g. 8, 34]. One explanation for this non-differential impact could be that the investigation in the present study had a rather pronounced medical focus and that the assessment of trauma exposure was only part of the total investigation. A more extensive assessment of trauma exposure and trauma-related consequences could have resulted in more distinct psychological effects particular in those subjects exposed to trauma.

An additional explanation for the lack of a non-differential impact can also be accounted for by the time-lag of more than eight years between the disaster and the start of the epidemiological study. Some authors have convincingly argued that exposure to the disaster's long-term aftermath may have more detrimental health consequences than the exposure to the disaster itself [3, 11, 32, 36]. This may be especially true for disasters with real or alleged exposure to hazardous chemicals. This kind of disaster in particular may have a long-lasting impact on the well-being of those involved because of the uncertainty about potential physical and mental health effects [10]. The long and turbulent aftermath of the Bijlmermeer aviation disaster may have diminished the effect of trauma exposure on possible health effects of participating in an epidemiological study. However, other risk factors for negative reactions to health survey study participation were replicated in the present study. In concordance with the results of previous studies [12, 14, 31] it seems that in particular participants with higher levels of psychological and physical symptoms may become more aware of their current health status.

To our knowledge our study is unique in investigating the effects of participating in an epidemiological investigation after a disaster on such a large scale. Also, we were able to investigate two large groups of rescue workers as well as residents living in the disaster area, and to compare subgroups according to their degree of involvement in the disaster. Another strong point of the present study is its prospective design.

Some limitations of the present study should also be mentioned. In the absence

of a control group of individuals not participating in a health survey or participating in a survey in which no personally relevant information is assessed, all observed effects could reflect time trends and regression to the mean. We analyzed the possible influence of time trends by dividing baseline measurements in equal time periods and found no evidence for systematic changes in scores for anxiety about health or subjective complaints as a result of passage of time however. Given the elevated scores for complaints and concerns at follow-up regression to the mean is also an unlikely alternative explanation of the present findings. As Norris et al. [21] showed in a review study among 160 samples of disaster victims, the general rule was for samples to improve as time passed and symptoms predominantly declined, even with two to 15 years between the two measurements. This makes it likely that our study results may be attributed to participation in the medical investigation.

Secondly, the validity of measurements of trauma exposure after so many years may be questioned, since empirical evidence showed that retrospective reporting of exposure to trauma may be influenced by the current physical and mental state of a person [18]. People suffering from serious psychological complaints unjustly tend to report more exposure to trauma, leading to an inflated association between exposure and outcome. In order to circumvent recall bias we therefore used the place of domicile of the residents as a more objective measure of their involvement. Of note is that this more objective measure concurred with self-reports of exposure to trauma. The group of residents who were most involved in the disaster not only reported more trauma exposure but also reported higher levels of post-traumatic stress symptoms, fatigue and somatic sensitivity and less reassurance compared to the two groups of residents with lower degrees of involvement [cp. 5]. These results suggest that our findings regarding changes in health experience in residents involved in varying degrees in the disaster are not critically affected by the operationalization of involvement in the disaster.

Finally, it is possible that factors such as social desirability or litigation issues may have influenced the answers. However, although these factors can result in over- or underreporting of health complaints, they are unlikely to influence changes in health problems during a 12 week time period 8 to 10 years after a disaster. Moreover, participants in the present study were invited to participate by the researchers and did not take part on their own initiative. Hence, they were probably more driven by compassion with the people involved in the disaster than by their own needs.

Conclusion

To conclude, the results of our study suggest that participation in an epidemiological study of the long term sequelae of exposure to a disaster does not lead to very strong negative reactions in most of the participants, but can result in an increased awareness of somatic sensations and enhanced health worries, especially in participants with higher levels of psychological and physical symptoms. Future and better controlled studies are needed to investigate the temporal stability of these inadvertent and unobtrusive negative consequences.

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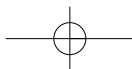
Chapter 4

Making a bad thing worse: Effects of communication of results of an epidemiological study after an aviation disaster



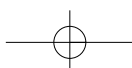
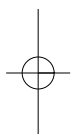
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Chapter 4

*Making a bad thing worse: Effects of communication of results
of an epidemiological study after an aviation disaster*



Abstract

Cognitions attributing health complaints to disaster exposure are associated with more severe health complaints and are therefore a promising target for interventions. Little is known about the best strategy to modify such cognitions following exposure to a technological disaster at the community level. In 1992, a Boeing 747 crashed in a residential area in Amsterdam, the Netherlands. Persisting rumours about the possible toxic cargo of the plane led to increasing health concerns among the residents and rescue workers involved in the disaster. The current study investigates (a) the effectiveness of providing information on the health consequences of exposure to the aviation disaster to residents and rescue workers with varying degrees of exposure to the disaster and (b) individual characteristics which may moderate the effectiveness of the health information provided. 1019 rescue workers and 453 residents involved in varying degrees in the disaster participated in an epidemiological investigation and 1736 rescue workers and 339 residents, all involved, participated in an individual medical examination. Participants were assessed at baseline and 6 weeks after communication of the results of the epidemiological study. Main outcome measures evaluated health anxiety, somatic sensitivity, reassurance by a physician, psychopathology, post-traumatic stress symptoms, fatigue and quality of life. All participants reported elevated levels of psychopathology and fatigue, increased anxiety and uncertainties about their health 6 weeks after communication of the study results irrespective of the degree of exposure to the disaster. Especially the conviction that health complaints were caused by toxic exposure was related to more severe health complaints and worries in both rescue workers and residents. Our study shows that communication about the health consequences of exposure to an aviation disaster at the community level has no symptom reducing or reassuring effects. Tailoring of the communication to individual characteristics such as existing expectancies may enhance its impact.

Introduction

Attention for the health consequences of disasters is growing during the last decades. Research studies have shown that in a significant proportion of individuals psychopathological symptoms such as post-traumatic stress, anxiety, depression, substance abuse and physical (somatisation) symptoms may persist for many years (see Foa, Stein & McFarlane (2006) for a review). Establishing a relationship between disaster exposure and persistent higher levels of mental and physical dysfunction is complex, because it remains unclear whether the degree of exposure to the disaster or the degree of exposure to the long-term aftermath of the disaster is

the primary causative factor (Boin, van Duin & Heyse, 2001; Havenaar, de Wilde, van den Bout, Drottz-Sjöberg & van den Brink, 2003; Vasterman, Yzermans & Dirkzwager, 2005; Yzermans & Gersons, 2002). This may be especially true with respect to disasters with real or alleged exposure to hazardous chemicals. This kind of disaster in particular may have a long-lasting impact on the well-being of those involved because of the uncertainty about potential physical and mental health effects (Baum, Fleming & Davidson, 1983; Havenaar & van den Brink, 1997).

It may be assumed that cognitive factors are important putative mediators between trauma exposure and persistent health problems. Havenaar et al. (2003) showed that cognitive variables such as risk perception and sense of control play an important role as mediating factors in the explanation of subjective health differences between exposed and non-exposed victims of the Chernobyl disaster. Also, in a study on self-reported health among residents of a chromium wasted area and a control group, McCarron, Harvey, Brogan and Peters (2000) found no evidence of harm to health from exposure to chromium. However, lower scores on self-reported health in participants who believed chromium to be harmful to health point to the potential importance of perception and possible anxiety.

These studies showed that illness cognitions attributing health complaints to disaster exposure are associated with more severe health complaints and therefore are a promising target for interventions. However, little is known about the best strategy to modify these cognitions at the community level. In one of the few studies in this field, Prince-Embury (1992a) investigated whether six years after the nuclear accident at Three Mile Island a course designed to offer relevant, credible information on health issues of concern in the community affected the level of psychological symptoms and/or perception of control. It was observed that in a selected group of information seekers from the vicinity of the disaster site, greater understanding of the information and education provided was associated with only a slight decrease in psychological symptoms. Moreover, higher perceived reliability of course information that openly acknowledged conditions of uncertainty was associated with less perceived control.

Several theoretical models of risk-communication interventions in health care in general are available and may hold promise in predicting the effectiveness of health communication to individuals that have been exposed to a disaster and worry about their health. According to the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1981), communication may be more effective when individuals are more likely to actively and thoughtfully process information that they perceive to be personally relevant and consequential. However, persons respond in various ways to personally relevant health information and several theoretical models might account for this differential feedback acceptance. The motivational biased reasoning model predicts that feedback is more readily accepted if it satisfies a person's striving for

a positive sense of self and for consistency in the sense of self (e.g., Croyle, Sun & Hart, 1993). Alternatively, the cue adaptive reasoning account (Renner, 2004) supposes that negative feedback or unexpected positive feedback which does not agree with existing expectancies generates more elaborate cognitive processing, thereby increasing the likelihood that real or imagined shortcomings of the information are perceived and that the feedback is subsequently rejected.

On October 4th, 1992 a cargo aircraft crashed into the Bijlmermeer district of the city of Amsterdam, the Netherlands. The death count totalled 43, including the four crew members of the plane, and 266 apartments were destroyed. In the years that followed, several studies were carried out to assess the long-term health consequences of this disaster (Boin et al., 2001; Carlier & Gersons, 1997; Donker, Yzermans, Spreeuwenberg & van der Zee, 2002). Boin et al. (2001) pointed out that while the authorities' emergency response to the crash was quite effective, the long-term crisis management performance was considerably less successful. Particularly the persistence of rumours about the possible toxic cargo of the plane led to a growing unease among the residents of the Bijlmermeer district as well as among the rescue workers involved in the disaster. Eventually, in 1999 a Parliamentary Inquiry was held, after which it was decided to start an epidemiological study with the purpose of assessing the relationship between health complaints and exposure to the disaster in order to reduce possible health concerns and uncertainties. In addition, involved rescue workers and residents were offered a medical examination.

In the epidemiological study among rescue workers no clinically relevant differences between occupationally involved and not-involved rescue workers regarding laboratory outcomes and indicators of biochemical exposure in blood and urine were found, although the involved rescue workers reported an impaired health-related quality of life with respect to general, physical, and psychosocial aspects (Slottje et al., 2003; Slottje, Bijlsma et al., 2005; Witteveen et al., 2007). All participants from the epidemiological study and the medical examination received a public summary of the first results of the epidemiological study (obtained among rescue workers involved and not involved in the disaster).

The current study is the first one to (a) study the effectiveness of providing information on the health consequences of exposure to an aviation disaster to residents and rescue workers with varying degrees of disaster exposure and (b) to investigate individual characteristics which may moderate the effectiveness of the health information provided. It was hypothesized that (a) providing information about the absence of serious health risks of exposure to the aviation disaster would not result in a marked reduction of subjective health complaints or health anxiety, and (b) that the effectiveness of the health information would be less pronounced in those participants for which the content of the health information is less personally relevant and not consistent with existing expectancies.

Methods

Procedure

The full project consisted of several parts, which were described in detail elsewhere (Medical Investigation Bijlmermeer Aviation Disaster Website, 2002; Slottje, Huizink et al., 2005). An epidemiological study was performed into medical and psychological outcomes contrasting rescue workers who were and who were not involved in the disaster. Residents involved in varying degrees in the aviation disaster also took part in the epidemiological study. The medical investigation took around two and a half hours and consisted of filling in questionnaires (if necessary assisted by professional interpreters and medical assistants), measuring of body height and weight, and collection of blood, saliva and urine samples. Participants in the epidemiological study did not receive any individual feedback on the results of their medical investigation, unless incidentally the investigation revealed that further medical examinations were necessary.

Rescue workers and residents involved in the disaster were also offered a medical examination. Here, the procedure consisted of an individual medical examination and a consultation with the physician to discuss the results of the examination. The medical examination took around four hours and consisted of completion of questionnaires (if necessary assisted by professional interpreters and medical assistants), an examination of lung function, collection of blood and urine samples and an interview with a medical doctor. At the consultation each participant was given specific advice based on the findings of the examination, for instance that no grounds had been found for further examination, that a further physical examination by their family doctor was warranted or that the participant might benefit from the special aftercare services set up for this purpose. If participants took part in both the epidemiological study and the medical examination, they were included in the group of participants of the medical examination, since they received individual feedback from the physician as opposed to the participants of the epidemiological study. This involved 27.8% of the residents and 35.5% of the rescue workers in the medical examination.

Here we report on the effect of communication of the results of the epidemiological study on rescue workers and residents who participated in the epidemiological study or the individual medical examination. There were measurements at two time points: one during the data collection of the epidemiological study or the medical examination (baseline), and one six weeks after the communication of the findings (follow-up). All participants received a public summary of the first results of the epidemiological study. More information was available on the website and in the newsletter of the project, and questions could be asked at meetings of the sounding-boards of rescue workers and residents. The process of publicity was supervised by

a communication expert. Data collection took place eight years after the disaster at a general hospital in Amsterdam (baseline) and by mail (follow-up). The follow-up measurement took place in April, 2003, at least one year after the baseline measurement which took place between December 2000 and March 2002. The research protocol was approved by the Medical Ethics Committee of the Leiden University Medical Center and all participants gave written informed consent.

Participants

In the epidemiological study, 1019 rescue workers completed the baseline measurements, as well as 453 residents who lived in the neighbourhood during the disaster. Of these, 246 randomly selected rescue workers and 263 residents took part in the follow-up measurements. As regards the individual medical examination, 1736 rescue workers and 339 residents completed the baseline measurements. Here, follow-up measurements were collected among 421 randomly selected rescue workers and 144 residents. We investigated whether the results of the present study were affected by selective drop-out. Of the potential participants in the follow-up measurement, 63% of the rescue workers and 59% of the residents in the epidemiological study responded, as well as 71% of the rescue workers and 52% of the residents in the individual examination. Despite this substantial loss to follow-up, there was no selective drop-out of participants apparent. The only difference between those that took part in the follow-up measurement and those that did not, was that rescue workers in the epidemiological study who participated in the follow-up measurement showed less fatigue and a better health-related quality of life ($p < .01$ and $p < .05$ respectively, effect-sizes were small) at baseline, compared to rescue workers who did not complete the follow-up measurement.

A description of the participants is shown in Table 1. The rescue workers in the individual examination were somewhat older than the residents in this examination, but no other differences in age were found. Both groups of rescue workers were predominantly ($\geq 87\%$) male, whereas among residents the sexes were more or less equally represented. More rescue workers than residents reported a secondary education. Almost all rescue workers were of a western ethnicity, whereas almost half of the residents who participated in the individual examination were of a non-western background (mainly Surinamese, Netherlands Antilles, Ghanaian, Moroccan, and Turkish).

Table 1. Demographic characteristics of participants that took part in the baseline and follow-up measurements

Characteristics	Rescue workers Epidemiological (n = 246)	Residents Epidemiological (n = 263)	Rescue workers Individual (n = 421)	Residents Individual (n = 144)	Total (n = 1074)
Age: mean (SD), years	44.5 (7.3)	44.7 (13.6)	45.3 (7.0)	42.6 (10.6)	$F = 2.77^*$
Sex ^a :					$\chi^2 = 265.68^{***}$
Men, No. (%)	214 (87.0)	108 (41.1)	386 (91.7)	72 (52.2)	
Women, No. (%)	32 (13.0)	155 (58.9)	35 (8.3)	66 (47.8)	
Education ^a :					$\chi^2 = 70.99^{***}$
Primary, No. (%)	66 (29.1)	83 (33.2)	86 (21.8)	60 (46.2)	
Secondary, No. (%)	116 (51.1)	74 (29.6)	214 (54.2)	33 (25.4)	
Higher, No. (%)	45 (19.8)	93 (37.2)	95 (24.1)	37 (28.5)	
Ethnicity ^a :					$\chi^2 = 274.11^{***}$
Western, No. (%)	238 (97.5)	168 (64.4)	410 (97.9)	68 (50.4)	
Non-western, No. (%)	6 (2.5)	93 (35.6)	9 (2.1)	67 (49.6)	

^aNumbers do not add up because not all the respondents answered these questions.* $p < .05$; *** $p < .001$.

Outcome measures

With regard to health concerns the following questionnaires were filled in. The Dutch version of the Somatosensory Amplification Scale (SAS) (Barsky, Wyshak & Klerman, 1990; Speckens, Spinhoven, Sloekers, Bolk & van Hemert, 1996) measures the tendency to experience somatic sensations as intense and harmful, e.g. 'I am often aware of various things happening within my body'. In this study the SAS has a Cronbach's α of 0.69. From the Illness Attitude Scales developed by Kellner, Abbott, Winslow and Pathak (1987), the Dutch version of the Health Anxiety subscale (HA) (Speckens et al., 1996) was used to study the degree of worry and anxiety about health (for example: 'Does the thought of a serious illness scare you?'). Cronbach's α in the present study was 0.90. To measure the extent to which a patient feels reassured by a physician the Reassurance Questionnaire (RQ) (Speckens, Spinhoven, van Hemert & Bolk, 2000) was administered, which includes items such as: 'If you initially feel reassured by a visit to your physician, does your anxiety return later on?'. In this study the RQ had a Cronbach's α of 0.79.

In addition, various aspects of participants' physical and psychological health

were investigated. To measure the general level of psychopathology the Dutch version of the General Health Questionnaire (GHQ) (Goldberg, 1972) was used. Respondents are asked to compare their current state with their 'normal' state, e.g. 'Have you recently been able to face your problems?'. Cronbach's α for the GHQ in the present study was 0.89. Post-traumatic stress symptoms related to the air disaster were investigated with the Dutch version of the Impact of Event Scale (Horowitz, Wilner & Alvarez, 1979). The IES is composed of 15 items on experiences of intrusion and avoidance commonly reported following traumatic events, e.g. 'Images of it kept passing through my mind'. The IES had a Cronbach's α of 0.95 in this study. The Checklist Individual Strength (Vercoulen et al., 1994) measures several aspects of fatigue, including 'Subjective fatigue', 'Concentration', 'Motivation' and 'Activity' (for example, 'I feel physically exhausted'). For the current study we used the total score on the CIS, with a Cronbach's α of 0.95. Health-related quality of life was measured with the EQ-5D, developed by the EuroQol Group (2001). It consists of five dimensions of possible health problems such as 'Mobility (walking)', to be answered with 1 (no problems), 2 (some problems) and 3 (extreme problems). The combination of answers on the dimensions leads to an index-score of quality of life between 0 (equal to death) and 1 (best imaginable health).

