

Social capital and post-disaster mental health

Tim R. Wind^{1,2*}, Maureen Fordham³ and Ivan H. Komproe^{1,4}

¹Department of Research and Development, HealthNet TPO, Amsterdam, the Netherlands; ²Department of Research, Arq Psychotrauma Expert Group, Diemen, the Netherlands; ³Divisions of Geography & Environmental Management, School of Applied Sciences, University of Northumbria, Newcastle upon Tyne, UK; ⁴Faculty of Social and Behavioral Sciences, Utrecht University, Utrecht, the Netherlands

Background: Despite national and international policies to develop social capital in disaster-affected communities, empiric evidence on the association between social capital and disaster mental health is limited and ambiguous.

Objective: The study explores the relationship between social capital and disaster mental health outcomes (PTSD, anxiety, and depression) in combination with individual factors (appraisal, coping behavior, and social support).

Design: This is a community-based cross-sectional study in a flood-affected town in northern England. The study is part of the MICRODIS multi-country research project that examines the impact of natural disasters. It included 232 flood-affected respondents.

Results: The findings showed that a considerable part of the association between cognitive and structural social capital and mental health is exerted through individual appraisal processes (i.e. property loss, primary and secondary appraisal), social support, and coping behavior. These individual factors were contingent on social capital. After the inclusion of individual characteristics, cognitive social capital was negatively related to lower mental health problems and structural social capital was positively associated to experiencing anxiety but not to PTSD or depression. Depression and anxiety showed a different pattern of association with both components of social capital.

Conclusions: Individual oriented stress reducing interventions that use appraisal processes, social support, and coping as starting points could be more effective by taking into account the subjective experience of the social context in terms of trust and feelings of mutual support and reciprocity in a community. Findings indicate that affected people may especially benefit from a combination of individual stress reducing interventions and psychosocial interventions that foster cognitive social capital.

Keywords: *social capital; PTSD; depression; anxiety; disaster; social support; coping*

Received: 10 February 2011; Revised: 10 May 2011; Accepted: 14 May 2011; Published: 15 June 2011

Increasingly, it is recognized that a disaster influences mental health of individuals via parallel trajectories (1). First, the individual transactional stress model describes the consequences of a natural disaster as follows (2): A disaster evokes an individual subjective experience of the event as stressful or not (i.e. primary appraisal) and an individual estimation to what extent he or she can deal with the disaster situation (i.e. secondary appraisal). Subsequently, an individual copes with the situation. Depending on the effectiveness of individual coping behavior and received social support, an individual may develop mental health problems in the wake of disasters. Second, it is recognized that beyond the individual traumatic experience (1–3), disaster mental

health outcomes are determined by the impact of disasters on the material and social environment (1). The destruction of and change of the material or physical environment is associated with disaster mental health outcomes (4) and, in the last decade, attention has turned to the exploration of the effects of the social context on mental health (1). Within this line, many scholars embraced ‘social capital’ as a possible explanation for differences in disaster mental health across affected places or affected groups of people (4–7). There are several definitions of social capital and in general social capital is defined as ‘the resources an individual can draw on through his or her social networks and the value ascribed to these resources by the individual’ (1, 8, 9).

In the aftermath of disasters social capital is typically fractured (10–12) as a result of dispersion and relocation of important others (13). Consequently, the natural health sustaining function of social capital [i.e. its buffer function against mental health problems in times of distress (14, 15)] that is generally found in the literature also subsides. As a result disaster-affected people may be more vulnerable to develop mental health problems (1, 15). The assumed relevance of social capital for disaster mental health has been underscored by national and international policies to develop social capital in disaster-affected communities (12, 14–16). Yet, there is a lack of empiric evidence on *how* social capital exerts its influence on disaster mental health (16). And thus, scholars concluded that current evidence on social capital and disaster mental health is inconclusive and inadequate to inform the development of specific social capital interventions to combat mental illness (17, 18).

Whereas the individual stress trajectory and the loss of social capital have been found to impact mental health, the role of the combination of the individual mechanisms and the loss of social capital on mental health problems is less clear. One fruitful idea has been that social capital exerts its influence on mental health *via* individual factors (11, 19). According to the well-established transactional stress model social support and coping behavior mediate the impact of trauma on mental health (2, 20) and, thus, these individual factors are indispensable starting points for individual interventions to diminish mental health problems. Kawachi and Berkman (11) assert that these person-related factors, such as social support and coping behavior, are contingent on social capital: The density of civic associations or the extent of voluntarism in a community affords the opportunity to establish one-on-one linkages for social support (19). In turn, perceived or received support may reduce negative emotional reaction to a stressful event (11, 21–24). Further, the classic definition of Lazarus and Folkman (20) of coping is ‘the cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person.’ In a community with high social capital one will have more resources to one’s disposition and may, therefore, be better able to deal with environmental demands (11, 12, 15). The latter may in turn decrease mental health problems (25, 26). The intuitively appealing tenet that individual protective factors for mental health outcomes – such as social support and coping behavior – are contingent on social capital would elucidate possible mechanisms via which social capital exerts its influence on mental health. However, such evidence has not been substantiated in disaster research thus far.

