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Helena Bakić

THE ROLE OF INDIVIDUAL AND COMMUNITY RESOURCES IN THE RESILIENCE PROCESS AFTER A NATURAL DISASTER

DOCTORAL THESIS

Zagreb, 2021



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DOCTORAL THESIS

Supervisor:
dr. sc. Dean Ajduković, prof. emeritus

Zagreb, 2021



Sveučilište u Zagrebu

Filozofski fakultet

Helena Bakić

ULOGA INDIVIDUALNIH RESURSA I RESURSA ZAJEDNICE U PROCESU OTPORNOSTI NAKON PRIRODNE KATASTROFE

DOKTORSKI RAD

Mentor:
dr. sc. Dean Ajduković, prof. emeritus

Zagreb, 2021

About the supervisor

Dean Ajduković is Professor Emeritus at the Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia where he spent most of his career. He received Ph.D. in psychology from the University of Zagreb (1983), was a Fulbright Senior Scholar at the University of California in Berkeley and Visiting Professor at the University of Denver. His research, teaching and practice include research methodology, intergroup relations in post-conflict settings, psychotraumatology, psychosocial care in disasters, prevention of interpersonal violence, development and evaluation of community-based interventions. He currently teaches at two doctoral programs at the University of Zagreb. He has published over 170 scientific and professional papers in peer-reviewed journals and book chapters, authored 7 and edited 12 books, and is among the most cited authors in Croatian psychology. He lectured in a number of centres of excellence in the US and Europe and directed over 30 research and applied projects and served in several internationally and EU funded projects as co-PI. He has developed and implemented numerous informal training programs for over 6000 care provider throughout the country and abroad. He continues to serve as a reviewer for a dozen leading international journals. He has been a consultant for international organizations in countries affected by conflict such as Bosnia and Herzegovina, Macedonia, Kosovo, Albania, Russia, Georgia, Azerbaijan, Ingushetia, Ukraine, Tajikistan, Colombia. He organized several major European professional conferences and was a member of numerous international conference program committees. He is past president (1993-2013) of the Society for Psychological Assistance (SPA), member of the Council of the International Society for Health and Human Rights (ISHHR, 1998-2011); president (2003-2005) and board member (1997-2007, 2015-) of the European Society for Traumatic Stress Studies (ESTSS). Currently, he is president of the Croatian Society for Traumatic Stress (CSTS) and Chair the Board of the European Network for Work with Perpetrators (WWP EN). For professional accomplishments he was awarded National Award for Science (2006), Fiat Psychologia Award for the advancement of applied psychology (2007), Wolter de Loos Award (2011) for outstanding contribution to European psychotraumatology, and the Croatian Psychological Association Lifetime Achievement Award (2019).

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Abstract

Disasters have a long-term negative impact on the mental health and well-being of individuals, communities and societies. However, a significant number of survivors feel only minimal effects or recover quickly. This dissertation aimed to examine how individuals and communities affected by a disaster exhibit resilience, that is, maintain and recover mental health and well-being and positively adapt in the situation of high risk. We examined the role of the individual, interpersonal, and community resources in mitigating psychosocial resource loss and protecting against symptoms of posttraumatic (PTS) stress and depression and decrease in life satisfaction in differentially exposed communities. We further examined the relationship of the directly measured, longitudinal change in resources to positive adaptation.

The two studies were conducted in the aftermath of the 2014 floods. One and a half years after the disaster (T1) we interviewed 224 residents of the most affected municipality in Croatia ("affected community") and 224 residents of a similar, but not flooded community ("comparison community"). Two and a half years after the disaster (T2) we reinterviewed 155 residents of the affected community. Interviews were conducted with the Connor-Davidson Resilience Scale 10-item version, the Multidimensional Scale of Perceived Social Support, the Community Resources Scale – the Social Capital and Community Engagement subscale, the PTSD Checklist for DSM-5, the Center for Epidemiological Studies Depression Scale-Revised and the Satisfaction with Life Scale.

At T1, the prevalence of probable PTSD and depression in the affected community was 32.7% and 35.4%, respectively, and in the comparison community 21.9% and 23.7%. At T2, the prevalence in the affected community decreased to 17.9% for PTSD and 18.4% for depression. Community members with stronger individual, interpersonal and community resources were more likely to experience less psychosocial resource loss, and through that, fewer symptoms of PTS and depression and greater life satisfaction. These relationships were stronger in the affected community, particularly for interpersonal resources and community social capital and engagement. Furthermore, intraindividual change in resources between T1 and T2 was related to a change in the level of positive adaptation in the affected community. Our results indicate that disaster resilience is primarily embedded in the social environment of the community. Psychosocial interventions in the aftermath of disasters should primarily aim to strengthen family and community ties.

Key words: resilience, natural disasters, Conservation of Resources theory, community resilience, resource loss, resource gain.

Sažetak

Uvod

Prirodne katastrofe i u suvremenom svijetu imaju brojne i teške posljedice. U prosjeku, svaki dan u godini dogodi se jedna katastrofa te je godišnje katastrofama pogođeno oko 200 milijuna ljudi. Pojedinci i zajednice pogođeni katastrofama proživljavaju niz visoko stresnih i potencijalno traumatskih događaja te nagle i dugotrajne promjene u dotadašnjem načinu života. Prethodna istraživanja su pokazala kako katastrofe dovode do niza negativnih ishoda koji mogu uključivati specifične probleme mentalnog zdravlja; nespecifični distres, poput psihosomatskih tegoba; kronične poteškoće življenja, kao što su interpersonalni i financijski stres, gubitak psiholoških resursa; kao i poteškoće specifične za djecu i mlade, poput pretjerane zavisnosti, inkontinencije ili delinkvencije. Ove posljedice za neke pogođene mogu trajati i desetljećima nakon katastrofe. No, velik broj pogođenih osjeća tek minimalne ili prolazne posljedice katastrofa po mentalno zdravlje i psihološko dobrostanje. Stoga, važno je znati koji čimbenici pojedincima i zajednicama olakšavaju nošenje s posljedicama te kako se odvijaju procesi oporavka nakon katastrofa.

Psihološka otpornost obično se definira kao dinamičan proces prilagodbe u uvjetima visokog rizika. Prema Teoriji očuvanja resursa, psihološki stres je rezultat prijetnje gubitka resursa, njihovog stvarnog gubitka ili nedostatka dobitka resursa po ulaganju resursa. Stoga, pozitivna prilagodba u uvjetima visokog rizika ovisit će o dinamičnim svojstvima resursa, njihovoj robusnosti (*eng. robustness*), nadomjestivosti (*eng. redundancy*) i brzini aktivacije (*eng. rapidity*). Resursi su robusni ako mogu izdržati nedaće bez da se iscrpe; nadomjestivi su ako su raznoliki te ako se nedostatak jednog resursa može nadopuniti drugim; a brzi su ako im se može brzo pristupiti i iskoristiti tijekom izloženosti rizicima. Istraživanje resursa, njihovog značaja za pozitivnu adaptaciju te njihovih osobina jedan je od presudnih zadataka u istraživanjima otpornosti.

Prethodna istraživanja uglavnom su se bavila ispitivanjem resursa koji povećavaju vjerojatnost dobrog funkcioniranja nakon katastrofe, i to najčešće na razini pojedinca. Djeca, starije odrasle osobe, žene, pripadnici rasnih i etničkih manjina, osobe izložene prethodnim traumatskim događajima i snažnije izložene katastrofi izložene su većem riziku od negativnih posljedica. Nadalje, niz stabilnijih psiholoških osobina i osobina ličnosti pokazale su se povezane s razinom prilagodne nakon katastrofe, uključujući "otpornost ega", neuroticizam, psihološku percepciju kontrole, samo-efikasnost, ruminiranje, samopoštovanje, kognitivna

fleksibilnost, pozitivnu emocionalnost i ekstraverziju. Istraživanja resursa na višim razinama ekoloških sustava puno su rjeđa. Od kontekstualnih resursa, najviše istraživanja se bavilo ulogom percepcije socijalne podrške koja se pokazala kao snažan zaštitan faktor.

Dosadašnja istraživanja otpornosti nakon katastrofa imaju nekoliko nedostataka. Iako se brojni istraživači slažu da je za otpornost nakon katastrofa važna i šira okolina, istraživanja resursa zajednice i dalje su rijetka. Fizička, ekonomska i socijalna okolina može pridonijeti ili otežati prilagodbu članova zajednice nakon katastrofe. Zatim, iako istraživanja pokazuju snažnu povezanost gubitka resursa i lošijih ishoda nakon katastrofa, malo se zna o procesima koji su povezani sa smanjivanjem ovog gubitka. Također, većina istraživanja posljedica katastrofa provodi se samo u jednoj vremenskoj točki, te samo u zajednici pogođenoj katastrofom, bez usporedbe sa sličnom, nepogođenom zajednicom. Iako istraživanja provedena samo na pogođenoj zajednici mogu pružiti uvid u to koji su resursi važni za pozitivnu prilagodbu, takvim nacrtom ne može se utvrditi koliko se brzo zajednica oporavlja od negativnih utjecaja katastrofe. Posebno je važno, ali još neistraženo, pitanje brzine oporavka resursa pogođene zajednice na razinu koja bi se očekivala da se nije dogodila katastrofa. Ovo se može utvrditi tek usporedbom pogođene zajednice i slične, ali nepogođene zajednice. Također, budući da se otpornost definira kao proces koji se događa kada postoji prijetnja, teorijski je važno pitanje postoje li resursi koji snažnije doprinose dobrom funkcioniranju u slučaju katastrofe, nego u uobičajenim situacijama.

Cilj i metoda

Cilj ove disertacije bio je ispitati ulogu nekih čimbenika u procesu prilagodbe na prirodnu katastrofu. Konkretno, ispitali smo ulogu individualnih i interpersonalnih resursa te resursa zajednice u smanjivanju gubitka psiholoških resursa te u smanjenju razine simptoma post-traumatskog stresa (PTS) i depresije te smanjenju zadovoljstva životom u dvije zajednice izložene različitom stupnju rizika. Nadalje, ispitali smo povezanost izravno izmjerene promjene u količini ovih resursa i pozitivne prilagodbe. Istraživanje je provedeno u kontekstu poplava u Vukovarsko-srijemskoj županiji u 2014. godini. Jednu i pol godinu nakon poplave (T1) intervjuirali smo 224 stanovnika najviše pogođene općine (“pogođena zajednica”) te 224 stanovnika slične, ali nepoplavljene općine (“usporedna zajednica”). Postotak odgovaranja u pogođenoj zajednici bio je 71% a u usporednoj zajednici 57.8%. Dvije i pol godine nakon katastrofe (T2) ponovno smo intervjuirali 155 stanovnika u pogođenoj zajednici. Stupanj osipanja iznosio je 30.5%. Sudionici su u uzorak odabrani po slučaju, na temelju popisa

kućanstva. Sudionici su mogli sudjelovati u istraživanju ukoliko su imali između 25 i 65 godina, ako su živjeli u mjestu barem 5 godina prije poplave, te ako su bili u mjestu na dan poplave. Za prikupljanje podataka o resursima korištene su Connor-Davidson skala individualne otpornosti, Skala karakteristika zajednica, Multidimenzionalna skala percipirane socijalne podrške, te modificirana Skala gubitka resursa. Za prikupljanje podataka o pozitivnoj prilagodbi korištene su Lista za procjenu PTSPa (PCL-5), Revidirana skala depresije Centra za epidemiološke studije (CESD-R), te Skala zadovoljstva životom (SWLS). Istraživanje je odobrilo Etičko povjerenstvo Odsjeka za psihologiju.

Rezultati i rasprava

Godinu i pol nakon poplave, prevalencija posttraumatskog stresnog poremećaja (PTSP) u pogođenoj zajednici iznosila je 32.4% za pripadnike većinske zajednice te 33.3% za pripadnike manjinske zajednice, te je bila statistički značajno viša nego u usporednoj zajednici (21.9%). Prevalencija depresije iznosila je 35.9% za pripadnike većine i 34.6% za pripadnike manjine u pogođenoj zajednici, što je ponovno bilo statistički značajno više nego u usporednoj zajednici (23.7%). Nije bilo razlike u prosječnoj razini individualnih i interpersonalnih resursa između dvije zajednice, no razina gubitka psihosocijalnih resursa, te razina resursa zajednice bila je statistički značajno niža u pogođenoj zajednici. Na razini cijelog uzorka, individualni i interpersonalni resursi bili su izravno povezani sa simptomima PTS i depresije te stupnjem zadovoljstva životom. Individualni resursi i resursi zajednice (te interpersonalni resursi u pogođenoj zajednici) bili su i neizravno povezani s mentalnim zdravljem i zadovoljstvom životom, preko smanjenja gubitka psihosocijalnih resursa. Nadalje, postojale su statistički značajne razlike u stupnju i snazi ovih veza između pogođene i usporedne zajednice. U usporednoj zajednici, individualni resursi bili su snažnije povezani sa simptomima PTS, interpersonalni resursi sa simptomima PTS i depresije, te zadovoljstvom životom, a socijalni kapital i uključenost zajednice sa zadovoljstvom životom. Ekonomska razvijenost i vodstvo bili su snažnije povezani s mjerenim ishodima u usporednoj zajednici. Dvije i pol godine nakon katastrofe prevalencije PTSP-a (17.9 %.) i depresije (18.4%) u pogođenoj zajednici značajno su se smanjile. No, nisu pronađene značajne promjene u razini individualnih i interpersonalnih resursa, te resursa zajednice. Uz statističku kontrolu drugih resursa, intrapersonalna promjena u individualnim resursima bila je značajno povezana s promjenom u zadovoljstvu životom, i bila je blizu statističke značajnosti za simptome PTS. Promjena u interpersonalnim resursima bila je statistički značajno povezana s promjenom u

svim ishodima, dok je promjena u resursima zajednice bila značajno povezana s promjenom u zadovoljstvu životom, no samo u modelu koji nije uključivao ostale resurse.

Rezultati ove disertacije ukazuju da katastrofe negativno utječu ne samo na mentalno zdravlje pojedinaca i zajednica, nego i na razinu resursa važnih za oporavak. No, također pokazuje kako se gubitak psiholoških resursa može nadomjestiti resursima na individualnoj razini, te pogotovo na interpersonalnoj razini te razini zajednice. Također, istraživanje pokazuje kako porast u razini resursa, naročito onih vezanih uz socijalno okruženje, može imat pozitivan učinak na mentalno zdravlje i zadovoljstvo životom. Ovi efekti osobito su snažni u pogođenoj zajednici. Stoga, psihološke intervencije nakon katastrofa trebale bi se prvenstveno usmjeriti na jačanje veza unutar obitelji i šire zajednice.

Ključne riječi: otpornost, prirodne katastrofe, Teorija očuvanja resursa, otpornost zajednice, gubitak resursa, porast resursa

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„The war was in the 90s, this was worse than the war. At least then we knew how to find shelter in our street. When the grenades were flying above us, we would turn off the electricity and all of that and took shelter. But this? Where could I have run, where? I stood at my window and called for help, there was nothing else to do."

(Woman from Gunja, Croatia)

Introduction

A period of heavy rainfall at the beginning and mid- May 2014 combined with the melting of the ice in the Alps led to the extreme rise in the water level of the Sava river in the east of Croatia, Bosnia and Herzegovina and Serbia. The amount of rainfall in some areas multiply exceeded the monthly average in only a couple of days, resulting in the Sava river levels reaching their historic maximum (DUZS, 2015). In Croatia, the defence and rescue mechanisms were activated on 15 May and numerous professional responders, including army and police forces, firefighters, civil protection units, and others were conducting the necessary operations (DUZS, 2015). Along the critical 210 km of the embankment, the local population was also involved in the response efforts. Community members, most of whom are farmers, self-organised and were reinforcing the embankment using farming vehicles and other available equipment. At some points of the embankment, the sandbags were piled up to one and a half meter above the water level as the river continued to spill over. Community members we interviewed, particularly from the non-flooded community, remembered the feeling of shared purpose and unity in those threatening times. Despite these lavish efforts, on 17 May at 14:55 and 15:12, the embarkment breached on two places east of a major town of Županja and soon partially or completely flooded three municipalities. In the hardest-hit municipality of Gunja, by the next morning, the water levels reached up to 4 meters (DUZS, 2015).

A full evacuation of the endangered population started after the breach and lasted until 20 May (DUZS, 2015). Emergency responders reported a significant number of people who initially refused evacuation, choosing instead to remain at the top floors of their houses. Community members recalled that the extent of the flooding greatly surpassed their expectations. Although close to a large river, the area did not face any significant flooding in about 80 years, so the dangers of the flooding were underestimated. Once they were able to see the water wave and were able to gauge the seriousness of the situation, the water levels

were rising so rapidly that they had no time to try and save some of their valuable possessions. Those that managed to evacuate often left with only the most necessary provisions. Those that stayed behind described a night spent in darkness, as the electricity was out, hearing the sound of gushing water and of drowning livestock. At the time of conducting this research, some community members were still reporting that the sound of rain brings back the anxiety and the fear of flooding. In total, over 13,000 people from flooded and endangered areas were evacuated (DUZS, 2015). Initially, most of them were placed in temporary mass accommodation. A significant number of them will have spent the next couple of months with family or relatives in the vicinity of their flooded homes. Some will have still lived in temporary container shelters built in the municipality of Gunja 2 years after that.

About a week after the flood the water levels started subsiding and sanitation efforts began. The first return to the flooded homes was a source of grief and stress for most of the community members. In a matter of hours, most people in Gunja suffered almost a complete loss of all their household items and cherished memories. The rebuilding efforts proved to be an additional source of stress for the community members. The government-led rebuilding programme offered two possibilities: either receiving monetary assistance towards the reconstruction of homes or entrusting the reconstruction or rebuilding of homes to the government where all of the costs would be covered. A large number of community members initially opted for the monetary assistance as they mistrusted the government programme (Vlašić, 2015). However, they soon realised that the awarded sums were insufficient to cover the extent of the damage and have thus experienced further financial loss. Further community strife was caused by the perceived injustice of the criteria for the rebuilding programme. Namely, homes were rebuilt according to the relative need, that is, the size of the home depended on the number of people who will reside in it and not on the previous size of the space. Some community members felt that loss was not equally experienced by all and that those who invested less in their homes prior to the flood, ended up better off than those who did. In 2020, almost 6 years after the flood, some court cases regarding the rebuilding programme were still pending and some estimate that about a third of the community moved out, likely because of the loss of employment opportunities exacerbated by the flood (Patković, 2020).

What is a disaster?

Mental health researchers see disasters first and foremost as potentially traumatic events. According to the American Psychiatric Association's (2013) *Diagnostic and statistical manual of mental disorders - DSM 5)*, traumatic events expose individuals to "actual or threatened death, serious injury, or sexual violence" (p. 217) either through direct exposure, witnessing the event, learning that it occurred to a family member of a close friend or by being repeatedly exposed to aversive details of the event through professional work. Disaster survivors are often exposed to these events – they get caught by a water wave or trapped in the face of incoming water, get burnt by the fire, lose their loved ones or witness bodily disfigurement. Not all disasters cause such effects, but they all have the potential to do so. Their destructive nature can be evidenced also in some illustrative definitions that are presented in Table 1.

What distinguishes disasters from other potentially traumatic events is their scale, their suddenness, the wide range of their consequences and their impact on the coping capacities of individuals and communities alike. First, disasters are collectively experienced. Unlike some other potentially traumatic events, such as traffic accidents, they affect a large number of people at the same time. Entire communities or even societies share damages and disruptions to their lives. Furthermore, they have a wide impact on both physical and social environment. They often destruct homes and important communal infrastructure, change the natural and economic environment and cause wide initial or prolonged unemployment and disruption of routine. At the same time, they disrupt community ties through displacement and community strife during the recovery process. For an event to be classified as a disaster, the extent of the damage needs to be such that the community cannot recover on its own – available community resources are seriously overwhelmed and outside help is needed. This is often also true for the affected individuals who can find themselves without anyone to turn to, given that their family and loved ones are also overwhelmed. Finally, unlike some other highly stressful conditions, such as living in chronic poverty, or potentially traumatic events, such as exposure to wars, disasters are usually acute. The warning period is usually no longer than a few days and the period of threat ends relatively quickly, followed by a long recovery. This dynamic of the unfolding of the massive stressor is likely to impact how individuals, communities and societies cope with the effects.

Table 1

A selection of definitions of disaster

Focused on…	Source (year)	Definition
Event	McFarlane & Norris (2006, p. 4)	Potentially traumatic event that is collectively experienced, has an acute onset, and is time delimited; disasters may be attributed to natural, technological, or human causes.
Physical and social impact	Australian Institute for Disaster Resilience (2021)	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.
	Fritz (1961, p. 651)	Basic disruption of the social context within which individuals and groups function.
Imbalance between needs and capacities	CRED (2021)	Situation or event, which overwhelms local capacity, necessitating a request to national or international level of external assistance.
	UNISDR (2009, p. 9)	A serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources.

The flooding in Croatia and neighbouring countries in May 2014 exhibited many of these characteristics. Community members reported fear and feeling life threat, particularly those who were stranded in the area when the water wave started approaching. Two community members in the villages close to the embankment breach lost their lives and some were injured or reported illnesses in the aftermath. The flooding was sudden and unexpected, highly destructive for individual and communal properties and affected almost all community members in the worst-hit municipalities. The extent of destruction was such that the Government of Croatia proclaimed the "state of catastrophe" for the first time in modern history (DUZS, 2015). The period of recovery lasted longer than the community members expected and was also followed by a degree of strife and unsatisfaction. These characteristics of the event had the potential to seriously affect the mental health and well-being of community members.

The consequences of disasters

In 2002, Norris and colleagues published a highly influential review of 20 years of research on disaster consequences (Norris et al., 2002). The review drew on results for 160 distinct samples of 60,000 survivors of 102 events in 29 countries. Six distinct categories of outcomes were found: (1) specific psychological problems, such as posttraumatic stress disorder (PTSD) and depression; (2) nonspecific distress, such as the elevation of psychological and psychosomatic symptoms; (3) (physical) health problems and concerns; (4) chronic problems in living, such as stressful life events, interpersonal relationships hardships and occupational and financial stress; (5) psychosocial resource loss; and (6) problems specific to youth, such as dependence, tantrums, incontinence or minor delinquency. All the samples were rated for the severity of the effects on a 4-point scale ranging from a minimal impairment, indicative of transient stress, to very severe impairment, indicating that over 50% of sample participants showed elevations in symptoms over non-patient norms. The results indicated that only 11% of samples showed minimal impairment, while 21% and 18% of samples showed severe or very severe levels of impairment.