In addition to these standardized measures, participants were asked six questions referring to the communication of the first results of the epidemiological study. Four questions evaluated (1) knowledge of the results of the epidemiological study of rescue workers, (2) satisfaction with the way in which the study has been carried out, (3) the conviction that their health complaints were caused by toxic exposure during the disaster, and (4) the belief that their complaints were in any other way connected to the disaster and its aftermath. Two additional questions assessed changes in the complaints participants mentioned during their first visit and changes in the worries about their complaints after communication of the results of the epidemiological study. Answers were given on a five point Likert-type scale ranging from 1 to 5, with higher numbers indicating more knowledge, more satisfaction, stronger conviction of toxic exposure or of another connection to the disaster, fewer complaints and more worries, respectively.

Statistical analysis

To measure changes in health experience between the baseline and follow-up measurement in the participants of the epidemiological study, repeated measures analyses of variance were performed that compared different groups according to their level of involvement in the disaster. Similarly, repeated measures analyses of variance were used to assess changes over time among the participants of the individual study. In order to quantify the magnitude of changes standardized effect-sizes

(Cohen's d) were calculated. Cohen's d is the difference between pre and post means divided by the pooled standard deviation. Effect sizes $<.15$ are considered negligible, between $.15$ and $.40$ small, between $.40$ and $.75$ medium, and $\geq .75$ large.

One-way analyses of variance were performed to compare all four groups on the effects of the communication of the results of the epidemiological study. Games-Howell post-hoc tests for multiple comparisons were used to correct for heterogeneity of variance and unequal sample sizes.

Hierarchical linear regression analyses were conducted to predict the scores for health experience on the follow-up measurement on the basis of the corresponding baseline scores and the four questions referring to the communication of the first results of the epidemiological study. First, the baseline scores were forced into the regression equation in order to create residualized gain scores. In the next step the four questions were entered into the equation. This was done to sort out the unique contribution of these questions over and above the variance explained by the baseline scores. In this way we could trace the most important predictors for gain scores at follow-up corrected for any differences in dependent variables at baseline.

Results

Changes in health experience after communication of epidemiological study results

Of the rescue workers participating in the epidemiological study, 25% were involved in the disaster and 75% constituted a control group of rescue workers that were not involved. Overall, a repeated measures analysis of variance with exposure to the disaster as between subjects variable and time as within subjects variable revealed neither significant main effects for condition nor significant time \times condition interaction effects. Only for the IES ($F = 6.9$, $p < .01$) and the EQ-5D ($F = 5.1$, $p < .05$) a small interaction effect was observed. A post hoc analysis of these interaction effects with an analysis of co-variance statistically correcting for between group differences in baseline scores however showed that differences between groups at follow-up on the EQ-5D ($F = 2.591$, $p = .109$) and the IES ($F = 1.741$, $p = .188$) were not statistically significant. Main effects for time, however, were significant for the other five dependent variables (see Table 2).

Repeating these analyses among residents participating in the epidemiological study, some significant main effects for condition were found. The residents that were most involved in the disaster (43%) reported the highest levels of psychopathology (GHQ), post-traumatic stress symptoms (IES) and somatic sensitivity (SAS) and were least reassured by a physician (RQ) at both measurements, compared to the residents that were intermediately (30%) or least involved (27%). Again, no significant interaction effect for time \times condition was found. Main effects for time, however, were significant for six of the seven dependent variables (see Table 2).

Table 2. Changes in health experience between baseline and follow-up measurement among participants of the epidemiological investigation

	Rescue workers (n = 246)				Residents (n = 263)			
	baseline M (SD)	follow-up M (SD)	F Time	d	baseline M (SD)	follow-up M (SD)	F Time	d
GHQ	0.7 (1.5)	1.0 (2.0)	4.5*	.17	2.3 (3.4)	3.5 (4.1)	24.8***	.32
IES	0.7 (3.1)	1.1 (3.7)	0.0	.12	11.3 (16.7)	14.7 (18.2)	11.6**	.20
CIS	39.4 (17.5)	47.4 (20.8)	35.5***	.42	63.5 (29.5)	68.2 (30.7)	11.5**	.16
EQ-5D	0.93 (0.1)	0.94 (0.1)	1.1	.10	0.77 (0.3)	0.76 (0.3)	0.2	.03
HA	4.7 (4.8)	6.5 (6.0)	37.1***	.33	9.3 (8.2)	13.1 (10.1)	70.5***	.41
RQ	6.4 (4.8)	7.3 (5.2)	8.9**	.18	9.4 (7.0)	11.2 (8.1)	19.1***	.24
SAS	7.7 (3.6)	8.9 (4.2)	17.3***	.31	11.6 (5.9)	14.5 (6.5)	77.2***	.47

M = mean; SD = standard deviation; d = effect-size. *p<.05; **p<.01; ***p<.001.

GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale.

So, on most of the measures of health experience both rescue workers and residents reported a deterioration of health irrespective of the degree of involvement in the disaster. Both groups were more sensitive to somatic sensations (SAS), and showed more health anxiety (HA), fatigue (CIS) and psychopathology (GHQ) at follow-up than at baseline. Moreover, both groups indicated that they felt less reassured by a physician at follow-up compared to baseline (RQ). Furthermore, residents indicated more post-traumatic stress symptoms (IES) at follow-up than at baseline. Effect-sizes were small to medium (range *d*: .17 - .47).

Table 3 shows the changes in health experience between the time of the individual medical examination (baseline) and 6 weeks after communication of the results of the epidemiological study (follow-up). Both rescue workers and residents were more sensitive to somatic sensations (SAS) and became more anxious about their health (HA) at follow-up than at baseline. In addition, they reported more symptoms of fatigue (CIS) and psychopathology (GHQ) at follow-up compared to baseline. All effect-sizes were small, except for the change in somatic sensitivity among residents which showed a medium effect-size (range *d*: .17 - .51).

Table 3. Changes in health experience between baseline and follow-up measurement among participants of the individual medical examination

	Rescue workers (n = 421)				Residents (n = 144)			
	baseline M (SD)	follow-up M (SD)	F Time	d	baseline M (SD)	follow-up M (SD)	F Time	d
GHQ	1.3 (2.4)	1.9 (3.1)	17.7***	.22	4.0 (3.6)	5.2 (4.1)	11.3**	.31
IES	3.1 (6.6)	3.3 (8.3)	0.4	.03	25.4 (19.9)	27.3 (20.1)	2.0	.10
CIS	52.4 (27.1)	58.5 (27.3)	36.8***	.22	81.8 (27.5)	87.6 (27.3)	7.5**	.21
EQ-5D	0.85 (0.2)	0.86 (0.2)	2.1	.05	0.61 (0.3)	0.59 (0.3)	0.4	.07
HA	6.7 (5.9)	8.0 (6.2)	33.7***	.22	14.2 (10.2)	16.8 (10.2)	14.1***	.26
RQ	8.1 (5.8)	7.9 (5.2)	0.4	.04	14.9 (7.1)	15.7 (7.9)	1.1	.11
SAS	8.5 (4.0)	9.2 (4.3)	14.8***	.17	14.6 (7.0)	18.2 (7.3)	50.5***	.51

M = mean; SD = standard deviation; d = effect-size. **p<.01; ***p<.001.

GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale.

Participants' evaluation of communication of epidemiological study results

Table 4 shows the results of the questions regarding the communication of the findings of the epidemiological study. Only the means of the answers of the participants that indicated that the questions were applicable to them are shown. Knowledge of the results of the epidemiological study was highest among the rescue workers who took part in the individual examination, followed by the residents in the same examination. Both groups of rescue workers were more satisfied with the way in which the epidemiological study has been carried out, than both groups of residents. Residents in the individual examination were most convinced that their health complaints were caused by exposure to possible harmful substances during the disaster or that these complaints were in any other way associated with the disaster and its aftermath, while rescue workers in the epidemiological study were least convinced. Repeating the analyses controlling for age, sex, education and ethnicity did not change the pattern of results (results not shown).

Table 4. Participants' evaluation of publication of epidemiological study results

	1 Rescue workers Epidemiological M (SD)	2 Residents Epidemiological M (SD)	3 Rescue workers Individual M (SD)	4 Residents Individual M (SD)	F	Post-hoc
Knowledge $n=971$	2.84 (1.30)	2.75 (1.34)	3.73 (1.09)	3.26 (1.40)	41.11***	2=1<4<3
Satisfaction $n=813$	3.76 (0.67)	3.31 (0.91)	3.77 (0.96)	3.06 (1.05)	23.56***	4=2<1=3
Toxic exposure $n=677$	2.02 (0.93)	2.91 (1.10)	3.05 (0.95)	4.02 (0.93)	61.25***	1<2=3<4
Other connection $n=663$	1.92 (1.00)	2.90 (1.09)	2.85 (0.96)	3.62 (1.19)	37.84***	1<3=2<4

Score range 1-5; M = mean; SD = standard deviation. *** $p<.001$.

Prediction of health experience at follow-up by participants' evaluation of study results

The results of the hierarchical regression analyses are presented in Table 5. Only significant predictors of the scores for health experience on the follow-up measurement are shown. For all outcome measures the score on the baseline measurement was a significant predictor of the score on the follow-up measurement, indicating that e.g. a high score on health anxiety at baseline predicted a high score on health anxiety at the follow-up measurement. The only exception to this was the baseline score on the Impact of Event Scale (IES) among rescue workers who took part in the epidemiological investigation, which did not reach significance as a predictor of the IES score on the follow-up measurement ($F(1,144) = 1.23$, $p = .27$). For clarity we did not incorporate all these significant predictors into Table 5. Also, the range of the R Square Change refers only to the predictors shown.

The most important predictor of an increase in complaints and concerns on all measures was the belief among all groups except the group of rescue workers from the epidemiological study that their health complaints were caused by toxic exposure. Also, being dissatisfied with the way in which the study was carried out predicted higher levels of complaints and concerns at the follow-up measurement on almost all measures, especially among the rescue workers in the individual examination. The conviction that there was some other connection between their complaints and the disaster and knowledge of the results of the epidemiological study were weak predictors.

Table 5. Prediction of residualized gain scores for health experience at follow-up by participants' evaluation of epidemiological study results

	Rescue workers Epidemiological	Residents Epidemiological	Rescue workers Individual	Residents Individual	Range ΔR^2 Sig. <i>F</i> Change
GHQ		3(.27)	3(.14)	1(-.28) 4(.21) 2(-.18)	.02**-.07***
IES		3(.31)	2(-.12) 3(.11)	3(.31)	.01*-.09***
CIS		3(.24)	3(.09) 2(-.11) 4(.08)	3(.34) 1(-.17)	.01*-.12***
EQ-5D	2(.19)	3(-.33)	3(-.11) 2(.13) 4(-.10)	3(-.27)	.01*-.11***
HA		3(.27) 1(-.09)	4(.12) 2(-.10)	3(.29)	.01*-.08***
RQ		3(.29)	2(-.31) 3(.28)	3(.47) 2(-.23)	.05**-.23***
SAS		3(.21)	4(.13) 1(-.09)	3(.24)	.01*-.06**

GHQ = General Health Questionnaire; IES = Impact of Event Scale; CIS = Checklist Individual Strength; EQ-5D = EuroQol-5 Dimensions; HA = Health Anxiety Scale; RQ = Reassurance Questionnaire; SAS = Somatosensory Amplification Scale. 1 = Knowledge; 2 = Satisfaction; 3 = Toxic exposure; 4 = Other connection. (.) = Beta. * $p < .05$; ** $p < .01$; *** $p < .001$.

Only significant ($p < .05$) predictors of the scores on health experience at follow-up are shown.

Rescue workers in the epidemiological investigation who were more satisfied with the way in which the study was carried out, reported a better quality of life at the follow-up measurement. No other predictors of the scores for health experience in this group were found. Hence, after communication of the first results of the epidemiological study among rescue workers, especially dissatisfaction about the execution of the study and belief in toxic exposure predicted health concerns and complaints among the participants that were not involved in that study (residents in both studies and rescue workers in the individual examination). Overall, the four questions evaluating the findings of the epidemiological study explained 6 to 23% of the variance in complaints and concerns at follow-up above and independent of the baseline scores on these outcome measures.

Validity

To investigate whether the results of the standardized measures were supported by answers on the self-report questions that retrospectively measured changes in complaints and worries, changes in scores on the former and latter measures were correlated. A worsening in health experience on almost all outcome measures was associated with an increase in complaints since their first visit to the hospital (range *sr*: -.30 - .32) and with increased worrying about these complaints after communication

of the first results of the epidemiological study (range *sr*: -.16 - .29). So, there is congruence between the subjective experience of change in complaints and worries as retrospectively assessed by the self-report questions at follow-up and the prospective standardized measurements of health experience.

Discussion

The aim of the present study was two-fold: (a) to investigate whether providing of information on the favourable findings of an epidemiological study about the health consequences of exposure to a disaster would influence subjective health complaints and health anxiety among rescue workers and residents with varying degrees of involvement in the disaster and (b) to investigate individual characteristics which may moderate the effectiveness of the health information provided. The hypothesis that providing general information about the health risks of exposure to an aviation disaster would not result in a marked reduction of subjective health complaints or health anxiety, was confirmed. The present study further showed that overall there were no significant differences in the change of health complaints and health anxiety between involved and non-involved residents and rescue workers from the epidemiological studies. Thus, despite the fact that no medical sequelae of the disaster among the rescue workers were found, our study results show that the effect of communicating this positive result to the risk group of exposed participants did not differ from that in non-involved participants. These results are consistent with those of previous studies showing that providing general risk information is not very effective compared to more personalized risk communication in influencing key outcomes such as cognitive measures (e.g. knowledge and risk perception), affective measures (e.g. health anxiety and worries) and behavioural measures (e.g. uptake of screening programmes) (Edwards et al., 2006).

Of note is that both residents and rescue workers who participated in the medical examination or epidemiological study even reported elevated levels of psychopathology and fatigue, increased health anxiety and somatic sensitivity 6 weeks after communication of the first results of an epidemiological study, compared to a baseline measurement that was conducted at least one year before. A possible explanation for this deterioration of health complaints and worries could be that participating in a health epidemiological study affects the mental and physical well-being of study participants due to an increased self-awareness of current physical and mental health problems (e.g. Jacomb et al., 1999; Parslow, Jorm, Christensen & Rodgers, 2004; Turnbull, McLeod, Callahan & Kessler, 1988).

The second aim of the present study was to investigate individual characteristics which may moderate the effectiveness of the health information provided.

Especially residents who had participated in the individual medical examination were less satisfied with the way the epidemiological study was carried out and most strongly attributed their health complaints to toxic exposure. Overall, the conviction that their health complaints were caused by toxic exposure and to a lesser extent dissatisfaction with the way in which the epidemiological study was carried out, were related to more severe health complaints and worries in both rescue workers and residents. According to the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1981) communication may be more effective when it is perceived as personally relevant. Although the present health information was given in a kind of one-size-fits-all approach, it may be assumed that the health information provided was more personally relevant especially for rescue workers who participated in the epidemiological study on which the communicated information of the health consequences of disaster exposure was based. Partly in accordance with this presupposition, we found that satisfaction with the way in which the study has been carried out was highest in rescue workers from both studies and that the conviction that health complaints were due to toxic exposure was lowest in the rescue workers in the epidemiological study. Moreover, in the latter group only a positive association of satisfaction with the study execution and quality of life was observed. These data can be interpreted as indicating that because the health information provided was more suited to rescue workers from the epidemiological study, the study results were more favourably received in this sample in particular.

It is remarkable that reassurance by physicians or medical information at follow-up was not reduced in those rescue workers and residents which had been personally informed of the results of their medical investigation six weeks after the medical examination. This result contrasts with the finding that in rescue workers and residents which did not receive personal feedback on their medical investigation and only received the public communication of the study at follow-up reassurance was decreased. This finding underscores the importance of a face-to-face contact with a physician in which individualized information and advice is given. Personalized health information may be more reassuring than general health information (Edwards et al., 2006). The importance of immediate, individualized, and specific (as opposed to delayed, generalized, and global) feedback has also long been recognized in other fields such as behaviour therapy (e.g., Ferster & Skinner, 1957). It is clear that the communication of the epidemiological results in the present study fails to meet all of these characteristics.

The finding that participants who believed their symptoms to be caused by toxic exposure during the disaster were less likely to accept the epidemiological results, is in line with the previously mentioned theoretical notions of motivational biased reasoning (e.g., Croyle et al., 1997) and the cue adaptive reasoning account (Renner, 2004), although these models explain reduced acceptance of the results in differing

ways. According to the motivational biased reasoning perspective, the favourable epidemiological results were unexpected for participants who believed in toxic exposure during the disaster, thus invoking self-defensive processing strategies that undermine the information to preserve consistency in the sense of self. Alternatively, according to the cue adaptive reasoning account, the unexpected favourable results would have invoked an increased amount of cognitive processing in these participants, thereby increasing the likelihood of detecting shortcomings in the information and rejecting the findings. Especially in a context of distrust and reduced faith in experts as also applies to the participants in our study, belief systems may be more immune to change on the basis of objective information (García-Mira, Real, Uzzell, San Juan & Pol, 2006; Prince-Embury, 1992b). Perceptions of trust and credibility in the government depend mainly on public perceptions of commitment (Peters, Covello & McCallum, 1997) and without such trust it is unlikely that institutions can effectively convince the public that e.g. a hazardous waste site is safe again (Williams, Brown & Greenberg, 1999).