The aim of this study is to examine the relationship between social capital and disaster mental health outcomes in combination with these individual factors. We

specifically explore the interplay between the individual trajectory and the individual perception of social capital that impact mental health outcomes. The mental health outcomes of study are the three most common researched and prevalent post-disaster mental health outcomes: posttraumatic stress disorder (PTSS), depression, and anxiety (1, 3, 27). All three mental health outcomes have been assumed to be associated to the individual perception of the social context (11, 19, 28–30).

Regarding our research aim several issues deserve explicit attention. First, within social capital research, most studies today distinguish between a ‘social network’ versus a ‘social cohesion’ approach to social capital (17). The ‘social cohesion’ approach of social capital defines social capital as the resources available to members of tightly knit communities and tends to emphasize social capital as an attribute of the community (e.g. neighborhood). By contrast, the ‘social network’ approach of social capital conceptualizes the concept in terms of resources that are embedded within an individual’s social network (17). Second, beyond the issue of level of definition, social capital can be assessed at the individual and collective level (1, 17). Although the level of definition (social cohesion school versus social network school) most commonly concurs with the level of assessment (collective versus individual), this is not exclusively true. For example, even if social capital is assessed at the individual level, scholars of the ‘social cohesion’ approach may conceptually consider an individual score as a reflection of social capital at the community level (31). Similarly, the authors view social capital as a community asset in accordance to the social cohesion school. Yet, we explore the interplay between the individual stress trajectory and the individual perception of social capital that impacts disaster mental health. Therefore, we assessed social capital at the individual level.

Method

Setting

We conducted a cross-sectional community survey in Morpeth. Morpeth is a small town located in the Northumberland County, UK, with about 15,000 inhabitants. Demographically, Morpeth comprises a relatively aged population, as many choose to retire in Morpeth (32). On the 5th and 6th of September 2008 Morpeth was struck by intensive rainfall. The ground water rose rapidly and the river that flows through the center burst its banks. Consequently, Morpeth was hit by one of its worst floods since 1963. Almost a thousand properties were flooded due to the water rise.

Study population

We aimed to conduct a census on the basis of the Morpeth address list of the affected households. The

address list comprised 786 addresses of which 39 business premises. We approached the 757 households in the list excluding the business premises.

Data collection

The data collection was carried out during August 2009. The study is part of the MICRODIS multi-country research project that examines the impact of natural disasters on social mechanisms, economical aspects, and health outcomes across Europe and Asia. A local research agency was hired to conduct the survey in Morpeth. The company hired experienced local surveyors that are familiar with the local sociocultural context to conduct face-to-face interviews under the supervision of the local principal investigator Fordham (author). They received a 1-day training in the administration of the interview. Written informed consent was obtained. The ethical approval for the study was obtained from the School of Applied Sciences Ethics Committee, University of Northumbria. The study has been performed in accordance to the ethical guidelines of the Declaration of Helsinki (33).

Measurements

Mental health outcomes

Anxiety and depression. Symptoms of anxiety and depression were assessed by the Hopkins Symptom Checklist-25 [HSCL-25 (34)]. The period of reference is the last month. Two scores were calculated: the anxiety score is the average of the 10 anxiety items, and the depressive symptoms score is the average of the 15 depression items. The respondent is asked to report how much he or she has been bothered by each item during the last month on a 5-point scale ranging from 1 = not at all to 5 = extremely. The internal consistency (Cronbach's alphas) of the scales Anxiety and Depression were respectively .81 and .69.

Posttraumatic Stress Disorder (PTSD). Symptoms of PTSD were assessed by the PTSD Checklist Civilian Version (PCL-C) (35). The PCL-C consists of 17 items organized in three subscales. Eight items are keyed to a specific trauma, in this study to the experience of the flood. The respondent is asked to report how much he or she has been bothered by each item during the last month on a 5-point scale ranging from 1 = not at all to 5 = extremely. The subscales correspond to the three symptom clusters of PTSD according to the *DSM-IV* (36): re-experience (five items), avoidance (seven items), and hyperarousal (five items). The internal consistency (Cronbach's alpha) of the PCL-C was .96.

