THE DEVELOPMENT AND VALIDATION OF THE DISASTER ADAPTATION AND RESILIENCE SCALE

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For Nathan, Oliver, and Henry

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The Development and Validation of the Disaster Adaptation and Resilience Scale

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Abstract

Disaster events both in the U.S. and worldwide are increasing in severity and prevalence. In response to the threat of disasters, the U.S. Federal Emergency Management Agency (FEMA) has issued calls for developing well-tested assessment tools that operationalize specific protective factors associated with resilience to disaster. Recognizing this need, this dissertation project developed and validated the Disaster Adaptation and Resilience Scale (DARS) to measure specific domains found to support adaptive responses in individuals exposed to disaster events. The development and validation processes of the scale occurred across two phases. Phase I consisted of the construct development, item generation, and expert review. Phase II conducted a full validation evaluation of the psychometric properties of the scale and tested direct and indirect relationships between disaster stress exposure, DARS, and mental health in a sample of adults (N=625) using structural equation modeling (SEM). Results found DARS demonstrated psychometric properties that support its use among adults experiencing disaster. Limitations and implications of the scale are discussed, including application within clinical, research, and policy settings.

Chapter One: Introduction

Statement of Problem

Disaster events, both natural (e.g., tornados, hurricanes, floods) and human-caused (e.g., major chemical spills; mass shootings), are increasing in prevalence and severity in the United States and world-wide (Kousky, 2012). The United Nations Office of Disaster Risk and Reduction define a disaster as "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources" (United Nations International Strategy for Disaster Reduction [UNISDR], 2016, p. 9). As serious disruptions, disasters can result in widespread injury and death, property loss and displacement, and reduced access to basic human needs such as food, water, and housing (Galea, Nandi, Vlahov, 2005). It is estimated between 1994 and 2013, approximately 1.35 million individuals have died from natural disasters (Centre for Research on the Epidemiology of Disasters [CRED], 2015). Beyond fatalities, disasters may also negatively impact a community's economy. Disasters resulted in $2,600 billion in losses globally between 1994 and 2013 (CRED, 2015). Disasters can also cause significant psychological harm and result in a range of mental health disorders such as depression, anxiety, and post-traumatic stress disorder (Galea, Nandi, & Vlahov, 2005; Houston et al., 2015b). The psychological and emotional implications of disaster-related stressors may deplete a person's coping resources, threaten individuals' social connections, and alter their beliefs about the world's safety or predictability (Hobfoll et al., 2007). Even if survivors do not develop a mental health disorder, common stress reactions experienced include shock, disbelief, anxiety, fear, sleep disturbances, anger, distress, and grief (Dass-Brailsford, 2010).

Furthermore, while disasters can broadly affect an entire community, they do not affect all people equally. Researchers have highlighted the ways in which racial/ethnic minorities, women, older adults, the poor, individuals with disabilities, and children are more vulnerable to negative impacts of disasters (Cutter, Boruff, & Shirley, 2003; Enarson, 2012; Fothergill, 1999; Reid, 2013; Tierney, 2014). In the disaster literature, the term "social vulnerability" refers to various social conditions such as race, class, and gender, that place human populations at increased risk for negative or adverse consequences resulting from a disaster (Tierney, 2014). For example, studies indicate that racial and ethnic minorities in particular, face more challenges and have less access to services and resources in disaster settings, due to institutional and interpersonal racism, language barriers, and distrust of governmental authorities (Bolin, 2006; Peek & Fothergill, 2008; Pulido, 2000).

In total, the range of negative consequences due to disasters has the potential to threaten life, livelihood, health, and well-being among individuals exposed. In response to the growing prevalence and severity of disasters, the Federal Emergency Management Agency have issued calls to identify key factors and measures of *disaster resilience* in an effort to develop capacity-building strategies in the event of a disaster (FEMA, 2018). Tierney (2014) describes disaster resilience as improving physical and human systems to adapt and recover from disaster events. Likewise, Norris and colleagues (2008) posit that enhancing disaster resilience is critical for mitigating vulnerabilities, reducing negative health consequences, and restoring population functioning and wellness. Masten and Obradovic (2008) also assert that identifying and bolstering resilience factors and processes can enhance adaptive responses and decrease psychopathologies in individuals experiencing disaster. Therefore, the focus of this study is

conceptualizing and measuring specific resilience domains that facilitate adaptive responses in individuals after disaster.