Apart from factors included in the theoretical models above, other factors could also have negatively influenced the impact of the health information provided to our study participants. One possible explanation might be the large time-interval between the disaster and communication of the epidemiological findings. In a longitudinal study after an explosion of a fireworks depot, van den Berg, Grievink, Stellato, Yzermans and Lebrecht (2005) found a gradual decrease in the number of physical symptoms, although the survivors still reported more symptoms than controls four years after the disaster. They argue that no theories about possible exposure to toxic substances developed in the aftermath of this disaster, because of the reassuring results of the blood and urine samples that were obtained as early as three weeks after the disaster. In the years following the Bijlmermeer aviation disaster particularly the persistence of rumours about the possible toxic cargo of the plane led to a growing unease among the residents of the Bijlmermeer district as well as among the rescue workers involved in the disaster (Boin et al., 2001).

Pre-disaster pathology may also have contributed to ineffectiveness of the communication of health information to study participants. In a longitudinal study using medical records of general practitioners after the previously mentioned fireworks disaster, Yzermans et al. (2005) showed that victims with pre-disaster psychological problems were at a greater risk for post-disaster problems and that relocated victims showed an excess of medically unexplained physical symptoms (MUPS) especially in a period of increased media attention. The prevalence of MUPS tended to increase in the two and a half years following the disaster. Although these findings resemble the increase in health complaints in our study, they are unfortunately not fully comparable since in the present study pre-disaster data were not available. Because mental disorders occur more frequently in persons from socio-economically deprived

urban areas (Reijneveld & Schene, 1998) such as the Bijlmermeer district, it is conceivable that especially in residents pre-disaster levels of psychological problems, aggravated by the disaster and associated feelings of lack of recognition or compensation for losses, have fuelled the illness attribution of health complaints being caused by exposure to toxic substances. This selective attribution of elevated and persistent health complaints to toxic effects may reflect a process of 'effort after meaning' making this attribution more immune to correction by objective information, because the attribution of health complaints to a large extent reflects the severity of health complaints (cf. McNally, 2003). This hypothesis is corroborated by the study of Donker et al. (2002) who showed that patients tended to attribute their symptoms to the plane crash in Amsterdam six years later, possibly to maintain self-esteem and perceptions of the world as predictable and controllable, while their GPs related only a small proportion of these symptoms to the disaster. Moreover, one out of nine symptoms attributed to the disaster by the patients, had already been reported to the GP before the disaster took place.

Some limitations of this study should also be mentioned. First, it is questionable whether the baseline measurement can be considered as a true first measurement because of the large time-interval between this measurement and the communication of the results of the epidemiological study. Given the elevated or even higher scores for complaints and concerns at follow-up, regression to the mean is an unlikely alternative explanation of the present findings. Also, we could not completely control for selection bias since some of the participants who were invited to participate in the epidemiological study also applied for participation in the medical examination and in the present study were included in the latter group only. Police officers who voluntarily underwent the medical examination more often reported health complaints and traumatic events than police officers who were invited to participate in the epidemiological study but did not volunteer to have a medical examination (Huizink et al., 2006). Finally, at baseline we did not investigate existing attributions concerning toxic exposure or other connections between complaints and the disaster. We can therefore only conclude that at follow-up the belief in toxic exposure is present, especially among residents, but we cannot detect possible changes in this conviction. However, in the epidemiological study among rescue workers attributions were also measured at baseline (Slottje et al., 2006), showing that 43% to 49% of the rescue workers involved in the disaster with long-term physical complaints somehow attributed these to the disaster and its aftermath. Nevertheless, in that study no explicit questions related to attributions with respect to exposure to toxic substances were asked.

In sum, communication of essentially favourable findings of an epidemiological study on the health consequences of exposure to an aviation disaster among rescue workers did not result in reduction of subjective health complaints or health worries

as hoped for by the Parliamentary Inquiry advising to start this epidemiological study. It could even be argued that the execution of the epidemiological study and the communication of its results to residents and rescue workers may have inadvertently promoted health complaints and worries even though the stated aim was to provide reassurance. Future studies must be more attentive to maximizing the effectiveness of health communication by identifying specific strategies that promote more thoughtful information processing. For health information to have impact on cognition, affect and behaviour individualizing of the communication with respect to characteristics such as pre-existing beliefs or individual cognitive styles (such as need for cognitive closure and ability to tolerate ambiguity) seem to be of paramount importance.

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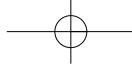
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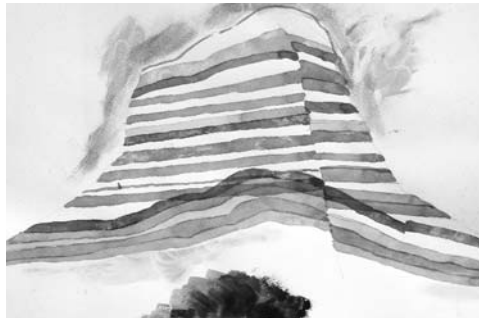
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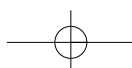
Chapter 5

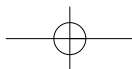
Factors predictive of changes in perception of current health problems following a trauma-focused study



Margot J. Verschuur, Philip Spinhoven and Frits R. Rosendaal

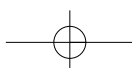
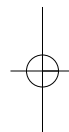
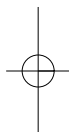
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Chapter 5

*Factors predictive of changes in perception of current health problems
following a trauma-focused study*



Abstract

Background The aim of the present study is to assess which risk factors are related to changes in perception of current health problems after participation in a trauma-focused study among rescue workers and residents in varying degrees involved in an aviation disaster.

Methods There were measurements during the data collection of an epidemiological study or a medical examination (baseline), 12 weeks after the first investigation (short-term follow-up) and six weeks after communication of the findings of the epidemiological study among rescue workers (long-term follow-up). 3514 participants completed the baseline measurements. Standardized instruments on health anxiety, somatic sensitivity and reassurability by a physician constituted the measurement for perception of current health problems. Linear regression analyses were conducted to predict the change score in perception of current health problems on both follow-up measurements on the basis of demographic, trauma-related and study variables and physical and psychological health symptoms at baseline.

Results The multivariate prediction of the short- and long-term follow-up change scores indicated that higher levels of perception of health problems at both measurements were reported more by residents than by rescue workers, participants with a lower education, participants with a non-western background, participants with higher levels of fatigue at baseline, and participants who did not consult the physician to discuss the results of their medical investigation. Post-traumatic stress symptoms were only predictive of short-term change scores.

Conclusion Several demographic and study characteristics and clinical variables are predictive of an enhanced perception of current health problems after participation in a trauma-focused study. Exploring ways of adapting trauma-related scientific studies and medical investigations to the needs of specific vulnerable groups seems warranted.

Introduction

In recent years there has been growing attention for the emotional reactions of participants in trauma-focused studies. The risk of such research causing distress and having a negative impact on the mental state of participants has been assessed in several studies (e.g. Runeson & Beskow, 1991; Newman *et al.* 1999; Boscarino *et al.* 2004). The prevalence of distress in trauma-focused studies is generally higher than in studies which focus on the participant's psychiatric state (Jorm *et al.* 2007). However, little indication was found for any longer-term harm to participants.

In their review article on participant distress in psychiatric research Jorm *et al.*

(2007) also report on the characteristics of participants that are most likely to become distressed. Generally, they are more likely to have mental disorders or symptoms, or have risk factors such as traumatic experiences. Post-traumatic stress symptoms were associated with distress in several studies (e.g. Walker *et al.* 1997; Parslow *et al.* 2000; Galea *et al.* 2005), as well as several socio-demographic variables such as age, gender and education.

In most of the studies on participant distress the prevalence is assessed with one or a few questions asked at the end of an interview or survey study investigating other issues. The only standardized instrument used is (part of) the Reactions to Research Participation Questionnaire (Newman *et al.* 2001). We have no knowledge of any studies in this area using specific standardised instruments to assess the reaction of the participants to the content of the examination they are undergoing. Only a few studies used a pre-post design to assess longer-term effects (e.g. Parslow *et al.* 2000; Halek *et al.* 2005), let alone that a control group was included (see Celio *et al.* 2003 for a notable exception).

On October 4th 1992, a transport plane crashed into the Bijlmermeer district of the city of Amsterdam, the Netherlands, after attempting to return to Schiphol airport shortly after take-off. The death count totalled 43 (including the plane's crew), and 266 apartments were destroyed of buildings that were populated predominantly by immigrants and refugees, many of whom might have been illegal (Knipscheer *et al.* 2000). Discussions about the health consequences in surviving residents and rescue workers ensued, fuelled by speculations about the possible radioactive cargo of the airplane. In their article about toxic fear, Boin *et al.* (2001) described how the Bijlmermeer air disaster developed into a public health crisis. The governmental reaction of crisis termination, combined with a collective underestimation of the possible effects of 'toxic fear' resulted in heightened public concern. In addition, extensive media coverage of unresolved issues, such as the disappearance of the depleted uranium used as balance weight in the aircraft, created fertile grounds for further rumours (Vasterman *et al.* 2005). Instigated by a parliamentary inquiry, political pressure led more than eight years later to the Medical Investigation Bijlmermeer Aviation Disaster (Dutch acronym: MOVb). The main intention of this investigation was to reassure the participants about their health and to provide information about the consequences of the disaster in general. The MOVb consisted of two main studies: an epidemiological investigation to assess the relationship between health complaints and exposure to the disaster and an individual medical examination for all individuals who considered themselves to be suffering from the consequences of the disaster. On top of these studies an examination of the effects of participation was carried out, specifically assessing a hoped-for decrease in health complaints and worries. The MOVb provided a unique opportunity to study these effects with appropriate, health-related measures.

We reported already on the short- and long-term effects of participating in this investigation. The short-term effects of participating in the medical examination showed that residents and rescue workers showed more health anxiety and somatic sensitivity after 12 weeks, with those that attended the consultation with the physician reporting less health anxiety than those not attending (Verschuur *et al.* 2008b). Short-term effects in the epidemiological investigation yielded similar results, also showing less reassurance at 12 weeks, irrespective of exposure to the disaster. This increased perception of health problems was predicted by higher levels of psychological and physical symptoms at baseline (Verschuur *et al.* 2008a). The long-term effects of both studies were assessed 6 weeks after communication of the results of the epidemiological study among rescue workers to all participants. Elevated levels of psychopathology and fatigue, increased anxiety and somatic sensitivity were reported by all participants, fuelled by the (unjustified) conviction that their health complaints were caused by toxic exposure (Verschuur *et al.* 2007). Overall, we found no long lasting reassuring effects, and concluded that such examinations may even have counterproductive effects by sensitizing participants for health complaints.

Since we found a worsening of health concerns in the short- and long-term, among residents as well as rescue workers, both in the medical examination and epidemiological study, the aim of the present study was to predict which risk factors are most likely to cause changes in perception of current health problems across participants and settings. Because of the medical focus of both the epidemiological investigation and individual medical examination it was hypothesized that a possible negative impact would become apparent in an enhanced perception of health problems in particular. For this reason specific standardized measures for health anxiety, somatic sensitivity and reassurability by a physician were used to obtain a relevant measure for participants' distress within the context of the present study. On the basis of previous studies (for a review see, Jorm *et al.* 2007), it was hypothesized that several socio-demographic variables (e.g. age, gender, education and ethnicity), being exposed to the disaster and clinical factors (especially post-traumatic stress symptoms) are associated with short- and long-term aggregated scores of participants' perception of current health problems.

Methods

Procedure

The full project consisted of several parts, which were described in detail elsewhere (Medical Investigation Bijlmermeer Aviation Disaster Website, 2002; Slottje *et al.* 2005). An epidemiological study was performed into medical and psychological

outcomes contrasting rescue workers who were and who were not involved in the disaster. Residents involved in varying degrees in the aviation disaster also took part in the epidemiological study. All participants were invited to participate on the basis of clearly defined criteria in order to compare representative groups of exposed and non-exposed participants. The medical investigation in this part of the study took around two and a half hours and consisted of filling in questionnaires (assisted by medical assistants and if necessary by professional interpreters), measuring of body height and weight, and collection of blood, saliva and urine samples. Participants in the epidemiological study did not receive any individual feedback on the results of their medical investigation, unless incidentally the investigation revealed that further medical examinations were necessary.

All rescue workers and residents involved in the disaster were also offered the possibility to undergo a medical examination. Participants in this part of the study were not invited, but took part on their own initiative. Here, the procedure consisted of an individual medical examination and subsequently a consultation with the physician to discuss the results of the examination. The medical examination took around four hours and consisted of completion of questionnaires (assisted by medical assistants and if necessary by professional interpreters), an examination of lung function, collection of blood and urine samples and medical history taking and physical examination by a medical doctor. At the consultation six weeks later each participant was given specific advice based on the findings of the examination, for instance that no grounds had been found for further examination, that a further physical examination by their family doctor was warranted or that the participant might benefit from the special aftercare services set up for this purpose. If participants took part in both the epidemiological study and the medical examination, in the present study they were included in the group of participants of the medical examination, since they received individual feedback from the physician as opposed to the participants of the epidemiological study. This involved 27.8% of the residents and 35.5% of the rescue workers in the medical examination.

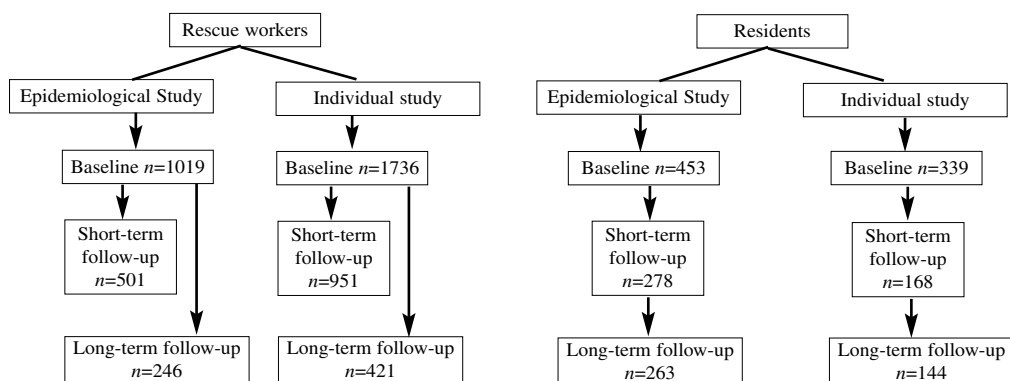
Here we report on the prediction of changes in health concerns in rescue workers and residents who participated in the epidemiological study or the individual medical examination. There were measurements at three time points: one during the data collection of the epidemiological study or the medical examination (baseline), one 12 weeks after the first examination (short-term follow-up) and one six weeks after communication of the findings of the epidemiological study among rescue workers (long-term follow-up). All participants irrespective of taking part in the epidemiological study or in the individual examination, or being rescue workers or residents, were informed of these findings. Data collection took place eight years after the disaster at a general hospital in Amsterdam (baseline) and by mail (both follow-ups). The long-term follow-up measurement took place in April, 2003, at least one

year after the baseline measurement which took place between December 2000 and March 2002. The research protocol of the present study was approved by the Medical Ethics Committee of the Leiden University Medical Center and all participants gave written informed consent.

Participants

In this study, 3514 rescue workers and residents completed the baseline measurements. Of these, 1883 participants took part in the short-term follow-up measurements. Of the potential participants in the epidemiological study, 501 (80%) of the randomly selected rescue workers and 278 (62%) of the residents responded to the short-term follow-up. Among participants in the individual examination, 951 (81%) of the randomly selected rescue workers and 168 (59%) of the residents responded. Long-term follow-up measurements were collected among 1068 rescue workers and residents. Here, response-(percentages) were 246 (63%) of rescue workers and 263 (59%) of residents in the epidemiological study, and 421 (71%) of rescue workers and 144 (52%) of residents in the individual examination respectively. Figure 1 shows a flow chart of the numbers of participants over the three measurements.

Figure 1. Flow chart of participants over time



All residents who completed the baseline assessment were also invited to complete the follow-up assessments. However, because of the relatively large sample size only a randomly selected subgroup of rescue workers who completed the baseline assessment was also invited to complete the follow-up assessments. Despite a substantial loss to both follow-up measurements, there was no selective drop-out of participants apparent. The results of the baseline comparisons between those that took part in the follow-up measurements and those that did not, were described elsewhere (Verschuur *et al.* 2007; Verschuur *et al.* 2008a; Verschuur *et al.* 2008b).

A description of the participants is shown in Table 1. At both follow-up measurements participants were predominantly male, and most participants were of a western ethnicity. Non-western participants were mainly of Surinamese, Netherlands Antilles, and Ghanaian background. More than 60% of the participants were either professionally involved in the disaster as rescue workers, or lived as residents in one of the three struck apartment buildings. About one-third of the participants did receive individual feedback on the results of their medical investigation in a consultation with the physician.

Table 1. Demographic characteristics of participants

Characteristics	Short-term Follow-up (<i>n</i> =1883)	Long-term Follow-up (<i>n</i> =1068)
Age in years: mean (SD)	44.6 (9.0)	44.6 (9.6)
Gender ^a : <i>n</i> (%)		
Men	1532 (81.4)	780 (73.0)
Women	350 (18.6)	288 (27.0)
Education ^a : <i>n</i> (%)		
Primary	539 (30.2)	295 (29.4)
Secondary	811 (45.5)	437 (43.6)
Higher	433 (24.3)	270 (26.9)
Ethnicity ^a : <i>n</i> (%)		
Western	1672 (89.4)	884 (83.5)
Non-western	199 (10.6)	175 (16.5)
Involved in disaster ^a : <i>n</i> (%)		
Yes	1216 (64.9)	646 (60.7)
No	658 (35.1)	419 (39.3)
Consultation with physician: <i>n</i> (%)		
Yes	584 (31.0)	367 (34.4)
No	1299 (69.0)	701 (65.6)

^a Numbers do not add up because not all the respondents answered these questions, % are valid.*Outcome measures*

With regard to health concerns the following questionnaires were filled in. The Dutch version of the Somatosensory Amplification Scale (SAS) (Barsky *et al.* 1990; Speckens *et al.* 1996) measures the tendency to experience somatic sensations as intense and harmful, e.g. 'I am often aware of various things happening within my body'. In this study the SAS has a Cronbach's α of 0.69. From the Illness Attitude Scales developed by Kellner *et al.* (1987), the Dutch version of the Health Anxiety

subscale (HA) (Speckens *et al.* 1996) was used to study the degree of worry and anxiety about health (for example: 'Does the thought of a serious illness scare you?'). Cronbach's α in the present study was 0.90. To measure the extent to which a patient feels reassured by information by a physician the Reassurance Questionnaire (RQ) (Speckens *et al.* 2000) was administered, which includes items such as: 'If you initially feel reassured by a visit to your physician, does your anxiety return later on?'. In this study the RQ had a Cronbach's α of 0.79.