Individual characteristics

The individual characteristics included in the study were the key variables of the transactional stress model:

appraisal processes (Property Loss, Primary Appraisal, Secondary Appraisal; described below), Social Support, and Coping. Further, we added Displacement as it has been shown to be a crucial predictor of mental health outcomes (13, 28). Demographic variables included in the study were Gender, Age, and Education Level.

Displacement was measured by the question: 'Did you have to move out of your home after the flood?' and could be answered by 'yes' or 'no.'

Property loss was measured by four questions: To what extent did you experience damage or loss to: (1) the structure of your house, (2) the contents and belongings of your house, (3) personal belongings with sentimental value, (4) your car. Respondents could answer from 1 = 'not at all' to 5 = 'fully damaged/lost.. The total Property Loss score was the average of the four items.

Primary and secondary appraisal. Primary appraisal refers to the perceived threat of the situation, and was measured by the question 'How traumatic was the flood for you at the time?' Secondary appraisal denotes the estimation of the capacities or possibilities one has to deal with the disaster was measured by the question 'To what degree did you believe that you were able to deal with the situation?' Respondents could indicate their answers on a 5-point scale ranging from 1 = 'not at all' to 5 = 'very much.'

Coping intensity. Most coping research in disaster settings thus far has focused on types of coping behavior (e.g. problem focused coping, emotional expression) in relation to mental health outcomes (20, 37). This study focused on the degree to which a variety of coping strategies were employed. We term this 'Coping Intensity.' Coping Intensity has been shown to be related to mental health outcomes in extreme situations such as political imprisonment (38). Six items measured individual coping (39). The items referred to Avoidance, Reappraisal, Religion, Active cognitive coping, Active behavioral coping, and Social support. For example: 'How much did you rely on your religious beliefs to help you deal with the flood situation?' [Religion] and 'How much did you do things improve your situation after the flood?' [Active behavioral coping]. The items rated on a 5-point scale from 1 = 'not at all' to 5 = 'extremely.' The total Coping Intensity score was the average of the six items.

Social support. The Social Support Scale of Harper and Kelly (40) was used to measure social support. Respondents were asked to indicate how often they received any social support (10 items). Example questions were 'Did you receive any help or support from anyone to improving your economic situation?' and 'Did you receive any advice or informational support to help you understand things?'

The items are rated on a 5-point scale rating from 1 = 'never' to 5 = 'on most days.' The social support score was the average of 10 items. The Cronbach's alpha was .72.

Social capital

There are various instruments that measure social capital. We selected the SA-SCAT (41, 42) for our study for (i) its brevity, (ii) its wide international use (e.g. Ref. 16), and (iii) its distinction between cognitive and structural capital (41).

Previous studies have provided evidence for the importance to distinguish the structural components of social capital (structural social capital) from its cognitive components (cognitive social capital). Structural social capital refers to presence of community linkages, while cognitive social capital refers to the appreciation of these community linkages in terms of trust, mutual help, and reciprocity (41). Research showed that the two components have different relationships with mental health outcomes: Cognitive social capital showed to be consistently salutary for mental health outcomes, whereas results for structural social capital are more ambiguous (16, 43). High structural social capital was generally found to be associated with better mental health (e.g. Refs. 16, 43), but was sometimes found to be associated with poorer mental health, and again other studies found no associations of structural social capital with mental health (10, 43). This study distinguishes between structural and cognitive social capital. The SA-SCAT has the pretence to measure social capital at the individual level.

In practice the SA-SCAT is often somewhat modified to the local context (16, 42). In this study some items of the SA-SCAT [version from (16)] were adapted to improve the relevance for the local context (see below). The adaptations were based on lessons learned from a similar previous study on a flood in Tewkesbury, UK, by the same authors (data unpublished). The SA-SCAT in our study comprised 15 questions that measure aspects of Structural Social Capital (eight items) as well as Cognitive Social Capital [7 items; (41, 42)].

Structural capital that refers to the presence of community linkages was measured by eight items that assess the frequency of interaction between community members. Example items are: 'During the last 12 months, have you joined together with other members of the community to address a problem or common issue?' and 'In the last 12 months, have you talked with a local authority or governmental organization about problems in this community?' The questions were answered on a 4-point scale from 1 = 'no' to 4 = 'yes, often.' In the structural social capital scale, we omitted the question on the number of groups one participates, as we could not aggregate the answer to this question to the questions on structural social capital about the frequency of interaction between community members. Further, the question on 'general

social support' was omitted because the topic of this question was deemed redundant as it was more specifically covered by another scale for assessment of emotional, instrumental, and informational support. Finally the question on material and economic support was combined in one question. Respondents indicated that they could not distinguish well between received financial and material support because most of the economic and material flood damage was directly reimbursed by the insurance to the relevant contractors. The Cronbach's alpha of Structural Social Capital was .74.