Mental health indicators, such as PTSD, depression and anxiety, are still among the most commonly studied disaster consequences. One review found that the prevalence of PTSD one to two years after disasters varies between 5% and 60%, with the prevalence usually ranging between 30% and 40% for direct survivors (Galea et al., 2005). A meta-analysis of PTSD after floods found that approximately 16% of survivors met the criteria for the diagnosis within the first 6 months after the disaster and 11% met the criteria beyond that period (Chen & Liu, 2015). A recent review of 83 studies found that the prevalence of PTDS varied between 0% and approximately 71% and of depression between approximately 2% and 60%, with estimates for depression being higher than those for PTSD in studies that assessed both (Lowe et al., 2019). Another meta-analysis, that included only studies with pre-disaster data or with a comparison, non-affected group, showed that psychological distress and other psychiatric disorders were significantly and moderately increased after disasters (Beaglehole et al., 2018). Longitudinal studies showed that the increased prevalence of disorders and symptom elevations can last decades after the event (Bromet & Havenaar, 2007; Raker et al., 2019; Thoresen et al., 2019).

At the same time, a significant number of disaster survivors show only minimal effects of disasters or recover well and quick, thereby exhibiting “resilience”. A growing

body of research studies latent trajectories of outcomes after disasters through multiple measurement points. Several typical trajectories have been uncovered: (1) chronic dysfunction, characterised by continuously elevated symptoms and distress even years after disasters; (2) recovery, a pattern in which moderate to severe symptoms and distress gradually decline to baseline levels over the course of a couple of years; (4) delayed, characterised by initial low levels of symptoms and distress, followed by their increase; and (4) resilience, characterised by transient symptoms and distress during and immediately after the event and an otherwise continuous pattern of positive adjustment (Bonanno & Diminich, 2013). The resilient trajectory is well documented and usually the most commonly observed pattern of reactions after disasters: it can be witnessed, on average, in approximately 66% of survivors (Galatzer-Levy et al., 2018). An important question for research and practice is, therefore, what predicts psychosocial outcomes after disasters.

What predicts psychosocial outcomes after disasters?

Disaster outcomes are related to a combination of risk and protective factors, found in different levels of systemic levels: in the biological and psychological system, as those closest to the individual, but also social, built and natural environment (Ungar & Theron, 2020). Furthermore, these factors can exist before the disaster or can be found in the elements of disaster exposure and post-disaster reality. Numerous risk and protective factors have been previously studied in the context of disasters, and several taxonomies of the most important ones have been proposed, particularly as they pertain to children (Masten & Narayan, 2012; Ungar & Theron, 2020). At the same time, these studies have indicated that no single predictor shows the dominant influence on the post-disaster adaptation: that is, "resilient outcomes are predicted by an array of unique variables, with each exerting relatively small effects and each independently explaining a relatively small portion of the overall outcome variance" (Bonanno et al., 2015, p. 150). Furthermore, risk and protective factors can change over time as demands of the post-disaster environment change and as the accessibility of personal and environmental resources changes (Hobfoll, 1989, 2002). However, several groups of risk and resilience factors have been found to be related to outcomes of disasters, including some sociodemographic characteristics, previous exposure to traumatic events and disasters, social support, personality and other trait-like characteristics, the type and severity of exposure to disaster, resource loss, and certain community resources.

Sociodemographic characteristics

Age has been repeatedly found to be related to mental health and psychological outcomes of disasters. Children have been found to be at greater risk for serious health and psychological problems compared to adults (Norris et al., 2002), especially in the presence of other risk factors such as separation from caregivers and disruption of usual routine (Masten & Narayan, 2012). At the same time, older adults also face unique additional risks in disasters, caused by relative lack of mobility, dependence on help, and potential for deprivation and injury (Bonanno et al., 2010). Therefore, they are often found to be at greater risk of mental health disorders after disasters (Parker et al., 2016). Furthermore, the female gender is consistently found to be related to worse post-disaster outcomes, especially internalizing problems, such as PTSD and depression (Bonanno et al., 2010; Masten & Narayan, 2012; Norris et al., 2002). Some studies indicate that this might be due to greater subjective exposure to disaster (Goenjian et al., 2001). Race and ethnicity have also been found related to worse outcomes (Adams & Boscarino, 2005; Bonanno et al., 2006). However, some multivariate studies have found that this effect is fully explained by the relatively lower socioeconomic status of minority groups (Bonanno et al., 2007).

Pre-disaster exposure to trauma

Findings regarding the effect of pre-disaster exposure to trauma and post-disaster adaptation are mixed. Some studies indicated that such exposure increases the risk of poor mental health outcomes (Adams & Boscarino, 2006), decreases that risk (Knight et al., 2000) or is not related to post-disaster outcomes (Breslau et al., 2008). There are indications that the type and severity of previously experienced traumatic events play an important role. Prior experiences with the same type of a disaster have been found to be related to better mental health outcomes (Breslau et al., 2008), while experiencing other negative and stressful events was related to worse outcomes (Brooks et al., 2016). Prior exposure to a disaster may inoculate against further stress as the survivors are more familiar with nature, timing and recovery which helps with the coping efforts (Bonanno et al., 2010). However, if previous traumatic events have exhausted coping mechanisms and depleted available resources exposure to a disaster will likely lead to worse mental health outcomes. Hence, previous mental health symptoms and diagnosis are consistently related to worse post-disaster adaptation (Dirkzwager et al., 2006; Lowe et al., 2020).

Social support

Perceived social support has consistently been associated with better mental health - with fewer symptoms of depression and anxiety and a higher level of psychological well-being – in a wide variety of stressful conditions (Kawachi & Berkman, 2001). This is usually attributed to the change in the appraisal of the situation – when social support is available, the situation is perceived as less stressful. This has also been found in research in the aftermath of disasters: higher perceptions of social support have often been associated with better post-disaster adaptation (Bonanno et al., 2007; Kaniasty & Norris, 2008; Watanabe et al., 2004). However, longitudinal studies yielded mixed results on whether lower social support leads to the increased risk for mental health problems or that mental health problems undermine social support as research findings support both models (Kaniasty & Norris, 2008).

Personality and trait-like characteristics

The majority of research on resilience in adult populations has focused on finding important personal resources and characteristics of individuals associated with positive adaptation to stressful conditions. The origins of this line of inquiry can be seen in the work of Block and Block (1980) and the concept of "ego resilience" that encompasses traits that reflect general resourcefulness and "sturdiness" of character as well as adaptability to new situations. Since then, numerous personality traits and trait-like characteristics have been found to be related to mental health and psychosocial adaptation in risk, including neuroticism, psychological sense of control, self-efficacy, tendency to ruminate, trait self-enhancement, cognitive flexibility, hardiness, positive emotionality, and extraversion (for reviews see e.g. Bonanno et al., 2010, 2015; Fletcher & Sarkar, 2013).

Individual traits that are most commonly explored in the context of disasters originate from Connor and Davidson (2003) conceptualization of resilience. These authors explored several trait-like characteristics related to positive adaptation in the context of adversity: the notion of personal competence, high standards, and tenacity; trust in one's instincts, tolerance of negative affect, and strengthening effects of stress; positive acceptance of change and secure relationships; a sense of control, and spirituality. These characteristics predicted lower symptoms of PTSD, depression, and post-earthquake anxiety (Ahmad et al., 2010; Ying et al., 2014), tsunamis (Irmansyah et al., 2010), and industrial accidents (Ghisi et al., 2013). Also, in studies conducted with war veterans, a distinction was made between veterans diagnosed with PTSD and those who did not (Green et al., 2010; Pietrzak & Southwick,

2011), and predicted risk for PTSD, suicide, alcohol abuse, depression, and ill health. health over a period of one year (Green et al., 2010; Green et al., 2014).

Disaster exposure

The level of disaster exposure is one of the strongest risk factors for poor psychosocial functioning after disasters. Disaster exposure is defined as the number of stressful and/or traumatic experiences a person has experienced during a disaster as well as the perception of life-threat during a disaster. The more such experiences a person is exposed to, the greater the level of deterioration in functioning can be expected. Disaster exposure has predicted poorer mental health in several studies, for example, following the terrorist attack on New York (Adams & Boscarino, 2006), the tsunami in Indonesia (Heir et al., 2011) and hurricanes in Mexico (Norris et al., 2006).

It was also shown that the overall severity of the disaster itself presents a risk for poor psychosocial adaptation. For example, in a study on PTSD following the 2004 Florida hurricanes, it was found that community-level damage was significantly related to worse outcomes over and above individual injury or damage (Ursano et al., 2014). Furthermore, the type of the disaster is repeatedly proven to be a risk factor for poorer mental health outcomes: with other characteristics held constant, severe levels of impairment were more likely to occur after exposure to mass violence, and human-made, industrial disasters were related to worse outcomes (Norris et al., 2002).

Resource loss

Resource loss is at the centre of Hobfoll's (1989, 2002) conceptualisation of stress. According to the Conservation of Resources theory, stress is experienced when people are exposed to a threat of loss of resources, to an actual loss of resources, or a lack of gain of resources following resource investment. According to the theory, (perception of) loss of resources is detrimental as they are valued in their own right and as they are used in process of coping with heightened environmental demands. Resource loss has been extensively studied in the disaster context and has been consistently found related to worse outcomes post-disaster (Benight et al., 1999; Freedy et al., 1992; Hobfoll et al., 2006; Sattler et al., 2006; Smith & Freedy, 2000; Zwiebach et al., 2010).

Community resources

Community researchers agree that "the whole is more than the sum of its parts" (Norris et al., 2008, pg. 128), and that a community with numerous “resilient” individuals will not necessarily recover well (Pfefferbaum et al., 2005). Communities consist of physical, economic and social environments that are interconnected and can contribute to or hinder the adaptation of community members. Community characteristics may be even more important for psychosocial adaptation following disasters, as they are experienced collectively. A seminal review of literature on community resilience after disasters has identified several important characteristics for post-disaster adaptation: economic development, social capital, information and communication, and community competence (Norris et al., 2008). These capacities will be further described in the text below.

Economic development is one of the fundamental characteristics that foster community adaptation both in terms of “ordinary” sustainable development and mitigation of the consequences of various risks (Godschalk, 2003), as well as in terms of preserving or recovering psychological well-being of individuals in the community (Pfefferbaum et al., 2005). The most important parameters of economic development are the amount of resources, their diversity and the degree to which they are evenly distributed (Adger, 2000; Godschalk, 2003). Previous systematic reviews show that the mental health consequences of disasters are significantly worse in developing compared to developed countries (Norris et al., 2002), due to the greater severity of disasters and lower availability of resources to foster recovery. The diversity of available resources is considered important as it reduces economic loss in the event of a disaster. Communities that are dependent on a small number of (natural) resources are more likely to suffer large losses post-disaster. For example, the well-studied Exxon Valdez oil spill resulted in the collapse of the fishing industry that was a major source of income for local communities as well as a core cultural determinant of life for Native Alaskan communities (Palinkas et al., 1993). Researchers further noted disruptions in previously abundant social interactions between families and community members; increases in drinking, drug abuse and domestic violence and a decline in perceived health. Finally, resource equity contributes to reducing the vulnerability of the most at-risk members of the community. Risk and disaster exposure are often not evenly distributed - that is, less economically developed parts of the community are more often and more severely exposed to disasters. For example, parts of New Orleans that were the most affected by Hurricane

Katrina were disproportionally inhabited by people of colour, people who do not own their own home and people who live below the poverty line (Logan, 2006).

Social capital represents actual or potential resources related to social networks (Bourdieu, 1985). In the context of disaster resilience, social capital encompasses coordination and collaboration between community organisations; a sense of connection to the wider community, such as a sense of community and trust; attachment to the place of residence and involvement of community members in formal and informal organizations (Norris et al., 2008). As with (perceived) social support at the interpersonal level, research up to date indicates that social capital is one of the strongest community-level predictors of good psychosocial outcomes after disasters (Bonanno et al., 2015). In a rare study of community social networks, Bryant et al. (2016) constructed a social network map in a community affected by a major bushfire disaster by analysing community members' ties based on individual nominations. Among other results, the study indicated that fewer social connections within the community were related to the risk of PTSD and depression. Furthermore, social capital, defined more broadly as community participation and community links, was found to be related to less PTSD in communities affected by a flood (Wind & Komproe, 2012). Similarly, the "sense of community", the feeling of trust and belonging to members of one's community, was found to be related to less depression (Peterson et al., 2008), higher life satisfaction (Prezza et al., 2001), and better subjective well-being (Davidson & Cotter, 1991).

Information and communication are vital in emergencies as they improve rescue efforts and increase public safety. Information on dangers needs to be quick and accurate and provide guidelines on rules of conduct (Norris et al., 2008). Disaster preparedness plans and community leadership are important in all the phases of disaster response: during the development of emergency response plans before a disaster occurs, response to the disaster and managing the aftermath of a disaster and recovery (Cohen et al., 2013). Interventions aimed at increasing disaster preparedness and training risk-reduction behaviours have been successful in decreasing mental health symptoms in disaster-affected communities (Welton-Mitchell et al., 2018). Another important determinant of communication that fosters good post-disaster outcomes is trust in information sources. A study of the long-term consequences of the Chernobyl nuclear disaster showed that trust in received information about the disaster mediated the relationship between disaster exposure and general mental health (Havenaar et al., 2003).

Finally, community competence includes the ability of different parts of the community to work together to identify problems and needs and work together to address them flexibly and creatively; collective efficiency, that is, the belief that joint action will lead to successful problem solving, and political partnership, that is, the ability of community members to actively participate in decision-making (Norris et al., 2008). Benight (2004) found that the collective efficacy of a community that faced a series of disasters significantly reduced the levels of stress a year later, particularly for the community members with higher perception of losses. The author attributed this finding to the community-organised committee that was involved in the reconstruction process, thus probably better reflecting the relative need of community members. Furthermore, a multi-level study on the effects of hurricanes found that higher community collective efficacy predicted lower PTSD symptom severity and prevalence in a sample of public health workers (Ursano et al., 2014).

Aim of this dissertation

This dissertation aimed to examine how communities affected by a disaster exhibit resilience, that is, maintain and recover psychological well-being and positively adapt in the situation of high risk. The first part of the dissertation introduces the concept of resilience in its historical origins and the context of disasters in particular, it discusses the key elements of the process of resilience, presents traditional and contemporary measurement approaches and proposes future research directions. The second part examines how communities that are differentially exposed to a flood adapt and recover and the key role of different levels of resources and resource loss in that process. The third part of the dissertation further explores the longitudinal change in both resources and psychosocial outcomes after a flood and their dynamic relationship. Jointly, these studies aim to address several identified research gaps and contribute to the theoretical understanding of the process of resilience as well as provide guidance for post-disaster interventions.

Part I. Resilience and Disaster Research: Definitions, Measurement, and Future Directions

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Introduction

On average, disasters strike any given day of the year and affect about 200 million people yearly (Guha-Sapir et al., 2016). Disaster can be defined as a "serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (United Nations Office for Disaster Risk Reduction, 2009). Disasters are potentially traumatic events since they expose people to life threat and potential or actual injuries to themselves or people they know. They are also highly stressful events, because they typically result in large economic losses, relocation and a long process of rebuilding of housing and infrastructure. Furthermore, they are experienced collectively, as they lead to sudden changes in the daily lives of entire communities or a society as a whole. This characteristic of disasters was described more than a half a century ago by Fritz (1961, p. 651) who stated that disaster can be defined as a "basic disruption of the social context within which individuals and groups function".

The devastating nature of disasters is evidenced by their numerous and long term consequences. A comprehensive systematic review summarizing findings for over 60,000 participants from 160 studies has shown that only 11% of samples exhibit minimal impairment, indicative of transient stress, while 39% exhibit severe or very severe impairment, indicative of significant psychopathology or distress (Norris et al., 2002). Furthermore, numerous studies indicated that prevalence of PTSD, depression and anxiety remain higher in disaster survivors compared to the general population years and even decades after the event itself (Ajdukovic et al., 2015; Havenaar et al., 1997; Morgan et al., 2003; Hull et al., 2002).

Lately, there has been an increasing accord that negative psychosocial consequences of disasters can be mitigated by building "resilience" of individuals and communities. For example, the National Science and Technology Council (2005) argued that identifying standards and metrics for assessing disaster resilience that will enable reducing community disaster vulnerability is one grand challenges of the future. Furthermore, one of the United Nations (2005) strategic goals for the period from 2005 to 2015 was building capacities of communities and nations that would increase resilience to disasters. However, the Third UN World Conference concluded that, although there has been a progress in reducing the effects of disasters, they continue to have a major impact on the social functioning of communities

(United Nations Office for Disaster Risk Reduction, 2015). Therefore, disaster resilience continues to spike interest both in research and practice. This paper aims to reflect on the key concepts of resilience, both historically relevant and currently utilized, to highlight promising measurement approaches and to propose future research directions, especially as it relates to resilience after disasters.

What is Resilience?

The fact that the word *resilience* is among 1% of lookups in Merriam-Webster dictionary speaks for its popularity in the modern society (Resilience, 2018). This dictionary defines resilience as (1) the capability of a strained body to recover its size and shape after deformation caused especially by compressive stress; (2) an ability to recover from or adjust easily to misfortune and change. These definitions portray how a concept which has been developed in physics was eventually transferred into social science within the individual ("individual resilience", e.g. Rutter, 2000), community („community resilience", e.g. Norris et al., 2008) and national level perspectives („national resilience", e.g. Kimhi, 2016). However, contrary to the resilience as a physical property of an object, in social sciences the term is used rather inconsistently. This ambiguity in defining the main concepts is in fact one of the most common critiques of the field (Luthar et al., 2000) resulting in high variability of estimates of „resilient" individuals ranging between 25 and 84% (Vanderbilt-Adriance & Shaw, 2008).

Human resilience research originated from developmental psychology, where the term was first used to describe children who are functioning well despite extremely adverse circumstances (Masten et al., 1990). In these early stages of inquiry, there was an emphasis on exploring the characteristics of individuals associated with positive adaptation at times of stress. Hence, the field of was dominated by the concepts such as sense of coherence (Antonovsky, 1979), hardiness (Kobasa, 1979) and ego resilience (Block & Block, 1980). These constructs mostly describe capacities and characteristics of the individual facing hardship: coping strategies, resourcefulness and flexibility. Therefore, the concept of resilience is sometimes used to describe relatively stable individual characteristics, especially in studies on adult populations (Luthar & Brown, 2007). However, most of the contemporary definitions describe resilience as a process (Table 2), for a number of reasons.

Table 2

Contemporary definitions of resilience

Process of, capacity for, or outcome of successful adaptation despite challenging or threatening circumstances. (Masten et al., 1990, p. 426)
Resilience refers to a dynamic process encompassing positive adaptation within the context of significant adversity. (Luthar et al., 2000, p. 543)
Ability of adults in otherwise normal circumstances who are exposed to an isolated and potentially highly disruptive event, such as the death of a close relation or a violent or life-threatening situation, to maintain relatively stable, healthy levels of psychological and physical functioning. (Bonanno, 2004, p. 20)
A process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance. (Norris et al., 2008, p. 130)
Resilience is the process of harnessing biological, psychosocial, structural, and cultural resources to sustain wellbeing. (Panter-Brick & Leckman, 2013, p. 333)
The capacity of a dynamic system to adapt successfully to disturbances that threaten the viability, the function, or the development of that system. (Masten, 2015, p. 10)

First, even though individual characteristics do indeed predict positive adaptation in the context of adversity, numerous studies show the importance of the broader context, as well as interactions between the individual and their environment (e.g. Masten & Narayan, 2012). Moreover, not only are the individual characteristics just a part of the resilience phenomena, but the importance of different factors can change in different contexts: what protects in one, can be a risk in another (Wright et al., 2013). These factors include interactions with different people or organizations, resources available at the time and differing community, societal, cultural and religious determinants (Southwick et al., 2014).

Therefore, most of the contemporary definitions describe resilience a process involving multiple and changeable factors. But, to define resilience we first need to go back to two key concepts: risk or adversity and positive adaptation.

Risk

The definition of resilience, from the earliest days of research, always included existence of risk. In fact, the notion that resilience can only be exhibited when there is significant risk differentiates this concept from a more general term of positive adaptation. As discussed by Luthar et al. (2000), even though with growing research resilience may be considered simply as a part of the "normal" pathway to positive adaptation, for now it seems that this is not the case. What leads to positive adaptation at times of risk is often-found to be different than in the usual course of life. Therefore, to study resilience, the type and scope or risk should be defined.

Risk can be defined as an external event that threatens the well-being of individuals and/or communities or societies as a whole. This can be a single highly stressful or potentially traumatic event (such as the loss of a loved one or surviving a violent attack) or a cumulative/chronic one (living in poverty or in a war zone). The distinction between single, highly adverse event and a set of events is an important one. The majority of research in the field of resilience studied the latter: in fact, the resilience research in developmental psychology originated from studies of children living in high-risk environment. Living with a mentally ill parent, for example, results in a multitude of risks, such as low socioeconomic status, marital distress, damaged attachment systems etc., that last over a long period of time. It can be argued that this type of risk is different, in terms of outcomes and coping mechanisms than experiencing a single potentially traumatic event in adulthood. Therefore, in disaster research, risk is clearly defined as a single, highly aversive external event.

However, not all individuals exposed to a disaster experience the same amount of risk. Some experience more proximal risks because they have been directly in the way of the water wave, trapped in the rubble or burnt by the fire. Others experience distal risks because they have managed to evacuate before the disaster struck or have been lucky enough to be at a location where the effect of the disaster was mild(er). Furthermore, the level of risk also depends on contextual factors. Even though disasters occur with similar frequency in the developed and less developed countries, the risk of human losses and material damage is strongly related to the degree of the (under)development of the country (Centre for Research on the Epidemiology of Disasters & United Nations Office for Disaster Risk Reduction, 2016).

Therefore, the multifaceted nature of risk should be reflected in the study design. For example, in a study of psychosocial consequences of 2004 tsunami, Johannesson et al. (2011) measured disaster exposure in three categories: high exposure group included individuals who were caught by the wave; medium exposure group included those who have lost a relative, felt life threat, had experienced or witnessed injury, were anxious about the fate of relatives, seen dead bodies, witnessed others suffering and/or seen young children without guardians or helped other victims; and low exposure group included people who were indirectly exposed, by being in the close vicinity of the disaster or have been in contact with highly affected people. Another possibility is to define the level of risk by the distance from the epicenter of the disaster (e.g. Dogan, 2011).

Positive Adaptation

Another key concept in resilience definitions is positive adaptation: to be resilient, an individual, a community or a society should exhibit positive outcomes in the context of high risk. Two key aspects of adaptation need to be considered: the level of adaptation or functioning one need to show to be resilient, and what outcomes should be considered within the umbrella of positive adaptation.

The amount of adaptation that characterizes resilience is a matter of continuous debate. Overall, there are three approaches to define the appropriate level of positive adaptation after a disaster: (1) experiencing better outcomes than expected; (2) maintaining positive functioning regardless of the event; (3) undergoing process of recovery after the event (Masten et al., 1990). To date, the most commonly used approach is based on the better-than-expected principle. In a typical study of resilience after a disaster, data on psychological outcomes are collected in an affected community and correlated with a set of predictors that are thought to be related with the outcomes. The findings indicate that certain variables contribute to better functioning of some individuals than other within the same community. However, this does not imply that those who adapt better than other affected people after surviving a disaster function well. This was found in a number of studies, as previously described, showing that the prevalence of psychopathology and levels of distress are several times higher in populations affected by disasters than in the general population. Therefore, the better-than-expected criterion, for most authors, falls short to characterize resilience (Masten, 1994).