In addition, various aspects of participants' physical and psychological health were investigated. To measure the general level of psychopathology the short Dutch version of the General Health Questionnaire (GHQ-12) (Goldberg, 1972; Koeter & Ormel, 1991) was used. Respondents are asked to compare their current state with their 'normal' state, e.g. 'Have you recently been able to face your problems?'. Cronbach's α for the GHQ-12 in the present study was 0.89. Post-traumatic stress symptoms related to the Bijlmermeer air disaster were investigated with the Dutch version of the Impact of Event Scale (Horowitz *et al.* 1979; Brom & Kleber, 1985). The IES is composed of 15 items on experiences of intrusion and avoidance commonly reported following traumatic events, e.g. 'Images of it kept passing through my mind'. The IES had a Cronbach's α of 0.95 in this study. The Checklist Individual Strength (Vercoulen *et al.* 1994) measures several aspects of fatigue, including 'Subjective fatigue', 'Concentration', 'Motivation' and 'Activity' (for example, 'I feel physically exhausted'). For the current study we used the total score on the CIS, with a Cronbach's α of 0.95. Health-related quality of life was measured with the EQ-5D, developed by the EuroQol Group (2001). It consists of five dimensions of possible health problems such as 'Mobility (walking)', to be answered with 1 (no problems), 2 (some problems) and 3 (extreme problems). The combination of answers on the dimensions leads to an index-score of quality of life between 0 (equal to death) and 1 (best imaginable health).

Demographic and trauma-related characteristics of participants that were considered possible risk factors for enhanced perception of health problems included age, gender, educational level, western/non-western ethnicity, and whether or not they were involved in the disaster (for a review see, Jorm *et al.* 2007). We also added the study variable whether or not they consulted the physician 6 weeks after the medical investigation, because earlier we found that those that attended the consultation with the physician reported less health anxiety than those not attending (Verschuur *et al.* 2008b).

Statistical analysis

Because it was hypothesized that changes in perception of health status (as assessed with the SAS, HA subscale of the IAS and RQ) will be correlated, it was first investigated whether the changes on these variables could be transformed in one princi-

pal component accounting for as much of the variability in the data as possible. To this end a principal component analysis was conducted on the 12 week follow-up residualized change scores on these measures (obtained by statistically correcting the follow-up scores for any baseline differences on these measures). Next, using the regression method a composite factor score for change in perception of current health problems was calculated. The univariate prediction of this change score by demographic and clinical variables was investigated with linear regression analyses, corrected for differences between rescue workers and residents and between participants of the epidemiological study and the individual examination. To assess the unique contribution of each variable over and above these two variables, semipartial correlation coefficients will be reported. The same procedure was executed for the long-term follow-up scores, which were collected 6 weeks after communication of the results of the epidemiological study among rescue workers.

Hierarchical linear regression analyses were conducted to predict the change score in perception of current health problems on both follow-up measurements on the basis of the demographic variables and the clinical variables at baseline. First, the dummy variables that differentiated between rescue workers and residents and between participants of the epidemiological study and the individual examination were forced into the regression equation. In the next steps the demographic variables (age, gender, education, ethnicity and involvement in disaster) and the clinical variables (CIS, GHQ-12, IES, and EQ-5D) were stepwise entered into the equation (Probability of F -to-enter $< .05$, probability of F -to-remove $> .10$). In the final step whether or not the participants had a consultation with the MOVb physician was added. This was done to sort out the unique contribution of the variables in each step over and above the variance explained by the differences between participants (rescue worker or resident, epidemiological study or individual examination). In this way we could trace the most important predictors for change scores at both follow-up measurements.

Results

Univariate prediction of changes in perception of health problems

A principal component analysis (PCA) on the residualized gain scores on the SAS, HA subscale and RQ at the short-term follow-up clearly yielded a one-factor solution (eigenvalue 1.75) accounting for 58.4% of the variance. Factor loadings were high (respectively 0.70, 0.82 and 0.77). A PCA at the long-term follow-up residualized gain scores yielded similar results: a one-factor solution (eigenvalue 1.81) accounting for 60.2% of the variance with high factor loadings (respectively 0.73, 0.83 and 0.77).

Of the investigated predictive demographic and clinical risk factors (age, gender, education, ethnicity, involvement in disaster and consultation with physician, CIS, GHQ-12, IES, and EQ-5D), besides education, ethnicity, and consultation with the physician also all clinical measures were predictive of changes in the perception of health problems at the short-term follow-up (see Table 2). At the long-term follow-up, except for age and involvement in the disaster, all of the demographic and clinical risk factors were predictive of changes in perception of health status. These results clearly indicate that participants with higher levels of psychological and physical symptoms at baseline are more prone to increased perception of their current health status. The same holds for rescue workers and residents of a non-western ethnicity and a lower level of education, particularly when they did not go to the consultation with the physician. Also, at the long-term follow-up women seemed to be more aware of health problems than men.

Table 2. Univariate prediction of changes in perception of health problems controlling for participants (rescue workers vs residents) and setting (epidemiological study vs individual examination)

Risk factors	Short-term Follow-up (n=1529)		Long-term Follow-up (n=941)	
	<i>sr</i>	β	<i>sr</i>	β
Age	.038	.038	-.038	-.038
Gender	-.019	-.023	.087	.100**
Education	-.144	-.144***	-.141	-.142***
Ethnicity	.127	.152***	.210	.244***
Involved in disaster	-.004	-.005	-.054	-.063
Consultation with physician	-.181	-.215***	-.105	-.149**
CIS	.173	.188***	.097	.109**
GHQ-12	.134	.142***	.062	.066*
IES	.182	.216***	.119	.141***
EQ-5D	-.167	-.185***	-.101	-.111**

* $p < .05$; ** $p < .01$; *** $p < .001$. *sr* = semi-partial correlation coefficient; β = standardized B; CIS = Checklist Individual Strength; GHQ-12 = General Health Questionnaire; IES = Impact of Event Scale; EQ-5D = EuroQol-5 Dimensions.

Multivariate prediction of changes in perception of health problems

In order to analyse the multivariate prediction of changes in perception of health problems on the basis of demographic and clinical variables at baseline, two hierarchical linear regression analyses were conducted, on both follow-up measurements. In Table 3 the results are shown of the multivariate prediction of the short-term follow-up change score. The variables that differentiated rescue workers from residents and participants of the epidemiological study from participants in the individual examination accounted for 10% of the variance in the short-term follow-up score ($F(2,1406) = 77.35, p < .001$) with the difference between rescue workers and residents as the only significant predictor. In the final model, of the demographic variables only education and ethnicity were significant predictors, and of the clinical variables the scores at baseline on fatigue (CIS) and post-traumatic stress symptoms (IES). In the final step whether or not the participants had a consultation with the MOV B physician explained a small although significant additional amount of 3% of the variance independent of and in addition to the other variables in the equation ($F_{\text{change}}(1,1401) = 55.14, p < .001$). Of note is that the difference between the participants of the epidemiological study and the individual examination, although significant in steps 4 and 5, was no longer an independent predictor in the final model. These results indicate that especially residents with a lower education, non-western background, higher levels of fatigue and post-traumatic symptoms at baseline, who did not consult the MOV B physician report higher levels of perception of health problems three months after the investigation.

Table 3. Multivariate prediction of short-term changes in perception of health problems

Model	Short-term Follow-up			
	β	p-value	Total R^2	ΔR^2
<u>Step 1</u>			.099	.099
Rescue workers/Residents	-.305	.000		
Epidemiological/Individual	-.025	.362		
<u>Step 2</u>			.120	.021
Rescue workers/Residents	-.304	.000		
Epidemiological/Individual	-.033	.211		
Education	-.146	.000		
<u>Step 3</u>			.130	.010
Rescue workers/Residents	-.237	.000		
Epidemiological/Individual	-.042	.117		
Education	-.135	.000		
Ethnicity	.118	.000		
<u>Step 4</u>			.150	.020
Rescue workers/Residents	-.182	.000		
Epidemiological/Individual	-.075	.005		
Education	-.123	.000		
Ethnicity	.106	.000		
CIS	.155	.000		
<u>Step 5</u>			.158	.008
Rescue workers/Residents	-.144	.000		
Epidemiological/Individual	-.095	.001		
Education	-.114	.000		
Ethnicity	.080	.009		
CIS	.123	.000		
IES	.117	.000		
<u>Step 6</u>			.190	.032
Rescue workers/Residents	-.129	.000		
Epidemiological/Individual	.013	.669		
Education	-.109	.000		
Ethnicity	.086	.004		
CIS	.125	.000		
IES	.118	.000		
Consultation with physician	-.211	.000		

CIS = Checklist Individual Strength; IES = Impact of Event Scale.

Table 4 shows the results of the multivariate prediction of the long-term follow-up change score. Again, the variables that differentiated rescue workers from residents and participants of the epidemiological study from participants in the individual examination accounted for well over 10% of the variance in the long-term follow-up score ($F(2,847) = 48.99, p < .001$), the difference between rescue workers and residents being the only significant predictor. In the final model, of the demographic variables ethnicity turned out to be a more important predictor than education, and of the clinical variables only the score at baseline on fatigue (CIS) was a significant predictor. Even on the long-term follow-up, whether or not the participants had a consultation with the MOVb physician six weeks after the first investigation, explained a small although significant additional amount of 1% of the variance independent of and in addition to the other variables in the equation ($F \text{ change}(1,843) = 7.62, p < .01$). The difference between the participants of the epidemiological study and the individual examination was not an independent predictor in any step. So, particularly residents of a non-western background and a lower level of education, with higher levels of fatigue at baseline, who did not consult the MOVb physician, report higher levels of perception of health problems even more than one year after the investigation.

Table 4. Multivariate prediction of long-term changes in perception of health problems

Model	Long-term Follow-up			
	β	p-value	Total R^2	ΔR^2
<u>Step 1</u>			.104	.104
Rescue workers/Residents	-.321	.000		
Epidemiological/Individual	-.002	.954		
<u>Step 2</u>			.146	.042
Rescue workers/Residents	-.200	.000		
Epidemiological/Individual	-.017	.601		
Ethnicity	.237	.000		
<u>Step 3</u>			.161	.015
Rescue workers/Residents	-.210	.000		
Epidemiological/Individual	-.019	.569		
Ethnicity	.216	.000		
Education	-.124	.000		
<u>Step 4</u>			.166	.005
Rescue workers/Residents	-.175	.000		
Epidemiological/Individual	-.040	.239		
Ethnicity	.213	.000		
Education	-.112	.001		
CIS	.081	.023		
<u>Step 5</u>			.173	.007
Rescue workers/Residents	-.152	.000		
Epidemiological/Individual	.037	.401		
Ethnicity	.219	.000		
Education	-.108	.001		
CIS	.082	.022		
Consultation with physician	-.122	.006		

CIS = Checklist Individual Strength.

Discussion

The aim of the present study was to assess which risk factors are related to changes in perception of current health problems when participating in a research study on health complaints after trauma exposure. We used standardized instruments on health anxiety, somatic sensitivity and reassurability by a physician to record perception of current health problems. It was hypothesized that several socio-demographic, trauma-related and clinical factors are associated with short- and long-term composite change scores.

Risk factors for an enhanced perception of health problems at short and long-term follow-up proved to be very consistent. Residents more than rescue workers, participants with a lower education, participants from a non-western background, participants with higher levels of fatigue at baseline, and participants who did not consult the MOVb physician showed more participants' distress. Post-traumatic stress symptoms were only predictive of short-term change scores. This convergence between the results of the short- and long-term prediction is remarkable, especially considering the fact that rescue workers were randomized to take part in either the short- or the long-term follow-up assessment. It is also noteworthy that the difference between the epidemiological study and the individual medical examination was not a significant predictor in the final model of the short- or long-term change scores. However, the most important element in this difference seems to be the consultation with the MOVb physician, which turned out to be an independent predictor in the short- and long-term prediction models.

First, we would like to compare our results with what is known about *demographic* characteristics of participants associated with study-distress. Martin *et al.* (1999) in a study of experiences of childhood sexual abuse also reported that a negative evaluation of participation in the study was associated with less education. Conversely, Jacomb *et al.* (1999) found a higher level of education to be a significant predictor of participants' distress. Only one study mentioned an association with ethnicity: veterans with PTSD that spontaneously reported emotional upset were more likely to be American Indian or Native Alaskan (Halek *et al.* 2005). Although in the present study women at the long-term follow-up seemed to be more aware of health problems than men in the univariate analyses, this effect was no longer present in the multivariate analyses. However, a gender difference in participants' distress has been reported in several previous studies, e.g. Jacomb *et al.* (1999), Galea *et al.* (2005) and Halek *et al.* (2005). We did not find a significant association between age and changes in perception of health problems. Previous studies also did not find consistent age effects, with younger age, middle age and older age participants all reporting more distress after participation in trauma-focused studies (Jorm *et al.* 2007).

In addition, a novel finding of the present study was the opportunity to directly compare differences in participants' distress between residents and rescue workers, showing a more pronounced perception of health problems in residents compared to rescue workers. The lower levels of perception of health problems of rescue workers could be explained by the 'healthy worker effect'. For example, in the individual medical examination a total of 63% of the residents and 26% of the rescue workers showed at baseline scores above the clinical cut-off value on the General Health Questionnaire, compared to approximately 27% in the normal population (Verschuur *et al.* 2008b). Also, the rescue workers were predominantly ($\geq 87\%$) male, whereas among residents the sexes were more or less equally represented. Because mental disorders occur more frequently in persons from socio-economically deprived urban areas (Reijneveld & Schene, 1998) such as the Bijlmermeer district, it is conceivable that especially in residents pre-disaster levels of psychological problems could have influenced our results. On the other hand, it is also possible that the difference between residents and rescue workers is not due to a difference in pre-disaster factors, but is more related to post-trauma factors. Residents that stayed in the area where the disaster took place probably were much longer confronted with the aftermath of the disaster than rescue workers.

Besides demographic variables, *trauma-related* variables were found to be predictive of participants' distress in several previous studies (Jorm *et al.* 2007). In contrast to these studies, we did not find that whether or not being involved in the disaster did predict the change scores at the short-term or long-term follow-up. Of note is that previous studies were either population studies in which e.g. childhood (sexual) abuse was predictive of participants' distress (Walker *et al.* 1997; Jacomb *et al.* 1999; Newman *et al.* 1999), or patient studies where the number of traumatic experiences predicted more upset than expected (Johnson & Benight, 2003; Halek *et al.* 2005). Only one study by Galea *et al.* (2005) specifically reported that being directly affected by the event studied (9/11) predicted emotional upset by survey questions 6 to 9 months after trauma exposure.

Moreover, we investigated two *study* characteristics as predictors of participants' distress. Participating in the epidemiological study vs. individual examination was not predictive of outcome, but changes in perception of current health problems were less apparent in those participants that consulted the physician, at the short term and even at the long-term follow-up. The possibility to consult a physician was only open for participants in the individual examination and used by approximately one-third of the participants. This result indicates that being given the opportunity to discuss the results of the medical examination must have had a positive effect. Of note is that in the present study medical assistants and physicians were specifically trained in discussing health worries and anxieties and giving personalized feedback in this particular group of people involved in the disaster. Dowrick *et al.* (2004)

showed that effective normalisation of unexplained symptoms includes an explanation with a tangible mechanism, grounded in patients' concerns, often linking physical and psychological factors. Without such an explanation, participants in our study tended to show more perception of health problems at the short- and long-term follow-up.

Previous studies also reported that *clinical* variables are predictive of participants' distress, in particular post-traumatic stress symptoms (e.g. Walker *et al.* 1997; Carlson *et al.* 2003; Johnson & Benight, 2003). Although in the present study all clinical variables (including level of psychopathology as assessed with the GHQ (cp. Henderson & Jorm, 1990) and post-traumatic stress symptoms as measured with the IES) were predictive of an enhanced perception of health problems, only an elevated level of fatigue (CIS) at baseline was a unique and significant predictor of participants' distress at short- and long-term follow-up. Medically unexplained symptoms after exposure to war or related events such as fatigue could exacerbate when the focus of medical care and diagnostics is on identifying objective clinical findings (Clauw *et al.* 2003). Perhaps the exhaustive diagnostic testing that took place in the Medical Investigation Bijlmermeer Aviation Disaster inadvertently gave the participants with higher levels of somatic symptoms such as fatigue the impression that the likelihood of a serious undiagnosed disease was high and as such led to a higher perception of current health problems.

The present study has some limitations. In addition to the last point, the findings of this study may not generalise to other studies on participants' distress, because of the circumstances which led more than eight years after the disaster to this investigation. As was mentioned in the introduction, there were persistent rumours concerning possible toxic contamination of the area and the instigation of the MOVb, after several other studies had been executed (e.g. Carlier & Gersons, 1997; Donker *et al.* 2002), may have contributed to the conviction that the government was trying to cover up that there was really something wrong. Especially in toxicological disasters risk perception and health anxiety are important putative mediators between trauma exposure and long-standing health problems (Havenaar *et al.* 2003). A second limitation of the present study is that we did not assess the prevalence of positive reactions but primarily focused on measuring changes in health complaints and worries. According to Jorm *et al.* (2007) participants can experience distress, and at the same time see their participation as a positive experience. Finally, since our study was designed on top of both the epidemiological and individual medical investigations to exclusively examine the effects of participation, it was not possible to introduce a control group of non-participants in those investigations. We did however compare the results of participants and non-participants in our study of the effects of participation (Verschuur *et al.* 2008a; Verschuur *et al.* 2008b). Overall, non-participants reported higher levels of physical and psychological complaints than par-

ticipants at baseline (e.g. post-traumatic stress symptoms). So, at the most our study results underestimate the effect of participation at baseline.