Cognitive social capital that refers to the appreciation of these community linkages in terms of trust, mutual help, and reciprocity was measured by seven statements about the community one lives in. For example: 'Do the majority of the people in this community generally get along with each other?' and 'Do you think that a majority of the people in the community would take advantage of you if they got the chance?' The questions could be answered on a 4-point scale from 1 = 'not at all' to 4 = 'completely.' The Cronbach's alpha of Cognitive Social Capital was .76.

Data analysis

We first examine the demographic characteristics with SPSS 16.0.

We estimated the association of the individual perception of social capital with mental health outcomes with a multi-step procedure. The relationships between social capital and individual characteristics with mental health outcomes were estimated with regression analyses for social capital and individual characteristics separately. The estimates of social capital from these analyses refer to the 'total association' of social capital and mental health outcomes (44).

Second, we defined social capital as 'the resources an individual can draw on through his or her social networks and the value ascribed to these resources by the individual.' Social networks are the province of the community and are thus by definition more distally related to individual mental health outcomes than individual characteristics (5). To account for this so called 'unequal proximity problem' (45), we conducted hierarchical linear regression analyses in which we included the proximal individual characteristics in step 1 and added the relatively distal components of social capital and in step 2. The estimates of social capital from these analyses refer to the 'direct association' of social capital and mental health outcomes (44). Regression analyses were conducted in SPSS 16.0.

Third, we analyze the 'indirect association' of social capital via individual characteristics. (44) To examine the indirect associations of the two components of social capital via the individual characteristics we conducted a path analysis with LISREL 8.0 in which the two

components of social capital were included as moderators on the relationship between the individual variables and mental health outcomes. The LISREL estimates (e.g. structural relationships) from the path analyses are comparable with β -values from the linear regression analyses.

The total association is the sum of the direct association and indirect association. To prevent multi-collinearity, the continuous variables were standardized.

Results

Ninety respondents refused to participate in the survey. Despite migration of some residents as their houses were still not livable (41 respondents), and absence of household members at the time of study (390 respondents), we were able to administer the interview to 236 respondents (31.2%). The demographics of the sample are depicted in Table 1. The final sample ($n=231$) consisted of mainly female (60.8%), 65+ of age (57.4%), and religious (94.9%); marital status/education/employment were

Table 1. Demographic characteristics of the study sample

	Frequency (percentage)
Gender	
Male	90 (38.8)
Female	141 (60.8)
Age group	
<18	1 (0.5)
18–24	5 (2.7)
25–39	17 (9.0)
40–64	57 (42.6)
>65	108 (57.4)
Religion	
Religious	197 (94.9)
None	34 (14.7)
Marital status	
Married	83 (35.8)
Single	40 (17.2)
Separated	6 (2.6)
Divorced	23 (9.9)
Widowed	73 (31.5)
Common law	6 (2.6)
Education	
<High school	93 (40.1)
High school	58 (25.0)
Some college	13 (5.6)
College or post-graduate	51 (22.0)
Work	
Employed	75 (32.3)
Seeking work	12 (5.2)
Carer or looking after children/house	9 (3.9)
Student or on training scheme	2 (0.9)
Retired	133 (57.3)

more spread with larger groups being married (31.5%) or widowed (31.5%), <high school (40.1%) and college or postgraduate (22.0%), employed (32.3%) or retired (57.3%).

Total associations

In the regression analyses with only Cognitive and Structural Social Capital as predictors for the mental health outcomes, the adjusted R^2 was .18 ($p < .001$) for Posttraumatic Disorder ($\beta = .21$; $p < .01$ for Structural Social Capital, and $\beta = -.39$; $p < .001$ for Cognitive Social Capital), .10 ($p < .001$) for Anxiety ($\beta = .22$; $p < .01$ for Structural Social Capital, and $\beta = -.26$; $p < .001$ for Cognitive Social Capital), and .17 ($p < .001$) for Depression ($\beta = .20$; $p < .01$ for Structural Social Capital, and $\beta = -.38$; $p < .001$ for Cognitive Social Capital).