Disaster Resilience

The term *resilience* has been in a variety of mental health fields such as psychology, psychiatry, human development (Masten, 2001). The recent emergence of the term disaster resilience in the disaster and hazards literature has inspired a paradigm shift in the disaster management field for conceptualizing preparing and responding to of disasters (Masten & Obradovic, 2008). A key assumption in a resilience approach toward disaster management is to strengthen and building protective factors (e.g., developing resources and capacities) as opposed to the traditional approach of only decreasing or eliminating threats and hazards (e.g., putting out fires; Manyena, 2006). *Disaster resilience* is often defined as the capacity of individuals, communities, or society to adapt effectively in the event of a community disaster (UNISDR, 2002). Capacity is defined as the individual, social, and community strengths and resources available to anticipate, cope with, resist and recover from disasters (UNISDR, 2017).

Unlike individual traumatic events (e.g., child maltreatment, interpersonal violence), disaster events have the ability to disrupt functioning across multiple systems in which human life is embedded (Masten & Obradovic, 2008). In response to disaster stress, resilience also operates within multiple system levels such as the individual, the family, and the community level. Each of these levels conceptualize resilience capacities in various ways (Masten & Obradovic, 2008). For example, disaster resilience at the community level is commonly described as a community's ability to withstand crisis or disruption brought about by external stressors or disturbances and environmental change (Neil Adger, 2000). While disaster events

have the ability to disrupt functioning across multiple levels (e.g., individual, family, community), the majority of disaster resilience measures have focused on measuring adaptive functioning at the community level primarily (Ostadtaghizadeh, Ardalan, Paton, Jabbari, Khankeh, 2015). In comparison to community resilience, disaster resilience at the individual level has been vastly overlooked in the field, despite a large amount of research reporting the negative individual psychological impacts of disasters (Höfler, 2014). In fact, many disaster projects have been criticized for missing opportunities to incorporate individual resilience assessment and intervention into disaster mental health approaches (Twigg, 2004). Because of the large risk of developing psychopathology following disasters, identifying and measuring individual resilience is highly relevant in the disaster field (Höfler, 2014).

To this end, the current study utilizes resilience theory as a theoretical framework and is focused on developing and validating a disaster resilience scale for individuals in post-disaster settings. Once validated, this measure would have applicability in post-disaster settings as a screening tool to identify individuals in possible need for additional support. In addition, such a measure could be used to identify protective factors that guide a framework for intervention development and provide a measure of the efficacy of such intervention.

Study Purpose

This main objective of this study is to develop and validate the Disaster Adaptation and Resilience Scale (DARS) so that clinicians and researchers can better understand what factors assist individuals in adaption following exposure to a disaster. The development and validation process of DARS will occur across two main study phases. Phase I involves the instrument's development and expert review procedures to establish content validity. Phase II includes the

study recruitment procedures, participant qualifications, sample size, dimensionality of the construct, the internal structure of the test, and the association among the test scores and other variables. By developing DARS, this project seeks to contribute to measurement, theory, practice, and education.

Measurement. First, in terms of measurement, there is a paucity of disaster resilience scales and the scales that do exist only measure disaster resilience at the community level. That is, current measures primarily operationalize disaster resilience as community-level capacities and resources (Ostadtaghizadeh, et al., 2015; Hofler, 2014). Individual-based disaster resilience has yet to be operationalized and tested in the disaster field and this study seeks to fill this measurement gap. In addition, resilience researchers have noted the increased need for operationalizing and measuring the phenomena of resilience in relation to specific stressors (e.g., disaster, interpersonal violence) instead of approaching resilience measurement as universal for all types of stressors (Schneiderman, Ironson, & Siegel, 2005).

Theory. Second, theoretically this study furthers the conceptual framework of resilience by applying a strengths-based approach toward understanding factors that support adaption and mental health in the face of disaster. Implementing a resilience theoretical framework focuses the attention on identifying the protective environmental and individual factors that interfere or disrupt risk factors related to poor mental health outcomes (Zimmerman, 2013). In addition, this study furthers theoretical understanding of the phenomena of resilience and how it operates in the specific context of disasters (Schneiderman, Ironson, & Siegel, 2005).

Practice. Third, once validated DARS would have applicability in post-disaster settings as a screening tool to identify individuals in possible need for additional support. Social workers (e.g., crisis counselors; case managers) often work in partnership with local, state, and federal

organizations to assess mental health needs and implement short-term and long-term recovery plans and services after a disaster (Bauwens & Natural, 2017). Findings from this study will be able to assist social work researchers and practitioners in identifying protective factors that guide a framework for interventions and practice models that promote resilience and healthy psychological development. In addition, DARS could be used to provide a measure of the efficacy of such interventions and practice models.