Several strengths of this study should also be mentioned. To our knowledge, this is the first study to use specific standardized instruments to assess relevant aspects of participants' distress in the context of a study on the health effects of trauma exposure. Also, we were able to predict longer-term effects of participation on two different moments in time. Almost 20% of variance in changes of perception of current health problems on both follow-ups could be explained by demographic and clinical variables at baseline. Ultimately, although we did not use a control group of non-participants, whether or not participants made use of the consultation with the physician turned out to be a small but independent predictor of participants' perception of current health problems.

We conclude that several demographic and study characteristics and clinical variables are predictive of an enhanced perception of current health problems after participation in a trauma-focused investigation. Exploring ways of adapting trauma-related scientific studies and medical investigations to the needs of specific vulnerable groups in order to prevent inadvertent negative reactions seems warranted.

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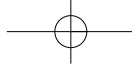
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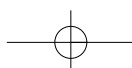
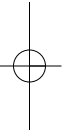
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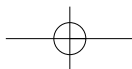
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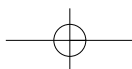
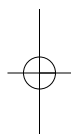
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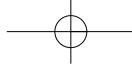




Chapter 5

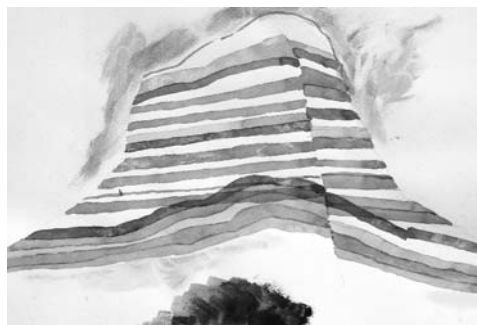
*Factors predictive of changes in perception of current health problems
following a trauma-focused study*





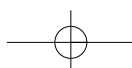
Chapter 6

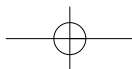
Differences in changes in perception of health problems between western and non-western participants in a trauma-focused study



Margot J. Verschuur, Marija Maric and Philip Spinhoven

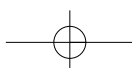
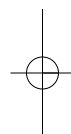
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Chapter 6

*Differences in changes in perception of health problems between western
and non-western participants in a trauma-focused study*



Abstract

Background Disaster victims from ethnic minorities manifest more complaints and health concerns than persons belonging to the dominant culture following a medical investigation.

Aims To analyse ethnicity as a proxy for risk factors predictive of changes in perception of health problems, and mediators that explain ethnic group differences after participating in a medical investigation.

Method Western ($n=406$) and non-western participants ($n=379$) were assessed at baseline and 12 weeks after the medical investigation. Besides risk factors at baseline, health complaints and concerns were collected at baseline and follow-up.

Results Education, unemployment, length of stay and post-traumatic stress symptoms were independent predictors of changes in perception of health problems, excluding ethnicity. The predictive value of ethnicity for changes in perception of health problems was mediated mainly by changes in psychopathology, fatigue and quality of life.

Conclusion Stronger responding to a trauma-related investigation by more vulnerable ethnic minority groups may explain their enhanced perception of health problems.

Introduction

Experiencing a disaster can have a significant influence on individuals involved. The most common long-term psychiatric reactions to a disaster are anxiety disorders, depression, post-traumatic stress disorder, substance abuse and medically unexplained physical symptoms. Estimates of the prevalence of these reactions vary widely. In Western countries, some 20% to 50% of disaster victims are thought to suffer one or more such effects.¹ Besides a history of psychological imbalance, lower socio-economic status and the lack of an adequate social network, ethnicity constitutes a significant predisposing factor for health problems. Adults from ethnic minorities manifest more complaints and problems following a disaster than persons belonging to the dominant culture.² For example, in the Netherlands immigrant victims of a fireworks disaster reported more physical symptoms such as fatigue, headache and pain in bones and muscles than native Dutch inhabitants.³ It has been suggested that these differences can be influenced by factors such as language problems, educational level, individuals living alone,⁴ nonpositive expectations for the future,⁵ being unemployed,⁶ and relocation after a disaster.⁷

Ethnicity and culture may also influence mental health care (MHC) utilization in the aftermath of disasters: on need for help; on availability and accessibility of help;

on help-seeking comfort, and on the probability that help is provided appropriately.⁸ Among victims of the previously mentioned fireworks disaster in the Netherlands MHC utilization was predicted by the following demographic variables: private insurance and relocation 18 months post disaster, and female gender, being single, and migrant status almost four years post disaster.⁹ Although migrants are more in need of health care because they experience more health problems than do Dutch inhabitants, they do not always benefit enough from it. Uniken Venema et al.¹⁰ showed that there are strong indications that migrants benefit less from health services than do most indigenous patients due to cultural and communication barriers. Less positive treatment outcomes and worse ratings of satisfaction with mental health services were also found among African Americans and Black Caribbean patients.^{11,12} Ethnic and linguistic matching as well as number of previous admissions were predictive of these findings. More relevant for the present study are possible ethnic differences in the effects of participating in trauma-related research, which as far as we know were only investigated in one study. Veterans with PTSD that spontaneously reported emotional upset after receiving a potentially upsetting survey were more likely to be American Indian or Native Alaskan than those not reporting emotional upset.¹³

It has to be emphasized that there is no one definition of ethnicity, race, and culture that is generally agreed on and these terms are often referred to interchangeably. However, grouping persons of the same biological, demographic or cultural background under terms as ethnicity, race, and culture and using such a term as an independent or predictor variable of health outcomes presupposes that these individuals share some common characteristics and that these characteristics are related to health outcomes. It is important to realize that ethnicity is a demographic variable that is relatively distal to health outcomes and often may serve as a proxy for more proximal variables such as cultural values, symptom interpretation, lack of social support, discrimination, etc.¹⁴ As proposed by various authors¹⁵⁻¹⁷ research into ethnicity must specify and directly measure underlying variables associated with ethnicity that are hypothesized to produce ethnic group differences in health outcomes.

The Medical Investigation Bijlmermeer Aviation Disaster (Dutch acronym: MOVb) provided an excellent opportunity to study the value of ethnicity in predicting health outcomes. A previous study found that persons with a non-western background reported higher levels of perception of current health problems three months after an individual medical examination or epidemiological investigation than western participants. The MOVb investigation seemed to sensitize non-western participants for health problems in particular. The present study has two major aims: (a) to analyse ethnicity as a proxy for risk factors predictive of changes in perception of health problems; and (b) to analyse mediators which could help to explain the association of ethnicity with changes in perception of health problems. It was hypothe-

sized that by identifying more proximal co-varying variables and mediating psychological processes, a more sophisticated understanding of associated features and relevant mediating mechanisms of ethnicity in relation to health problems can be derived at.

Method

Study design and procedure

In the years following the Bijlmermeer aviation disaster on October 4th 1992, there was growing concern about the physical and psychological health of the residents and rescue workers exposed to the disaster. Persisting rumours about the cause of the crash, possible toxic exposure and health consequences led more than eight years later to the MOVb. The main intention of this investigation was to reassure the participants about their health and to provide research-based information about the consequences of the disaster in general. The full project consisted of several parts, which were described in detail elsewhere.^{18,19}

An epidemiological study was performed into medical and psychological outcomes in which residents involved in varying degrees in the aviation disaster took part. All participants were invited to participate on the basis of clearly defined criteria in order to compare representative groups of exposed and not or less exposed participants. The epidemiological study included a medical investigation which took around two and a half hours and consisted of filling in questionnaires (assisted by medical assistants and if necessary by professional interpreters), measuring of body height and weight, and collection of blood, saliva and urine samples. Participants in the epidemiological study did not receive any individual feedback on the results of their medical investigation, unless incidentally the investigation revealed that further medical examinations were necessary.

All residents involved in the disaster were also offered the possibility to undergo a medical examination, outside the context of the epidemiological study. Participants of the medical examination only were not invited, but took part on their own initiative. Here, the procedure consisted of an individual medical examination and subsequently a consultation with the physician to discuss the results of the examination. The medical examination took around four hours and consisted of completion of questionnaires (assisted by medical assistants and if necessary by professional interpreters), an examination of lung function, collection of blood and urine samples and medical history taking and physical examination by a medical doctor. At the consultation six weeks later each participant was given specific advice based on the findings of the examination, for instance that no grounds had been found for further examination, that a further physical examination by their family

doctor was warranted or that the participant might benefit from the special aftercare services set up for this purpose, e.g. because of post-traumatic stress symptoms (PTSD referral). If participants took part in both the epidemiological study and the medical examination, in the present study they were included in the group of participants of the medical examination, since they received individual feedback from the physician as opposed to the participants of the epidemiological study. This involved 27.8% of the residents in the medical examination. There was no difference in procedure between western and non-western participants.

On top of these studies an examination of the effects of participation was carried out, specifically assessing a hoped-for decrease in health complaints and worries. The MOVb provided a unique opportunity to study these effects with appropriate, health-related measures. We reported already on the short- and long-term effects of participating in this investigation.²⁰⁻²² Overall, we found no long-lasting reassuring effects, and concluded that such examinations may even have counterproductive effects by sensitizing participants for health complaints. Recently, we found that especially residents with a non-western background reported higher levels of perception of health problems at follow-up.

Data collection took place eight years after the disaster at a general hospital in Amsterdam (baseline) and 12 weeks later by mail (follow-up). Participants that were not able to read either Dutch or English (5.1%) were excluded from the study. The baseline measurement took place between December 2000 and March 2002. The measures related to perception of current health problems were assessed at baseline and follow-up. Possible risk factors were assessed at baseline. Possible mediating variables were either assessed at baseline and follow-up or recorded in between. The research protocol of the present study was approved by the Medical Ethics Committee of the Leiden University Medical Center and all participants gave written informed consent.

Participants

In this study, 792 residents completed the baseline measurements. Of these, 446 participants took part in the follow-up measurements. Of the potential participants in the epidemiological study, 278 (62%) of the residents responded to the follow-up. Among participants in the individual examination, 168 (59%) of the residents responded. Despite a substantial loss to the follow-up measurement, there was no selective drop-out of participants apparent. However, residents that dropped out of the epidemiological study were more often of a non-western ethnicity ($\chi^2(1)$: 21.01, $p < .001$), were younger ($t(444)$: 3.77, $p < .001$) and showed more post-traumatic symptoms ($t(444)$: -2.11, $p < .05$) than participants which completed the follow-up measurements. Residents that dropped out of the individual examination had a somewhat better quality of life ($t(254)$: -2.72, $p < .01$) than residents that took part in

the follow-up.

Our sample consisted of 406 (51.3%) participants of western ethnicity, and 379 (47.9%) of non-western ethnicity. Of 7 (0.9%) participants ethnicity was unknown. We classified ethnicity of participants on the basis of what ethnic group the participants themselves considered to belong to ('ethnic identity'¹⁰). Next, ethnicity was categorized as western or non-western according to the criteria of the Dutch Central Bureau for Statistics (CBS). Western participants had an origin in Europe (excluding Turkey), North America and Oceania or Indonesia (former colony) or Japan, and non-western participants had an origin in Africa, Latin America and Asia (excluding Indonesia and Japan) or Turkey. Of the participants of western ethnicity, 93.8% considered themselves as Dutch; the others were either European or Indonesian. Non-western participants were mainly of African, i.e., Ghanaian (20.1%), and (Dutch-speaking) Surinamese-Creole (22.4%), Surinamese-Hindu (14.5%), Surinamese (unknown or other) (22.4%) and Netherlands Antillean/Aruban background (8.2%).

Measures

With regard to health concerns the following questionnaires were filled in. The Dutch version of the Somatosensory Amplification Scale (SAS)^{23,24} measures the tendency to experience somatic sensations as intense and harmful, e.g. 'I am often aware of various things happening within my body'. In this study the SAS has a Cronbach's α of 0.70. From the Illness Attitude Scales developed by Kellner *et al.*,²⁵ the Dutch version of the Health Anxiety subscale (HA)²⁴ was used to study the degree of worry and anxiety about health (for example: 'Does the thought of a serious illness scare you?'). Cronbach's α in the present study was 0.91. To measure the extent to which a patient feels reassured by information by a physician the Reassurance Questionnaire (RQ)²⁶ was administered, which includes items such as: 'If you initially feel reassured by a visit to your physician, does your anxiety return later on?'. In this study the RQ had a Cronbach's α of 0.81.

In addition, various aspects of participants' physical and psychological health were investigated. To measure the general level of psychopathology the short Dutch version of the General Health Questionnaire (GHQ-12)^{27,28} was used. Respondents are asked to compare their current state with their 'normal' state, e.g. 'Have you recently been able to face your problems?'. Cronbach's α for the GHQ-12 in the present study was 0.91. Post-traumatic stress symptoms specifically related to the Bijlmermeer air disaster were investigated with the Dutch version of the Impact of Event Scale.^{29,30} The IES is composed of 15 items on experiences of intrusion and avoidance commonly reported following traumatic events, e.g. 'Images of it kept passing through my mind'. The IES had a Cronbach's α of 0.95 in this study. The Checklist Individual Strength³¹ measures several aspects of fatigue, including 'Subjective fatigue', 'Concentration', 'Motivation' and 'Activity' (for example, 'I

feel physically exhausted'). For the current study we used the total score on the CIS, with a Cronbach's α of 0.94. Health-related quality of life was measured with the EQ-5D, developed by the EuroQol Group.³² It consists of five dimensions of possible health problems such as 'Mobility (walking)', to be answered with 1 (no problems), 2 (some problems) and 3 (extreme problems). The combination of answers on the dimensions leads to an index-score of quality of life between 0 (equal to death) and 1 (best imaginable health).

Baseline characteristics included age, gender, educational level, number of years in the Netherlands, whether participants spoke Dutch, had a paid job, lived together or alone, the number of traumatic events they experienced during or in the aftermath of the disaster, or at least one traumatic event, and whether they moved out of the district after the disaster. Finally, two questions were asked regarding the attributions of the participants towards the disaster: 'The disaster has changed my life' and 'I expect to be able to resume my life in the future in a satisfactory way'. Answers were given on a 5-point Likert-type scale, ranging from 1 'In a very negative way-Not at all' to 5 'In a very positive way-Extremely'.

Statistical analyses

In the first series of analyses we assessed which baseline variables were possible risk factors in the prediction of changes in perception of health problems. We defined how the different risk factors work together to affect the change scores in perception of health problems by following the principles proposed by Kraemer *et al.*³³: temporal precedence, correlation with ethnicity and change score, and dominance of risk factor and/or ethnicity in predicting the change score. Pearson's or point-biserial correlation coefficients were calculated between the risk factors and western/non-western ethnicity as well as the change score, and domination of risk factor or ethnicity was assessed by executing linear regression analyses with both risk factor and ethnicity as predictors of the change score in perception of current health problems. All regression analyses were corrected for participation in the epidemiological study versus the individual examination. Data were analysed using SPSS Version 14.0 for Windows.

Next, a hierarchical linear regression analysis was conducted to predict change scores in perception of current health problems on the follow-up measurement on the basis of ethnicity and the selected risk factors found in the previous analyses. First, the dummy variable that differentiated between participants of the epidemiological study and the individual examination was forced into the regression equation. In the next step the selected variables were entered stepwise into the equation (Probability of *F*-to-enter < .05, probability of *F*-to-remove > .10). This was done to sort out the unique contribution of the variables in each step over and above the variance explained by participation in the epidemiological study versus the individual

examination. In the last step, ethnicity was entered into the regression equation. In this way we could trace the importance of ethnicity in predicting change scores at the follow-up measurement on top of the selected risk factors entered in the previous steps.

In the second series of analyses we assessed which variables were possible mediators in the prediction of changes in perception of health problems by ethnicity. These analyses tried to answer the question to what extent differences in changes in perception of health problems between western and non-western participants may be attributed to e.g. changes in psychopathology. As recommended by Baron and Kenny,³⁴ we first regressed the mediator (e.g. change in severity of fatigue or quality of life) on the independent variable ethnicity, the outcome (change in perception of health problems) on ethnicity and the outcome on both ethnicity and the mediator. Next, to formally evaluate whether putative mediators (partly) mediated the relationship of ethnicity with changes in perception of health problems, the standard errors of the mediated effect were bootstrapped of those selected mediators that fulfilled the Kraemer *et al.*³³ criteria. While the classical technique of constructing confidence intervals assumes a normal distribution of the mediated effect, forcing symmetric confidence intervals,³⁴ bootstrap confidence intervals remain asymmetrical even with large intervals.³⁵ The macro for SPSS developed by Preacher and Hayes³⁶ was used to generate estimates for the indirect effects in a multiple mediator model in which the mediating effects of all putative mediators could be investigated together.

Results

Preliminary analyses

Because it was hypothesized that changes in perception of health status (as assessed with the SAS, HA subscale of the IAS and RQ) are correlated, the changes on these variables were transformed in one principal component accounting for as much of the variability in the data as possible. To this end a principal component analysis (PCA) was conducted on the 12 week follow-up residualised change scores on these measures (obtained by statistically correcting the follow-up scores for any baseline differences on these measures). Next, using the regression method a composite factor score for change in perception of current health problems was calculated.

The PCA on the residualised gain scores on the SAS, HA subscale and RQ at follow-up clearly yielded a one-factor solution (eigenvalue 1.75) accounting for 58.4% of the variance. Factor loadings were high (respectively 0.70, 0.82 and 0.77). Since there were no significant differences between the major non-western groups in change score in perception of current health problems (data not shown), we decided to operationalise ethnicity as western versus non-western. The ethnic difference in

changes in perception of health status was significant ($t(295)$: -3.53, $p < .001$) and had a moderate effect size ($d = 0.38$).