In the regression analyses with individual characteristics as predictors for the mental health outcomes, the adjusted R^2 for the individual characteristics was .18 ($p < .001$) for Posttraumatic Disorder ($\beta = .16$; $p < .05$ for Property Loss, and $\beta = .32$; $p < .001$ for Coping Intensity), .22 ($p < .001$) for Anxiety ($\beta = .16$; $p < .05$ for Property Loss, $\beta = .19$; $p < .05$ for Primary Appraisal, $\beta = .30$; $p < .001$ for Coping Intensity, and $\beta = -.20$; $p < .01$ for Social Support), and .23 ($p < .001$) for Depression ($\beta = .19$; $p < .05$ for Property Loss, $\beta = .26$; $p < .001$ for Coping Intensity, and $\beta = -.17$; $p < .05$ for Social Support).

Direct associations

The hierarchical linear regression analyses with the individual characteristics as predictors of mental health outcomes in step 1 and Cognitive and Structural Social Capital as predictors in step 2 revealed a substantial decrease of the explained variance of both components of social capital. The ΔR^2 of social capital in addition to individual characteristics was for .06 ($p < .001$) for Posttraumatic Disorder, .03 ($p < .001$) for Anxiety, and .06 ($p < .001$) for Depression. The results of the regression analyses are depicted in Table 2.

Cognitive social capital

Cognitive social capital remained significantly related to all three mental health outcomes beyond the individual characteristics ($\beta = -.28$; $p < .001$ for Posttraumatic Stress Disorder; $\beta = -.13$; $p < .001$ for Anxiety; and $\beta = -.26$; $p < .001$ for Depression). Structural Social Capital remained positively related to Anxiety beyond the individual characteristics ($\beta = .13$; $p < .01$). Among the individual characteristics, Coping Intensity was positively associated to all four mental health outcomes ($\beta = .26$; $p < .001$ for Posttraumatic Stress Disorder; $\beta = .26$; $p < .001$ for Anxiety; and $\beta = .20$; $p < .01$ for Depression). Social support was negatively associated to

Table 2. Independent predictors for mental health outcomes, expressed in adjusted *R* squares and Betas

	Posttraumatic stress disorder			Anxiety			Depression		
	Social capital model	Individual characteristics model	Combined model	Social capital model	Individual characteristics model	Combined model	Social capital model	Individual characteristics model	Combined model
<i>R</i> ²	.18	.18	.26	.10	.22	.25	.17	.23	.29
	<i>β</i>	<i>β</i>	<i>β</i>	<i>β</i>	<i>β</i>	<i>β</i>	<i>β</i>	<i>β</i>	<i>β</i>
<i>Individual characteristics</i>									
<i>Demographics</i>									
Gender		.06	.07		-.01	-.01		-.02	-.02
Age		.05	.01		.08	.07		.12*	.09
Education		.06	.07		-.01	-.02		-.03	-.02
<i>Disaster related</i>									
Displaced		-.04	-.05		.00	-.01		-.00	-.01
Property loss		.16*	.09		.16*	.10		.19*	.11
Primary appraisal		.05	.07		.19*	.19*		.09	.11
Secondary appraisal		.12	.09		.03	.05		.06	.03
Coping Intensity		.32***	.26***		.30***	.26***		.26***	.20**
Social support		-.12	-.13		-.20**	-.22**		-.17*	-.17**
ΔR^2			.20			.22			.23
<i>Social capital</i>									
Structural social capital	.21**		.09	.22**		.13*	.20**		.11
Cognitive social capital	-.39***		-.28***	-.26***		-.13*	-.38***		-.26***
ΔR^2			.06			.03			.06

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

Anxiety ($\beta = -.20$; $p < .01$) and Depression ($\beta = -.17$; $p < .01$). Primary appraisal was positively associated to Anxiety ($\beta = .19$; $p < .05$). The results of the regression analyses are depicted in Table 2.

Indirect associations

The path analyses revealed that the indirect effect of Cognitive Social Capital on PTSD was $-.10$ ($p < .01$), on Anxiety was $-.10$ ($p < .01$), on Depression was $-.09$ ($p < .01$). The indirect effect of Structural Social Capital on PTSD was $.10$ ($p < .01$), on Anxiety was $.09$ ($p < .01$), on Depression was $.09$ ($p < .01$). The results of the path analyses are depicted in Table 3. The path analyses further revealed that Cognitive Social Capital was indirectly related to the three mental health outcomes via Property Loss, Primary Appraisal, Secondary Appraisal, Social Support, and Coping Intensity (data not shown). Structural Social Capital was indirectly related to the three mental health outcomes via Property Loss and Coping Intensity (data not shown).

Discussion

The aim of this study was to examine the relationships of the individual perception of social capital with disaster mental health outcomes in combination with individual factors that have found to mediate the impact of trauma on mental health (2, 20, 21).