Education. Fourth and finally, in regard to social work education, the profession of social work plays an important role in the disaster field, as nearly half of the disaster mental health services in the United States have been delivered by social workers who are affiliated with the American Red Cross and the Federal Crisis Counseling Assistance and Training programs (Bauwens & Natural, 2017). Social work's involvement in disaster settings has long emphasized the unique needs of socially vulnerable populations in disaster events and has stressed the value of services, resources, and effective policies for disenfranchised populations (First, et al., 2017b). It is important to maintain the relevance and perspective of social work in developing disaster-related interventions, research, and empirical evidence. The present study seeks to affirm the role of social work in the disaster arena by encouraging the profession to continue to support curricula that incorporates disaster response content with a focus on survivors' resilience and mental health needs. Furthermore, this study affirms social work's strength-based values that affirm individual strengths and the ability to survive and grow following adversity.

Research Questions. As explained in the introductory paragraphs, the main objective of this study is to develop and validate the Disaster Adaptation and Resilience Scale (DARS). In Phase I of the research project, the instrument design and development phase, the following research questions will be addressed:

- Is DARS supported by disaster resilience literature and theory?
- Do the proposed DARS items make sense and are they clearly worded?
- Does DARS demonstrate content and face validity from experts?

In Phase II of the research project, the full validation analysis phase, a second set of research questions will be addressed:

- What is the factor structure of DARS items?
- To what extent are DARS and its subscales internally consistent?
- What are the direct and indirect relationships between disaster stress, DARS, and mental health outcomes (PTSD, Depression) to test discriminant and convergent validity?

This introduction has provided the rationale, purpose, and research questions for this dissertation project. Chapter 2 identifies and describes the historical developments and framework of resilience. Specifically, the background and conceptual overview of resilience are provided, disaster and resilience literature are reviewed, and current measures for resilience are explained. Chapter 3 outlines the sampling, data collection, and data analysis procedures in order to develop and validate DARS. Chapter 4 will present the results of the two phases that comprise this research project. Finally, Chapter 5 will discuss the theoretical and practical implications.

Chapter Two: Review of Literature

Resilience Theory

Historical developments. The theory of resilience first emerged in the early 1970's within the fields of psychology, psychiatry, and human development literature (Garmezy, Masten, & Tellegen, 1984; Masten, 2001; Rutter, 1979, 1985). The identification and emergence of the concept of resilience is generally linked to initial work by a developmental psychologist, Norman Garmezy who was studying children's risk factors related to having parents with severe schizophrenia (Garmezy, 1991; Garmezy, Masten, & Tellegen, 1984; Rutter, 1979, 1985; Werner, 1993, 1995). A risk factor is a measurable characteristic or event (e.g., poverty child maltreatment) that often leads to negative outcomes (Rutter, 1979). Garmezy's research included multiple longitudinal studies wherein children who had a parent with severe schizophrenia were exposed to numerous risk factors and adversity which lead to some children experiencing negative outcomes (e.g. depression, mental illness; Masten, 2001). However, Garmezy also discovered a subsample of children that exhibited positive outcomes despite being exposed to severe risk factors and adversity and possessed various adaptive factors which strengthened a child's ability to positively adapt in the face of significant adversity (Masten, 2001).

In addition to Garmezy's research, several other landmark studies are credited for preliminary identification and conceptualization of resilience theory. These are generally linked to the work of Werner and Smith (1992) who conducted a longitudinal study of children born in Kauai, Hawaii and Rutter (1979, 1985) who conducted multiple longitudinal studies examining children with various risk factors in London. Their findings revealed that children in the study

were exposed to a variety of risk factors ranging from poverty, violence, to familial alcoholism (Rutter 1979, 1985; Werner & Smith, 1992; Werner, 1993, 1995). However, a subset of the children exhibited positive adaptation. Werner identified various protective factors that included (but are not limited to) social competence, problem solving skills, and a sense of purpose (Werner, 1993, 1995). Likewise, Rutter (1979, 1985, 1987) identified multiple protective factors of youth who flourished despite adverse environmental conditions and risks. These protective factors included self-efficacy, self-mastery, planning skills, and positive relationships with an adult. These early pioneers in resilience decided to change the direction of mental health research and began to also study the positive outcomes of children exposed to risk, stress, and adversity. Until this time, the field was highly influenced by psychodynamic theory and the medical model which only focused on deficits among children exposed to adversity.

