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Resilience and Disaster Research: Definitions, Measurement, and Future Directions

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Abstract

Disasters pose a significant threat to the long-term well-being of individuals, communities and societies. Therefore, studying resilience, defined as the process of maintaining and recovering psychological well-being after adversity, is crucial for disaster preparedness and mitigation. The aims of this paper are to summarize the historical context of resilience research, present the key concepts, discuss current measurement approaches and propose future research directions. Key determinants of resilience - risk, positive adaptation and resources - are discussed with the focus on studies of adults affected by disasters. This narrative review demonstrates that research up to date has focused mostly on finding the individual characteristics that predict the absence of psychopathology or mental health disorder symptoms, while other types of resources or dynamic relations between key aspects of resilience have been neglected. Future studies should aim to include multiple measurement points, high- and low-risk groups, long-term follow-up and broader perspectives on both psychological well-being and potential resources.

Keywords: resilience, disasters, positive adaptation, resources

Introduction

On average, disasters strike any given day of the year and affect about 200 million people yearly (Guha-Sapir, Hoyois, & Below, 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

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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 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, Bakic, Corkalo Biruski, & Löw Stanic, 2015; Havenaar et al., 1997; Morgan, Scourfield, Williams, Jasper, & Lewis, 2003; Hull, Alexander, & Klein, 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 challenge 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 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 with resilience after disasters. In doing so, this paper draws extensively on findings from studies of resilience in different fields, especially developmental and community psychology, and attempts to bridge across different views as they tie into the emerging field of resilience after large-scale adversities. It also strives to elaborate on the conceptual divide between those disciplines and to highlight the distinctive characteristics of disaster resilience research. By addressing the crucial concerns and misconceptions in operationalization and measurement of resilience after disasters and proposing ways to mitigate them, this paper aims to add to the theoretical clarity and to serve as a road map for future research.

What is Resilience?

The fact that the word *resilience* is among 1% of lookups in the Merriam-Webster dictionary speaks for its popularity in 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, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 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, Cicchetti, & Becker, 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, Best, & Garmezy, 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 was dominated by concepts such as sense of coherence (Antonovsky, 1979), hardiness (Kobasa, 1979) and ego resilience (Block & Block, 1982). 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 1), for a number of reasons.

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, Masten, & Narayan, 2013). These factors include interactions with different people or organizations, resources available at the time and differing community, societal, cultural and religious determinants (Southwick, Bonanno, Masten, Panter-Brick, & Yehuda, 2017).

Table 1

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).
The 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, 2014, p. 10).

Therefore, most of the contemporary definitions describe resilience as 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 the 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 a 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 (e.g. Bonanno & Diminich, 2013; Kimhi & Eshel, 2009; Kimhi & Shamai, 2004; Masten, 1994; Masten et al., 1990; Wright et al., 2013). In fact, the resilience research in developmental psychology originated from studies of children living in a 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 with 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, Lundin, Fröjd, Hultman, and Michel (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 epicentre 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 certain levels of adaptation 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 how does positive adaptation manifests or, more specifically, which indicators should be considered within the umbrella of positive adaptation.

Before discussing the key determinants of positive adaptation to disasters, we need to clarify the terminology. In this paper, the term "positive adaptation" is used to describe the desirable result of the resilience process. Other terms are also found in the literature, such as "good outcomes" (e.g. Masten & Reed, 2002), "healthy level of functioning" (e.g. Bonanno, 2004) or "positive adjustment" (e.g. Luthar et al., 2000). Furthermore, the terms are commonly used interchangeably (e.g. Southwick

et al., 2017), since they all describe the desired end result of a resilience process. The term positive adaptation is preferred in this paper since it more clearly emphasizes the notion that resilience is a dynamic, ongoing process, rather than just a set of static "outcomes" that are achieved at a certain point after adversity (for similar use of the term see for example Masten, 2014 and Norris et al., 2008).

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 the others 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 outcomes that are expected in the face of chronically aversive environments, typically under study in developmental psychology, and outcomes of a single, high impact event 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 the authors argue, this type of resilience is typically evidenced by the 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" (p. 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 curve models (LGM; Curran & Hussong, 2002) and 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 subpopulations 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 (Bonanno & Diminich, 2013). The second and third trajectories 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, Arinell, & Arnberg, 2015); whereas others argue that this outcome indicates "resistance" (e.g. Hobfoll et al., 2009; Norris, Tracy, & Galea, 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 which specific indicators of positive adaptation after disasters should be taken into account. 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 a 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 behaviour; (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 with 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 the 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 (Hobfoll, 1989; Luthar et al., 2000; Norris et al., 2008). Despite differences in the used terminology, all of these refer to factors that, if available, increase the odds for positive post-disaster adaptation. The term resources is particularly utilized in studies of disasters, and refer to human, social and material capital in adaptive processes (Masten & Reed, 2002). The term itself suggests that there is a wide array of factors that can potentially lead to resilience in the face of risks and disasters.

However, 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., 2017).

There are ample 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, Brewin, Kaniasty, & Greca, 2010). In fact, the focus on trait resiliency has been so prevalent in studies with the adult population that a large number of questionnaires measuring "resilience" have been developed (for a detailed methodological review see Windle, Bennett, & Noyes, 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, Wu, Lin, & Jiang, 2014), tsunami (Irmansyah, Maramis, & Minas, 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, Dahlem, Zimet, & Farley, 1988) and it has been consistently found to be related with better mental health outcomes in disaster context (e.g. Bonanno, Galea, Bucciarelli, & Vlahov, 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 and colleagues (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 with 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 adaptations 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., 2017). 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, Rhodes, & Roemer, 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 with 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 with 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 the 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 correlation 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 a 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. Inter-Agency Standing Committee, 2007; Williams et al., 2009), 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, Bakić, & Ajduković, 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.

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Otpornost i istraživanje katastrofa: Definicije, mjerenje i preporuke za buduća istraživanja

Sažetak

Katastrofe predstavljaju značajnu prijetnju dugoročnom blagostanju pojedinaca, zajednice i društava. Stoga je proučavanje otpornosti, koja se definira kao proces održavanja i oporavka psihološkog blagostanja nakon nedaća, ključno za pripremu i ublažavanje posljedica katastrofa. Ciljevi su ovoga rada sažeti povijesni kontekst istraživanja otpornosti, opisati ključne koncepte, raspraviti sadašnje mjerne pristupe i predložiti buduće smjerove istraživanja. Ključne odrednice otpornosti – rizik, pozitivna prilagodba i resursi – opisani su s naglaskom na studije odraslih pogođenih katastrofama. Ovaj pregledni rad pokazuje da su dosadašnja istraživanja uglavnom bila usmjerena na pronalaženje individualnih osobina koje predviđaju odsutnost psihopatologije ili simptoma poremećaja mentalnog zdravlja, dok su druge vrste resursa ili dinamični odnosi između ključnih odrednica otpornosti zanemareni. Buduća bi se istraživanja trebala usmjeriti na uključivanje više mjernih točaka, uzoraka izloženih visokom i niskom riziku, dugoročno praćenje te obuhvatniji pogled na psihološku dobrobit i potencijalne resurse.

Ključne riječi: otpornost, katastrofe, pozitivna prilagodba, resursi

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