In Table 1 an overview is presented of characteristics of participants with a western or non-western ethnicity. Except for gender, all demographic variables show a significant difference between residents of a western or non-western ethnicity. In addition, non-western residents reported more symptoms of fatigue, psychopathology, and post-traumatic stress and less health-related quality of life compared to western participants at baseline.

Table 1. Demographic characteristics and baseline variables

	Western ethnicity ($n=406$)	Non-western ethnicity ($n=379$)	$t(df)$	$\chi^2(df)$
Age in years: M (SD)	44.6 (13.3)	39.3 (11.6)	5.96(780)***	
Gender (male): n (%)	201 (49.5)	163 (43.0)		3.33(1)
Education: n (%)				35.40(2)***
Primary	116 (30.4)	166 (45.7)		
Secondary	109 (28.5)	119 (32.8)		
Higher	157 (41.1)	78 (21.5)		
# years in Netherlands: M (SD)	38.0 (16.8)	16.4 (7.0)	23.61(543)***	
Language (Dutch): n (%)	384 (94.6)	302 (79.7)		39.48(1)***
Job (paid): n (%)	263 (64.8)	212 (56.1)		6.20(1)*
Living together: n (%)	189 (46.6)	140 (37.0)		7.28(1)**
# traumatic events: M (SD)	1.2 (1.2)	2.0 (1.6)	-8.01(716)***	
At least 1 traumatic event: n (%)	255 (62.8)	315 (83.1)		40.64(1)***
Moved out of district: n (%)	172 (44.9)	138 (37.2)		4.63(1)*
CIS: M (SD)	66.23 (29.32)	72.79 (30.17)	-3.04(758)**	
GHQ-12: M (SD)	2.44 (3.25)	3.61 (3.88)	-4.54(733)***	
IES: M (SD)	11.71 (16.71)	22.87 (19.37)	-8.57(744)***	
EQ-5D: M (SD)	0.77 (0.24)	0.66 (0.30)	5.86(706)***	

* $p < .05$; ** $p < .01$; *** $p < .001$. CIS = Checklist Individual Strength; GHQ-12 = General Health Questionnaire; IES = Impact of Event Scale; EQ-5D = EuroQol-5 Dimensions.

Table 2 shows a summary of the variables that were measured either at baseline and follow-up or recorded in between. Whether the participants indicated a change between baseline and follow-up in the attribution that the disaster has changed their life did not differ significantly, but all other variables show a significant difference between residents of a western or non-western ethnicity. On all psychopathology measurements non-western participants reported a less favourable change over time indicating that their symptoms got worse than those of the western participants.

Table 2. (Changes in) research-related and psychopathology measurements

	Western ethnicity (n=406)	Non-western ethnicity (n=379)	t(df)	χ^2 (df)
Consulted physician: n (%)	47 (11.6)	90 (23.7)		20.15(1)***
Δ Disaster changed life: M (SD)	0.04 (0.82)	-0.05 (1.18)	0.78(291)	
Δ Satisfying life in future: M (SD)	0.10 (0.80)	-0.14 (1.22)	2.24(275)*	
PTSD referral: n (%)	60 (14.8)	121 (31.9)		32.49(1)***
Δ CIS: M (SD)	0.03 (1.12)	0.36 (1.21)	-2.81(412)**	
Δ GHQ-12: M (SD)	0.11 (1.21)	0.58 (1.40)	-3.62(338)***	
Δ IES: M (SD)	0.14 (1.24)	0.55 (1.85)	-2.59(278)*	
Δ EQ-5D: M (SD)	-0.13 (1.26)	-0.53 (1.82)	2.54(278)*	

*p<.05; **p<.01; ***p<.001. Δ = Residualized change score. CIS = Checklist Individual Strength; GHQ-12 = General Health Questionnaire; IES = Impact of Event Scale; EQ-5D = EuroQol-5 Dimensions.

Definition of risk factors

In Table 3 an overview is given of the definition of the risk factors measured at baseline based on the correlation with ethnicity, correlation with the change score and domination of the risk factor, ethnicity or both.

Table 3. Determination of the type of risk factor

Risk factors	Correlation with ethnicity	Correlation with change	Risk factor β	Ethnicity β	Definition
Age	-.231***	.003	.046	.180***	No risk factor
Gender	.068	.022	.016	.169**	No risk factor
Education	-.226***	-.228***	-.192***	.132*	Overlapping
# years in Netherlands	-.652***	-.218***	-.152*	.076	Ethnicity proxy
Language (Dutch)	.183***	.133**	.095	.160**	Proxy
Job (paid)	.119*	.181***	.154**	.150**	Overlapping
Living together	.126**	.110*	.080	.160**	Proxy
# traumatic events	.304***	.202***	.144*	.136**	Overlapping
At least 1 traumatic event	.233***	.102*	.039	.163**	Proxy
Moved out of district	-.123*	-.077	-.066	.153**	No risk factor
CIS	.110**	.218***	.184***	.150**	Overlapping
GHQ-12	.162***	.173***	.126*	.142**	Overlapping
IES	.296***	.253***	.210***	.111*	Overlapping
EQ-5D	-.209***	-.250***	-.207***	.121*	Overlapping

* $p < .05$; ** $p < .01$; *** $p < .001$. CIS = Checklist Individual Strength; GHQ-12 = General Health Questionnaire; IES = Impact of Event Scale; EQ-5D = EuroQol-5 Dimensions. β 's are given when both risk factor and ethnicity predict the change score.

Age, gender and whether the participants moved out of the Bijlmermeer district after the disaster were not considered risk factors, because they were not associated with the change score. Following the approach of Kraemer *et al.*³³ proxy risk factors were also set aside in the subsequent statistical analysis.

Multivariate prediction of changes in perception of health problems based on selected risk factors at baseline

Table 4 shows the results of the multivariate prediction of the change score in perception of current health problems. After controlling for participation in the epidemiological investigation versus individual examination in step 1, the following variables were entered stepwise into the equation: education, number of years in the Netherlands, having a paid job, number of traumatic events, and the baseline scores on CIS, GHQ-12, IES and EQ-5D. In the last step ethnicity was entered.

Table 4. Multivariate prediction of changes in perception of health problems based on selected risk factors at baseline

Model	β	p-value	Total R^2	ΔR^2
<u>Step 1</u>			.005	.005
Epidemiological/Individual	.074	.160		
<u>Step 2</u>			.061	.056
Epidemiological/Individual	.025	.635		
Education	-.241	.000		
<u>Step 3</u>			.090	.029
Epidemiological/Individual	-.037	.496		
Education	-.197	.000		
IES	.190	.001		
<u>Step 4</u>			.112	.021
Epidemiological/Individual	-.050	.353		
Education	-.162	.003		
IES	.180	.001		
Job (paid)	.153	.003		
<u>Step 5</u>			.130	.018
Epidemiological/Individual	-.065	.224		
Education	-.145	.007		
IES	.155	.005		
Job (paid)	.158	.002		
# years in Netherlands	-.139	.007		
<u>Step 6</u>			.130	.000
Epidemiological/Individual	-.066	.222		
Education	-.146	.007		
IES	.157	.006		
Job (paid)	.159	.002		
# years in Netherlands	-.145	.030		
Western/non-western ethnicity	-.010	.885		

IES = Impact of Event Scale.

The results of the final model indicate that especially residents with a lower level of education, a higher level of post-traumatic stress symptoms, less often having a paid job, and living in the Netherlands for a shorter period of time report higher levels of perception of health problems three months after the investigation. Ultimately, being from a western or non-western ethnicity does not add significantly to the regression equation. There were no signs of multicollinearity. The change score in perception of current health problems is not predicted by the number of traumatic events participants experienced during or in the aftermath of the disaster or by the baseline levels of fatigue, psychopathology or health-related quality of life.

Definition of mediators

In Table 5 an overview is given of the definition of possible mediators measured either at baseline and follow-up or recorded in between, based on the correlation with ethnicity, correlation with the change score and domination of the mediator, ethnicity or both.

Table 5. Determination of possible mediators

Risk factors	Correlation with ethnicity	Correlation with change	Risk factor β	Ethnicity β	Definition
Consulted physician	.181***	-.051	-.193**	.185***	No mediator
Δ Disaster changed life	-.041	-.238***	-.218***	.154**	No mediator
Δ Satisfying life in future	-.116*	-.230***	-.218***	.151**	Mediator
PTSD referral	-.187***	-.192***	-.176**	.158**	Mediator
Δ CIS	.137**	.443***	.415***	.146**	Mediator
Δ GHQ-12	.176***	.435***	.405***	.111*	Mediator
Δ IES	.133**	.395***	.376***	.127**	Mediator
Δ EQ-5D	-.131**	-.377***	-.354***	.132**	Mediator

* $p < .05$; ** $p < .01$; *** $p < .001$. Δ = Residualized change score. CIS = Checklist Individual Strength; GHQ-12 = General Health Questionnaire; IES = Impact of Event Scale; EQ-5D = EuroQol-5 Dimensions. β 's are given when both risk factor and ethnicity predict the change score.

Whether or not the participants consulted the physician six weeks after baseline and the change in the attribution if the disaster changed their life were not considered mediators, because they either lacked an association with ethnicity or with the change score.

Multiple mediators of the relationship of ethnicity with changes in perception of health problems

Changes in perception of health problems was regressed on ethnicity together with the selected six putative mediators (i.e. PTSD referral, Δ Satisfying life in future, Δ CIS, Δ GHQ-12, Δ IES, and Δ EQ-5D). In the mediation analysis participating in the epidemiological investigation versus the medical examination was entered as control variable. With these variables being included together in the regression equation, the relationship between outcome and ethnicity decreased in strength, from $\beta = .509$, $t = 3.860$, $p < .001$, to $\beta = .226$, $t = -2.07$, $p = .039$. Bootstrapping the indirect effects of the six putative mediators on outcome using 5,000 bootstrap samples, the six mediators together proved to be a significant mediator of the ethnicity - changes in perception of health problems relationship (estimate = .286, bias corrected and accelerated 95% CI: .112 – .461). Looking at the independent and unique contribution of each of the six mediators, only the following three mediators proved to be significant mediators: Δ CIS, Δ GHQ-12, and Δ EQ-5D. Table 6 presents the estimates for the indirect effects of the putative mediators in the multiple mediator model.

Table 6. Multiple mediators of the relationship of ethnicity with changes in perception of current health problems

	Estimate	SE	Bootstrapping					
			Percentile 95% CI		BC 95% CI		BCa 95% CI	
			Lower	Upper	Lower	Upper	Lower	Upper
TOTAL	.2859	.0883	.1153	.4635	.1120	.4608	.1120	.4608
PTSD referral	.0208	.0182	-.0091	.0631	-.0044	.0711	-.0045	.0707
Δ Satisfying life in future	.0183	.0176	-.0102	.0595	-.0058	.0667	-.0057	.0669
Δ CIS	.0681	.0360	.0096	.1476	.0138	.1586	.0131	.1557
Δ GHQ-12	.0614	.0336	.0082	.1391	.0105	.1457	.0105	.1457
Δ IES	.0642	.0367	-.0044	.1405	-.0020	.1437	-.0017	.1443
Δ EQ-5D	.0531	.0308	.0051	.1230	.0084	.1340	.0090	.1359

BC, bias corrected; BCa, bias corrected and accelerated; 5,000 bootstrap samples. Δ = Residualized change score. CIS = Checklist Individual Strength; GHQ-12 = General Health Questionnaire; IES = Impact of Event Scale; EQ-5D = EuroQol-5 Dimensions.

Discussion

The present study investigated differences in changes in perception of current health status between participants of a western or non-western ethnicity in a longitudinal trauma-focused study. Previously, we found that three months after the investigation non-western participants had an increased perception of current health problems compared to western participants. The present study had two major goals: (a) to analyse ethnicity as a proxy for risk factors predictive of changes in perception of health problems; and (b) to analyse mediators which could help to explain the association of ethnicity with changes in perception of health problems.

With regard to our first study aim, the hypothesis was confirmed. The current study revealed that ethnicity co-varied with more proximal variables and was no longer predictive of changes in perception of health problems over and above these more proximal risk factors. There were numerous differences between the two groups in demographic and psychological characteristics at baseline. Lower education, no paid job, being in the Netherlands for a shorter period of time and higher levels of post-traumatic stress symptoms all showed an independent and unique relationship with higher levels of perception of health problems after the investigation. After accounting for the effect of these risk factors of enhanced perception of health problems, ethnicity was no longer predictive of outcome. These results indicate that grouping together individuals of various ethnic backgrounds is fruitful when subsequently possible common demographic and clinical characteristics are investigated, which may be related to health outcome.

Demographic characteristics such as education, work situation and years of residence are known predisposing factors of long-term psychological reactions to a disaster.^{3,37} These factors are more common and prevalent in non-western participants, which helps to explain that disadvantaged non-western participants may also become more aware of current health problems than western participants following the MOVb investigation. Higher levels of post-traumatic stress symptoms probably constitute a perpetuating factor³ dominating the effects of higher baseline levels of fatigue, psychopathology and health-related quality of life as also present in the non-western participants of our study. Persons with higher levels of intrusions and avoidance reactions with respect to the Bijlmermeer aviation disaster may have been more sensitive to the effects of the epidemiological investigation or medical examination. The MOVb procedure may have reactivated trauma-related health concerns in these vulnerable participants in particular.

Of note is that no evidence was found that the ethnic differences in changes in perception of current health problems are largely due to differential trauma exposure. This is in contrast with the systematic review of Jorm *et al.*,³⁸ which found more traumatic experiences to be predictive of more participants' distress. The num-

ber of traumatic events participants experienced during or in the aftermath of the disaster was not predictive of the change score over and above the effect of predisposing factors and level of post-traumatic stress symptoms. Notwithstanding the strong association between trauma exposure and post-traumatic stress symptoms ($r = .476$, $p < .001$), enduring stress symptoms proved to be more predictive of differences in changes in health perception than trauma exposure per se.

With respect to our second study aim, the hypothesis was partly confirmed. The relationship of ethnicity with changes in perception of current health problems was significantly mediated by changes in psychopathology, fatigue, and quality of life, but the relationship between outcome and ethnicity remained statistically significant. Apparently, participants with a non-western background reacted more strongly to the MOV B investigation than western participants and their development of higher levels of psychopathology and fatigue partly explained their higher perception of current health problems three months after the investigation (partial mediation). It is conceivable that in particular the group of non-western participants reacted in this way to the MOV B investigation, given their vulnerability in terms of associated demographic (lower education, no paid job, being in the Netherlands for a shorter period of time) and clinical risk factors (higher levels of post-traumatic stress symptoms) for trauma-related psychological responding.

Of note is that non-western participants manifested higher levels of both psychological and physical fatigue symptoms at baseline and also reacted more strongly to the MOV B investigation with psychological as well as physical symptoms than western participants. These findings do not concur with the assertion that non-western participants will show a stronger somatic rather than psychological presentation of symptoms and will express their psychological distress in a more somatic idiom.³⁹ Apparently, the diverse health measures as used in the present study were sensitive enough to measure their health problems. However, the extent to which more culturally defined somatised distress in non-western participants has been missed remains unknown and is worth studying into more detail in future studies.

The increased perception of health problems in non-western participants may also suggest the possible importance of cultural mechanisms and indicate that an approach that is feasible in one group cannot simply be exported to another cultural group. A recent meta-analytic review⁴⁰ found that culturally adapted mental health interventions resulted in significant client improvements across a variety of conditions and outcome measures when the interventions are targeted to a specific racial/ethnic group. Consequently, it seems warranted to explore how psychosocial interventions after disasters can be adapted to the needs of particular ethnic minorities. Although in the present study non-western participants were assisted by professional interpreters if necessary at baseline, a similar approach to diagnosis and intervention was used in western and non-western participants. Besides an ethnical

match of MHC providers and victims,⁴¹ a cognitive match (i.e. the congruence between helping professionals and ethnic minorities conceptions) may be essential.⁸ Similarity of explanatory models for the presenting problems in terms of aetiology, symptom meaning, course and appropriate intervention⁴² may be a prerequisite for effective intervention and adequate reassurance. The medical approach of the MOVb with its emphasis on excluding somatic health problems as a consequence of trauma exposure may have been less suitable to the socially and economically more disadvantaged group of non-western participants with probably also higher levels of pre-disaster psychopathology.

Study strengths and limitations

There are at least three reasons to think that the current data deserve serious considerations. To our knowledge, this is the first study to assess ethnicity as a predictor of changes in perception of health problems after a trauma-focused investigation. We concentrated on risk factors that could serve as a proxy for ethnicity as well as on underlying mediating mechanisms to explain differences between western and non-western participants in measurements of health concerns over time. Ultimately, we used specific standardised instruments to assess relevant aspects of participants' distress in the context of a study on the health effects of trauma exposure.

Finally, several limitations of this study merit consideration. Since there were no significant differences between the major non-western groups in change score in perception of current health problems, we decided to operationalise ethnicity as western versus non-western. This could have been due to the small group sizes of some of these groups, and it would have been preferable to compare as many different ethnic groups as possible. Secondly, participants that were not able to read either Dutch or English were excluded from this study at follow-up since this measurement was collected by mail, so our results cannot be generalised to all residents of the Bijlmermeer district that participated in the MOVb. Also, the substantial loss to the follow-up measurement of the epidemiological study resulted in more participants of a western ethnicity. However, these factors at the most could lead to an underestimation of our study results. Although we can not presume translation, conceptual and metric equivalence (i.e. a particular test score of a native speaker can be interpreted in the same manner as a test score of a foreigner⁴³), 95% of our sample indicated that they preferred to speak either Dutch or English.

Conclusions

In conclusion, by identifying more proximal co-varying variables and mediating psychological processes a more sophisticated understanding of associated features and relevant mediating mechanisms of ethnicity in relation to health problems can be arrived at. Ethnicity may be a proxy for more proximal demographic and clinical

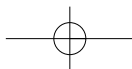
risk factors, which are more common and prevalent in disadvantaged ethnic minority groups. Stronger psychological and physical responding to a trauma-related investigation by more vulnerable ethnic minority groups may partly explain their enhanced perception of current health problems following a medical examination. Exploring ways of adapting psychosocial interventions after disasters to the needs of specific racial/ethnic groups seems warranted.