Waves of resilience theory. The initial pioneer studies of resilience served as a foundation that fostered and developed multiple waves of inquiry into resilience research (Masten, 2001). Resilience theory has since progressed in the social sciences in four major waves. The first wave of resilience theory focused on the individual child/youth and was focused on describing resilience. Researchers began to study children facing adversity and for those that demonstrated positive outcomes, researchers began to identify individual traits within the child. This first wave primarily focused on identifying personal characteristics of individuals that were predictive of both personal and social success (Richardson, 2002). Resilience theory in its early developments conceptualized resilience as a static, individual trait. Much of the early resilience studies were focused on the qualities of the individual child or adolescent and viewed resilience as a "superhuman" trait that a person was born with or not.

Over time and moving into the second wave of resilience research, researchers began to identify factors that assisted in mitigating/moderating or protecting an individual from risk factors that contribute to negative outcomes (Masten, 2001). These *protective factors,* both internal and external, were studied and found to contribute to better outcomes in individuals facing risk and adversity (Rutter, 1990; Werner, 1993, 1995). Examples of *internal* protective factors include self-efficacy, healthy coping skills (e.g., problem-solving), and examples of *external* protective factors include good parenting, access to education, and spirituality/religiosity. A protective factor influences (e.g., mediates or buffers) the negative effect of risk or adversity upon a child. Researchers found that risk and resilience occur is a dynamic, evolving, interactive systems and that resilience is not a static, individual, trait, but rather a process influenced by a variety of factors in the child's life. Within the second wave of resilience the identification of protective factors shifted to examination of resilience processes as researchers began focusing on the function of acquiring protective factors and how they interacted with risk factors to assist in adaptation (Richardson, 2002). Resilience was no longer conceptualized as a static trait, but as an evolving and dynamic process between risk mechanisms (vulnerability factors) and protective mechanisms (protective factors) following adversity (Luthar, Cicchetti, & Becker, 2000; Rutter, 1987, 2007; Saleebey, 1996).

The third wave of resilience research focused on applying the prior findings and creating interventions that centered on enhancing resilience in children exposed to risk and adversity (Masten, 2001). Researchers within this wave focused on developing and testing interventions tools to bolster protective processes within individuals as well external resources to enhance or promote resilience (Luthar, 2006; Masten, 2007; Weissberg, Kumpher, & Seligman, 2003; Yates & Masten, 2005). Currently, resilience focused interventions generally emphasize reducing risk

exposure and building upon internal and external protective factors rather than emphasizing a person's deficits in intervention design. Particularly, the third wave was built upon the framework that resilience is a mechanism that assists individuals in redirecting or maintaining a trajectory of positive adaptation despite adversity.

The fourth and current wave of resilience research is focusing on multi-levels of resilience by researching resilience in various systems (i.e. family and community resilience). Advancements in technology have provided the means to expand the examination of resilience to include biological markers such as measuring cortisol in hair and saliva samples (e. g., Alink, Cicchetti, Kim, & Rogosch, 2012; Simeon et al., 2007). In addition, researchers are now able to investigate resilience at cellular and neural levels and the role genetic system play in influencing adaptive behavior (see Yehuda, Flory, Southwick, & Charney, 2006).

Conceptual frameworks and models of resilience. Resilience theory has evolved from decades of research and scholarly literature examining resilience is constantly growing. Current conceptual models of resilience include two fundamental criteria: 1.) exposure to significant adversity or risk and 2.) the individual or system is functioning effectively (Masten & Obradovic, 2008). Although different definitions of resilience exist in the literature (for a review see Southwick et al., 2014), most of them generally share the idea that resilience is the ability of an individual or system to positively adapt in the face of stress, risk, and adversity (Garmezy, Masten, & Tellegen, 1984; Luthar, Cicchetti, & Becker, 2000; Werner, 1992; Southwick, et al., 2014). This definition indicates that resilience is *a process* and not a static, personality trait (e.g. intelligence) and that protective factors (e.g., optimism, distress-regulation, environmental resources) foster certain processes in the individual that assist in preventing negative outcomes and promote positive adaption and growth (Bonanno, 2004; Unger, 2004). Furthermore, the

process of resilience is viewed as contextual and based on conditions such as the nature of the group being studied (e.g., adolescent, adult, family, community) and the type of adversity (e.g., natural disaster, sexual abuse, poverty). For example, in a sample of adults in a post-disaster community, indicators of resilience may be the absence of posttraumatic stress disorder (PTSD; Bonnano, 2004) or for school-age children the indicators of resilience may be academic success (Wyman, 2003). Resilience processes are therefore shaped within a context or environmental conditions (e.g., nature of the group; the type of adversity) wherein a factor is found to be protective or not (Masten & Obradovic, 2008).