The findings revealed that a considerable part of the association between both components of social capital and mental health is exerted through individual appraisal processes (i.e. property loss, primary and secondary appraisal), social support, and coping behavior. The inclusion of individual characteristics in our analyses partly veiled the relationship between social capital and mental health outcomes. Nonetheless, cognitive social capital remained consistently related to lower mental health problems. But, structural social capital was only associated to experiencing more anxiety and not to PTSD or depression.

The inclusion or exclusion of these individual characteristics may partly explain mixed results on the association between structural social capital and mental

health outcomes across previous studies thus far (1, 16, 43): As in our study the inclusion of individual characteristics may have shrouded the association between structural social capital and mental health. The findings further concur with previous studies that found the cognitive component of social capital to be consistently negatively related to mental illnesses, and the structural social capital revealed to have ambiguous associations with illnesses (16, 43, 46). The positive association between structural social capital and anxiety confirms the ideas of several scholars (11, 47) that tight-knit social structures may not always lead to better mental health outcomes. And indeed, structural social capital showed to have a ‘dark side’ for feelings of anxiety in disaster situations (cf. 47, 48).

We found that while feelings of cohesiveness (i.e. cognitive social capital) may protect especially against depressive illness, participation in social structures (i.e. structural social capital) may be associated with an excess of anxiety disorders (cf. 48). This distinct pattern of association across mental health outcomes may be another reason for inconsistent associations of social capital with mental illnesses across studies (43). Several processes may explain the distinct pattern of relations of the two components with anxiety and depression. Whereas depressed individuals symptomatically avoid structural involvement in social networks, anxious people may seek reassurance for their anxious feelings and thoughts. As a result, those individuals who show the greatest anxiety may have a larger network (i.e. higher structural social capital) to address their needs (11, 19, 47). Paradoxically, especially in a disaster situation intimate social involvements within one’s network may predispose individuals to the ‘contagion of stress’ (cf. 49) when stressful life events afflict those whom they feel emotionally close (11). This may lead to increased feelings of anxiety.

The tenet that the relatively ‘weak’ ties consisting of involvement in community, voluntary, and religious organizations (i.e. social capital) afford the opportunity to establish one-on-one interactions necessary for social support and certain coping strategies (11, 19) was

Table 3. Total, direct, and indirect effects of structural and cognitive social capital on mental health outcomes

	Posttraumatic stress disorder		Anxiety		Depression	
	Cognitive social capital	Structural social capital	Cognitive social capital	Structural social capital	Cognitive social capital	Structural social capital
Total effect	-.38**	.20**	-.23**	.23**	-.35**	.20**
Direct effect	-.28**	.09**	-.13**	.13**	-.26**	.11**
Indirect effect	-.10**	.10**	-.10**	.09**	-.09**	.09**

Note: Values are estimates from the statistical software LISREL 8.0.

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

supported in our study. Contingent on cognitive social capital, the beneficial value of social support increased for PTSD and anxiety. Social support in itself was negatively related to mental health problems, as consistently found in the literature (22–24). Further, the relationship between coping intensity and mental health problems was also moderated by both components of social capital. The employment of a variety of coping behaviors (coping intensity) *per se* was associated to worse mental health outcomes. Through coping strategies, people either attempt to change the stressful reality or to regulate their emotional reactions (2, 11, 19). It follows that individuals with higher mental health problems will employ more coping behavior to address these emotional reactions, and the association between coping intensity and mental health problems is therefore likely to be reciprocal (43). Perceptions of higher trust and mutual help (i.e. cognitive social capital) decreased the negative relationship between coping intensity and mental health outcomes.

The study has several potential limitations. First, the cross-sectional design did not allow for the establishment of a causal relationship between social capital and disaster mental health (50). Second, the non-response due to refusal and especially absence was considerable. As a result our sample may not be representative for the flood-affected population in Morpeth.

How can we translate our findings into implications for interventions? The study found evidence for the importance of individual factors and for the relevance of the individual perception of environmental factors for disaster mental health outcomes. *Vis-à-vis* the environmental factors, we distinguished the cognitive and structural components of social capital, and found a salutary effect of cognitive social capital for mental health. Taken together, the individual oriented stress reducing interventions that use appraisal processes, social support, and coping as starting points could be more effective by taking into account the subjective experience of the social context in terms of trust and feelings of mutual support and reciprocity in a community. Psychosocial interventions are tailored to establish such trust and feelings of mutual support and reciprocity in a community. Thus, the findings indicate that affected people may especially benefit from a combination of individual stress reducing interventions and psychosocial interventions that foster cognitive social capital. Work remains to be carried out, however, in elucidating the specific individual causal mechanisms by which components of social capital lead to the maintenance, improvement, or deterioration of different mental health outcomes. Structural modeling with longitudinal data may offer solace to reveal such mechanisms.