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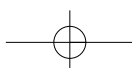
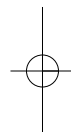
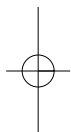
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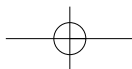
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Chapter 6

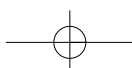
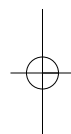
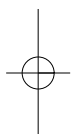
*Differences in changes in perception of health problems between western
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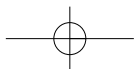




Chapter 7

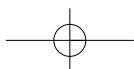
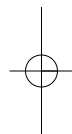
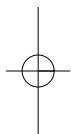
Summary and General discussion





Chapter 7

Summary and General discussion



Introduction

In the years following the Bijlmermeer aviation disaster on October 4th 1992, there was growing concern about the physical and psychological health of the residents and rescue workers exposed to the disaster. Persisting rumours about the cause of the crash, toxic exposure and health consequences led more than eight years later to the Medical Investigation Bijlmermeer Aviation Disaster (Dutch acronym: MOVB). The main intention of this investigation was to reassure the participants about their health and to provide evidence-based information about the consequences of the disaster in general. The MOVB consisted of two main studies: an epidemiological investigation to assess the relationship between health complaints and exposure to the disaster and an individual medical examination for all individuals who considered themselves to be suffering from the consequences of the disaster. On top of these studies an examination of the effects of participation was carried out, specifically assessing a hoped-for decrease in health complaints and worries. This thesis describes the results of this last study.

The first aim of the present study was to investigate whether participation in the individual medical examination or the epidemiological study reduced persistent anxiety about health among residents and rescue workers in varying degrees involved in the Bijlmermeer Aviation Disaster. The second aim was to study the effect of participation on self-reported physical and psychological health complaints. The third aim was to assess which risk factors were related to changes in perception of current health problems. Factors influencing cultural differences in changes in perception of health problems among residents of the Bijlmermeer district were studied separately.

This study was a prospective longitudinal study in both residents and rescue workers assessed at four time points: during the data collection of the epidemiological study and the individual medical examination (baseline), 6 weeks later during the consultation with a physician (post measurement, only in the medical examination), 12 weeks after the first examination (short-term follow-up) and six weeks after communication of the results of the epidemiological study among rescue workers (long-term follow-up), at least one year after baseline.

Summary of results

In Chapter 2 the results are described of a study that tested the hypothesis that a large-scale provision of an individual medical examination will reduce persistent anxiety about health and subjective health complaints after involvement in an aviation disaster with alleged exposure to hazardous chemicals. Changes in health expe-

rience between baseline, consultation (6 weeks) and short-term follow-up (12 weeks) were assessed. Rescue workers and residents reported increased health anxiety and somatic sensitivity after 12 weeks. Residents reported more post-traumatic stress symptoms, whereas rescue workers seem to have gained a better quality of life and were somewhat reassured compared to baseline measurements. Participants who attended the consultation with the physician showed increased reassurance scores after six weeks, but at follow-up their worries had increased again. However, non-attendees reported more health anxiety at follow-up than attendees. Participants more often judged participation to have had a positive than a negative impact on their health.

The study presented in Chapter 3 investigated whether participation in a trauma-focused epidemiological study reduced health complaints and concerns irrespective of trauma exposure. Changes in health experience of rescue workers and residents were assessed between baseline and short-term follow-up (12 weeks). Both rescue workers and residents reported less reassurance, and increased health anxiety and somatic sensitivity 12 weeks after the investigation compared to the first measurement. Exposure to the aviation disaster was not predictive of these changes in health perception, but higher levels of psychological and physical symptoms at baseline were. Only 0.2% to 1.6% of the residents and rescue workers indicated at baseline that the investigation had had a very negative impact on their mental and/ or physical well-being.

The study described in Chapter 4 investigated (a) the effectiveness of providing information on the health consequences of exposure to the aviation disaster to residents and rescue workers with varying degrees of exposure to the disaster and (b) individual characteristics which may moderate the effectiveness of the health information provided. This study assessed the long-term effects among participants of the individual medical examination and the epidemiological study, at least one year after the baseline measurement. All participants reported elevated levels of psychopathology and fatigue, increased anxiety and uncertainties about their health 6 weeks after communication of the results of the epidemiological study, irrespective of the degree of exposure to the disaster. Especially the conviction that health complaints were caused by toxic exposure was related to more severe health complaints and worries in both rescue workers and residents.

The aim of the study reported on in Chapter 5 was to assess which risk factors are related to changes in perception of current health problems after participation in a trauma-focused study among rescue workers and residents in varying degrees involved in an aviation disaster. Prediction of short- and long-term changes was performed among participants of both the individual medical examination and the epidemiological study. The multivariate prediction of the short- and long-term follow-up change scores indicated that especially residents with a low education, non-west-

ern background and higher levels of fatigue at baseline who did not consult the physician to discuss the results of the examination report increased levels of perception of health problems at both measurements. In addition, post-traumatic stress symptoms were predictive of short-term change scores.

In Chapter 6 the results are reported of an investigation of the effect of cultural differences on the short-term effects of participation in the MOVb among residents of the Bijlmermeer district. This study assessed which risk factors and mediators influence differences in changes in health concerns between western and non-western residents who participated in the epidemiological study or the individual medical examination. Previously, we found that non-western participants had an increased perception of current health problems compared to western participants. However, the current study revealed that there were numerous differences between the two groups in baseline characteristics as well as in (research-related) measurements over time. At baseline, high levels of post-traumatic stress symptoms, low education, no paid job and being in the Netherlands for only a short period of time were the only remaining multivariate risk factors of increased levels of perception of health problems three months after the investigation. Being from a western or non-western ethnicity did not add significantly to the regression equation. We also analysed psychological processes that took place during the investigation, which could help to explain the association of ethnicity with changes in perception of current health problems. The predictive value of western/non-western ethnicity for the change score in perception of health problems was mediated mainly by changes in psychopathology, fatigue and quality of life.

Discussion of results

Apparently, participation in the MOVb has had a negative overall effect on residents and rescue workers. Several factors seem important in explaining this adverse effect: the way in which reassurance was provided and communication of the results of the epidemiological study took place, the timing of this investigation more than eight years after the aviation disaster, and individual differences and vulnerabilities among the participants.

Reassurance and communication

The main intention of the MOVb was to reassure the participants about their health and to provide evidence-based information about the consequences of the disaster in general. Of note is that only about 50% of the participants in the individual examination made use of the possibility to discuss the results of their medical examination with the physician. In this subgroup scores for reassurance by medical information

provided by a physician became more positive over time. However, as hypothesised this effect was most pronounced directly after the consultation and already had largely disappeared 6 weeks later. Nevertheless, health anxiety was more manifest at follow-up among participants that did not attend the consultation than among attendees. Taken together, these data suggest that a medical examination in itself may not be very helpful. Without a vis-à-vis consultation, a medical examination may have the same inadvertent negative consequences as participation in an epidemiological study without seeing a physician may have.

The presence of some positive results on reassurance in patients consulting a physician may be interpreted from what is known about the effects of consultations in medical practice. Results of studies in this area indicate that patients with medically unexplained physical symptoms need explanations for their symptoms rather than simple reassurance (Salmon, 2006). Of note is that in the present study medical assistants and physicians were specifically trained in discussing health worries and anxieties and in giving personalised feedback in this particular group of people involved in the disaster. Possibly, the physicians in our study were successful in discussing the results of the medical examinations without reinforcing the opinion that complaints resulted from toxic exposure, while at the same time offering a more convincing alternative explanation (e.g. in terms of stress). Dowrick et al. (2004) showed that effective normalisation of unexplained symptoms includes an explanation with a tangible mechanism, grounded in patients' concerns, often linking physical and psychological factors. Apparently undergoing a medical examination without this personal feedback is not as reassuring in itself.

Medically unexplained symptoms such as fatigue after exposure to war or related events could exacerbate, when the focus of medical care and diagnostics is on identifying objective clinical findings (Clauw et al., 2003). Perhaps the exhaustive diagnostic testing that took place in the Medical Investigation Bijlmermeer Aviation Disaster inadvertently gave the participants with elevated levels of somatic symptoms such as fatigue the impression that the likelihood of a serious undiagnosed disease was high and as such led to a higher perception of current health problems.

Apart from personal feedback in the individual examination, all participants in the MOVb received a public summary of the first results of the epidemiological study. Although no medical sequelae of the disaster among the rescue workers were found, our study results show that the effect of communicating this positive result to the risk group of exposed participants did not differ from that in non-involved participants. These results are consistent with those of previous studies showing that providing general risk information is not very effective compared to more personalised risk communication in influencing key outcomes such as cognitive measures (e.g. knowledge and risk perception), affective measures (e.g. health anxiety and worries) and behavioural measures (e.g. uptake of screening programmes) (Edwards et al., 2006).

Timing of interventions

Other factors could also have negatively influenced the impact of the health information provided to our study participants. One explanation might be the large time-interval between the disaster and communication of the epidemiological findings. In a longitudinal study after an explosion of a fireworks depot, van den Berg, Grievink, Stellato, Yzermans and Lebreton (2005) found a gradual decrease in the number of physical symptoms, although the survivors still reported more symptoms than controls four years after the disaster. They argue that no theories about possible exposure to toxic substances developed in the aftermath of this disaster, because of the reassuring results of the blood and urine samples that were obtained as early as three weeks after the disaster. In the years following the Bijlmermeer aviation disaster particularly the persistence of rumours about the possible toxic cargo of the plane led to a growing unease among the residents of the Bijlmermeer district as well as among the rescue workers involved in the disaster (Boin et al., 2001).

So, in order to prevent chronicity of health complaints after a disaster it seems important to rule out the possibility of toxic exposure in an early stage. However, single session debriefing after psychological trauma was proven to be less effective in reducing PTSD and other symptomatology than not intervening (van Emmerik et al., 2002). Also, these early interventions do not improve natural recovery from psychological trauma. More research is needed into the optimal timing of screening for psychological and physical consequences of disasters.

Individual differences and vulnerabilities

Pre-disaster pathology may have contributed to ineffectiveness of the communication of health information to study participants. In a longitudinal study using medical records of general practitioners after the previously mentioned fireworks disaster, Yzermans et al. (2005) showed that victims with pre-disaster psychological problems were at a greater risk for post-disaster problems than those without and that relocated victims showed an excess of medically unexplained physical symptoms especially in a period of increased media attention. The prevalence of these symptoms tended to increase in the two and a half years following the disaster. Although these findings resemble the increase in health complaints in our study, they are unfortunately not fully comparable since in the present study pre-disaster data were not available.

Because mental disorders occur more frequently in persons from socio-economically deprived urban areas (Reijneveld & Schene, 1998) such as the Bijlmermeer district, it is conceivable that especially in residents pre-disaster levels of psychological problems, aggravated by the disaster and associated feelings of lack of recognition or compensation for losses, have fuelled the illness attribution of health complaints being caused by exposure to toxic substances. It is also possible that the dif-

ference between residents and rescue workers is not due to a difference in pre-disaster factors, but is related to post-trauma factors. Residents who stayed in the area where the disaster took place probably were much longer confronted with the aftermath of the disaster than rescue workers.

The levels of post-traumatic stress symptoms at baseline as well as a worsening of these symptoms over time indicated that non-western participants in particular were (increasingly) bothered by memories of the Bijlmermeer aviation disaster and by other characteristic reactions to the disaster (Van der Ploeg et al., 2004). Although we cannot firmly conclude that these symptoms are actually related to being involved in the disaster (they could have existed already before the disaster), it can not be left unnoted that more residents of non-western origin lived in the struck apartment buildings at the time of the disaster than western residents.

Conclusions

Our study does not indicate that a large-scale medical examination offered after involvement in a disaster has long-lasting reassuring effects, and suggests that such examinations may have counterproductive effects by sensitizing participants for health complaints.

Participation in an epidemiological study of the long-term sequelae of disaster exposure does not lead to strong negative reactions in most of the participants, but may result in an increased perception of somatic sensations, enhancement of health worries and lowered reassurability by physicians, especially in participants with higher levels of psychological and physical symptoms at baseline.

Communication of essentially favourable findings of an epidemiological study on the health consequences of exposure to an aviation disaster among rescue workers did not result in reduction of subjective health complaints or health worries as hoped for by the Parliamentary Inquiry from which came the recommendation to start this epidemiological study. It could even be argued that the execution of the epidemiological study and the communication of its results to residents and rescue workers has inadvertently promoted health complaints and worries even though the aim was to provide reassurance.

As indicated by increased levels of health anxiety and somatic sensitivity and feeling non-reassured by information provided by a physician, participation in a trauma-focused study may cause increased perception of current health problems.

When the level of psychological and physical complaints deteriorates during a medical investigation, participants from non-western origins are especially vulnerable to develop increased perception of their current health problems.

Methodological strengths and limitations of the study

Strengths

To our knowledge our study is unique in investigating the effects of a large-scale provision of a medical examination to people involved in an aviation disaster with alleged exposure to hazardous chemicals and also in investigating the effects of participating in an epidemiological investigation after this disaster. Moreover, we were able to investigate two large groups of rescue workers as well as residents living in the disaster area, and in the epidemiological study to compare subgroups according to their degree of involvement in the disaster.

In addition, this is the first study to use specific standardized instruments to assess relevant aspects of participants' distress in the context of a study on the health effects of trauma exposure. Another strong point of the present study is its prospective design. We were able to predict longer-term effects of participation on two different moments in time. Well over 40% of variance in changes of perception of current health problems on both follow-ups could be explained by demographic and clinical variables at baseline.

Ultimately, although we did not use a control group of non-participants, whether or not participants made use of the consultation with the physician turned out to be a weak independent predictor of participants' perception of current health problems. To assess selection bias we also compared the results of participants and non-participants in our study of the effects of participation (Verschuur et al., 2008a; Verschuur et al., 2008b). Overall, non-participants reported higher levels of physical and psychological complaints than participants at baseline. So, at the most our study results underestimate the effect of participation at baseline.

Limitations

The time-lag of more than eight years between the disaster and the intervention with subsequent data-collection for our study may raise questions concerning the relevance and generalisability of the results. However, health concerns were still very prevalent after this time (Slottje et al., 2005; Witteveen et al., 2007), as has also been previously reported for survivors of (presumed) toxicological disasters (Havenaar & van den Brink, 1997). It may be, however, that the chronicity of the health complaints made them less easily influenced than with an intervention shortly after the disaster, and it remains unknown what the results would have been if the intervention had taken place earlier in time.

Since our study was designed on top of both the epidemiological and individual medical investigations to exclusively examine the effects of participation, it was not possible to introduce a control group of non-participants in those investigations. In the absence of a control group of individuals not participating in a health survey or

participating in a survey in which no personally relevant information is assessed, all observed effects could reflect time trends and regression to the mean. An example of a time trend is increased media attention for the consequences of disasters in case of a new emergency (e.g. the attacks on the World Trade Center in New York took place during our inclusion period). External confounders such as increased media attention could lead to extensive symptom reporting attributed to the disaster (Donker et al., 2002). However, one out of nine symptoms attributed to the disaster by the patients in this last study had already been reported to the GP before the disaster took place. We analysed the possible influence of time trends by dividing baseline measurements in equal time periods during the inclusion period, and found no evidence for systematic changes in scores for anxiety about health or subjective complaints as a result of passage of time. Given the elevated and increasing scores for complaints and concerns at follow-up, regression to the mean is also an unlikely alternative explanation of the present findings. As Norris et al. (2002) showed in a review study among 160 samples of disaster victims, the general rule was for samples to improve as time passed and symptoms predominantly declined, even with two to 15 years between the two measurements. This makes it likely that our study results can be attributed to participation in the medical investigation, particularly because we found differences in outcome between participants that did and did not attend the consultation.

Thirdly, the validity of measurements of trauma exposure after so many years may be questioned, since empirical evidence has shown that retrospective reporting of exposure to trauma may be influenced by the current physical and mental state of a person (McNally, 2003). People suffering from serious psychological complaints unjustly tend to report more exposure to trauma, leading to an inflated association between exposure and outcome. In order to circumvent recall bias we therefore used the place of domicile of the residents as an objective measure of their involvement. Of note is that this measure concurred with self-reports of exposure to trauma. The group of residents who were most involved in the disaster not only reported more trauma exposure but also reported higher levels of post-traumatic stress symptoms, fatigue and somatic sensitivity and less reassurance than the two groups of residents with lower degrees of involvement (cp. Elklit, 2007). These results suggest that our findings regarding changes in health experience in residents involved in varying degrees in the disaster are not critically affected by the operationalisation of involvement in the disaster.

Another limitation is that study participants in the individual medical examination volunteered to have their health checked by a medical doctor. As such, this self-selected group was probably concerned about their health as a result of the disaster. In a recent study it was shown that the police officers who voluntarily underwent the medical examination significantly more often reported health complaints and trau-

matic events than police officers who were invited to participate in an epidemiological study but did not take the medical examination (Huizink et al., 2006). Study results can therefore not be generalized to involved residents or rescue workers in general. It is also possible that factors such as social desirability or litigation issues may have influenced the answers in the epidemiological study. However, although these factors can result in over- or underreporting of health complaints, they are unlikely to influence changes in health problems during a 12 week time period 8 to 10 years after a disaster. Moreover, participants in the epidemiological study were invited to participate by the researchers and did not take part on their own initiative. Hence, they were probably more driven by compassion with the people involved in the disaster than by their own needs.