Other authors consider that resilience is defined by a stable trajectory of functioning regardless of the disaster (e.g. Bonanno, 2004; Bonanno & Diminich, 2013). Although certain levels of distress are to be expected after a disaster - they are considered to be a normal reaction to an abnormal event (Flynn, 1994), resilience is characterised by a relatively stable level of healthy functioning. In addition, Bonanno and Diminich (2013) argue that typical outcomes that are expected in developmental resilience research and research on the effects of single, high impact events such as disasters differ. Noticing that some individuals thrive despite living in chronically aversive environments has led developmental researchers to identify the key factors which foster positive adjustment. As authors argue, this type of resilience is typically evidenced by gradual emergence of positive outcomes, usually when the stress of the aversive environment has been reduced. They refer to this pattern as "emergent resilience". Differently, single aversive events usually occur within a well-functioning environment and represent an isolated stressor. Authors argue that resilience in this context is characterized by "little or no lasting impact on functioning and a relatively stable trajectory of continuous healthy adjustment from before to after the potentially traumatic event" (pg. 4), and refer to this as "minimal-impact resilience". Finally, some authors consider that resilience is in fact the speed of recovery towards good or pre-event functioning (Norris et al., 2008).

The notion that resilience is exhibited in a certain trajectory of adjustment or the speed of recovery suggests that longitudinal study designs are necessary to fully capture this phenomenon. However, this is usually not the case in disaster resilience research. Up to 68% of studies in this field are conducted at a single time point, and long-term follow-ups are scarce (Norris et al., 2002). However, recent years have brought about an increase in longitudinal measurement of disaster outcomes, which, along with the rise of new, more sophisticated data analyses has brought significant breakthrough in resilience research. Such analyses include, for example, latent growth mixture modelling (LGMM; Muthen, 2004). In LGM, an underlying growth trajectory is estimated by specifying two unobserved factors: baseline level (the intercept) and rate of change over time (the slope). Different models of change can be tested against each other; most commonly testing whether the trend of change is linear (e.g. continuously increasing or decreasing) or curvilinear (e.g. exponential increase or decline). Once an appropriate model of change is established, time-constant or time-variant correlates of both the baseline level and the rate of change can be included. Differently, the more commonly applied LGMM approach is used to determine distinctive variations in

outcome patterns. LGMM assumes that there are multiple unobserved sub-populations and aims to describe longitudinal change within the groups separately. The objective of the model is to empirically identify subgroups within the overall sample and to describe possible differences in longitudinal change between those groups.

Studies so far have been consistent in establishing prototypical trajectories of response after single-event traumatic events, including disasters (Bonanno & Diminich, 2013). Typical trajectories of adaptation include: (1) high and stable levels of dysfunction over time; (2) low and stable levels of dysfunction over time; (3) moderate to high dysfunction in the earlier time period after disaster, followed by an improvement in functioning; and (4) initial good functioning after the disaster followed by increased dysfunction over time. The first and the last trajectory are consistently named across studies as chronic dysfunction and delayed dysfunction. Current estimates suggest that about 5-30% of affected people fall in the first, and up to 15% in the latter trajectory. The second and third trajectory are not named consistently. Some authors argue that resilience is exhibited only when there are stable low levels of dysfunction over time (e.g. Bonanno & Diminich, 2013; Johannesson et al., 2015); whereas others argue that this outcome indicates "resistance" (e.g. Hobfoll et al., 2009; Norris et al., 2009). Accordingly, fast recovery from moderate and high levels of dysfunction for some denotes a "recovery" trajectory, and for others "resilience" trajectory. The estimates of these two trajectories seem to vary more than for the others, with resilience/resistance usually ranging from 35-65%, and recovery/resilience from 15-25% (Bonanno & Diminich, 2013).

A related issue is that of the scope of positive adaptation after disasters. The vast majority of studies of post-disaster functioning address mental health issues, such as PTSD, depression or anxiety (Norris et al., 2002), where the absence of psychopathology is considered an indicator of resilience. There are several advantages to this approach. First, given that the absence of psychopathology can be determined using validated diagnostic instruments and criteria, this approach offers a straightforward interpretation of the results, even in the absence of a comparison group and facilitates cross-study comparisons. In addition, since epidemiologic studies show that about 18 - 36% of the general population meets the diagnostic criteria for one or more mental health disorders during lifetime, in high risk populations the absence of psychopathology may not be such a lax criterion (Kessler et al., 2007). However, there has been increasing concern that conceptualization of positive adaptation only through the absence of psychopathology lens may be too narrow. For

example, Litz (2005) cautions that this view neglects the impact of stress and trauma on work, family, leisure and self-care capacities. An individual can, therefore, exhibit low levels of symptoms, and at the same time experience considerable functional impairment, and vice versa. Accordingly, Norris et al. (2008) propose that positive adaptation is defined as: (1) absence of psychopathology, (2) healthy patterns of behavior; (3) adequate role functioning at home, school, and/or work; and (4) high quality of life.

The Role of Resources

Having reviewed two key concepts related to resilience, risk and positive adaptation, it is time to turn to the third component of the resilience process. As discussed earlier, the study of resilience started with exploration of various individual characteristics that are found in people who, when exposed to risks and after surviving adversities adapt well, or exhibit high level of functioning when others do not. In the literature, these capacities are named differently, but usually as correlates of resilience, protective factors and, especially in disaster research, resources (Luthar et al., 2000, Norris et al., 2008, Hobfoll, 1989).

Resources are defined as different contextual factors that, if available, increase the odds for good post-disaster adaptation. In that sense, resources represent the potential for resilience in the face of risks and disasters. Whether or not positive adaptation or fast recovery is exhibited depends on the dynamic attributes of available resources - on their robustness, redundancy and rapidity (Norris et al., 2008). Resources are robust if they can withstand adversities without deteriorating or depleting; they are redundant if they are diverse in a sense that multiple resources exist in a substitutable manner; and they are rapid if they can be accessed and utilized fast in the course of exposure to risks. Therefore, studying resources and their attributes is one of the crucial points in resilience research (Norris et al., 2008; Southwick et al., 2014).

There are ample of studies examining resilience resources. It has been found that a number of relatively stable individual characteristics or traits contribute to resilience after disasters, such as positive emotionality, hardiness, self-efficacy, cognitive flexibility, perceived control, sense of mastery, and trait self-enhancement (see for example Bonanno & Diminich, 2013; Bonanno et al., 2010). In fact, the focus on trait resiliency has been so prevalent in studies with adult population that a large number of questionnaires measuring "resilience" have been developed (for a detailed methodological review see Windle et al., 2011). One of the most commonly used questionnaires in disaster research, Connor-Davidson

resilience scale (Connor & Davidson, 2003), assesses five, relatively stable individual characteristics: personal competence; trust in one's instincts, tolerance of negative affect, and strengthening effects of stress; acceptance of change, and secure relationships; control and spiritual influences. The scale has been found to predict lower symptoms of PTSD, depression and anxiety after an earthquake (Ahmad et al., 2010; Ying et al., 2014), tsunami (Irmansyah et al., 2010) and industrial disaster (Ghisi et al., 2013).

However, it is important to emphasize that none of the "resilience scales" in fact measure resilience as a process triggered by a risk. They assess the capacities to adapt well or function well or recover fast in the face of adversity, and therefore assess resources that contribute to positive adaptation. Positive adaptation will only be achieved if appropriate resources can be accessed when needed, and were not affected or diminished by a disaster itself. In addition, most instruments for assessing resources focus on personality traits. However, traits represent just a (small) portion of resources available to an individual. Other resources can be found in the wider social context, in the community or society as a whole. Among the variety of resources, some authors argue that it is not pragmatic to focus on those that are least likely to be enhanced by interventions that aim to reduce effects of disasters (Masten et al., 1990).

That said, studies on resources other than individual traits are scarce. The other most commonly assessed resource is social support, a resource that has been repeatedly found to contribute to good outcomes at times of stress. Social support is usually measured as perception of support from a significant other, family and friends and it reflects the belief that help will be available if needed (e.g. Zimet et al., 1988) and it has been consistently found to be related to better metal health outcomes in disaster context (e.g. Bonanno et al., 2007; Kaniasty & Norris, 2008). Other resources, especially at the community level, have been extensively discussed, but rarely systematically assessed. In a seminal review paper on community resilience after disasters by Norris et al. (2008) a conceptual model of community resilience is presented based on literature review across multiple scientific fields. The model points to four key community resources: economic development, community social capital, community competence, and information and communication. A number of studies show that individual-level perceptions of community resources are related to PTSD symptoms, anxiety, anger, general stress reactions and life satisfaction in the context of armed conflict in Israel (Braun-Lewensohn & Sagy, 2014; Kimhi & Eshel, 2009; Kimhi & Shamai, 2004). However, they are yet to be tested in post-disaster settings.

Resilience as a Process

Throughout this paper resilience has been described as a process involving utilizing resources to achieve positive adaptation in the context of exposure to risk. But, to understand resilience as a dynamic process, conceptual links between risk, resources and positive adaptation should be described and tested. The links between the risk and positive adaptation are built into the definition of resilience itself – resilience can only be manifested if the risk, threat or adversity is present and positive adaptation as an outcome is evident. However, links between risk and resources, as well as between resources and positive adaptation are yet to be fully established.

The process of building up and maintaining resources after disasters is starting to be viewed as central to resilience (Norris et al., 2008; Southwick et al., 2014). One of the most studied theoretical models in disaster research, Conservation of Resources (COR) theory focuses on resource loss and gain in post-adversity adaptation (Hobfoll, 1989). COR theory claims that psychological stress is the result of threat of loss of resources, actual loss of resources or lack of resource gain following resource investment. According to the model, to prepare for future adverse events, people, organizations or wider systems aim to develop resource surpluses, which can be drawn upon at times of risk, including disasters. If resources are seriously disrupted, lost or cannot be called upon when needed, stress will be experienced, manifested in lower levels of adaptation. Given that, by definition, the state of disasters is declared when the demands by far exceed the resources, studying how resources change may be critical in disaster preparedness and mitigation. And while studying trajectories of post-disaster outcomes is becoming the golden standard in the field, much less is known how disasters affect different levels of resources. Some studies have shown that disasters and armed conflicts diminish the available resources at the individual (Benight et al., 1999; Sattler et al., 2006; Zwiebach et al., 2010), and also at the community level (Kimhi & Shamai, 2004). However, no studies up to date known to the author have examined the trajectories of resource recovery, or their dynamic attributes – robustness, redundancy and rapidity.

Furthermore, the roles of resources in predicting different outcomes of resilience process are yet to be established. This particularly refers to exploring interactive or moderating processes in positive adaptation. In developmental psychology a distinction is made between resources that have direct ameliorative effects - those that are related to good outcomes in both low- and high-risk settings, and interactive processes - those that exhibit

their effect only in high-risk settings. The direct, ameliorative effects, often called protective factors, are those that are not specific to adapting well to a certain event. It is therefore crucial to investigate interactive processes, such as "protective-stabilizing" – meaning that the presence of a resource is related to positive adaptation only in high-risk setting, "protective-reactive" – when the presence of a resource fosters adaptation, but less so when stress levels are high compared to low, or even "protective-enhancing" – when the presence of a resource leads to increased functioning in disaster setting (Luthar et al., 2000). Identifying resources that are critical for positive adaptation in disaster settings could serve as a guide for designing post-disaster interventions. However, up to date, studies that compare the importance of a resource in a high-risk and a comparable, non-affected or low-risk group are scarce.

Finally, since it is highly unlikely that a single resource can have a predominant effect on positive adaptation, it is important to investigate and compare their relative strength. In addition, the strength of a single resource may vary over time, given that it can become less accessible or its influence may be changed by other environmental factors. Therefore, taxonomy or a model of potential resources and their interrelations would highly benefit disaster resilience studies. Often used model, stemming from COR theory, proposes 4 key types of resources: objects, for example, housing or personal transportation; personal characteristics, such as skills, optimism or hope; conditions, such as marriage or health; and energies, such as money or knowledge (Hobfoll, 1989). Other conceptualization, informed by developmental ecological models, such as Bronfenbrenner's (1977) ecological theory, define resources at different levels of proximity to the individual – as individual characteristics, community and society resources. However, a comprehensive model of such resources in disaster resilience, including their interrelations and underlying processes, is still nascent.

Conclusions and Future Directions

The current paper aimed to highlight current knowledge and state of research into resilience after disasters. Resilience is defined as a dynamic process in which a range of resources, individual and contextual, stable and more variable, leads to maintaining and faster recovery of psychological well-being in the situation of risk, adversity and disaster. In other words, resilience can be measured as the level of well-being and good functioning and the speed at which this level is achieved after an event that carries high risk for negative psychological consequences and poor functioning. If the individual, community or society in question exhibits good functioning post-event, compared to diagnostic or functioning standards, or in

comparison to other individuals, communities or societies, it can be concluded that they have shown resilience. Resources are the driving force behind achieving these outcomes. Where they are ample, able to withstand the impact of the event and can be accessed rapidly, the odds of exhibiting resilience are higher. Knowing what resources are strong contributors to the process of resilience is the basis for planning and conducting effective interventions aiming to prevent or mitigate negative consequences of different adversities, including disasters.

Before focusing on the future directions of research of resilience after disasters, another historical reference will be borrowed from resilience studies in developmental psychology. Summarizing decades of research efforts in the field, Wright et al. (2013) describe four waves of inquiry. Initial research was dominated by studies describing the phenomena, differentiating between correlates of resilience (resources) and the quality of adaptation, and finding the "list" of resources contributing to adaptation. The second wave moved from description ("what questions") to studying the process leading to resilience ("how questions") (Masten et al., 1990). This included the greater emphasis on ecological systems approach that examines also the wider social, community and society systems as well as studying stability and change in both resources and adaptation. Building on the better understanding of the involved processes, the third wave aimed at creating and evaluating interventions to foster resilience. Finally, the current fourth wave focuses on dynamic relations between different levels of systems as well as neurobiological underpinnings of resilience.

The current focus on individual characteristics and the quality of adaptation in studies of disaster resilience seems to correspond with the first wave of resilience research in developmental psychology. The studies on trajectories of outcomes after disasters, and the development of questionnaires measuring potential resources, mostly at the level of the individual with the aim to identify the "key resources" can be seen as the "what" questions. However, in order to achieve further progress in the field of disaster resilience it is critical to move on to the "how" questions. The efforts are already visible in calls to focus on wider ecological systems, such as communities and their potential resources, as well as trajectories and processes concerning the links between resources and positive adaptation (Norris et al., 2008). Resources and processes at play at the level of community may be particularly important for disaster resilience, because of the nature of the event itself. Therefore, efforts to

enhance resilience to disasters will likely involve large-scale community-based interventions that will increase the resources of a large number of individuals at the same time.

There are growing efforts to increase resilience by building up resources before the disaster strikes. These include developing guidelines on mitigating mental health consequences of disasters that can be translated in specific operational plans (e.g. Williams et al., 2009; Inter-Agency Standing Committee, 2007), training responders for efficient post-disaster interventions (e.g. World Health Organization & War Trauma Foundation and World Vision, 2011) and increasing knowledge and awareness of consequences of disasters (e.g. Ajduković et al., 2017) as well as establishing networks that aim at strengthening coordination and cooperation between different stakeholders and countries (e.g. Disaster Action and EUR-OPA). These efforts aim to contribute to disaster preparedness and, in turn, reduce mental health consequences. However, research on the process of disaster resilience is still emerging and there is a need for further consideration and grounding of these interventions on basic research findings (Bonanno & Diminich, 2013).

Future studies should, therefore, aim to address existing caveats. Longitudinal study designs, with samples exposed to differing levels of risk, followed over a longer period of time and assessing a wider spectrum of outcomes and resources at different levels of systems are needed. With the development of sophisticated statistical methods, including longitudinal and multi-level methods of assessment, there are numerous possibilities to study the relation between different processes that unfold over time, including the variability and changes in resources themselves. These findings should further aim to develop a working model of resilience of adults after exposure to disasters that would enable building evidence-based intervention models in order to increase resilience of endangered individuals and communities.

Part II. Resilience After Natural Disasters: The Process of Harnessing Resources in Communities Differentially Exposed to a Flood

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Introduction

As weather-related disasters are becoming more frequent and with more people living in disaster-prone areas, mitigating the impact of disasters is becoming increasingly important. Disasters negatively impact individuals and communities: they increase the incidence of mental health disorders and decrease the quality of life (Norris et al., 2002). The mental health consequences of disasters persist in the long-term period for a significant number of survivors. For example, two years after widespread flooding in the UK, the prevalence of anxiety and depression among survivors was higher than 10% and the prevalence of probable PTSD higher than 20% (Jermacane et al., 2018). Furthermore, a meta-analysis of 14 studies of PTSD among survivors of flooding showed the incidence of PTSD was 11.5% in the period longer than 6 months post-disaster (Chen & Liu, 2015). These detrimental effects can endure even decades after the disaster (Raker et al., 2019). Still, a substantial number of survivors experience only transient distress or successfully recover from disaster impact (Bonanno et al., 2010). Therefore, studying resilience as a dynamic process of maintaining and recovering psychological well-being after adversity is one of the key challenges in preparing for future disasters.

Resources are regarded as central to the resilience process because recovery, positive adaptation, wellness, and well-being in high-risk situations result from harnessing available resources. There is ample research showing that individual level resources contribute to the positive adaptation after disasters. Perceived control and sense of mastery, sense of coherence, ability to "bounce back", generalised sense of efficacy and disaster-specific coping self-efficacy, hardiness, self-esteem, and positive affect have all been found to contribute to better mental health outcomes (Ahmad et al., 2010; Benight et al., 1999; Bonanno et al., 2010; Braun-Lewensohn & Sagy, 2014; Kaniasty, 2006; Ying et al., 2014). However, the extensive focus on individual resources has been criticised for a number of reasons. First, previous studies show that no single resource or trait has a dominant influence on post-disaster outcomes; rather, they seem to each explain a relatively small part of the variance (Bonanno et al., 2015). Second, the relative importance of a particular resource can change along with the contextual circumstances as some resources become more or less accessible (Hobfoll, 1989, 2002). Finally, some also argue that it is not pragmatic to focus on those resources that are less likely to be enhanced by (post-disaster) interventions (Masten et al., 1990).

It is commonly recognised that multiple ecological systems play a part in the resilience process, including close relationships, community systems, and built and natural environment (Maercker & Hecker, 2016; Ungar & Theron, 2020). A rich body of literature in community (for an overview see e.g. Harvey, 2007) and developmental psychology (for an overview see e.g. Masten & Narayan, 2012) highlights the importance of person-environment interactions in complex and changing social contexts that shape resilience. Disaster researchers have recently begun to integrate the ecological framework in the study of resilience-promoting resources. One resource that has received particular attention is social support, which has consistently been shown to be related to better mental health and overall functioning after disasters (Bonanno et al., 2010; Norris & Kaniasty, 1996; Norris et al., 2008). At the community level, the most commonly studied resource has been social capital, the construct that encompasses feelings of trust and belonging to a community, attachment to the community, and engagement and participation of community members (Bonanno et al., 2015). Social capital and community efficacy were found to be related to posttraumatic stress (PTS) in the aftermath of an earthquake and a tsunami (Hikichi et al., 2016), a hurricane (Ursano et al., 2014) and a flood (Wind & Komproe, 2012). Furthermore, studies conducted in the context of prolonged political violence showed that the availability of community resources, defined as a composite of leadership, collective efficacy, preparedness and social capital, were related to stress reactions (Braun-Lewensohn & Sagy, 2014).

At the same time, there are still gaps in our understanding of resources that promote disaster resilience. In a recent review, Bonanno et al. (2015) substantiate that the study of resilience-promoting factors after disasters with regards to communities lags behind that of individual-level factors, despite rich theoretical conceptualisations. Studies that do look into community resources typically research how these resources relate to individual psychological adaptation, rather than community adaptation assessed across community units (Bonanno et al., 2015). This limits current understanding of disaster resilience for two reasons. First, researchers agree that community adaptation cannot be identified in studies of individuals within only one population as the overall average at the level of the community hides the variability across community units (Norris et al., 2008). Second, this approach fails to identify potential differences between resilience and recovery processes in different communities. Identifying protective factors that interact with the level of risk is one of the central objectives of resilience research as

they help uncover the potential mechanisms that underlie resilience (Luthar et al., 2000). It is also an important strategy for disaster preparedness and response as it can point out resources that are particularly important in the aftermath of disasters. A couple of notable studies highlight this point. For example, Benight (2004) found that collective efficacy was a stronger predictor of distress in a community affected by a flood than in a similar, non-affected community, reaffirming the importance of social resources in coping with disasters. Moreover, West et al. (2013) found that the relationship between community support and mental health after a hurricane differs across types of community: whereas community support buffers against psychological distress in nonurban areas, that effect was not observed in an urban sample. These findings provide strong evidence that community recovery is tied to the wider social context. However, more studies that look into key resources across ecological levels are needed (Bonanno et al., 2015).

Furthermore, given the importance of resources for post-disaster adaptation, it is critical to study the processes behind building up and maintaining resources (Southwick et al., 2014). According to the Conservation of Resources theory (COR), when confronted with an event threatening to deplete one's resources (e.g. job loss), people try to offset such losses by drawing on available resources in their environment (e.g. savings, social networks) (Hobfoll, 1989, 2002). Because of this role of resources in the coping process, a threat of resource loss, their actual loss, or a lack of resource gain after investment of resources lead to psychological distress. The Conservation of Resources theory has been extensively applied to disaster research, with numerous studies showing that resource loss has consistently been found to be one of the strongest predictors of symptoms of psychological distress after disasters (Benight et al., 1999), over and above disaster exposure, previous exposure to stress and pre-disaster mental health (Hobfoll, Tracy et al., 2006; Zwiebach et al., 2010).

Even though all coping efforts include the use and, therefore, expenditure of resources, where resources are abundant the final resource sum should remain unchanged or even increase (Hobfoll, 2002). In other words, to achieve good post-disaster adaptation, resources need to be diverse in a sense that multiple resources exist in a substitutable manner (Norris et al., 2008). However, few studies up to date have looked into how resource loss can be prevented and how resource redundancy can be used to mitigate it. Some studies found evidence that having strong social support does indeed reduce later resource loss, which can in turn positively contribute to

post-disaster outcomes (Littleton et al., 2009; Norris & Kaniasty, 1996). Moreover, an illustrative multi-level study conducted one year after a flood showed that in communities with higher social capital individuals employed fewer individual psychosocial resources to cope with the effects of the disaster (Wind & Komproe, 2012).Yet, these studies examined only one aspect of the social context and did not look into other potential community level resources, such as economic resources, preparedness or leadership. Furthermore, they focused mainly on mental health outcomes, rather than overall wellness, that also includes positive adaptation such as life satisfaction.