Conflict of interest and funding

The authors declare no conflict of interest. The study was supported by the MICRODIS project and funded by the European Commission under the 6th Framework Programme (036877-2).

References

1. Kawachi I, Subramanian SV. Measuring and modeling the social and geographic context of trauma: a multilevel modeling approach. *J Trauma Stress* 2006; 19: 195–203.
2. Lazarus RS. Coping theory and research: past, present, and future. *Psychosom Med* 1993; 55: 234–47.
3. Priebe S, Grappasonni I, Mai M, Dewey M, Petrelli F, Costa A. Mental disorders, psychological symptoms and quality of life 8 years after an earthquake: findings from a community sample in Italy. *Soc Psychiat Epidemiol* 2010; 32: 76–83.
4. Galea S, Tracy M, Norris F, Coffey SF. Financial and social circumstances and the incidence and course of PTSD in Mississippi during the first two years after hurricane Katrina. *J Trauma Stress* 2008; 21: 357–68.
5. Hamano T, Fujisawa Y, Ishida Y, Subramanian SV, Kawachi I, Shiwaku K. Social capital and mental health in Japan: a multilevel analysis. *PLoS One* 2010; 5: e13214.
6. Kawachi I, Kennedy BP, Lochner K, Prothrow-Stith D. Social capital, income inequality, and mortality. *Am J Public Health* 1997; 87: 1491–8.
7. Baum F. Social capital: is it good for your health? Issues for a public health agenda. *J Epidemiol Community Health* 1999; 53: 195–6.
8. Field J. *Social capital*. London: Routledge; 2003.
9. Bourdieu P. The forms of capital. In: Richardson J, ed. *Handbook of theory and research in the sociology of education*. New York: Greenwood Press; 1986, 241–58.
10. Hurtado D, Kawachi I, Sudarsky J. Social capital and self-rated health in Colombia: the good, the bad and the ugly. *Soc Sci Med* 2011; 72: 584–90.
11. Kawachi I, Berkman LF. Social ties and mental health. *J Urban Health* 2001; 78: 458–67.
12. Hobfoll SE, Watson P, Bell CC, Bryant RA, Brymer MJ, Friedman MJ, et al. Five essential elements of immediate and mid-term mass trauma intervention: empirical evidence. *Psychiatry* 2007; 70: 283–315.
13. Najarian LM, Goejian AK, Pelcovitz D, Mandel F, Najarian B. The effect of relocation after a natural disaster. *J Trauma Stress* 2002; 14: 511–26.
14. de Jong JT, Komproe IH, Van Ommeren M. Common mental disorders in postconflict settings. *Lancet* 2003; 361: 2128–30.
15. Norris FH, Stevens SP, Pfefferbaum B, Wyche KF, Pfefferbaum RL. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *Am J Community Psychol* 2008; 41: 127–50.
16. De Silva MJ, Huttly SR, Harpham T, Kenward MG. Social capital and mental health: a comparative analysis of four low income countries. *Soc Sci Med* 2007; 64: 5–20.
17. Kawachi I. Commentary: social capital and health: making the connections one step at a time. *Int J Epidemiol* 2006; 35: 989–93.
18. McKenzie K, Whitley R, Weich S. Social capital and mental health. *Br J Psychiatry* 2003; 181: 280–3.
19. Lin N, Ye X, Ensel WM. Social support and depressed mood: a structural analysis. *J Health Soc Behav* 1999; 40: 344–59.