Finally, at baseline we did not investigate existing attributions concerning toxic exposure or other connections between complaints and the disaster. We can therefore only conclude that at the long-term follow-up the belief in toxic exposure is present, especially among residents, but we cannot detect possible changes in this conviction. However, in the epidemiological study among rescue workers attributions were also measured at baseline (Slottje et al., 2006), showing that 43% to 49% of the rescue workers involved in the disaster with long-term physical complaints somehow attributed these to the disaster and its aftermath. Nevertheless, in that study no explicit questions related to attributions with respect to exposure to toxic substances were asked.

Suggestions for future research

Only those participants who personally discussed the results of their medical examination with a physician remained somewhat reassured. This underscores the potential value of a vis-à-vis consultation after a medical examination. Future studies must be more attentive to communication and interaction patterns between doctors and patients, which should promote a reattribution of symptoms and better tolerance for, or management of, symptoms.

Further controlled studies are needed to investigate the temporal stability of the inadvertent and unobtrusive negative consequences of participation in the MOVb. For instance, a randomised and controlled study design could assess the differences in health effects between participants in an intensive medical and psychological investigation (such as the MOVb) and a less intensive population screening in which only the most relevant physical and psychological complaints are assessed over time. However, it is questionable whether such a randomised design is possible in the emotionally charged aftermath of a disaster.

Future studies must be more attentive to maximizing the effectiveness of health

communication by identifying specific strategies that promote thoughtful information processing. Personalised health information may be more reassuring than general health information (Edwards et al., 2006). The importance of immediate, individualised, and specific (as opposed to delayed, generalised, and global) feedback has also long been recognised in other fields such as behaviour therapy (e.g., Ferster & Skinner, 1957). For health information to have impact on cognition, affect and behaviour individualising of the communication with respect to characteristics such as pre-existing beliefs or individual cognitive styles (such as need for cognitive closure and ability to tolerate ambiguity) seem to be of paramount importance. In a recent study by Brewin et al. (2008) on a screen and treat approach following the 2005 London bombings, the program succeeded in its aim of generating many more referrals of affected individuals than through normal referral channels, by outreach efforts specifically focused on screening and advising directly affected individuals rather than on public education and general counselling.

In addition, it would be interesting to investigate if a large-scale medical examination immediately following a disaster leads to similar health concerns in the short- and long-term. However, negative consequences of screening in the immediate aftermath of a disaster could be the medicalisation of people with a natural attrition of acute stress symptoms. Also, screening the entire group of people involved in a disaster could yield insufficient benefit in terms of health outcome relative to costs (Landelijke Stuurgroep Multidisciplinaire Richtlijnontwikkeling in de GGZ, 2007). Health research in the immediate aftermath of a disaster, however, does make it possible to assess potential toxic exposure, the absence of which could prevent unnecessary concerns about health risks, unjust attribution of health complaints to exposure and claiming of damages because of supposed exposure (Gezondheidsraad, 2006).

As stated by Norris et al. (2002), the strongest design would have been to control for pre-disaster symptoms when assessing the effects of participation on health complaints and concerns. Survivors with prior mental health problems appear to be at greater risk for new or renewed problems after disasters than other survivors. For example, North et al. (1999) found pre-disaster psychiatric disorder to be a predictor for post-disaster PTSD among survivors of the Oklahoma City bombing.

Practical implications

The chaotic aftermath of the Bijlmermeer aviation disaster has led to the understanding that providing information and advice to the victims should be radically improved (Gezondheidsraad, 2006). From this, the idea developed to establish an Information and Advise Centre after a disaster to prevent psychological damage due

to badly organised aftercare. After the fireworks disaster in Enschede in 2000 an Information and Advice Centre functioned for the first time in the Netherlands.

Our study results show that in particular participants with a low level of education, of non-western ethnicity and with a high level of health complaints at baseline did not profit from this investigation. Part of this group was already excluded because they were dependent on interpreters for filling in the questionnaires. It seems important to include this vulnerable group in future interventions after disasters by designing a protocol that addresses the needs of the entire multicultural society we are living in. Hall (2001) proposed that the treatment of ethnic minorities should be adapted to be culturally sensitive. Ethnicity and culture influence mental health care utilization in the aftermath of disasters: on need for help; on availability and accessibility of help; on help-seeking comfort, and on the probability that help is provided appropriately (Norris & Alegria, 2005).

Only a limited percentage of the participants who were referred to the special aftercare services actually took advantage of this opportunity. Yet, the aftercare services were not directly connected to the MOVb. Developing an integrated health care system should promote the coordination between population screening, relief and treatment. Stepped care models, which start with monitoring of health and increasingly offer more intense care and support according to the severity and progression of complaints seem appropriate in this respect. An example of such a model is the set up of a centralised screen and treat program after the London City bombings to identify all affected individuals, screen them for mental disorders, refer them for evidence-based treatment where appropriate, and monitor outcomes (Brewin et al., 2008).

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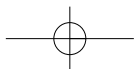
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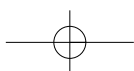
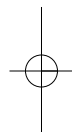
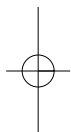
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Chapter 7

Summary and General discussion



Samenvatting

Samenvatting

De effecten van het Medisch Onderzoek Vliegcramp Bijlmermeer op de gezondheidsbeleving van bewoners en hulpverleners

In de jaren die volgden op de vliegcramp Bijlmermeer op 4 oktober 1992, ontstond er een groeiende bezorgdheid over de psychische en fysieke gezondheid van de bewoners en hulpverleners die betrokken waren bij de ramp. Hardnekkige geruchten over de oorzaak van het ongeluk, blootstelling aan schadelijke stoffen en gezondheidsgevolgen leidden meer dan acht jaar later tot het Medisch Onderzoek Vliegcramp Bijlmermeer (MOV). Het voornaamste doel van dit onderzoek was om de deelnemers gerust te stellen omtrent hun gezondheid en om uitsluitel te verschaffen over de gevolgen van de ramp in het algemeen. Het MOV bestond uit twee hoofdonderzoeken: een epidemiologisch onderzoek om de relatie tussen gezondheidsklachten en betrokkenheid bij de ramp te beoordelen en een individueel medisch onderzoek voor iedereen die aangaf gevolgen van de ramp te hebben onderzocht. Bovendien werd voor beide onderzoeken het effect van deelname onderzocht, om de beoogde afname van gezondheidsklachten en –zorgen te kunnen beoordelen. Dit proefschrift beschrijft de resultaten van dit effectonderzoek.

Het eerste doel van het huidige onderzoek was vast te stellen of deelname aan het individuele medische onderzoek of aan het epidemiologische onderzoek de voortdurende gezondheidsangst bij bewoners en hulpverleners, die al dan niet betrokken waren bij de Bijlmercramp, heeft doen verminderen. Het tweede doel was het effect van deelname op zelfgerapporteerde fysieke en psychische gezondheidsklachten in kaart te brengen. Het derde doel was om na te gaan, welke risicofactoren gerelateerd waren aan veranderingen in de beleving van huidige gezondheidsproblemen. Factoren die van invloed waren op culturele verschillen in veranderingen in gezondheidsbeleving bij bewoners van de Bijlmermeer werden apart onderzocht.

Dit onderzoek was een prospectieve longitudinale studie bij bewoners en hulpverleners op vier meetmomenten: tijdens de dataverzameling van het epidemiologische onderzoek en het individuele medische onderzoek (baseline), 6 weken later tijdens de consultatie met een arts (postmeting, alleen in het individuele medische onderzoek), 12 weken na het eerste meetmoment (korte termijn follow-up) en zes weken na de bekendmaking van de resultaten van het epidemiologische onderzoek onder hulpverleners (lange termijn follow-up), ten minste een jaar na de baseline.

In hoofdstuk 2 worden de resultaten beschreven van een onderzoek dat de hypothese toetste dat het grootschalig aanbieden van een individueel medisch onderzoek de voortdurende gezondheidsangst en –klachten na betrokkenheid bij een vliegcramp met mogelijke blootstelling aan schadelijke stoffen zou verminderen. Veranderingen in gezondheidsbeleving werden beoordeeld tussen baseline, consultatie en korte ter-

Samenvatting

mijn follow-up. Hulpverleners en bewoners meldden verhoogde gezondheidsangst en somatische sensitiviteit na 12 weken. Bewoners rapporteerden meer posttraumatische stress symptomen, terwijl hulpverleners een betere kwaliteit van leven aangaven en enigszins gerustgesteld waren vergeleken met de baseline metingen. Deelnemers die de arts hadden geconsulteerd lieten meer geruststelling zien na 6 weken, maar bij de follow-up maakten ze zich weer meer zorgen. Desondanks was hun gezondheidsangst lager dan die van deelnemers die de arts niet geconsulteerd hadden. Hulpverleners en bewoners gaven vaker aan, dat deelname aan het onderzoek een positieve invloed op hun gezondheid had gehad, dan een negatieve.

Het onderzoek waarvan verslag wordt gedaan in hoofdstuk 3 behandelt de vraag of deelname aan een traumagericht epidemiologisch onderzoek gezondheidsklachten en –zorgen vermindert, ongeacht de mate van blootstelling aan de traumatische gebeurtenis. Veranderingen in gezondheidsbeleving van hulpverleners en bewoners werden gemeten tussen baseline en korte termijn follow-up. Zowel hulpverleners als bewoners gaven minder geruststelling aan, en meer gezondheidsangst en somatische sensitiviteit 12 weken na de eerste meting. Deze veranderingen in gezondheidsbeleving werden niet voorspeld door blootstelling aan de vliegkamp, maar wel door hogere niveaus van psychische en fysieke symptomen tijdens baseline. Slechts 0,2% tot 1,6% van de bewoners en hulpverleners gaven bij de eerste meting aan, dat het onderzoek een zeer negatieve invloed had op hun psychische en/of fysieke welzijn.

Het onderzoek beschreven in hoofdstuk 4 beoordeelde (a) de effectiviteit van het verstrekken van informatie over de gezondheidsgevolgen van blootstelling aan de vliegkamp aan bewoners en hulpverleners die in verschillende mate betrokken waren bij de ramp en (b) individuele kenmerken die de effectiviteit van de verstrekte gezondheidsinformatie zou kunnen modereren. Dit onderzoek stelde de lange termijn effecten vast van deelnemers aan het individuele medische onderzoek en het epidemiologische onderzoek. Zes weken na bekendmaking van de resultaten van het epidemiologisch onderzoek onder hulpverleners rapporteerden alle deelnemers verhoogde niveaus van psychopathologie en vermoeidheid, en meer angst en zorgen over hun gezondheid, onafhankelijk van de mate van betrokkenheid bij de ramp. Vooral de overtuiging dat hun gezondheidsklachten werden veroorzaakt door blootstelling aan schadelijke stoffen ging gepaard met ernstiger gezondheidsklachten en –zorgen bij zowel bewoners als hulpverleners.

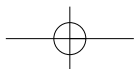
Het doel van het onderzoek waarover gerapporteerd wordt in hoofdstuk 5 was om vast te stellen welke risicofactoren verband houden met veranderingen in gezondheidsbeleving na deelname aan een traumagericht onderzoek onder hulpverleners en bewoners die in verschillende mate betrokken waren bij de vliegkamp. De voorspelling van korte en lange termijn veranderingen werd uitgevoerd bij deelnemers van zowel het individuele medische onderzoek als de epidemiologische studie. De multivariate voorspelling van de korte en lange termijn follow-up veranderingsscores

Samenvatting

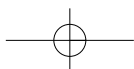
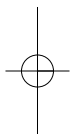
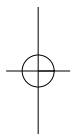
voor gezondheidsbeleving wees uit, dat vooral bewoners met een laag opleidingsniveau, een niet-westerse achtergrond en hogere niveaus van vermoeidheid tijdens de baseline en deelnemers aan het individuele medische onderzoek die niet de arts consulteerden om de resultaten van het onderzoek te bespreken, verslechterde niveaus van gezondheidsbeleving rapporteerden op beide follow-ups. Bovendien waren posttraumatische stress symptomen op baseline voorspellend voor de korte termijn veranderingsscores.

In hoofdstuk 6 worden de resultaten gerapporteerd van een onderzoek naar de invloed van culturele verschillen op het korte termijn effect van deelname aan het MOVb bij bewoners van de Bijlmermeer. Dit onderzoek brengt in kaart welke risicofactoren en mediators van invloed zijn op verschillen in veranderingen in gezondheidsbeleving tussen westerse en niet-westerse bewoners die deelnamen aan het individuele medische onderzoek of de epidemiologische studie. Eerder vonden we dat niet-westerse deelnemers een verslechterde gezondheidsbeleving hadden ten opzichte van westerse deelnemers. Het huidige onderzoek toonde echter aan, dat er vele verschillen waren tussen beide groepen, zowel in baseline kenmerken als in (onderzoeksgerelateerde) metingen over de tijd. De enige overgebleven multivariate risicofactoren voor een verslechterde gezondheidsbeleving drie maanden na het onderzoek waren hoge niveaus van posttraumatische stress symptomen tijdens baseline, een lage opleiding, geen betaald werk hebben en nog niet lang in Nederland verblijven. Wel of niet een westerse achtergrond hebben had geen significante toegevoegde waarde aan de voorspelling van veranderingen in gezondheidsbeleving bovenop de bovengenoemde factoren. Ook werden er psychologische processen geanalyseerd, die plaatsvonden tijdens het onderzoek, om het verband tussen etniciteit en veranderingen in gezondheidsbeleving te helpen verklaren. De voorspellende waarde van westerse/niet-westerse etniciteit werd voornamelijk gemedieerd door veranderingen in psychopathologie, vermoeidheid en gezondheidsgerelateerde kwaliteit van leven.

Klaarblijkelijk heeft deelname aan het MOVb over het algemeen een negatief effect gehad op de bewoners en hulpverleners. Een aantal factoren lijken van belang om dit ongunstige effect te verklaren: de manier waarop geruuststelling werd verschaft en de resultaten van de epidemiologische studie bekend werden gemaakt, het tijdstip van dit onderzoek, meer dan acht jaar nadat de vliegcrash plaatsvond, en individuele verschillen in kwetsbaarheid tussen de deelnemers.



Samenvatting



*Dankwoord***Dankwoord**

In de eerste plaats gaat mijn dank uit naar de deelnemers aan dit onderzoek, die bereid zijn geweest herhaalde malen een aantal vragenlijsten in te vullen over de effecten van deelname aan het MOVb. Hopelijk doen de resultaten van dit onderzoek recht aan de ongerustheid en gezondheidszorgen die zij gevoeld hebben.

Zonder de Begeleidingscommissie en Commissie van Deskundigen, de Uitvoeringsorganisatie MOVb, KLM Arbo Services en de studentassistenten en onderzoeksassistenten van de Universiteit Leiden was de uitvoering van dit onderzoek niet mogelijk geweest. Ook de collega's van het EMGO Instituut ben ik erkentelijk voor de goede samenwerking.

Mijn beide promotoren ben ik veel dank verschuldigd voor de kennis en inzichten die zij met mij hebben willen delen, en voor het enorme doorzettingsvermogen waarmee zij dit promotietraject met mij hebben willen voltooien. Ook de scriptiestudenten die op basis van dit onderzoek hun scriptie geschreven hebben waren een bron van inspiratie.

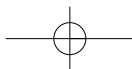
De collega's van het Instituut Psychologie hebben mij gesteund door hun bijdragen aan dit proefschrift in de vorm van coauteurschappen, literatuursearches, methodologische adviezen, belangstelling, een luisterend oor of op andere wijze. Ook de (voormalige) leden van het AIO-overleg ben ik dankbaar. Ik heb mij als 'vreemde eend in de bijt' altijd welkom gevoeld.

Mijn speciale waardering gaat uit naar de afdeling Neurochirurgie van het LUMC en vele andere leden van de (para)medische professie. Zonder hun hulp en inzet had ik dit proefschrift nooit afgemaakt.

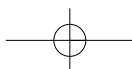
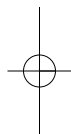
Mijn beide paranimfen, die (vrijwel) vanaf het begin bij dit onderzoek betrokken waren, wil ik bedanken voor hun relativeringsvermogen, gevoel voor humor en niet-aflatende ondersteuning. Ik ben blij jullie aan mijn zijde te hebben.

Ook mijn familie en vrienden zijn zeer belangrijk voor mij geweest tijdens dit promotietraject. Zij zorgden voor afleiding, hadden altijd interesse en boden houvast in moeilijke tijden.

Tenslotte mijn gezin, degenen zonder wie ik niet compleet ben. Mijn zoon wil ik danken omdat hij altijd zo onvoorwaardelijk voor mij opkomt en mijn aandacht regelmatig op andere zaken wist te vestigen. Mijn man, die mij al deze jaren met zijn liefdevolle zorgen heeft omringd, nooit aan mij twijfelde en mij altijd weer de moed gaf om door te gaan, dank ik uit de grond van mijn hart.



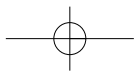
Dankwoord



Curriculum Vitae

Curriculum Vitae

Margot Jeannette Verschuur werd geboren op 29 maart 1956 te Venlo. Ze behaalde haar Atheneum-B diploma aan het Collegium Marianum te Venlo in 1975. In 1984 studeerde zij af aan de Rijksuniversiteit Utrecht in de Klinische Psychologie met als nevenrichting Ontwikkelingspsychologie en bijvakken Psychopathologie en Jeugdrecht. Na gewerkt te hebben als onderzoeksassistent bij het RIAGG Westelijk Utrecht en als psycholoog bij ziekenhuis De Weezenlanden te Zwolle, begon zij in 1987 aan de afstudeerrichting Methoden en technieken van psychologisch onderzoek aan de Rijksuniversiteit Leiden, welke zij in 1992 voltooide. Van 1988 tot 1992 werkte zij aanvankelijk als onderzoeksondersteunend assistent en later als onderzoeker bij het Leids Instituut voor Sociaal Beleidsonderzoek en het Centrum Onderzoek Jeugdhulpverlening aan de Rijksuniversiteit Leiden. Vanaf 1992 was zij werkzaam als onderzoeker/docent bij de sectie Klinische, Gezondheids- en Neuropsychologie aan de Universiteit Leiden. Zij startte haar promotieonderzoek bij dezelfde sectie in november 2001.



Curriculum Vitae