The present study aims to build on existing research and address previously identified gaps. We analysed how people in communities that were differentially exposed to a flood harness different resources to mitigate psychosocial resource loss and therefore experience better post-disaster outcomes. To address existing gaps, we studied resources at different levels of ecological context and multiple outcomes that go beyond mental health, we analysed the differences in the contributions of resources across differentially exposed communities, and how harnessing available resources is related to reducing resource loss. We made two predictions about the relationship between resources, psychosocial resource loss and indicators of adaptation. First, we predicted that having stronger resources at the individual, interpersonal, and community level will be related to less psychosocial resource loss after a disaster, and through that to lower symptoms of posttraumatic stress (PTS) and depression and higher life satisfaction. Second, we predicted that this relationship will be stronger in a flooded community than in a threatened, but non-flooded comparable community.

Method

Event

We conducted the study after the 2014 floods in South East Europe. In Croatia, more than 300,000 people were endangered along the critical 210 kilometres of the river Sava embankment. Despite lavish efforts to reinforce the embankment by emergency responders and community members, it eventually breached on 17 May, causing severe flooding in several municipalities. Two persons died and more than 13,000 were evacuated. Some of these people had to be rescued from their flooded homes due to the suddenness of the water surge and refusal of early(-ier) evacuation.

Participants and procedure

Participants were community members from two neighbouring municipalities in Croatia (N = 447). Half of the participants (n = 223) were residents of the most severely flooded municipality (referred hereinafter as the "affected community"); the other half (n = 224) lived in a nearby municipality, about 30 km away, that was not flooded, but was threatened by the flood and narrowly escaped the disaster ("comparison community"). The sample size was large enough to detect small to medium differences in correlation coefficients (Cohen's q = 0.27) with a probability of 80% (Faul et al., 2009).

The comparison community was carefully selected based on its proximity and similarity on a number of parameters to the affected community according to 2011 census data. The two communities were similar in terms of size, population age and gender composition, educational attainment, and economic indicators. A known a priori difference was the larger percentage of ethnic minorities members in the affected community than in the neighbouring communities that were almost exclusively populated by ethnic Croats. We acknowledged this difference in the subsequent analysis, however, having a deep insight of the socio-cultural-political context of the region, we did not expect it would impact the results. Moreover, even though ethnicity is sometimes found to be related to post-disaster outcomes, it is often confounded with other factors, such as socioeconomic status (Bonanno et al., 2010). Where socioeconomic status is controlled for, the effects of ethnic differences are no longer found (Bonanno et al., 2007). As the two studied communities are among the most disadvantaged ones in Croatia based on a number

of economic criteria, we expected that this context will similarly impact both communities and overpower the possible differences related to ethnic status. Finally, the minority in question is regarded as well and fully integrated in the Croatian society, enjoying full and equal civic status and benefits as any other citizen, as is often emphasised by the leaders of this ethnic group (e.g. Šoštarić, 2014), and found in studies focusing on social distance (Vujević Hećimović et al., 2010).

We used a stratified random sample in which a proportionate number of households were randomly selected in each street based on a registry of household numbers. Participants were eligible for the study if they had been between 25 and 65 years old, had lived in the community at least 5 years prior to the flood, and had been present in the community in the period leading to the flood. If several participants in one household were eligible for the study, one participant was randomly selected. Up to three attempts were made to contact the participant. In case the participant was not eligible or refused to participate, a new household was randomly selected. The response rate was 71% in the affected community and 57.8% in the comparison community. The main reasons for failing to participate in the affected community were lack of time or not wanting to be reminded of the floods; in the comparison community they were lack of time and not seeing the benefits of the study. In the affected community, 6.0% of the community members participated in the study; in the comparison community, 5.7% of the community members participated.

The study was conducted in November 2015, after the majority of the affected community residents returned to the municipality. It was supported and announced by several community leaders, including local self-government, school principals, and religious leaders. The individual face-to-face interview was conducted in the homes of the participants and privacy during the interview was ensured. The interview lasted about one hour. Interviewers underwent extensive training prior to the beginning of the study. The local language was used and the instruments were either validated prior to this study or developed specifically for the local context and pre-piloted. When prior validation did not exist, experts fluent in both English and the local language translated and back translated the instrument (Resource Loss Scale, PTSD Checklist for DSM-5). The study was approved by the Ethical Board of the Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb. Signed informed consent was obtained from all participants and an individual code was assigned to every participant to assure

confidentiality. If a participant reported symptoms of distress, s/he was provided with information on stress and coping and referred where to seek help.

Measures

Individual resources

Individual resources were assessed as the ability to tolerate and bounce back from change, problems, illness, pressure, failure, and painful feelings (e.g. Can deal with whatever comes) with the Connor-Davidson Resilience Scale 10-item version (Campbell-Sills & Stein, 2007). Responses ranged from 0 (not true at all) to 4 (true nearly all the time). Scores were calculated as an average response across items with higher scores indicating stronger individual resources (α_{total} = .88, $\alpha_{affected}$ = .89, $\alpha_{comparison}$ = .88).

Interpersonal resources

Interpersonal resources were assessed by the 12-item Multidimensional Scale of Perceived Social Support (Zimet et al., 1988) as a perception of support from family (e.g. My family really tries to help me), friends (e.g. I can talk about my problems with my friends) and significant other (e.g. There is a special person who is around when I am in need). Responses ranged from 1 (strongly disagree) to 7 (strongly agree). Scores were calculated as an average response across items with higher scores indicating stronger interpersonal resources (α_t = .91, α_a = .91, α_c = .92).

Community resources

Community resources were defined as individual-level perceptions of community social capital and engagement (6 items, e.g. There is trust between members of community; Community members work together to solve problems), economic development (4 items, e.g. There are diverse ways to secure livelihood), preparedness (4 items, e.g. People know what to do in case of a disaster) and leadership (6 items, e.g. Community members trust the local authorities). We measured community resources using the Community Resources Scale (Bakic, 2017) that was developed in the context of the 2014 flooding. Responses ranged from 0 (not at all) to 4 (to a full extent). Scores were calculated as an average response across items with higher scores indicating stronger community resources (α_t = .92, α_a = .89, α_c = .92).

Psychosocial resource loss

Psychosocial resource loss measure was measured using a list of key resources proposed by Hobfoll et al. (2006) that reflect the five essential elements of mass trauma intervention – promoting feelings of safety, calming, a sense of self- and community efficacy, connectedness, and hope (Hobfoll et al., 2007). Participants rated the amount of loss of 11 resources since the flood: time for adequate sleep, feeling valuable to others, free time, feeling of accomplishing one's goals, time with loved ones, sense of optimism, sense of humour, feeling of control over one's life, feeling that life is peaceful, motivation to get things done, and feeling that life has a purpose. Responses ranged from 0 (not at all) to 4 (to a large extent). Scores were calculated as an average response across items with higher scores indicating greater resource loss (α_t = .9, α_a = .89, α_c = .84).

Posttraumatic stress symptoms

Posttraumatic stress (PTS) symptoms in the past month were assessed with the 20-item PTSD Checklist for DSM-5 (Weathers et al., 2013). Responses ranged from 0 (not at all) to 4 (extremely). Scores were calculated as an average response across items with higher scores indicating a more severe level of PTS symptoms (α_t = .93, α_a = .93, α_c = .92). When calculating rates of probable PTSD, a cut-off score of 33 was used with a score calculated as a sum of all responses (Bovin et al., 2016).

Depression symptoms

Depression symptoms in the past two weeks were assessed with the 20-item Center for Epidemiologic Studies Depression Scale Revised (Eaton et al., 2004). Responses ranged from 0 (not at all or less than 1 day last week) to 4 (nearly every day for two weeks). Scores were calculated as an average response across items with higher scores indicating higher depression symptoms (α_t = .94, α_a = .94, α_c = .93). When calculating rates of probable depression, a cut-off score of 16 was used with a score calculated as a sum of all responses (Eaton et al., 2004).

Life satisfaction

Life satisfaction was measured with the 5-item Satisfaction with Life Scale (Diener et al., 1985) as a global assessment of quality of life (e.g. I am satisfied with my life). Responses ranged from 1 (strongly disagree) to 7 (strongly agree). Scores were calculated as an average response across items with higher scores indicating higher life satisfaction (α_t = .88, α_a = .88, α_c = .88).

Socioemografic variables and exposure

Sociodemografic variables included age, gender, war veteran status, ethnic background, employment, education, and marital status. Exposure to traumatic events prior to the flood was assessed with Trauma History Screen (Carlson et al., 2011) where participants reported experiencing or not 14 potential traumatic events. Exposure to 2014 floods was measured by a single item referring to feeling life threat (no/yes). The participants were also asked if they had attended psychological counselling of therapy prior to the flooding.

Data Analysis

First, we analysed descriptive statistics in the affected and the comparison communities. Then, we examined the bivariate relationships between the study variables (Pearson r). Finally, we tested the proposed process of resilience with structural equation modeling in lavaan (Rosseel, 2012). Missing data was treated using full information maximum likelihood that was shown to result in less bias than ad hoc missing data techniques (Enders, 2001).

To test the proposed model, we first specified all study variables as latent constructs measured by parcels (Little et al., 2013). As the use of parcels can mask model misspecifications, especially at the measurement model, we followed the recommendations on constructing parcels for the unidimensional and multidimensional constructs (for a review of critical issues in the use of parcels see e.g. Marsh et al., 2013). For the constructs that met the assumption of unidimensionality, we constructed parcels based on item loadings and residual covariance, assigning items with correlated unique terms to a single parcel (Marsh et al., 2013). We parceled the multidimensional constructs (as measured by the Multidimensional Scale of Perceived Social Support, the Community Resources Scale, and the PTSD Checklist for DSM-5) homogenously, meaning that all items corresponding to one factor were included in one parcel Three parcels

were calculated for each latent construct, except for the Community Resource Scale that has 4 factors.

We then tested the relationship of different levels of resources, resource loss, and positive adaptation on the whole sample (N = 447). The model included direct and indirect paths from the individual, interpersonal, and community resources on one side, and indicators of positive adaptation - PTS, depression symptoms, and life satisfaction - on the other side. Indirect paths were estimated through psychosocial resource loss. Then, we used multigroup structural equation modeling to test whether exposure to a flood moderated the indirect relationship of resources and positive adaptation through resource loss. To do so, we fitted the model in both the affected and the comparison communities and compared the size of indirect coefficients. Finally, we analysed the relationship of different factors of the Community Resource Scale to resource loss and positive adaptation in both affected and comparison communities. Additionally, we tested a number of alternative models to clarify the order of the variables in the model and to test the potential influence of confounding variables to the relationships of interest. Where the addition of control variables did not change the results, the more parsimonious model without control variables was kept.

To mitigate the effects of non-normal multivariate distribution, we calculated parameter estimates using maximum likelihood estimation with robust standard errors and scaled test statistics (Zhong & Yuan, 2011). We analysed the fit of the models using Hu and Bentler (1999) criteria for the Root Mean Square Error of Approximation (RMSEA), the Bentler Comparative Fit Index (CFI) and the Standardized Root Mean Square Residual (SRMR). Indirect regression coefficients and their differences between the affected and comparison communities were found significant if their 95% confidence interval (CI) calculated from the empirical sampling distribution based on 1000 samples did not contain 0. This approach has been found to have the best balance of Type I error and statistical power when testing the mediation hypothesis (e.g. MacKinnon et al., 2002).

Results

Descriptive statistics and correlation analysis

As expected, a significantly higher number of participants in the affected community identified themselves as belonging to an ethnic minority (affected community: n_a= 78; comparison community: n_c= 2; X^2 (1, N = 447) = 87.98, p < .001). Therefore, Table 3 shows the sample characteristics for the affected community, broken down by minority status, and the comparison community. There were only a few identified differences between the majority and minority nationals living in the affected community. Compared to the majority nationals and the comparison community, minority nationals less often declared themselves as war veterans, were more often unemployed after the flood, and more often reported feeling life threat during the flood. Interestingly, comparison community members more often reported feeling life threat during the flood compared to majority nationals in the affected community. They were also more likely to have attained higher education and had marginally more traumatic experiences prior to the flooding compared to the overall sample in the affected community.

However, we observed notable differences in study variables between the two communities: members from the affected community reported having fewer community resources, more psychosocial resource loss, and higher symptoms of PTS and depression. No differences were found between majority and minority nationals in the affected community. The rates of probable PTSD in the affected community were 32.4 % (95% CI: 24.8% - 40.7%) for the majority nationals and 33.3% (95% CI: 23.1% - 43.6%) for the minority nationals, compared to 21.9% (95% CI: 16.5% - 27.7%) in the comparison community. For probable depression, the rates were 35.9% (95% CI: 28.3% -44.4%) for the majority nationals and 34.6% (95% CI: 24.4% - 44.9%) for the minority nationals, compared to 23.7% (95% CI: 18.3% – 29.5%) in the comparison community. As there were no significant differences in the study variables between the majority and minority nationals in the affected community, subsequent analysis were conducted on all members of the affected community together.

Table 3

Summary of Sample Characteristics in the Affected and Comparison Community and Results of Difference Testing Between the Affected (Majority and Minority Nationals) and Comparison Community

	Affected community (n = 223)						Comparison community (n = 224)			p^+
	Majority nationals (n = 145)			Minority nationals (n = 78)						
	M / n	SD	%	M / n	SD	%	M / n	SD	%	
Socio-Demographic Variables										
Age	49.0	10.83		45.9	11.5		47.1	10.43		.14
Female	85		58.6	48		61.5	132		59.2	.91
War veteran	38		26.2	6		7.7	55		24.7	<.01
Unemployed before the flood	58		40.0	40		51.3	-		-	.11
Unemployed after the flood	68		46.9	50		64.1	99		44.6	.01
Higher education	11		7.6	4		5.1	37		16.7	<.01
Married/cohabitation	99		68.3	56		72.7	170		76.2	.24
Traumatic events before the flood	3.1	2.1		3.0	1.9		3.5	2.1		.09
Exposure										
Felt life threat	66		45.5	53		67.9	133		59.6	<.01
Psychological counselling/therapy										
Attended before the flood	27		18.6	10		12.8	25		11.2	.13
Study variables										
CD-RISC 10	2.9	0.78		3.0	0.74		2.9	0.67		.9
MSPSS	6.1	1.05		6.3	0.81		6.1	0.90		.28
CRS	1.5[a]	0.64		1.6[b]	0.68		2.2	0.66		<.001
COR-E	1.6[a]	1.08		1.7[b]	1.01		0.8	0.73		<.001
PCL-5	1.3[a]	0.93		1.4[b]	0.89		1.0	0.75		.001
CESD-R	0.8[a]	0.87		0.8[b]	0.88		0.5	0.59		<.001
SWLS	4.8	1.47		5.0	1.55		5.1	1.31		.21

Note. CD-RISC 10 = Connor-Davidson Resilience Scale 10; MSPSS = Multidimensional Scale of Perceived Social Support; CRS = Community Resources Scale; COR-E = The Conservation of Resources Evaluation Scale; PCL-5 = PTSD Checklist for DSM-5; CESD-R = The Center for Epidemiological Studies Depression Scale Revised; SWLS = Satisfaction with Life Scale.

[+]Tests of differences between the national majority and minority nationals in the affected community and comparison community (for categorical variables: Chi-square test; for continuous variables: one-way ANOVA).

[a]Significant difference between affected community majority nationals and comparison community (Tukey post-hoc test).

[b]Significant difference between affected community minority nationals and comparison community (Tukey post-hoc test).

Correlations between the variables are presented in Table 4. The relationships between the study variables were all significant, small to medium in size, and in the expected direction. There were some significant relationships between sample characteristics that were found to be different in the affected and the comparison community and the study variables. War veteran status was significantly related to less interpersonal resources; higher education was related to fewer symptoms of PTS; the number of traumatic events experienced before the flooding and feeling life threat during the flooding were related to more psychosocial resource loss, higher symptoms of PTS and depression and lower life satisfaction. These correlations were small. Unemployment was not significantly related to any of the study variables.

Table 4

Summary of Intercorrelations for Scores on the Study Variables and Intercorrelations between Control and Study Variables (N = 447)

	1	2	3	4	5	6	7
Study variables							
1. CD-RISC 10	-						
2. MSPSS	.36***	-					
3. CRS	.24***	.22***	-				
4. COR-E	-.26***	-.17***	-.33***	-			
5. PCL-5	-.33***	-.21***	-.16**	.5***	-		
6. CESD-R	-.34***	-.28***	-.2***	-.46***	.69***	-	
7. SWLS	.47***	.47***	.28***	.41***	-.36***	-.46***	-
Control variables							
War veteran	-.02	-.13**	-.02	-.01	-.04	-.07	-.02
Unemployed after the flood	-.03	-.04	-.00	-.03	-.04	-.03	.07
Higher education	.03	.00	.03	.01	-.12*	-.06	.02
Traumatic events before the flood	.01	-.04	-.04	.14**	.23**	.21**	-.12*
Felt life threat	-.08	-.04	.07	.12**	.28**	.19***	-.04

Note. CD-RISC 10 = Connor-Davidson Resilience Scale 10; MSPSS = Multidimensional Scale of Perceived Social Support; CRS = Community Resources Scale; COR-E = The Conservation of Resources Evaluation Scale; PCL-5 = PTSD Checklist for DSM-5; CESD-R = The Center for Epidemiological Studies Depression Scale Revised; SWLS = Satisfaction with Life Scale.
*$p < .05$, **$p < .01$, **$p < .001$

Structural Model: the Indirect Effect of Resource Loss

Results of model testing among all participants are shown in Figure 1. The model fitted the data well (χ^2 (188) = 302.8, $p < .001$; CFI = .98; RMSEA (90% CI) = .04 (.03 - .05); SRMR = .04) and all parcels loaded on the respective factors significantly ($p < .001$) and strongly (.59 - .94). The model showed significant direct relationship between resources and positive adaptation. Stronger individual resources were related to lower symptoms of PTS and depression and higher life satisfaction. Stronger interpersonal resources were related to lower symptoms of depression and higher life satisfaction. Psychosocial resource loss was related to higher symptoms of both PTS and depression symptoms and lower life satisfaction. Furthermore, stronger individual and community resources were related to less psychosocial resource loss since the flood. Overall, the model accounted for 18% of the variance in resource loss, 42% of the variance in PTS symptoms, 33% of the variance in depression symptoms, and 51% of the variance in life satisfaction. There were no significant direct associations between interpersonal resources and psychosocial resource loss (β = -0.06, p = 0.414) and PTS symptoms (β = -0.08, p = 0.187), nor between community resources and PTS symptoms (β = 0.07, p = 0.128), depression symptoms (β = 0.02, p = 0.656), and life satisfaction (β = 0.06, p = 0.172).

We found significant indirect relationships between resources and positive adaptation through psychosocial resource loss. Having stronger individual resources was related to less psychosocial resource loss and thus to lower PTS (b = -0.12, 95% CI: -0.2, -0.03) and depression symptoms (b = -0.08, 95% CI: -0.15, -0.03), and to higher life satisfaction (b = 0.1, 95% CI: 0.04, 0.19). The same was found for community resources: stronger resources were also related to less psychosocial resource loss and through that to lower PTS (b = -0.2, 95% CI: -0.29, -0.14) and depression symptoms (b = -0.14, 95% CI: -0.22, -0.09), as well as to higher life satisfaction (b = 0.17, 95% CI: 0.1, 0.26). Indirect relationships between interpersonal resources and positive adaptation were not significant (for PTS symptoms: b = -0.03, 95% CI: -0.12, 0.04; for depression symptoms: b = -0.02, 95% CI: -0.08, 0.03; for life satisfaction b = 0.03, 95% CI: -0.03, 0.09).

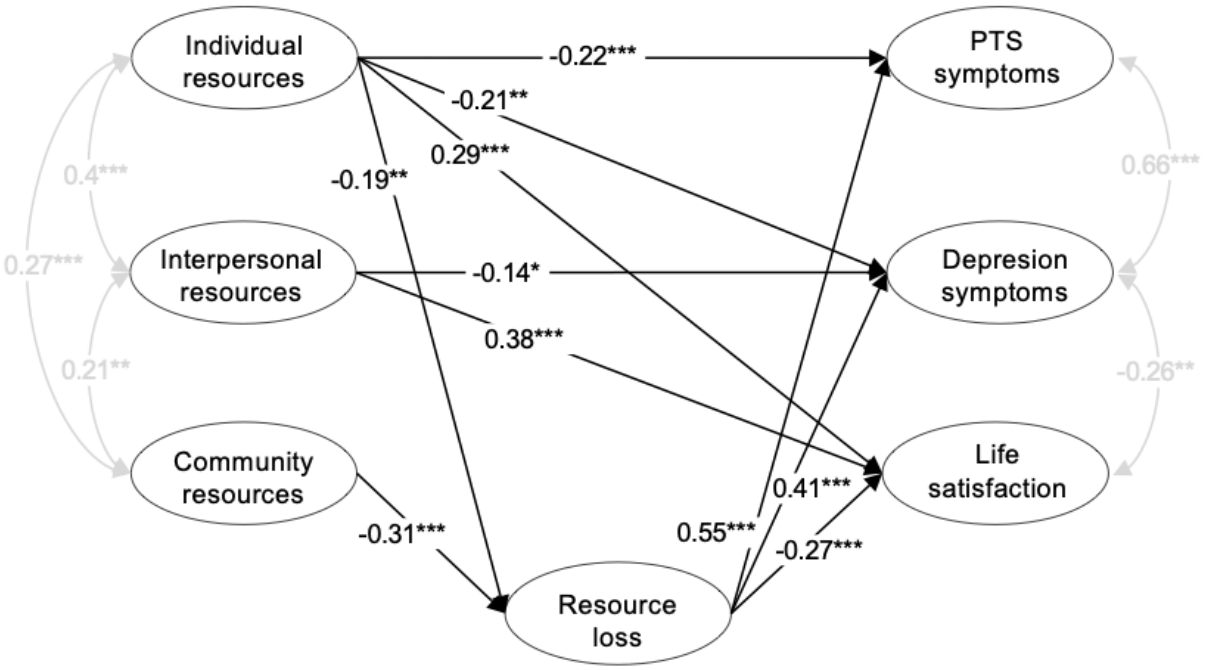


Figure 1. Relationship Between Individual, Interpersonal and Community Resources, Resource Loss and Positive Adaptation in a Community Sample (N = 447)
Note. Only significant regression paths shown (standardized coefficients). *p < .05, **p < .01, **p < .001

Alternative model

To further test the adequacy of the proposed model, we tested an alternative model where we reversed the role of assumed predictors and outcomes; that is, we tested whether mental health and life satisfaction were related to psychosocial resource loss, and through that to the levels of resources. As the two models have exactly the same fit to the data, no statistical decision of the model adequacy could have been made. However, analysis of the size and significance of the indirect effects (Table S1 in the Supplementary Material) has shown that the estimates of indirect effects were mostly not significant, and for those that were, the effects were smaller than in the proposed model. Therefore, the alternative model had little practical significance in explaining the data.

