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

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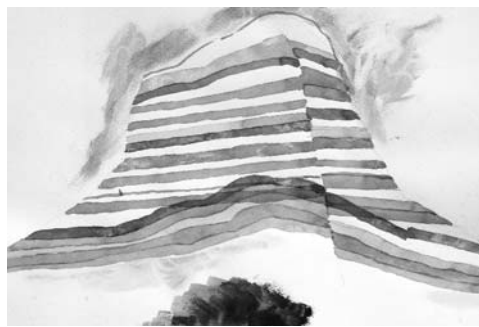
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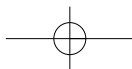
Chapter 6

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



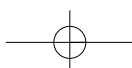
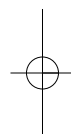
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Submitted



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

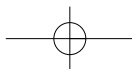
risk factors, which are more common and prevalent in disadvantaged ethnic minority groups. Stronger psychological and physical responding to a trauma-related investigation by more vulnerable ethnic minority groups may partly explain their enhanced perception of current health problems following a medical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

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Chapter 6

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