In terms of conceptualizing the process of resilience in a research model, protective factors typically operate as moderators (Boyes, et al., 2016; Rutter, 1985; Tlapek, et al., 2017; Zimmerman, 2005) and/or as mediators (Threlfall et al., 2017; Yu & Stiffman, 2010) between risk factors and negative outcomes. For instance, moderating resilience factors may operate by lowering the level of psychopathology more in adolescents with childhood adversity, compared to adolescents without childhood adversity, while a mediating resilience factor mitigates the relationship between childhood adversity and psychopathology (Fritz, et al., 2018). By understanding the interactive mechanisms underlying the association between specific risk and protective factors, resilience research is able to provide important contributions to our understanding of the processes by which individuals overcome adversity despite exposure to stressful and traumatic events (Zimmerman, 2013).

Current measures of resilience. As the scholarly field of resilience has evolved, researchers have developed a number of instruments to measure a construct of resilience at the individual level (for a systematic review of child and adult resilience instruments see Ahern et al., 2006; Smith-Osborne & Bolton, 2013; Windle, Bennett, Noyes, 2011). The section below

provides an overview of resilience measure used in scholarly literature among adult population samples.

The Baruth Protective Factors Inventory (BPFI) is a measure developed by Baruth and Caroll (2002) and measures four general resilience factors for adults experiencing adversity by assessing protective factors including: adaptable personality, supportive environment, fewer stressors and compensating experiences. The scale was initially validated on 98 undergraduate psychology students and tested later on a total of 428 people from university and clinical settings (Baruth & Caroll, 2002). Validation has included populations of college students, clinical samples from groups experiencing a DSM-IV mental illness, chemical dependency, and domestic violence. Global Cronbach's alpha reliabilities ranged from .76 to .96. It does not specifically address any type of stressor such as disaster.

The Brief Resilient Coping Scale (BRCS) was developed by Sinclair and Wallston (2004) and is a 4-item measure rated on a 5-point Likert scale, and measures one factor, namely, Adaptive Coping (Sinclair & Wallston, 2004). The BRCS only addresses one factor, adaptive coping, thereby assesses resilience in terms of an individual trait and does not include environmental and social factors (Smith-Osborne & Bolton, 2013). The BRSC has been validated on two samples of predominantly female adult with Rheumatoid Arthritis and the measure had a Cronbach's alpha range of .64 to .71. Similar to other general resilience measures it does not indicate a specific type of stressor.

The Connor-Davidson Resilience Scale (CD-RISC) is a 25-item scale developed by Connor and Davidson (2003) and is comprised of five factors: personal competence, high standards, and tenacity; trust in one's instinct, tolerance of negative effects, and strengthening effects; positive acceptance of change and secure relationships; control; spiritual influences. The

CD-RISC is rated on a 5- point Likert scale the initial validation sample of the CD-RISC consisted of 6 groups (general population, primary care, psychiatric outpatients, generalized anxiety disorder, and PTSD) with a total of 827 participants (Connor & Davidson, 2003). For the general sample, the scale was found to be reliable and valid and the alpha coefficient was reported at .89. While the measure has been used in previous disaster studies (Karairmak, 2010) it was not developed with this specific stressor in mind.

The Resilience Scale (RS) is a 25-item measure developed by Wagnild and Young (1991) and is comprised of two factors: personal competence and acceptance of life and self. The scale was created from qualitative interviews with 24 older adult females who had positively adapted to adversity. The RS is rated on a 7-point Likert scale and was originally validated on 810 community dwelling of older female adults (Wagnild & Young 1991). Although originally tested with adult subjects, other studies have validated that the scale has worked well with samples of all ages and ethnic groups (Ahern et al., 2006). Global reliability was tested with coefficient alpha of .91. Although the scale is widely used, it is not specifically related to disaster resilience. as the items were generated from the qualitative work with older female adults experiencing general difficulties.