Structural Model: the Moderating Effect of Exposure

To analyse the moderating effect of exposure to a flood, the model was tested in the affected and the comparison community. First, we established that the measurement model was the same in the two communities, since the partial intercept invariance model resulted in a good fit ($\chi2$ (404) = 544.5, $p < .001$; CFI = .97; RMSEA (90% CI) = .04 (.03 - .05); SRMR = .05), that was not different from the loading invariance model ($\Delta\chi2$ (13) = 20.5, $p = .084$). Then, we compared this model, where all regression coefficients were freely estimated, to a constrained model, where all regression coefficients were constrained to be equal in the two communities. As the constrained model resulted in a worse fit ($\Delta\chi2$ (15) = 29.8, $p = .013$), we proceeded to calculate the differences in the size of indirect path coefficients and their bootstrap confidence intervals. The estimates of indirect path coefficients in the affected and comparison communities are presented in Table 5.

In the affected community, individual and interpersonal resources were more strongly related to positive adaptation through lower psychosocial resource loss. For individual resources, the difference was significant for PTS symptoms, while for interpersonal resources it was significant for all indicators of positive adaptation. In the comparison community, indirect paths from community resources to positive adaptation were all significant; however, compared to the affected community, only the path to life satisfaction was significantly stronger. The entire model accounted for 19% of the variance in resource loss, 53% of the variance in PTS symptoms, 38% of the variance in depression symptoms, and 56% of the variance in life satisfaction in the affected community. In the comparison community, it explained 13% of the variance in resource loss, 21% of the variance in PTS symptoms, 18% of the variance in depression symptoms, and 46% of the variance in life satisfaction.

Alternative models

To test whether or not the differences in sociodemographic variables between the affected and comparison communities impacted the results, we have analysed three alternative models. First, we have fitted the model in the affected community only, comparing the majority and minority nationals. The results of the model testing (Table S2 in the Supplementary Material) show that 1) the partial intercept invariance model fitted well in the two subgroups, showing that the measured

constructs did not differ between the two groups, and that 2) constraining the structural regression coefficients had no impact on the model fit, meaning that all structural regression coefficients were the same in the two subgroups of the affected community. Then, we fitted the model again in the affected and comparison community, but this time using only the results from majority nationals. The measurement model did not differ between the two groups; however, there were significant differences in regression paths between the two communities (Table S3 in the Supplementary Material). Comparing the estimates of indirect path coefficients from this model (Table S4 in the Supplementary Material) to the coefficients from the full sample (Table 5) shows that the magnitudes of the effects and their differences were unchanged. Finally, we fitted the model in the affected and comparison communities controlling for sociodemographic variables that were found related to the study variables, namely, war veteran status, education, number of traumatic events before the flood and feeling life threat. The model fitted the data well ($\chi 2$ (562) = 780.1, $p < .001$; CFI = .96; RMSEA (90% CI) = .04 (.04 - .05); SRMR = .06). Again, the estimates of indirect path coefficients (Table S5 in the Supplementary Material) did not differ from the model without control variables (Table 5).

Supplementary Analysis: a Closer Look at Community Resources

To further clarify the role of community resources, we analysed the relationship of the four subscales of the Community Resources Scale with psychosocial resource loss and indicators of positive adaptation. The model fitted the data well ($\chi 2$ (184) = 282.2, $p < .001$; CFI = .98; RMSEA (90% CI) = .05 (.04 - .06); SRMR = .04) and the results of testing the indirect paths are presented in Table S6 in the Supplementary Material. In the affected community, the social capital and community engagement subscale was more strongly indirectly related to symptoms of PTS and depression, and marginally more strongly related to life satisfaction. In the comparison community, the economic development subscale was significantly indirectly related to all indicators of positive adaptation; in the affected community, there were no significant relationships. However, the difference in paths did not reach statistical significance. Finally, in the comparison community, the leadership subscale was more strongly indirectly related to all indicators of positive adaptation. Preparedness was not significantly related to the outcomes in either community.

Table 5

Unstandardized Regression Coefficients, Standard Errors and Confidence Intervals for Indirect Paths Between Individual, Interpersonal and Community Resources and PTS and Depression Symptoms and Life Satisfaction through Psychosocial Resource Loss in the Affected and the Comparison Community (n_a = 223, n_c = 224)

	Affected community				Comparison community				Difference: Affected - Comparison			
	Value	SE	95% CI		Value	SE	95% CI		ΔValue	SE	95% CI	
			LL	UL			LL	UL			LL	UL
Individual resources												
→ PTS symptoms	-0.23***	0.06	-0.35	-0.12	-0.07*	0.04	-0.18	-0.01	-0.15*	0.07	-0.30	-0.02
→ Depression symptoms	-0.14**	0.04	-0.23	-0.06	-0.05*	0.03	-0.15	-0.01	-0.08	0.05	-0.20	0.01
→ Life satisfaction	0.15**	0.06	0.06	0.30	0.12*	0.06	0.03	0.32	0.04	0.09	-0.13	0.19
Interpersonal resources												
→ PTS symptoms	-0.14*	0.06	-0.28	-0.03	0.02	0.03	-0.02	0.09	-0.17*	0.07	-0.32	-0.05
→ Depression symptoms	-0.09*	0.04	-0.20	-0.02	0.02	0.02	-0.01	0.07	-0.1*	0.05	-0.22	-0.03
→ Life satisfaction	0.09*	0.04	0.03	0.21	-0.04	0.04	-0.14	0.03	0.14*	0.06	0.04	0.28
Community resources												
→ PTS symptoms	0.03	0.08	-0.13	0.21	-0.09*	0.04	-0.18	-0.03	0.13	0.09	-0.03	0.33
→ Depression symptoms	0.02	0.05	-0.09	0.14	-0.07*	0.03	-0.15	-0.02	0.09	0.06	-0.01	0.23
→ Life satisfaction	-0.02	0.06	-0.16	0.08	0.15*	0.07	0.05	0.32	-0.17*	0.09	-0.40	-0.04

Note. Value = unstandardized regression coefficient; CI = confidence interval (1000 bootstrap samples); LL = lower limit; UL = upper limit
*p < .05, **p < .01, **p < .001

Discussion

The results of this study indicate that, one and a half years after the disaster, the affected community is still recovering. The rates of probable PTSD and depression were significantly higher in the affected community than in the comparison community. With over 32% of the community members at risk of PTSD and almost 36% at risk of depression, our results indicate worse mental health outcomes than in similar studies of the consequences of flooding (Chen & Liu, 2015; Jermacane et al., 2018). As the rates of probable mental health disorders were high in the comparison community as well (over 20%), the mental health consequences were likely exacerbated by prior exposure to traumatic events, as this whole area of the country has been severely affected during the Croatian Homeland War (1991-1995). Traumatic pre-exposure is a well-known factor of greater mental health risks in repeated expose to adversity (Lowe et al., 2019). At the same time, life satisfaction did not differ between the communities, highlighting the notion that positive adaptation is more than mental health and can co-occur with mental health symptoms (Southwick et al., 2014). Individual and interpersonal resources did not differ between the two communities, indicating relative stability or recovery at the level of the community. However, the affected community experienced more psychosocial resource loss and estimated less availability of community resources than the comparison community. These findings are in line with the previous research showing that disasters increase psychosocial resource losses and that the level of exposure is related to the depletion of community resources (Benight, 2004; Braun-Lewensohn & Mosseri Rubin, 2014).

Furthermore, our findings reaffirm the important role resources play in positive adaptation in the aftermath of disasters. We found that resources from different levels of ecological systems are both directly and indirectly related to mental health and life satisfaction, thus supporting the multisystemic perspective in the study of resilience (Ungar & Theron, 2020). Individual resources, defined as the ability to tolerate and bounce back from problems, as well as interpersonal resources, defined as the support from family, friends, and the significant other, both had direct salutogenic effect on mental health and life satisfaction, as previously found in other studies (Ahmad et al., 2010; Bonanno et al., 2010; Kaniasty & Norris, 2009; Ying et al., 2014). Resources from different levels of ecological systems also had an indirect effect on mental health and life satisfaction, through lower psychosocial resource loss. There is numerous

evidence that resource loss has a detrimental effect on positive adaptation after disasters (Benight et al., 1999; Hobfoll, Canetti-Nisim et al., 2006; Zwiebach et al., 2010), but less is known on how to mitigate psychosocial resource loss. This study supports the often discussed notion that any single resource at different systemic levels can promote a "cascade of changes" (Ungar & Theron, 2020, p. 3) or that people tend to build and maintain 'resource caravans', the associations of linked resources, that protect against resource loss (Hobfoll, 2014, p. 22). Furthermore, this study shows that community level resources can contribute to reducing individual level resource loss and thus supplement resources on lower levels of ecological systems. This finding is in line with Wind and Komproe's (2012) conclusion that disaster-affected individuals in communities with high social capital rely less on individual resources to protect their mental health. It should also be regarded as an important strategy for interventions, as community level interventions can reach a larger number of people at the same time.

Moreover, we found that depending on the exposure level, different resources are harnessed in order to protect against psychosocial resource loss and adapt in the post-disaster environment. This, in addition to the fact that our models were significantly better in explaining the variance of the outcomes in the affected community, provides new evidence that the processes that occur in the context of high risk are qualitatively different to those that occur in the absence of high risk (Luthar et al., 2000). In the affected community individual resources more strongly related to PTS symptoms through psychosocial resource loss. This finding is in line with previous studies that have shown that individual resources have a more important role in reducing symptoms of PTS at higher levels of risk (Besser et al., 2014; Green et al., 2010). No such effect was found for depression symptoms and life satisfaction, contrary to some previous studies (e.g. Kaniasty, 2006). It is possible that, due to the inclusion of interpersonal and community resources, the relative importance of intrapersonal coping strategies in this study was diminished. Furthermore, interpersonal resources were found to be more strongly indirectly related to all indicators of positive adaptation in the affected community, thus supporting the important role of social support in buffering the effects of high risk (Arnberg et al., 2012; McGuire et al., 2018). In fact, in the comparison community, interpersonal resources were not significantly related to positive adaptation. This could be attributed to the type of resource loss that was experienced: in the comparison community resource loss was likely related to more individually experienced stressors; therefore, the coping efforts might have not relied as much on interpersonal support. It

could also reflect a qualitatively different adaptation process in differentially exposed communities, as social support can be seen as a potential catalyst of the resilience process in the context of high risk (Abramson et al., 2015).

Finally, and contrary to our expectations, community resources as a whole were more strongly indirectly related to positive adaptation in the comparison community. However, an additional analysis showed that the pattern of relationships was not the same for all aspects of community resources. Community social capital and engagement was more important in the affected community, whereas trust in leadership and economic development was more important in the comparison community. Taken together with the important role of interpersonal resources, this study points out that the recovery of communities affected by a disaster is deeply embedded in the social environment and that improving and strengthening this dimension in the post-disaster period is essential for individual and community mental health and wellness (Ungar & Theron, 2020). Nevertheless, more research is needed to determine the appropriate timing of these supports. A longitudinal study after hurricane Katrina showed that the level of children's PTS was associated with increased social support from parents and peers only about a year and a half after the disaster (Lai et al., 2018). It is therefore possible that the "naturally occurring" social support systems come into play only in the mid- to long-term period after disaster if not facilitated by interventions. Further research that examines longitudinal patterns of relationships between interpersonal and community resources and psychological outcomes should clarify this point.

That leadership and community economic development were more important resources in a non-flooded community is contradictory to the theoretical predictions (Norris et al., 2008). But some studies indicated that higher community economic development was related to better outcomes only among participants who were not exposed to disasters (Lowe et al., 2015). In the present study it is likely that disaster mitigation efforts and subsequent governmental relief targeting the affected community has superseded the leadership role of municipal authorities and diminished the effects of economic loss. Although often regarded as an important resource (Braun-Lewensohn & Sagy, 2014; Krishna et al., 2018), disaster preparedness was not related to positive adaptation in either community. It is possible that the suddenness of the event as well as previous war-related experience with displacement shaped a relatively disengaged relationship to preparedness. This would be in line with some studies that indicate that cumulative exposure to

disasters can reduce disaster preparedness (Liddell et al., 2020). Further research is needed to clarify these findings, particularly conducted in communities differentially exposed to risks.

Study limitations

This study has several limitations. First, as all measurements have been conducted in a single time point, the true causal relationships could not be determined. Rather, the order of the variables entered into the model was based on logical sequence and predictions based on Hobfoll's COR theory (1989). Because of the cross-sectional nature of the data, it is also not possible to determine whether or not there are other factors that can affect the findings. Even though we attempted to overcome these limitations by testing alternative models with different order of the variables or with control variables, we acknowledge that factors such as pre-disaster and current mental health, time of the measurement, as well as observed and unobserved differences between the two communities might have impacted the results. However, previous studies have found that resource-to-outcome relationship holds true even after accounting for pre-disaster mental health (e.g. Zwiebach et al., 2010). It has also been found that psychosocial resource loss is a stronger predictor of distress over longer time periods than vice versa (Heath et al., 2012), thus supporting our proposed order of variables in the models.

Second, community resources in this study were measured at an individual level and can be more accurately described as individual-level perceptions of community resources or the availability of those resources to the individual. The limitation of this approach is the possibility that individuals cannot accurately estimate community resources, and therefore the results reflect a portion of the variance attributed to participant's individual characteristics. Nevertheless, our findings are in line with previously conducted multi-level studies that have assessed community resources at an aggregate level (e.g. Ursano et al., 2014; Wind & Komproe, 2012). Therefore, it is likely that individual perceptions are embedded in the actual resources available in the community.

Although the fit of the analytical model to the data was good and the percentage of explained variance in indicators of positive adaptation was high, the study was less successful in explaining the variance of psychological resource loss. This is an important consideration for future studies, given the importance of resource loss for post-disaster recovery. It is evident that there are a multitude of resources that play a part in fostering resilience; future studies should aim

to identify those resources with the strongest potential to protect from psychosocial resource loss and therefore lead to better post-disaster outcomes. Furthermore, even though the sample size was adequate for addressing the research questions and included approximately 6% of all community members from each community, in absolute terms it was modest in size.

Finally, we have not said anything about the generalisability of this study yet. Even though it is not a limitation in the same sense as those previously mentioned, it is possible that some characteristics of the studied communities have shaped the results of this study, particularly as it concerns the relative (un)importance of economic development and trust in leadership in the affected community. This study was conducted in two rural communities that have both been economically disadvantaged and where unemployment was rampant. Additionally, a high percentage of participants have previously experienced a number of potentially traumatic events related to war experiences. The closing of workplaces and further increased unemployment after the disaster, combined with high material losses and a government-led reconstruction programme, might have reduced previous socioeconomic differences in the affected community (that have already been small) and diminished the leadership role of the municipal authorities. Furthermore, this study was conducted in the mid-term period after the flooding, when a higher emphasis on social ties and resources may dominate, which may be different at other recovery phases.

Conclusions and implications

Despite its limitations, this study adds to the knowledge of the resilience process after exposure to disasters. We explored how communities adapt to a disaster by harnessing resources and mitigating resource loss. We included resources from different levels of the ecological systems and moved forward from operationalising positive adaptation only as the absence of psychopathology. The samples were of sufficient size and randomly sampled , therefore strengthening the generalisability of the findings in the similar contexts. We were also able to compare findings between two communities similar in terms of population composition and life experiences but differentially exposed to flooding. The findings indicate that strong individual, interpersonal, and community resources protect against psychosocial resource loss and through that reduce symptoms of PTS and depression and improve life satisfaction. Individual resources, and especially interpersonal resources and community social capital and engagement, were found

to be particularly important in the flooded community. These findings support the notion that processes occurring in the presence of high risk are different from those occurring in the presence of low risk (Luthar et al., 2000), hence contributing to the development of resilience models in disaster research and planning interventions at different stages of disaster response. Future studies might benefit from examining these relationships in different social contexts and, particularly, longitudinally, at different times post-disaster.

Our findings have implications for disaster preparedness efforts and post-disaster interventions. Building resources in communities is likely to positively influence community members' health and well-being even in the absence of high community-level exposure to risk. Individual resources, community economic development, and trust in community leadership play an important role in improving community mental health and life satisfaction. However, after exposure to disasters, and following the stepwise model of psychosocial support (Inter-Agency Standing Committee, 2007), interventions should aim to strengthen family and community ties. As disasters have a lasting impact on community life, these interventions should continue in the long-term period (Reifels et al., 2014). Finding ways to promote social support and community connectedness could be the key to fostering disaster resilience.

Part III. Stability and Change Post-Disaster: Dynamic Relations Between Individual, Interpersonal and Community Resources and Psychosocial Functioning

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Introduction

Unlike cognition-based theories of stress, where stress is considered to be rooted in an individual's appraisal of an event, a more environmental, resource-based approach has spurred interest in disaster research. This is related to the very nature of the event: surviving a disaster includes a myriad of losses, some tangible, such as the loss of loved ones, physical health and widespread material losses, and many impalpable ones, such as loss of social networks due to relocation, along with loss of optimism, belief in the just world, and hope. These attributes are usually embedded in the definition of the event itself, for example, the United Nations Office for Disaster Risk Reduction (2009) states that a disaster is a "serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources".

One of the most commonly applied perspectives on stress in studies of disasters stems from the Conservation of Resources (COR) theory (Hobfoll, 1989). COR theory claims that people strive to obtain, retain and protect their resources because of their value in itself or their potential in obtaining other valuable resources. Therefore, psychological stress is experienced when there is a threat of loss of resources, actual loss of resources, or lack of resource gain following the investment of resources. Resiliency to stress, or fast recovery after stressful situations, is the result of preventing resource loss or recovering resources, which is related to the previous amount, strength and diversity of one's resources (Hobfoll, 1989; 2001). The main resource categories proposed by Hobfoll (1989) are presented in Table 6.

There is ample evidence supporting the role of resource loss in post-disaster functioning. Resource loss predicted distress after hurricane, both concurrently (Freedy et al., 1992) and longitudinally (Benight et al., 1999), mediated the relationship between the severity of flood exposure and psychological distress and physical symptoms (Smith & Freedy, 2000), and had effects over and beyond traumatic exposure and pre-disaster psychological functioning (Sattler et al., 2006; Zwiebach et al., 2010). On the other hand, empirical support for the role of resource gain seems to be inconsistent: some studies indicate that it increases psychological functioning (e.g. Hobfoll et al., 2003), others found no relationship (e.g. Zwiebach et al., 2010), while some even found it related to a decrease in functioning (e.g. Hobfoll, Canetti-Nisim et al., 2006).

However, there are several limitations in the approaches used up to date. These include the definition of resources, as well as methodological approaches used to measure them.

Table 6

Types of resources

Resource Categories	Definition	Examples
Objects	Items of value due to their physical nature, rarity or expense	Housing, personal transportation
Personal Characteristics	Traits and skills that foster stress resistance	Self-esteem, optimism, skills
Conditions	States that are valued because of their general desirability	Marriage, health
Energies	Resources that aid in obtaining other resources	Time, money, knowledge

Note. Adapted from Hobfoll (1989)

The most common criticism of the COR theory is the definition and scope of the key resources that play a role in experiencing stress (Thompson & Cooper, 2001; Halbesleben et al., 2014). Acknowledging that almost anything of value may be considered a resource, Hobfoll (2001) proposed 74 key resources broadly representing four resource categories. However, previous studies have been inconsistent in the selection of key resources, both in the number of resources assessed as well as their focus. For example, the number of resources under study can be found to vary from 14 to 52, focusing on all the four resources categories, material resources or personal and social resources specifically (Benight, 1992; Freedy et al., 1992; Sattler et al., 2006; Smith & Freedy, 2000). Furthermore, resource loss score is commonly aggregated across different categories of resources, assuming equal impact on post-stressor functioning. For example, Hobfoll, Tracy et al. (2006) examined the psychological impact of terrorist attacks using an 11-item scale to assess a mixture of individual and social resources, such as time for sleep, optimism, feeling valuable to others and time with loved ones.

Other studies have examined the role of resources at different levels of ecological systems (e.g. Kimhi, 2016; Norris et al., 2008). Individual resources can be seen as personal characteristics that affect the ability to cope with threatening events and promote the rate of

recovery, such as socio-demographic characteristics, personality traits, sense of control and self-efficacy. Similarly, community and societal resources also contribute to post-disaster functioning, but influence a larger number of individuals at the same time. These resources include, among others, community economic resources, social capital, community efficacy or trust in government and public institutions. This view is linked closely to the widely acknowledged approaches that emphasize the ecological perspective of multiple, dynamic and interrelated systems that contribute to development, psychopathology and well-being in general (e.g. Bronfenbrenner's ecological model, Bronfenbrenner, 1977). It may be especially useful in disaster research as it has the potential to guide the pre- and post-event interventions given that disasters affect a multitude of systems at once.

The evidence suggests that resources at differing levels of systems contribute to psychological outcomes post-disaster (for a comprehensive review see for example Bonanno et al., 2010 and Masten & Narayan, 2012). For example, individual characteristics, such as hardiness and persistence were found to be related to lower levels of PTSD, depression and anxiety after natural and human-made disasters (Ahmad et al., 2010; Irmansyah et al., 2010; Ying et al., 2014). An important interpersonal resource, social support, has repeatedly been found to contribute to better mental health outcomes after disasters (e.g. Bonanno et al., 2007; Kaniasty & Norris, 2008). Some studies indicate that community resilience, defined as community leadership, collective efficacy, preparedness, place attachment and social trust contribute to mental health and well-being in the context of armed conflict (Braun-Lewensohn & Sagy, 2014; Kimhi & Eshel, 2009), but more evidence, including in different contexts, is needed. Even though these studies demonstrate the importance of individual and social resources, they do not directly test the role of resource change. Studies following this line of research, despite the advancement in the understanding of the ecology of resources, have yet to contribute to the understanding of the process of resource loss or gain across time (Benight et al., 2009).

Finally, resource change is usually assessed retrospectively by asking the participants to rate the amount of loss or gain they experienced since the disaster up to a given time point (e.g. Benight et al., 1999; Freedy et al., 1992; Sattler et al., 2006; Smith & Freedy, 2000). Yet, studies show that retrospective measurements are burdened with recall bias (Moffitt et al., 2010), especially when it comes to psychosocial variables (Henry et al., 1994). This may be especially true when measuring change, since change scores tend to be greater in retrospective

measurements (Norman, 2003). A few authors (e.g. Zwiebach et al., 2010) applied a more direct approach to assess changes in resources, namely calculating a difference score by subtracting the scores from two measurement points. However, it has been shown that change scores are burdened with measurement error, impacting significance testing and standardized coefficients (Newsom, 2015). Structural equation modeling approaches (SEM) provide a method to analyze longitudinal change and to test change-to-change relationships among two or more processes unburdened by measurement error (Henk & Castro-Schilo, 2015; McArdle 2009).

The current study aims to contribute to a growing body of evidence supporting the role of resource loss and gain in post-disaster psychological outcomes. At the same time, it aims to address several of the previously identified gaps. First, it utilizes an ecological perspective by identifying resources at individual, interpersonal and community level. Second, resources and outcomes are measured longitudinally, thus directly testing the role of resource loss or gain in psychosocial outcomes across time. Finally, a SEM approach is used to test the dynamic relationship between the change in resources and change in several psychological outcomes, therefore accounting for measurement error associated with change scores. Specifically, it was hypothesized that an increase in hardiness and persistence (individual resources), social support (interpersonal resources) and community social capital and engagement (community resources) would be related to a decrease in the symptoms of posttraumatic stress and depression and an increase in life satisfaction in the long-term period after a natural disaster.