20. Lazarus RS, Folkman S. *Stress, appraisal, and coping*. New York: Springer; 1984.
21. Norris FH, Kaniasty K. Received and perceived social support in times of stress: a test of the social support deterioration deterrence model. *J Pers Soc Psychol* 1999; 71: 498–511.
22. Punamäki RL, Komproe I, Qouta S, El-Masri M, de Jong JT. The deterioration and mobilization effects of trauma on social support: childhood maltreatment and adulthood military violence in a Palestinian community sample. *Child Abuse Negl* 2005; 29: 351–73.
23. Gibbs MS. Factors in the victim that mediate between disaster and psychopathology: a review. *J Trauma Stress* 1989; 2: 489–514.
24. Norris FH, Baker CK, Murphy AD, Kaniasty K. Social support mobilization and deterioration after Mexico's 1999 flood: effects of context, gender, and time. *Am J Community Psychol* 2005; 36: 15–28.
25. Bokszczanin A. The role of coping strategies and social support in adolescent's well-being after a flood. *Polish Psychological Bull* 2003; 34: 67–72.
26. Bokszczanin A, Kaniasty K. The impact of 1977 flood on children and adolescent symptoms of PTSD, depression and loneliness. The role of coping strategies. *Studia Psychologiczne* 2002; 40: 21–39.
27. Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak: part I: an empirical review of the empirical literature, 1981–2001. *Psychiatry* 2002; 65: 240–60.
28. Norris FH. Psychosocial consequences of disasters. *PTSD Res Q* 2002; 13: 1–7.
29. Charuvastra A, Cloitre M. Social bonds and posttraumatic stress disorder. *Annu Rev Psychol* 2008; 59: 301–28.
30. Brown GW, Harris TO. *Social origins of depression: a study of psychiatric disorder in women*. London: Tavistock; 1978.
31. Kawachi I, Subramanian SV, Kim D. Social capital and health: a decade of progress and beyond. In: Kawachi I, Subramanian SV, Kim D, eds. *Social capital and health*. New York: Springer; 2008, pp. 1–26.
32. Government Office of the North East. *Local authority area profile, Castle Morpeth, 2007*. Available from: http://www.gos.gov.uk/nestore/docs/ourregion/laps/castle_morpeth.pdf
33. 48th World Medical Assembly. *Declaration of Helsinki: recommendations guiding physicians in biomedical research involving human subjects*. *JAMA* 1997; 277: 925–6.
34. Derogatis LR, Lipman RS, Rickels K, Uhlenhuth EH, Vovi L. The Hopkins Symptom Checklist (HSCL): a self-report symptom inventory. *Behav Sci* 1974; 19: 1–15.
35. Weathers F.W., Litz B.T., Herman D.S., Huska J.A., Keane T.M. The PTSD Checklist (PCL): reliability, validity, and diagnostic utility. Paper presented at the 9th Annual Meeting of the International Society for Traumatic Stress Studies, San Antonio, Texas; 1993, 24–7.
36. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders IV-TR*. Washington, DC: American Psychiatric Association; 2000.
37. Sandler I. Quality and ecology of adversity as common mechanisms of risk and resilience. *Am J Community Psychol* 2001; 29: 19–61.
38. Punamäki R-L, Salo J, Komproe I, Qouta S, El-Masri M, De Jong JTVM. Dispositional and situational coping and mental health among Palestinian political ex-prisoners. *Anxiety, Stress & Coping* 2008; 21: 337–58.
39. Mattlin JA, Wethington E, Kessler RE. Situational determinants of coping and coping effectiveness. *J Health Soc Behav* 1990; 31: 103–22.
40. Harper R, Kelly M. *Measuring social capital in the United Kingdom*. London: Office for National Statistics; 2003.
41. Harpham T, Grant E, Thomas E. Measuring social capital within health surveys: key issues. *Health Policy Plann* 2002; 17: 106–11.
42. Tuan T, Harpham T, Huong NT, De Silva M, Huong VTT, Long TT, et al. *Measuring social capital and mental health in Vietnam: a validity study*; 2005. Available from: <http://www.younglives.org.uk>
43. De Silva MJ, McKenzie K, Harpham T, Huttly SR. Social capital and mental illness: a systematic review. *J Epidemiol Community Health* 2005; 59: 619–27.
44. Jöreskog K, Sörbom D. *Lisrel 8: structural equation modelling with the SIMPLIS command language*. Chicago, IL: Scientific Software International; 1993.
45. Weitkunat R, Wildner M. Exploratory causal modeling in epidemiology: are all factors created equal? *J Clin Epidemiol* 2002; 55: 436–44.
46. Yen IH, Syme SL. The social environment and health: a discussion of the epidemiologic literature. *Annu Rev Public Health* 1999; 20: 287–308.
47. Portes A. Social capital: its origins and applications in modern sociology. *Annu Rev Sociol* 1998; 24: 1–24.
48. Ross CE, Reynolds J, Geis K. The contingent meaning of neighbourhood stability for residents psychological well-being. *Am Sociol Rev* 2000; 65: 581–97.
49. Barrera M. Models of social support and life stress: beyond the buffering hypothesis. In: Cohen LH, ed. *Life events and psychological functioning*. Newbury Park, CA: Sage Publications; 1989, 211–36.
50. Dietz RD. The estimation of neighborhood effects in the social sciences: an interdisciplinary approach. *Soc Sci Res* 2002; 31: 539–75.

***Tim R. Wind**

Department of Research and Development
 HealthNet TPO
 NL-1074VJ Amsterdam, the Netherlands
 Tel: +3120 620005
 Fax: +3120 4201503
 Email: twind@healthnettpo.org