Method

Event

In May 2014 severe flooding struck south-eastern Europe. In Croatia, the event resulted in the first official declaration of a "state of catastrophe" by the National Protection and Rescue Directorate. After several weeks of heavy rainfall, on May 17th around 15:00 hours the river Sava embankment breached in several locations, which led to a rapid water surge to the surrounding communities. As a result of the flooding, two people were killed and more than 13,000 people were evacuated. Due to the suddenness of the event and a number of refusals of early evacuation, a large number of people had to be rescued from their flooded homes.

The flood resulted in devastating material losses: thousands of livestock drowned and around 7,500 damaged buildings, amounting to hundreds of millions EUR worth of damage (National Protection and Rescue Directorate, 2015). The reconstruction of homes was an additional source of stress for the affected population. Faced with a choice of receiving monetary reimbursement (up to around 9,500 EUR) to conduct reconstruction or entrusting the reconstruction to the Government, the majority of the affected people chose to take the reimbursement (Bobovec et al., 2016). However, it later became clear that the sum awarded for the reconstruction was insufficient, leading to additional material losses and dissatisfaction and a sense of unfairness.

Participants and procedure

The sample consisted of 224 community members from the most severely struck municipality in Croatia. The sample size was large enough to ensure that parameter estimates are within the acceptable margin of error of 6%, with the confidence level of 95%. Participants were eligible for this study if they were between 25 and 65 years old, have lived in the community at least 5 years prior to the flooding and have been in the community at the day of the flood incident. They were recruited using random sampling of households based on the register provided by the State Geodetic Administration. If several adults in one household were eligible, one adult whose birthday was closest to the interview date was selected. Up to 3 attempts were made to conduct the interview. Interviews were conducted by trained interviewers using instruments that have been translated and back-translated by experts fluent in English and Croatian. The average time for completing a single interview was approximately 1 hour. Several community leaders supported and announced the study to community members, including the school principal, religious leaders and the local radio station.

Interviews were conducted at two time points: in November 2015 (T1) and in September 2016 (T2). T1 was selected based on the almost completed rebuilding efforts in the community and the return of the majority of the community members, to ensure the feasibility of assessing community resources. The 10-month interval between the measurement points was deemed adequate in order to capture change in resources and psychosocial outcomes. Response rate at T1 was 71.3% and the most common reasons for refusal were lack of time or not wanting to be reminded of the floods. Dropout rate at T2 was 30.5% and was mostly due to moving out of the

community or working seasonal jobs. Only 19 participants (8.5% of the original sample) refused to participate at T2, due to low interest or perceiving no benefits from participating. No significant differences were found in socio-demographic variables, exposure, mental health-care utilization and resource and outcome measures at T1 between the participants who dropped-out and those who remained in the study; therefore no evidence was found for systematic drop-out. Descriptive information about the sample and dropout analysis is provided in Table 7.

Table 7

Sample Descriptive Information and Drop-Out Analysis

	Time 1 (N = 224)			Time 2 (N = 155)			t / χ^2 (p) [a]
	M / *n*	*SD*	*%*	*M* / *n*	*SD*	*%*	
Demographics							
Age	48.2	10.69		49.6	10.43		-0.77 (.44)
Female	133		59.6	93		60.0	0.03 (.87)
War veteran	44		19.7	33		21.3	0.78 (.38)
Croatian nationality	145		65.0	104		67.1	0.96 (.33)
Employed prior to the flood	79		35.4	53		34.2	0.34 (.56)
Employed after the flood	58		26.0	48		34.5	0.59 (.44)
Up to high school education	208		93.3	142		91.6	2.23 (.14)
Married/cohabitation	155		69.8	117		75.5	0.01 (.94)
Exposure							
Felt life threat	119		53.4	76		49.0	3.83 (.05)
Injured/ill	43		19.3	28		18.1	0.48 (.49)
Seen water	165		74	117		75.5	0.59 (.44)
Psychological counselling/therapy							
Attended before the flood	37		16.6	21		13.5	3.4 (.07)
Attended after the flood	46		20.6	22		14.3	0.53 (.47)
Unmet health needs	71		32.4	53		35.3	1.06 (.3)
CD-RISC 10	2.93	0.77		2.98	0.76		1.12 (.27)
MSPSS	6.15	0.98		6.17	1.03		0.43 (.67)
CRS-SCCE	1.6	0.79		1.65	0.73		0.92 (.36)
PCL-5	1.35	0.92		1.06	0.86		0.81 (.42)
CESD-R	0.81	0.87		0.54	0.65		1.83 (.07)
SWLS	4.88	1.5		4.94	1.34		0.56 (.58)

Note. CD-RISC = Connor-Davidson Resilience Scale 10; MSPSS = Multidimensional Scale of Perceived Social Support; CRS-CSCE = Community Resources Scale – Social Capital and Community Engagement subscale; PCL-5 = PTSD Checklist for DSM-5; CESD-R = The Center for Epidemiological Studies Depression Scale Revised; SWLS = Satisfaction with Life Scale
All scale results were calculated as an average response across all items.
[a]Tests of differences in T1 measures between participants who participated in T2 compared to those who did not.

The study was approved by University of Zagreb Department of Psychology ethical committee. Written informed consent was obtained from all participants at T1. Data collection guaranteed confidentiality since an individual code assigned to the household was used to match questionnaires from two time points. In case a participant reported symptoms of distress, he/she was provided with information on where to seek help and a flyer with information on stress and coping.

Measures

Individual resources were assessed with Connor-Davidson Resilience Scale 10-item version (CD-RISC 10; Campbell-Sills & Stein, 2007). This self-report scale captures two facets of individual resources, hardiness and persistence. Participants rated their responses on a 5-point scale (0 = *not true at all*, 1 = *rarely true*, 2 = *sometimes true*, 3 = *often true*, 4 = *true nearly all the time*) referring to the previous month. Internal consistency of the scale was very good at both time points (Cronbach's $\alpha_{(T1)}$ = .89, Cronbach's $\alpha_{(T2)}$ = .91).

Interpersonal resources were assessed using the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988). The 12-item scale assesses the perception of support from three different sources (family, friends and a significant other) on a 7-point rating scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *slightly disagree*, 4 = *neither agree nor disagree*, 5 = *slightly agree*, 6 = *agree*, 7 = *strongly agree*). Internal consistency was excellent at both time points (Cronbach's $\alpha_{(T1)}$ = .91, Cronbach's $\alpha_{(T2)}$ = .93).

Community resources were assessed using a 6-item Social Capital and Community Engagement subscale of the Community Resources Scale (Bakic, 2017). The scale was developed for the purpose of this study and pretested in a pilot. The Social Capital and Community Engagement subscale taps into social relationships at the community level, namely connectedness, trust and mutual helping as well as collective efficacy (e.g. *There is a feeling of trust between community members*; *Community members work together to solve problems*). Participants responded on a 5-point rating scale (0 = *not at all*, 1 = *to a small extent*, 2 = *somewhat*, 3 = *to a large extent*, 4 = *to a full extent*). Internal consistency was good at both time points (Cronbach's $\alpha_{(T1)}$ = .81, Cronbach's $\alpha_{(T2)}$ = .79).

Posttraumatic stress (PTS) symptoms were measured using the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013), a self-report measure based on the *DSM-5* classification. Participants rated to what extent they have been bothered in the past month by 20 problems across 4 clusters of symptoms (re-experiencing, avoidance, negative alterations in mood or cognitions, increased arousal) on a 5-point scale (0 = *not at all,* 1 = *a little bit,* 2 = *moderately*, 3 = *quite a bit*, 4 = *extremely).* Internal consistency of the scale was excellent at both time points (Cronbach's $\alpha_{(T1)}$ = Cronbach's $\alpha_{(T2)}$ = .93). A cut-off score of 33 is recommended for diagnosing PTSD when the score is calculated as a sum of all responses (Bovin et al., 2016).

Depression symptoms were measured using The Center for Epidemiologic Studies Depression Scale Revised (CESD-R; Eaton et al., 2004). The scale measures symptoms of depression in 9 clusters as defined by *DSM-5* (sadness, loss of interest, appetite, and sleep, thinking/concentration, guilt, fatigue, movement/agitation, suicidal ideation). Participants rated the number of days the problem bothered them in the past week/past two weeks on a 5-point scale (0 = *not at all or less than 1 day last week,* 1 = *one or 2 days last week,* 2 = *three to 4 days last week,* 3 = *five to 7 days last week,* 4 = *nearly every day for two weeks*). Internal consistency of the scale was excellent at both time points (Cronbach's $\alpha_{(T1)}$ = .94, Cronbach's $\alpha_{(T2)}$ = .93). A cut-off score indicating "significant" depressive symptomatology is 16 when the score is calculated as a sum of all responses (Eaton et al., 2004).

Life satisfaction was measured by the Satisfaction with Life Scale (SWLS; Diener et al., 1985). The 5-item scale measures global life satisfaction. Participants rated their responses on a 7-point scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *slightly disagree*, 4 = *neither agree nor disagree*, 5 = *slightly agree*, 6 = *agree*, 7 = *strongly agree*). Internal consistency of the scale was very good at both time points (Cronbach's $\alpha_{(T1)}$ = Cronbach's $\alpha_{(T2)}$ = .88).

Data Analysis

To analyze the relationship between the change in resources and change in psychosocial outcomes, latent difference score (LDS) models were specified (McArdle, 2009). These models allow assessing the change directly, as a difference between the latent scores from two measurement points; the approach which has previously been described as particularly useful to examine the mean change in scores and predicting change across time (Henk & Castro-Schilo, 2015; McArdle, 2009). In addition, they enable parceling out the part of variance pertaining to

the error, resulting in perfectly reliable change variables; a property especially important when measuring inherently unreliable difference scores (McArdle, 2009).

Conceptually, a difference score calculated using an LDS model is analogous to an observed difference score calculated by subtracting the values of two measurements, but is defined at a latent level. This is achieved by specifying a second-order latent variable with no observed indicators and forcing a decomposition of the T2 latent construct by a series of constraints. To specify a LDS model, we (1) specified a latent construct at T1 and T2; (2) regressed the T2 latent construct on both the T1 latent construct and a second-order latent construct, with the two regression weights set to 1.0; and (3) freely estimated the covariance between the T1 and the second-order latent construct. Mathematically, these constraints define the T2 latent construct as a sum of a T1 latent construct and a second-order latent construct, meaning that the latter represents the difference between a T2 and a T1 latent construct and can be interpreted as a latent difference score variable (for detailed discussion on specifying LDS models see Henk & Castro-Schilo, 2015 and McArdle, 2009).

To analyze the independent contribution of a single resource, LDS models were specified by regressing latent difference scores of psychosocial outcome variables on the latent difference scores of the three levels of resources separately. Upon identifying the significant independent contributions, a full LDS model was tested by regressing psychosocial outcome variables on all the three levels of resources at the same time, thus allowing to identify the relative contribution of a resource with others held constant. Prior to fitting LDS models, longitudinal invariance was tested for all latent constructs in order to ascertain latent construct comparability across two measurement points (see Little, 2013).

Latent constructs were identified by same observed indicators at each time point using parcels. When the key study question pertains to relationships among latent variables, parcels have several advantages over single items: superior psychometric properties (higher reliability and communality, better distributional properties) as well as more favorable intervals between scale points (Little et al, 2002). In addition, they reduce the number of parameters in the model; a property that is especially beneficial with relatively small samples. Three parcels per scale were constructed using recommendations from Little et al. (2013). The parcel score was calculated as an average response across all items assigned to it. Latent constructs were scaled by constraining

the indicator loadings to average 1.0 and indicator intercepts sum to zero for each construct (effects coding) (Little, Slegers, & Card, 2006). Latent variances are thus estimated as the average of indicators' variances, and latent means as the optimally weighted average; resulting in latent variances and means estimation in the original response scale (Little, 2013; Little et al., 2006).

Although skew (SI) and kurtosis (KI) indices did not point to an extreme deviation from normality (for all variables in the analysis SI < |3| and KI < |10|) (Kline, 2011), multivariate skew and kurtosis tested by Mardia's multivariate test were significantly different from normal (*g1p* = 38.4, $p < .001$, *g2p* = 206.22, $p < .001$). Therefore, robust standard errors and corrected model test statistics were used to assess models (see Kline, 2011). Models were considered to fit the data well when: the model $\chi^2$was non-significant ($p < .01$), the Root Mean Square Error of Approximation (RMSEA) was ≤ .05, the Bentler Comparative Fit Index was ≥ .95 and the Standardized Root Mean Square Residual was ≤ .08 (Hu & Bentler, 1999).

Multiple imputations (MI) were used to address participant dropout between the two time points of the study. MI were shown to work well with sample sizes as low as $N = 50$, multiple regressions up to 18 predictors and as much as 50% missing data in the dependent variable (Graham, 2009). One hundred multiple imputations were calculated and parameters and model fit indices are shown as pooled values (Enders & Mansolf, 2016).

Analyses were conducted in R (v 3.2.1; R Core Team, 2015), using the following packages: MVN (v 4.0; Korkmaz et al., 2014), lavaan (v 0.5-22; Rosseel, 2012), semTools (v 0.4-11; semTools Contributors, 2016) and Amelia (v 1.7.4; Honaker, King, & Blackwell, 2011).

Results

Bivariate correlations of all variables prior to multiple imputations are reported in Table 8. At the first assessment point (T1), 32.7 % (n = 73) of community members met the cut-off criteria for probable PTSD, while at the second assessment point (T2) the prevalence declined to 17.9 %. (n = 40). Similarly, 35.4 % (n = 79) of participants met the criteria for probable depression at T1, which declined to 18.4 % (n = 41) at T2.

In order to meaningfully compare latent constructs over time, longitudinal measurement variance was tested for all 6 constructs in the analysis. The scalar model of invariance fitted the data well for all 6 constructs in the model (Table S7 in Supplementary materials), allowing for a meaningful comparison of means across time. For all models, indicators represented the latent variables significantly (all at $p < .001$), while standardized coefficients ranged from .69 - .95.

Latent difference score models

Prior to fitting regression models with latent difference constructs, separate LDS models were analyzed in order to estimate the mean and the variance of change scores (Table 9). The fit of these models is the same as the fit of intercept invariant model (Table S7 in Supplementary materials). The means of all the latent difference scores for different types of resources (individual, interpersonal and community resources) as well as life satisfaction were non-significant, indicating no change in sample mean between the two time points. For posttraumatic stress symptoms, the mean change was significant ($p < .001$) and it indicated a small to medium sample level decrease in symptoms (M = -0.27, Cohen's d = 0.43). For depression symptoms, the mean change was also significant ($p < .001$), indicating a small decrease in sample mean level of symptoms (M = -0.26, Cohen's d = 0.36). The latent difference score variances were significant for all constructs (all $p < .001$), indicating significant between-person differences in a within-person change: for some participants the score increased while for others it decreased over time.

Table 8

Zero-Order Correlation of Variables in the Model

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Individual resources (T1)	1											
2. Individual resources (T2)	.6***	1										
3. Interpersonal resources (T1)	.31***	.28***	1									
4. Interpersonal resources (T2)	.36***	.44***	.63***	1								
5. Community resources (T1)	.24***	.07	.16*	.14	1							
6. Community resources (T2)	.14	.16*	.1	.19*	.53***	1						
7. PTS (T1)	-.4**	-.26**	-.22**	-.15	-.14*	-.22**	1					
8. PTS (T2)	-.35***	-.47***	-.19*	-.31***	-.14	-.24**	.67***	1				
9. Depression (T1)	-.41***	-.31***	-.33***	-.24**	-.17*	-.17*	.69***	.46***	1			
10. Depression (T2)	-.3***	-.41***	-.19*	-.3***	-.13	-.21*	.49***	.67***	.53***	1		
11. Satisfaction with life (T1)	.52***	.41***	.5***	.35***	.21**	.16*	-.43***	-.37***	-.55***	-.38***	1	
12. Satisfaction with life (T2)	.31***	.49***	.34***	.5***	.11	.24**	-.35***	-.58***	-.48***	-.59***	.68***	1

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

Table 9

Means and Variances of Latent Differences Constructs

Latent difference construct	*M*	*V*	Cohen's d
Individual resources	0.08	0.37***	
Interpersonal resources	0.02	0.69***	
Community resources	0.06	0.36***	
Posttraumatic stress symptoms	-0.27***	0.39***	0.43
Depression symptoms	-0.26***	0.5***	0.36
Life satisfaction	0.06	0.93***	

***p<.001

Regression analysis

Single multivariate regression models were tested in order to analyze the independent contribution of different levels of resources (Table 10). Regressing psychosocial outcomes on individual resources resulted in a good model fit (χ^2 (237) = 281.5, p = .04; CFI = .99; RMSEA (90% CI) = .02 (.00 - .03); SRMR = .07). The increase (decrease) in individual resources was related to a decrease (increase) in PTS symptoms and to an increase (decrease) in life satisfaction. Individual resources accounted for 6.8% of change in PTS symptoms and 14.8% of change in life satisfaction. Difference scores in individual resources were not related to difference scores in depression symptoms. The regression model with interpersonal resources also fitted the data well (χ^2 (237) = 280.63, p = .04; CFI = .99; RMSEA (90% CI) = .03 (.01 - .04); SRMR = .07). The increase (decrease) in interpersonal resources was related to a decrease (increase) in PTS and depression symptoms, and an increase (decrease) in life satisfaction. Interpersonal resources predicted 11.2% of variance of change in PTS symptoms, 5.1% in depression symptoms, and 23.1% in life satisfaction. Finally, specifying community resources as a predictor resulted in an acceptable model fit (χ^2 (237) = 320.95, p = .001; CFI = .97; RMSEA (90% CI) = .04 (.02 - .05); SRMR = .08). The increase (decrease) in community resources was related to an increase (decrease) in life satisfaction, accounting for 6.2% of variance. The change in community resources was not related to a change in PTS and depression symptoms.

Table 10

Standardized Regression Coefficients in Single Multivariate Regression Models Predicting Latent Difference Scores in PTS and Depression Symptoms and Life Satisfaction with Latent Difference Scores in Resources

Predictors	Δ PTS		Δ Depression		Δ Life satisfaction	
	β	*SE*	β	*SE*	β	*SE*
Δ Individual resources	-.26*	0.11	-.14	0.08	.39***	0.15
Δ Interpersonal resources	-.34***	0.06	-.23**	0.06	.48***	0.1
Δ Community resources	-.11	0.11	-.08	0.09	.25*	0.15

Note. Δ = latent difference scores
*p < .05. **p < .01. ***p < .001.

In the multiple structural regression model shown in Figure 2, only significant regression paths from previous analysis were specified. The model fitted the data well (χ^2 (567) = 653.92, p = .03; CFI = .98; RMSEA (90% CI) = .02 (.01 - .03); SRMR = .07). While controlling for other resources, an increase (decrease) in individual resources significantly predicted an increase (decrease) in life satisfaction, while the effect on PTS symptoms was close to statistical significance (p = .054). The change in interpersonal resources significantly predicted the change in all three psychosocial outcomes: an increase (decrease) in those resources was related to a decrease (increase) in PTS and depression symptoms and to an increase (decrease) in life satisfaction. The relationship between community resources and life satisfaction was no longer significant while controlling for other predictors. In total, resources accounted for 10% of change in PTS symptoms, 3.5% in depression symptoms and 25.9% in life satisfaction.

Covariances between all other latent constructs in the model were initially estimated freely; however, only significant covariances were included in the final model. All latent constructs at T1 correlated significantly, with the correlations ranging from r = .19 to r = .75 (Figure 1). In addition, latent differences in the psychosocial outcomes correlated significantly ranging from r = -.29 to .5, as well as T1 level of PTS and depression symptoms with the change in depression and PTS symptoms respectively, and T1 life satisfaction with the change in depression symptoms (Figure 1). Latent differences in the resource variables did not correlate significantly (for individual and interpersonal resources r = .17, p = .095; for individual and community resources r = .11, p = .263; for interpersonal resources and community resources r = .18; p = .146).

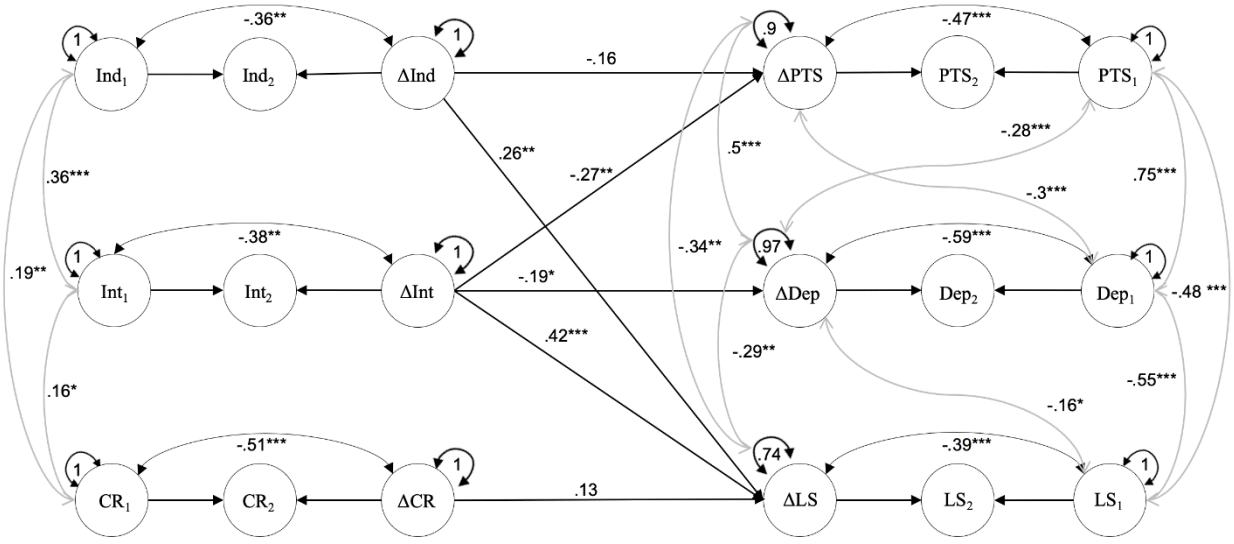


Figure 2. *Standardized Coefficients in Multiple Multivariate Regression Model Predicting Latent Difference Scores in PTS and Depression Symptoms and Life Satisfaction with Latent Difference Scores in Resources*

Note. Ind = Individual resources; Int = Interpersonal resources; CR = Community resources; Δ = latent difference scores. Subscript 1 denotes first measurement point (T1), subscript 2 denotes second measurement point (T2)
Measurement models and correlations between resources and psychosocial outcomes at T1 not shown for simplicity; Ind_1:PTS_1 (r = -.46; p = <.001); Ind_1:Dep_1 (r = -.4; p < .001); Ind_1:LS_1 (r = .49; p = <.001); Int_1: PTS_1 (r = -.29; p = <.001); Int_1:Dep_1 (r = -.27; p = <.001); Int_1:LS_1 (r = .46; p = <.001);CR_1:PTS_1 (r = .21; p = .003); CR_1:Dep_1 (r = -.16; p = .02); CR_1:LS_1 (r = .22; p = .003); *p < .05. **p < .01. ***p < .001.

Discussion

The current study aimed to contribute to a growing body of evidence supporting the role of resources in post-disaster psychosocial outcomes. It analyzed the independent and relative contribution of change in individual, interpersonal and community resources to change in PTS and depression symptoms and life satisfaction after a flooding based on a dynamic process hypothesis derived from the Conservation of Resources (COR) theory. The change was observed directly, rather than retrospectively, over a time period between one and a half and two and a half years post-disaster, and modeled using the Latent Difference Score models (McArdle, 2009) thus addressing several of the gaps in previous studies.

One and a half years after a severe flooding, about 30% of the participants met the cut-off criteria for probable PTSD and depression. Although this percentage declined two and a half

years post-disaster, the rates of potential mental health disorders remain high. Independently, the increase (decrease) in individual resources was related to a decrease (increase) in PTS symptoms ($\beta = -.26$; $p = .01$) and an increase (decrease) in life satisfaction ($\beta = .39$; $p < .001$). The increase (decrease) in interpersonal resources was related a decrease (increase) in PTS ($\beta = -.34$; $p < .001$) and depression symptoms ($\beta = -.23$; $p = .001$) and an increase (decrease) in life satisfaction ($\beta = .48$; $p < .001$). The increase (decrease) in community resources was related to an increase (decrease) in life satisfaction ($\beta = .25$; $p = .009$). In the full LDS model, while controlling for other resources, community resources were no longer significantly related to life satisfaction ($\beta = .13$; $p = .144$).

The prevalence of probable PTSD and depression are comparable to the mid-range found in previous studies. The prevalence of disorders among direct disaster survivors range between 3.7% and 60% for PTSD (Neria et al., 2007) and 5.8% and 54% for depression (Tang et al., 2014), and declines over time (Goldmann & Galea, 2014; McFarlane, 1988; Norris et al., 2004). In addition, the overall pattern of relationships in estimated models support the role of resources in COR theory: the more the resources changed over the time period of the study, the greater was the change in psychosocial recovery. Importantly, resources at different levels of the ecological system predicted different psychosocial outcomes, with interpersonal resources as the strongest predictor of recovery.

That interpersonal resources were related to all of the measured outcomes came as no surprise: the support from a significant other, family and friends has consistently been found as a protective factor, contributing to good post-disaster outcomes (Bonanno et al., 2007; Bonanno et al., 2010; Kaniasty & Norris, 2008). Deterioration of social support was previously found to negatively impact psychological distress even in the mid- to long-term period after a disaster (Norris & Kaniasty, 1996). Disasters are characterized by numerous factors that can cause deterioration in social support: they disrupt social networks, increase expectations for support, interfere with social activities and can lead to conflicts related to aid distribution; all of which impact mental health and general well-being (Kaniasty & Norris, 2004). In other words, interpersonal resources can serve as a mesosystem, by fostering availability of other resources closer to the individual (Bronfenbrenner, 1977). They can be used to obtain different types of support, such as emotional, instrumental or informational, therefore contributing to mobilizing multiple resources and influencing several psychosocial outcomes at the same time.

Individual resources defined as relatively stable traits of hardiness and persistence reflect the ability to adapt to change, problems, illness, pressure, failure and painful feelings (Campbell-Sills & Stein, 2007). Consistently with the results of the current study, they have previously been found to be related to a range of mental health outcomes after disaster (Ahmad et al., 2010; Irmansyah et al., 2010; Ying et al., 2014), as well as personality traits, such as neuroticism, positive and negative affectivity, optimism and hardiness, all of which are important factors in post-disaster adaptation (Campbell-Sills et al., 2006; Connor & Davidson, 2003; Karaırmak, 2010). It has also been found that individual resources can increase following an intervention (e.g. Connor & Davidson, 2003); however to the authors' knowledge no previous study has examined whether they change in the aftermath of a disaster or the relationship of that change to psychosocial outcomes. That individual resources were not related to depression symptoms is an interesting finding, as they are conceptually related to the concept of mastery, the belief that one can solve one's problems and respond effectively in times of stress; a construct that has been found to be related to a less depressed mood and should prevent feelings of helplessness often found in mood disorders (Yehuda et al., 2006). Our findings may reflect the higher importance of contextual resources in post-disaster settings and the crucial role of accessing support across broader networks (Bonanno et al., 2010), rather than the role of individual resources.

Finally, community resources, namely social capital and community engagement, exhibited a positive contribution through general life satisfaction. Studies on these resources are scarce; however, available evidence suggest that they are related to lower levels of anxiety and distress in the context of war (Braun-Lewensohn & Sagy, 2014; Kimhi & Eshel, 2009) and have a buffering effect against psychological distress after a series of natural disasters (Benight, 2004). In addition, a closely related resource, sense of community, was found to be related to subjective well-being and life satisfaction in community based samples (Davidson & Cotter, 1991; Prezza et al., 2001). All of these studies examined related, but not identical aspects of community resources, in a wide variety of contexts and communities; therefore, the extent of the effect of community resources on psychosocial adaptation is yet to be determined. Although not directly beneficial for psychological health recovery in the current study, connectedness among members of the community, levels of trust, mutual helping and community efficacy enhance the quality of life and may contribute to the efforts to revitalize and rebuild the community after a disaster (Norris et al., 2008). Furthermore, the relationship between distal systems, risks or resources

(those that are further away in relation to the individual in an ecological system) to individual-level outcomes is expected to be weaker, since they arise from the broader community or societal context and exhibit their influence through more proximal processes. This is also evidenced in the current study, where community resources were no longer a significant predictor of psychological adaptation after controlling for other resources. However, resources at distal levels of systems, such as community social capital and engagement, impact a large number of individuals at the same time, and thus have an important value as a strategy for disaster preparedness and response (Norris et al., 2008).

It is important to emphasize that the mean level of resources during the course of the study remained the same. In addition, there were no significant relationships between changes in different resources, meaning that for any individual they changed independently: increase in one resource was not necessarily followed by an increase in the other. These findings call for targeted post-disaster interventions that can, by increasing the mean levels of resources in affected communities, decrease the levels of symptoms and increase well-being. Following the stepwise model of psychosocial support (Inter-Agency Standing Committee, 2007) and essential elements of mass trauma interventions (Hobfoll et al., 2007), the present study provides further evidence that such interventions should start by securing basic needs and safety, followed by family and community level interventions focused on fostering social support and connectedness. Interventions focused on recuperating individual resources may be needed later during the post-disaster recovery, and should target individuals who experience higher mental health risks. However, the research interests up to date do not reflect the relative need for better understanding of the role of different levels of interventions. There is a disproportional amount of evidence of successful interventions at the individual level compared to the community level. This gap is largely due to major challenges of doing research at the community level in the immediate aftermath of disasters; nevertheless, such studies are essential to determine potential benefits and pitfalls of community-level interventions (Bonanno et al., 2010).

Study limitations

There are several limitations of this study. It should be noted that the sample size relative to the number of estimated parameters in the models is relatively small. However, the requirement of a large sample size in SEM models is most often related to specific distributional assumptions, namely multivariate normality. Since robust estimators are used in this study, this limitation is somewhat addressed. In addition, new developments in the field of structural equation modeling point to relatively small gains in mean and variance confidence intervals above the sample size of 150 (Little, 2013), arguing that much smaller samples are required compared to earlier recommendations.

Other limitations pertain to methodological and theoretical considerations. The first time point of measurement in this study was one and a half years after the disaster, which might have resulted in lower means and variances of change and reduced the size of regression coefficients. In addition, refusals at T1 due to not wanting to be reminded of the floods could have further reduced the estimated psychosocial effects of the disaster. However, since the means of PTS and depression symptoms were still changing between two time points, this indicates that the community was still recovering from the disaster.

Next, community resilience in this study is measured through individual-level perceptions, and can more precisely be understood as the availability of those resources to that individual. Although these perceptions are likely to be embedded in the actual resources available in the community, this cannot be ascertained without a cross-community examination of both community level estimates and individual perceptions. The emerging literature on the role of community resources in post-disaster outcomes continues to rely on aggregating individual-level perceptions, and even though measures of community resources for archival, population-level data have been developed (e.g. Sherrieb et al., 2010), they have not been applied yet to studies of psychological outcomes after adversity.

In addition, given the correlational nature of the study, it is possible that individual characteristics as well as current levels of mental health and well-being affected estimates of resources. However, previous studies found that resource loss is an important predictor of post-disaster outcomes over and beyond pre-disaster psychological functioning (e.g. Zwiebach et al., 2010), suggesting the resources-to-outcomes relationship. Finally, the percentages of the

explained change in the psychosocial outcomes, especially for depression symptoms, are relatively small. This indicates that there are numerous resources that contribute to post-disaster recovery, and further research is needed to establish their relative importance.

Conclusions and implications

In conclusion, this study emphasizes the role of dynamic change of different levels of resources in psychosocial outcomes in communities after disasters. It supports the position that understanding resources, their trajectories and change, is one of the most important challenges for future research (Norris et al., 2008). Identifying resources at individual, but especially at community and society level that can be easily mobilized, that are robust to disaster impact and can be increased by interventions, is of paramount importance to disaster preparedness and response. Future studies would benefit from including more time points in both the immediate aftermath of disasters as well in the long term period, and examining the factors that affect resource change.

General discussion

This dissertation aimed to examine the process of resilience in the face of disastrous flooding. Resilience was defined as a dynamic process in which individuals and communities harness resources from different levels of ecological systems in order to adapt to aversive and potentially traumatic circumstances and maintain or recover their psychological health and well-being. Previous studies explored the trajectories of post-disaster outcomes (Galatzer-Levy et al., 2018), developed numerous questionnaires for measuring potential resources (Windle et al., 2011) and examined the relations between some risk and protective factors to post-disaster outcomes (Bonanno et al., 2010, 2015; Norris et al., 2008). This dissertation argued that most of these questions can be seen as "what" questions and that the further progress in the field will be linked to the "how" questions: inquiries into the dynamic aspects of the process of resilience.

Several notable research gaps were identified. First, even though the availability of resources is generally regarded to be the key to positive adaptation after disasters (Norris et al., 2008; Southwick et al., 2014), far less is known about how disasters affect them and how their availability changes in different periods of disaster recovery. Then, even though resource loss is considered to be the key cause of why individuals and communities experience negative effects of disasters (Hobfoll, 1989, 2002), several theoretical and methodological aspects related to the measurement of resource loss need to be further explored. These include, for example, the possibility of reaching an understanding of the types of resources that are most likely to foster positive adaptation, exploring how to mitigate resource loss and considering direct ways of measuring resource loss as opposed to retrospective ones. Furthermore, interactive or moderating processes in resilience after a disaster are largely unexplored. Resilience as a theoretical lens is focused on processes that occur in the context of high risk, however, studies that compare processes related to positive adaptation in communities differentially exposed to disasters are scarce. This section of the dissertation will present the main findings, their generalizability to other contexts, the contribution of this dissertation to the study of resilience after disasters, practical implications and future research directions.

Main findings

Two studies were conducted in order to achieve the research aim and to respond to the previously identified research gaps. The first study was conducted in two communities about one and a half years after the 2014 flood. One community was the most severely affected municipality in Croatia in the flood ("affected community"), the other community was not flooded and was selected based on its similarity and proximity to the affected community ("comparison community"). The study analysed the relationship between resources found at different levels of ecological systems (individual, interpersonal, community) to psychosocial resource loss and mental health and life satisfaction. It also compared these relationships between the two communities. The second study analysed the relationship between resource change and positive adaptation in the affected community through time, between one and a half and two and a half years after the disaster. The main findings can be summarised in three categories: the impact of disasters on psychosocial outcomes and resources, the role of the preservation of resources in post-disaster recovery, and the differences in the importance of resources from different levels of ecological systems for adaptation and recovery.

Disasters negatively impact mental health and resources

A year and a half after a disaster, the prevalence of probable PTSD and depression were higher in the affected community compared to a similar, but not flooded community. Approximately a third of the community members from the affected community met the criteria for either probable PTSD or depression, compared to approximately a fourth in the comparison community. Previous studies generally indicated lower levels of mental health burden for the time period when this study was conducted. For example, Chen and Liu's (2015) meta-analysis, which included studies where PTSD was assessed with self-report questionnaires, found that the prevalence of PTSD was 11% in the period of more than 6 months after a disaster. Similarly, in a recent review, the prevalence of probable depression varied between approximately 5% and 28% in the time period longer than 10 months after natural disasters (Lowe et al., 2019).

Contrary to the effect of the flood on mental health, life satisfaction was not different between the two communities. The effects of disasters on life satisfaction are largely unknown as most studies focus on mental health indicators (Bonanno et al., 2010). Studies that did look into

subjective well-being and life satisfaction reported mixed results: some indicated that life satisfaction is not related to disaster exposure (Van Ootegem & Verhofstadt, 2016), others report lower life satisfaction for disaster survivors (Cui & Han, 2019). A study conducted on the data obtained from the European/World Values Survey indicated that hurricanes have a systematically negative effect on individual well-being in developing countries, while this effect was much smaller in highly developed countries (Berlemann, 2016). As locations, severities of studied disasters and timing of these studies varied, further evidence is needed to fully understand life satisfaction in the context of disasters. Nevertheless, this finding highlights the notion that positive adaptation is more than just the "level" of mental health and that symptoms of mental health problems can occur alongside indicators of well-being (Southwick et al., 2014).

The first study also found that the level of community resources was significantly lower in the affected community one and a half years after the disaster, suggesting the negative impact of the flooding. This impact lasted throughout the course of the study: at the community level, the average level of resources remained the same between one and a half and two and a half years after the disaster. This finding supports some previous studies conducted in the context of ongoing political violence that showed that the severity of exposure and repeated exposure to potentially traumatic events can deplete community resources (Braun-Lewensohn & Mosseri Rubin, 2014, Kimhi & Shamai, 2004). Furthermore, the second study showed that the intraindividual change in the availability of community resources was not related to the change in either individual or interpersonal resources, thereby indicating that community resources have a unique variance that can not be supplemented by individual "strengths" of social support from family or loved ones. Given that the availability of community resources can have a positive impact on a large number of people at the same time, this finding has a particular value for disaster strategy and preparedness.

Preservation of key resources fosters post-disaster recovery

Not surprisingly, the first study showed that the affected community experienced a significantly higher psychosocial resource loss than the comparison community. Similar results were previously found in a study of differentially exposed communities two years after a disaster (Ritchie et al., 2018). This study also reaffirmed the previously reported strong relationship between resource loss and psychosocial adaptation: those community members who experienced

greater psychosocial resource loss reported worse symptoms of posttraumatic stress and depression and lower life satisfaction. However, resource loss was not inevitable. Community members who had stronger individual and community resources, and in the affected community also interpersonal resources, experienced less psychosocial resource loss, and through that, experienced fewer PTS and depression symptoms and greater life satisfaction. Similar findings were reported for the role of social support in longitudinal studies 6 months after a mass shooting (Littleton et al., 2009) and almost two years after a hurricane (Norris & Kaniasty, 1996).

Furthermore, the second study found that a direct change in resources over time was related to the change in the level of adaptation in the affected community. Namely, community members who experienced an increase in individual, interpersonal and community resource experienced a decrease in PTS and depression symptoms and an increase in life satisfaction, and vice versa. Previous studies on resource gain showed inconsistent results, ranging from week positive association to psychological adaptation, no association or even a negative association to adaptation (Hobfoll et al., 2003, Hobfoll et al., 2006, Zwiebach et al., 2010). However, these studies assessed a variety of resources, mostly only on lower levels of ecological systems, and measured the gains retrospectively or indirectly – by asking the participant to rate the "amount of gain". To the author's knowledge, this is the first community-based study of disaster effects that examined the prospective change in resources and how it relates to a change in psychosocial adaptation.

Finally, the two studies jointly indicated that disasters have a different impact on the average level of resources in the community, depending on the ecological level. While the flood depleted the community resources in the affected community, there were no differences in the community-level individual and interpersonal resources between the affected and the comparison community. Moreover, the average level of resources did not change in the affected community between the two time points of the study, meaning that the negative impact of the flood on community resources persisted till at least two and a half years after the disaster. Studies on dynamic changes in resources, particularly community resources, after disasters are scarce (Southwick et al., 2014). Still, there are some indications that individual resources recover relatively quickly post-adversity (Kimhi et al., 2017). For interpersonal resources, namely perceived social support, results are mixed with some studies indicating that it decreases after a disaster (Lowe et al., 2010; Norris et al., 2005; Thoresen et al., 2019) and others that it remains

unchanged (Cherry et al., 2011). Resource robustness has important implications for post-disaster recovery. On the one side, resources that are robust, meaning they can withstand the impact of the adverse effect of a disaster, will be more readily available to support the recovery process (Norris et al, 2008). On the other side, interventions will likely be targeted at important resources that are recovering more slowly.

Resilience is embedded primarily in the social context

The positive effect of interpersonal resources, namely social support, on mental health outcomes in the general population and positive adaptation after disasters, has been extensively documented (Bonanno et al., 2007, 2010, 2015; Cherry et al., 2011; Norris et al., 2005, Kaniasty & Norris, 2008; Lowe et al., 2010; Watanabe et al., 2004). The results of the first study indicated that interpersonal resources are directly related to fewer symptoms of depression and greater life satisfaction in both communities. Moreover, as it was mentioned earlier, it also showed that interpersonal resources exhibit an indirect effect on positive adaptation, through mitigating psychosocial resource loss. However, by comparing the relationship of different levels of resources and outcomes, this study indicated that social support was the most consistent predictor of outcomes. The second study furthermore indicated that intrapersonal change in interpersonal resources was the strongest predictor of change in mental health and life satisfaction over time, over and above individual and community resources: the more the interpersonal resources increased over time, the more the symptoms decreased and life satisfaction increased.

Although some previous studies found a direct relationship between community resources and mental health (Braun-Lewensohn & Sagy, 2014; Bryant et al., 2016; Kimhi & Eshel, 2009; Wind & Komproe, 2012), in the first study community social capital and engagement only had an indirect contribution to mental health and life satisfaction, through being related to less psychosocial resource loss. The second study found that an intraindividual change in community resources over time was related only to the change in life satisfaction and that this association was not significant when controlling for other resources. This, however, does not diminish the importance of community resources for post-disaster resilience. Given that psychosocial resource loss has a strong relationship to post-disaster outcomes, the role of community resources in supplementing resources on lower levels of ecological systems is non-negligible. Although previous studies mostly did not test the relationship between community resources and outcomes

while controlling for resources on other levels of ecological systems, it is reasonable to expect that the relationship between distal systems and the individual is weaker. Nevertheless, as they affect a large number of people, they are still an important strategy for disaster preparedness and recovery (Norris et al., 2008).

Finally, the first study also found that the association between resources and mental health and life satisfaction was different in the affected and the comparison community. In the affected community, the relationship between the interpersonal resources and community social capital and engagement, as a facet of community resources, was stronger for all measured outcomes. Conversely, in the comparison community, economic diversity and leadership, other facets of community resources, were stronger predictors of outcomes. While some previous studies found that interpersonal resources buffer the effect of high risk for individuals who were exposed to higher levels of risk (Arnberg et al., 2012; McGuire et al., 2018), this is one of the rare studies that examined this effect for community resources. Taken together, these findings suggest that long-term positive adaptation of disaster-affected communities has more to do with the aspects of the social environment, both at the individual and the community level, than other potential resources.

Generalizability of findings

Studies of disaster resilience are conducted in a variety of contexts: at different time points after the disaster, in various cultural and community contexts and after a range of different events. These characteristics of a particular study could impact the results in different ways and limit their future generalizability and practical implications to specific situations. The two presented studies were conducted in the long term period after a flood, between one and a half and two and a half years after a disaster. The two studied communities were rural, previously affected by war and among the least developed municipalities in Croatia based on a number of economic criteria. In addition, a large percentage of ethnic minority members traditionally live in the affected community. In the next section, some findings that are potentially relevant for future studies and interventions will be discussed from the point of the broader context of the study.

Different time points

The initial recovery period after disasters is a time of major changes in the physical and social environment during which individuals and whole communities experience numerous changes. This turbulent period has previously been described in the literature. Early after a disaster, disaster survivors quickly engage in the recovery efforts and usually exhibit high levels of support and mutual helping (Kaniasty & Norris, 2004). This phase is often referred to as "the honeymoon period". The honeymoon phase is usually followed by the deterioration in the levels of solidarity and mutual support. Disillusionment, mistrust and anger become more common, as the causes of the event are being discussed and blame is attributed to certain actors in the events leading up to the event or during the disaster response (Ursano et al., 2008). The depletion of supportive resources can also be caused by a variety of factors often present in the post-disaster reality, including disruption in social networks due to death, injury or relocation, unrealistic expectations of the levels of available support and disruption of community activities (Kaniasty & Norris, 2004).

As the two presented studies were conducted in the long-term period after a disaster, they likely failed to capture some of the previously described processes. The results of this study indicated that individual and interpersonal resources might be more robust than the community resources, as they were not impacted by the disaster. But, it is possible that the flooding also reduced the average level of individual and interpersonal resources in the affected community, but that they recovered by the time the study was conducted. In a rare example of a longitudinal study of resources, Kimhi et al. (2017) studied the effects of intensive terrorist acts in the context of the ongoing Arab-Israeli conflict. The first time point of the study was during a 'relatively peaceful time', the second during a period of intensive terror attacks characterised by almost daily stabbing attacks, and the third six months after the wave of violence. Authors found that individual resources, defined similarly as in this dissertation, declined between the first two time points and then increased between the second and the third time point. A similar pattern of resource loss and recovery was found by Norris et al. (1999) or social support in a study of the effects of floods in Mexico in two communities. In the first measurement point, conducted 6 months after the flood, the perceived social support was lower in both affected communities in comparison to the Mexican norms. However, 24 months post-disaster, the levels of social support

recovered to expected levels in one community. In the other community, that experienced mass casualties and was completely relocated to a new area due to the severity of the damage, the levels of social support remained below the norms.

The time period when this dissertation was conducted could have also impacted associations between the resources and the outcomes. As resources become more or less available, the relative importance of a resource for positive adaptation is expected to change (Hobfoll, 1989, 2002). It is, therefore, possible that the patterns of relationships between individual, interpersonal and community resources and outcomes in this dissertation would have been different had the measurement points been earlier or later. Studies of the relationship between social support and mental health appear to support this notion. In a study conducted after the previously mentioned floods in Mexico, Kaniasty and Norris (2008) found that social support significantly predicted PTSD between 6 and 12 months post-disaster and 12 and 18 months post-disaster, but not between 18 and 24 months post-disaster. Similarly, in a study of children from New Orleans that were affected by Hurricane Katrina, Lai et al. (2018) found that social support from peers significantly predicted posttraumatic stress only in the long-term period after the disaster - between 13 to 17 and 19 to 22 months. More research, especially regarding community resources, should further clarify these temporal factors.

Different communities

All disaster-affected communities have a unique set of pre- and post-disaster characteristics that can impact research results in various ways. The members of both the affected and the comparison community in this dissertation have experienced a high number of potentially traumatic events prior to the flood. As previous exposure to non-disaster related trauma can sensitize individuals to trauma-related stress (Brooks et al., 2016), this could have resulted in the relatively high prevalence of probable PTSD and depression in both communities. These communities also shared some other potential risk factors for poor mental health such as very high levels of unemployment and living in an environment that is among the most disadvantaged ones in the country based on several indicators, such as average *per capita* income and community demographic change. Interestingly, even though majority and minority members in the affected community differed in the percentage of unemployment after the flood, there were no differences in any of the resource or outcome variables. Previous studies found that minority

status is related to a greater risk of mental health problems after disasters (Adams & Boscarino, 2005; Bonanno et al., 2006), likely due to differences in the socioeconomic status (Bonanno et al., 2007). It is possible that in this particular context the pervasive economic hardship for both the majority and minority community members annulled these differences.

In the light of recent devastating earthquakes in Croatia, in Zagreb in March 2020 and Petrinja, in December 2020, the question of the effect of the level of urbanisation on the resilience process is particularly salient. This dissertation, conducted in two non-urban communities, found that community social capital and engagement were associated with positive adaptation in the affected community. However, previous studies found several differences in disaster resilience between urban and non-urban communities. In a study that compared urban and rural communities during missiles attacks, Braun-Lewensohn and Sagy (2014) found that community resources, defined as emergency leadership and social capital, were the lowest among urban residents. Moreover, the relationship between community resources and stress reactions was stronger in non-urban areas. Similarly, West et al. (2013) found that community support mediated the relationship between individual exposure to a hurricane and mental health in the non-urban sample, whereas this effect was not observed with the urban sample. Finally, Cutter et al. (2016) examined community resources in urban and non-urban communities in the USA based on a resiliency index drawn largely from secondary sources. The authors found that, overall, community resources were slightly stronger in urban areas. However, they found significant qualitative differences in the types of community resources that primarily describe these communities: economic resources were more related to urban and community capital to non-urban areas.

While economic development might be somewhat less important in rural areas, it is still viewed as one of the key resources for disaster resilience (Norris et al., 2008). Our finding that economic development was unrelated to mental health and life satisfaction in the affected community is an interesting one. Economic development might have generally weaker effects in communities with uniformly low levels of resources and low economic diversity, which were then further negatively impacted by a disaster. Some support for this notion comes from studies on low-income sub-populations affected by disasters. In a study of low-income mothers 5 years after hurricane Katrina, Paxson et al. (2012) found that hurricane-related home damage, but not pre-hurricane income, predicted psychological distress 7 to 19 months after the disaster.

Moreover, in a multi-level study of communities 13 to 16 months after Hurricane Sandy, Lowe et al. (2015) found that, contrary to expectations, community economic development was unrelated to mental health in the disaster affected areas, but was related to mental health in areas that were not affected by disasters. Similar to the 2014 flooding in Croatia, extensive government programs were implemented in the aftermath of Hurricane Sandy to mitigate the damages to homes and support rebuilding efforts (Abramson et al., 2015). It is possible that government-financed models of home reconstruction help to mitigate further financial loss and render undistinguishable interpersonal differences in access to community economic resources and previous socio-economic differences.

Different types of disasters

Disasters are oftentimes classified according to their cause in natural (e.g. floods, earthquakes, storms, fires, epidemics) and industrial (e.g. chemical and oil spills, explosions, poisonings, radiation). Previous reviews have indicated that mental health consequences of industrial disasters are even more persistent than those of natural disasters (Neria et al., 2008; Norris et al., 2002). This is likely related to different social processes unfolding in the aftermath of these disasters. Communities in the aftermath of industrial disasters typically do not experience the high levels of compassion and mutual help that are usually observed after natural disasters (Cuthbertson & Nigg, 1987). They are also usually followed by more community strife and stronger deterioration of social relationships due to disagreements between community members on "who is a victim"; search for parties responsible for the disaster and division of community regarding the legal aspects of disaster recovery and reparations of damages (Kaniasty & Norris, 2004). These processes are likely to have an impact not only on the mental health outcomes but also on resilience-promoting resources. In a study conducted a year after the Exxon Valdez Oil spill, Palinkas et al. (1992, 1993) found that higher exposed community members reported greater declines in quality of relationships with family members, relatives, co-workers, friends, and neighbours. In another study after the same disaster, Picou et al. (1992) found that these effects persisted 18 months after the event. Therefore, it appears that interpersonal resources, as found in this dissertation, could be recovering more quickly after natural disasters.

Finally, even though epidemics and pandemics are usually classified as natural disasters, they have some distinct differences compared to non-biological natural events. Pandemics

impose severe restrictions on (community) social environment, including limitations on face-to-face contact with other people due to official regulations or fear of infection, obligatory self-isolation due to infection, closing of usual places of gathering and workplaces, and disagreements between community members on the appropriate strategies to curb the infection rates. It is therefore likely that future studies will show that pandemics have a more detrimental effect on the community resources than other natural disasters. Furthermore, community resources may be less likely to protect against psychosocial consequences of pandemics, as individuals will have to rely more on their individual resources. Some preliminary evidence indicates that community resources indeed decrease with repeated outbreaks of the pandemic (Kimhi, Eshel, et al., 2020) and that individual resources, but not community resources, are associated with pandemic-related distress (Kimhi, Marciano, et al., 2020).

Theoretical contributions and practical implications

This dissertation provided further evidence in support of the Conservation of Resources theory (Hobfoll, 1989, 2002) in the context of disasters. The first study indicated that psychological resource loss, which is regarded to be in the centre of the process of coping with stress and trauma, can be mitigated through investment of resources at the individual, interpersonal and community level. It further indicated, in a rare case of comparison of an affected and a similar but not affected community, that individual and interpersonal resources are likely to recover faster than community resources. The second study, which assessed the relationship between a change in resources to a change in mental health and life satisfaction, provided evidence that, when resource loss and gain are accessed directly, gain in resources is related to positive adaptation of disaster-affected community members.

Moreover, this dissertation contributed to the understanding of the process of resilience after disasters. First, it aimed to explore the relative contribution of key resources across ecological levels, while most studies of disaster resilience focus only on resources at the level of the individual (Bonanno et al., 2015). In doing so, this study provided novel evidence that resilience after disasters is primarily embedded in the social environment. Additionally, by comparing how communities adapt in the context of different levels of exposure to a disaster, this dissertation provided evidence that processes that unfold in conditions of high risk are different from those in conditions of lower risk. This finding supports the notion that resilience is a distinct

construct and not just an extension of the more general theory of stress (Luthar, Cicchetti, & Becker, 2000).

Our findings have practical implications for psychosocial interventions in communities affected by disasters. Given the importance of the social environment for disaster resilience, post-disaster interventions should primarily aim to strengthen family and community ties that are not only able to impact a large number of people at the same time, but also likely to facilitate positive adaptation the most. Focused non-specialised and specialised supports that can strengthen individual resources may be needed for a smaller number of people, particularly those that are less likely to benefit from interpersonal and community supports. Furthermore, as the negative impact of disasters on mental health, psychosocial resource loss and community resources persist years after the event, psychosocial interventions too need to continue long after the disaster officially ends.

Future research directions

Despite recent advances in the study of disaster resilience, there are still substantial knowledge gaps. The research of resources on higher levels of ecological systems is substantially lagging behind other, more easily measurable and observable resources such as individual capacities. Future studies should aim to examine variables across different ecological systems and their interactions and relationships to positive adaptation. Furthermore, while the impact of disasters on mental health outcomes has been extensively studied, we know very little about how key resources change in the aftermath of disasters. In order to better understand how to support individuals and communities in recovery after disasters, it is necessary to study the dynamic attributes of resources - their robustness, redundancy and rapidity, as well as the "normal" rates of their recovery. As resource availability will likely fluctuate throughout disaster recovery, understanding the effects of time on resource-outcome relationships - knowing what helps when - would be another important step in promoting disaster resilience. These complex research aims need to be followed by an overall advancement in study designs and analysis approaches. Longitudinal study designs, in communities differentially exposed to disasters and at multiple levels of data aggregation, will be important to drive future development of the research field.

Conclusion

This dissertation aimed to examine how communities affected by a disaster exhibit resilience, that is, positively adapt in the context of high risk. In doing so, we analysed how communities that are exposed to different levels of risk harness their individual, interpersonal and community resources in order to mitigate resource loss and experience better outcomes post-disaster. We also analysed how the change in the levels of resources over time is related to the change in mental health and life satisfaction. Our findings indicated that community members with stronger individual, interpersonal and community resources will be more likely to experience less psychosocial resource loss, and through that, fewer symptoms of PTS and depression and greater life satisfaction. Importantly, these effects were different in the affected and comparison community. Overall, these processes were stronger in the affected community, particularly for interpersonal resources and community social capital and engagement. In the comparison community, economic development and (marginally) leadership were stronger predictors of mental health and life satisfaction. Furthermore, we found that intraindividual change in resources between one and a half and two and a half years after a disaster was related to a change in the level of positive adaptation in the affected community. The change in interpersonal resources had the strongest relationship to mental health and life satisfaction while controlling for individual and community resources. Overall, these results indicate that disaster resilience is primarily embedded in the social environment of the community. Psychosocial interventions in the aftermath of disasters should primarily aim to strengthen family and community ties**.**

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Supplementary Material

Table S1

Unstandardized Regression Coefficients, Standard Errors and Confidence Intervals for Indirect Paths Between PTS and Depression symptoms and Life Satisfaction and Individual, Interpersonal and Community Resources through Psychosocial Resource Loss for the Alternative model with Reversed Order of Variables in the Model (N = 447)

	Value	*SE*	95% CI	
			LL	UL
PTS symptoms				
→ Individual resources	0.02	0.03	-0.03	0.09
→ Interpersonal resources	0.06	0.04	-0.01	0.15
→ Community resources	-0.14***	0.04	-0.23	-0.08
Depression symptoms				
→ Individual resources	0.00	0.01	-0.03	0.01
→ Interpersonal resources	0.00	0.02	-0.05	0.02
→ Community resources	0.01	0.03	-0.04	0.08
Life satisfaction				
→ Individual resources	-0.01	0.01	-0.03	0.01
→ Interpersonal resources	-0.02	0.01	-0.04	0.00
→ Community resources	0.04**	0.01	0.02	0.07

Note. Value = unstandardized regression coefficient; CI = confidence interval (1000 bootstrap samples); LL = lower limit; UL = upper limit
**$p < .01$, **$p < .001$,

Table S2

Comparison of Fit Indices in Multigroup Models Fitted in the Affected Community for the Majority (n = 145) and the Minority Nationals (n = 78)

Model	χ^2			$\Delta\chi^2$			RMSEA		CFI	SRMR
	Value	df	*p*	Value	Δdf	*p*	Value	90% CI		
Configural	501.4	376	<.001	-	-	-	0.06	[0.04, 0.07]	0.96	0.06
Loading	525.7	391	<.001	23.6	15	0.072	0.06	[0.04, 0.07]	0.96	0.07
Partial intercept	541.3	404	<.001	15.3	13	0.287	0.06	[0.04, 0.07]	0.96	0.07
Constrained	558.2	419	<.001	16.5	15	0.349	0.06	[0.04, 0.07]	0.96	0.08

Note. The difference in χ^2 is relative to the previous model in the table. RMSEA = root-mean-square error of approximation; CI = confidence interval.

Table S3

Comparison of Fit Indices in Multigroup Models Fitted in the Affected Community for the Majority Nationals (n_a = 145) and the Comparison Community (n_c = 224)

Model	χ^2			$\Delta\chi^2$			RMSEA		CFI	SRMR
	Value	df	*p*	Value	Δdf	*p*	Value	90% CI		
Configural	491.0	376	<.001	-	-	-	0.04	[0.03, 0.05]	0.97	0.05
Loading	509.9	391	<.001	19.0	15	0.213	0.04	[0.03, 0.05]	0.97	0.06
Partial intercept	529.5	404	<.001	20.1	13	0.093	0.04	[0.03, 0.05]	0.97	0.06
Constrained	556.0	419	<.001	26.6	15	0.032	0.05	[0.04, 0.06]	0.97	0.08

Note. The difference in χ^2 is relative to the previous model in the table. RMSEA = root-mean-square error of approximation; CI = confidence interval.

Table S4

Unstandardized Regression Coefficients, Standard Errors and Confidence Intervals for Indirect Paths Between Individual, Interpersonal and Community Resources and PTS and Depression Symptoms and Life Satisfaction through Psychosocial Resource Loss in the Affected (Majority Nationals) and the Comparison Community (n_a = 145, n_c = 224)

	Affected Community (Majority Nationals)				Comparison Community				Difference Affected - Comparison			
	Value	*SE*	95% CI		Value	*SE*	95% CI		ΔValue	*SE*	95% CI	
			LL	UL			LL	UL			LL	UL
Individual resources												
→ PTS symptoms	-0.23**	0.07	-0.38	-0.09	-0.07†	0.04	-0.15	0.01	-0.16*	0.08	-0.33	-0.00
→ Depression symptoms	-0.16**	0.06	-0.28	-0.05	-0.05	0.03	-0.11	0.01	-0.10	0.07	-0.24	0.02
→ Life satisfaction	0.15*	0.07	0.02	0.29	0.12+	0.06	0.00	0.23	0.03	0.09	-0.14	0.22
Interpersonal resources												
→ PTS symptoms	-0.16*	0.08	-0.31	0.01	0.02	0.03	-0.03	0.08	-0.19*	0.09	-0.34	-0.01
→ Depression symptoms	-0.11+	0.06	-0.21	0.01	0.02	0.02	-0.02	0.06	-0.13*	0.06	-0.24	-0.00
→ Life satisfaction	0.10+	0.05	-0.01	0.21	-0.04	0.04	-0.12	0.04	0.14*	0.07	0.00	0.28
Community resources												
→ PTS symptoms	0.07	0.12	-0.16	0.31	-0.09*	0.04	-0.17	-0.02	0.16	0.13	-0.08	0.42
→ Depression symptoms	0.05	0.08	-0.11	0.21	-0.07*	0.03	-0.13	-0.01	0.12	0.09	-0.05	0.29
→ Life satisfaction	-0.05	0.08	-0.21	0.11	0.15*	0.06	0.02	0.28	-0.20+	0.10	-0.41	0.00

Note. Value = unstandardized regression coefficient; CI = confidence interval (1000 bootstrap samples); LL = lower limit; UL = upper limit

†$p < .07$, +$p < .06$,*$p < .05$, **$p < .01$, **$p < .001$,Table S5

Table S5

Unstandardized Regression Coefficients, Standard Errors and Confidence Intervals for Indirect Paths Between Individual, Interpersonal and Community Resources and PTS and Depression Symptoms and Life Satisfaction through Psychosocial Resource Loss in the Affected and the Comparison Community (n_a = 223, n_c = 224) in the Model with Control Variables

	Affected Community				Comparison Community				Difference Affected - Comparison			
	Value	*SE*	95% CI		Value	*SE*	95% CI		ΔValue	*SE*	95% CI	
			LL	UL			LL	UL			LL	UL
Individual resources												
→ PTS symptoms	-0.23**	0.07	-0.37	-0.09	-0.07+	0.04	-0.15	0.00	-0.16+	0.08	-0.32	0.00
→ Depression symptoms	-0.16**	0.06	-0.27	-0.04	-0.05	0.03	-0.11	0.01	-0.10	0.07	-0.23	0.02
→ Life satisfaction	0.15*	0.07	0.01	0.29	0.12+	0.06	0.00	0.24	0.03	0.09	-0.15	0.22
Interpersonal resources												
→ PTS symptoms	-0.16*	0.08	-0.31	0.01	0.02	0.03	-0.03	0.08	-0.19*	0.09	-0.34	-0.01
→ Depression symptoms	-0.11+	0.06	-0.22	0.01	0.02	0.02	-0.02	0.06	-0.13*	0.06	-0.24	-0.00
→ Life satisfaction	0.10	0.06	-0.01	0.21	-0.04	0.04	-0.13	0.04	0.14*	0.07	-0.00	0.28
Community resources												
→ PTS symptoms	0.07	0.11	-0.15	0.29	-0.09*	0.04	-0.17	-0.02	0.16	0.12	-0.07	0.40
→ Depression symptoms	0.05	0.08	-0.11	0.20	-0.07*	0.03	-0.13	-0.01	0.12	0.09	-0.05	0.28
→ Life satisfaction	-0.05	0.08	-0.20	0.10	0.15*	0.06	0.03	0.28	-0.20*	0.10	-0.39	-0.00

Note. Value = unstandardized regression coefficient; CI = confidence interval (1000 bootstrap samples); LL = lower limit; UL = upper limit
+$p < .06$,*$p < .05$, **$p < .01$, **$p < .001$

Table S6

Unstandardized Regression Coefficients and Confidence Intervals for Indirect Paths Between Subscales of Community Resources Scale and PTS and Depression Symptoms and Life Satisfaction through Psychosocial Resource Loss in the Affected and Comparison Community (n_a = 223, n_c = 224)

	Affected Community				Comparison Community				Difference Affected - Comparison			
	Value	*SE*	95% CI		Value	*SE*	95% CI		ΔValue	*SE*	95% CI	
			LL	UL			LL	UL			LL	UL
Social capital and engagement	-0.20**	0.07	-0.34	-0.06	-0.02	0.03	-0.08	0.05	-0.18*	0.08	-0.34	-0.03
→ PTS symptoms	-0.14**	0.05	-0.25	-0.04	-0.01	0.02	-0.06	0.03	-0.13*	0.06	-0.25	-0.02
→ Depression symptoms	0.23**	0.09	0.06	0.41	0.03	0.05	-0.07	0.13	0.20*	0.10	0.00	0.40
→ Life satisfaction												
Preparedness												
→ PTS symptoms	0.03	0.05	-0.07	0.13	0.03	0.03	-0.03	0.09	0.00	0.06	-0.11	0.12
→ Depression symptoms	0.02	0.04	-0.05	0.09	0.02	0.02	-0.02	0.06	0.00	0.04	-0.08	0.08
→ Life satisfaction	-0.04	0.06	-0.15	0.08	-0.05	0.05	-0.14	0.04	0.01	0.07	-0.14	0.15
Economic capital												
→ PTS symptoms	-0.04	0.06	-0.16	0.08	-0.08*	0.04	-0.16	-0.01	0.04	0.07	-0.10	0.18
→ Depression symptoms	-0.03	0.04	-0.12	0.06	-0.06*	0.03	-0.12	-0.00	0.03	0.05	-0.07	0.13
→ Life satisfaction	0.05	0.07	-0.09	0.19	0.14*	0.06	0.02	0.26	-0.09	0.09	-0.27	0.09
Leadership												
→ PTS symptoms	0.09	0.06	-0.03	0.22	-0.05	0.03	-0.12	0.01	0.15*	0.07	0.01	0.29
→ Depression symptoms	0.07	0.05	-0.02	0.16	-0.04	0.03	-0.09	0.01	0.11*	0.05	0.00	0.21
→ Life satisfaction	-0.11	0.07	-0.26	0.04	0.09	0.05	-0.02	0.20	-0.20*	0.09	-0.38	-0.01

Note. Value = unstandardized regression coefficient; CI = confidence interval (1000 bootstrap samples); LL = lower limit; UL = upper limit
$^{+}p < .06$,*$p < .05$, **$p < .01$, **$p < .001$

Table S7

Model Fit Results for Testing Measurement Invariance across Measurement Points for Constructs in the Model

Constructs	χ^2(df)	*p* (χ^2)	$\Delta\chi^2$ (Δdf)	p($\Delta\chi^2$)	CFI	RMSEA (90% CI)	SRMR
Individual resources							
Configural	8.13 (5)	.11	-	-	1.0	.04 (.00 - .1)	.04
Loading	8.98 (7)	.26	0.86 (2)	.65	1.0	.03 (.00 - .08)	.06
Intercept	9.15 (9)	.43	0.17 (2)	.92	1.0	.00 (.00 - .07)	.06
Interpersonal resources							
Configural	3.67 (5)	.59	-	-	1.0	.00 (.00 - .07)	.03
Loading	10.48 (7)	.07	6.81 (2)	.03	.99	.06 (.00 - .09)	.04
Intercept	11.18 (9)	.27	0.7 (2)	.71	.99	.03 (.00 - .08)	.04
Social capital							
Configural	1.83 (5)	.87	-	-	1.0	.00 (.00 - .04)	.04
Loading	6.89 (7)	.44	5.06 (2)	.08	1.0	.00 (.00 - .08)	.06
Intercept	10.08 (9)	.34	3.19 (2)	.2	1.0	.02 (.00 - .08)	.06
PTS							
Configural	11.4 (5)	.04	-	-	.99	.07 (.02 - .13)	.05
Loading	16.75 (7)	.02	5.35 (2)	.07	.99	.08 (.03 - .12)	.07
Intercept	18.18 (9)	.03	1.44 (2)	.49	.99	.08 (.03 - .12)	.07
Depression							
Configural	5.53 (5)	.36	-	-	1.0	.00 (.00 - .08)	.06
Loading	5.68 (7)	.58	0.15 (2)	.93	1.0	.00 (.00 - .05)	.06
Intercept	5.94 (9)	.75	0.26 (2)	.88	1.0	.00 (.00 - .03)	.06
Life satisfaction							
Configural	2.75 (5)	.74	-	-	1.0	.00 (.00 - .06)	.03
Loading	8.83 (7)	.27	6.08 (2)	.05	1.0	.03 (.00 - .09)	.06
Intercept	9.47 (9)	.4	0.67 (2)	.72	1.0	.03 (.00 - .08)	.06

Curriculum Vitae

Helena Bakic received bachelor's degree in 2007 and master's degree in 2012 at the Department of Psychology of the Faculty of Humanities and Social Sciences, University of Zagreb. She completed numerous trainings in advanced research methodology and data analysis as well as in psychological counselling and disaster psychosocial support and humanitarian assistance. In 2016, she was awarded the Annual Award for Popularisation of Science along with other members of the organising board of the "Psihofest" psychology fair. She is a member of the Croatian Society for Traumatic Stress and the European Society for Traumatic Stress Studies.

Between 2013 and 2017 she was working as a project manager and research assistant at the Department of Psychology on several national and European projects in the field of disaster response and migration. She also co-organised the 25th Psychology Summer School and was teaching courses at the bachelor and master levels. From 2017 to 2019 she was working as an advisor in the Office for Human Rights and Rights of National Minorities of the Government of the Republic of Croatia. She managed EU-funded projects in the field of migration and secured new funding streams. She participated in the development of national strategies and policies for refugee integration, drafted policy analysis and national reports to international stakeholders, and planned, supervised and organised activities in the field of migrant integration, such as research and educational activities and policy dissemination. She currently works as a freelance researcher and policy analyst.

She has authored and co-authored 7 articles in national and international peer-reviewed journals, edited two and authored one book and presented work at more than 15 national and international conferences. Her research interests include topics of community resilience, migration and human rights. She lives in Berlin, is married and has a cat-daughter.

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