The Resilience Scale for Adults (RSA) is a multidimensional scale that measures the protective factors believed to enhance general resilience in adults (Jowkar et al., 2010). The scale for adults was created based on a thorough review of the literature concerning protective factors. Five factors emerged including: personal competence, social competence, structured style, family cohesion, and social resources. The RSA is comprised of 33 items, with 5-point Likert response options. Based on a sample of 279 adults, the Cronbach's alpha ranged from .74 to .92. Higher levels of the RSA protective factors have been found to be correlated with lower levels of

psychological pathology (Friborg, Hjemdal, Martinussen, & Rosenvinge, 2009). While this measure assesses multidimensional protective factors associated with resilience, similar to the measures above it does not specify a stressor type.

In sum, each of the above measures of resilience contain a unique factor structure with varying operationalizing of the construct. From the five scales, only one of the measures, the RSA, operationalizes resilience to include both individual and environmental factors, reflecting the importance of including external resources for supporting resilience (Masten & Obradovic, 2008). Adapting to change is a dynamic process, and research has found that it involves a variety of internal and external protective factors. In addition, as noted by Cicchetti (2003) there is a need for increased overall empiricism in the field of resilience that furthers understanding into how the phenomena is measured in relation to *specific* stressors. In terms of limitations, all five of the resilience measures do not specifically address a type of stressor and were not developed with a post-disaster population in mind. Past resilience research has shown that protective factors change in different contexts such as a resource-depleted environment like disasters (Bonanno, 2004; Hobfoll, Stevens, & Zalta, 2015) and disaster-context measures are needed.

Literature on Disasters and Resilience

Disasters as collective traumatic events. Disasters in this study are defined as potentially traumatic events that are collectively experienced and have an acute onset that is time-delimited (McFarlene & Norris, 2006). The Diagnostic and Statistical Manual of Mental Disorders (DSM) defines a traumatic event as: "1.) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others, and 2.) the person's response involved intense fear,

helplessness, or horror" (pp. 427–428). Disaster events can be classified into a larger set of potentially traumatic events and can be distinguished from individually experienced events for their ability to create stress for many people simultaneously. As a phenomenon with an acute onset that is time-delimited, disasters are distinguished from other collective traumas that are chronic (e.g., community violence, poverty) or ongoing (McFarlane & Norris, 2006). See Figure 1 adapted from McFarlene & Norris, 2006.

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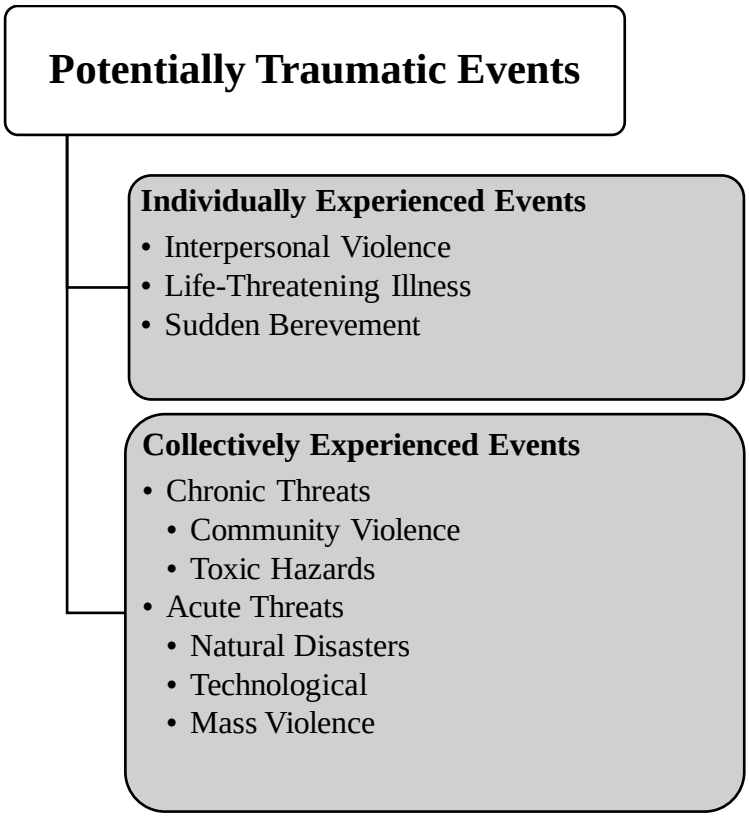
Figure 1. Classification of potentially traumatic events (Based on McFarlene & Norris, 2006)



Disaster-related risk factors. Disasters are considered potentially traumatic events and include various risk factors including mental health disorders such as depression, anxiety, and post-traumatic stress disorder (PTSD; Galea et al., 2005; Neria, Nandi, Galea, 2008). PTSD is one of the most frequently studied post-disaster and is likely to be the most frequent mental health disorder diagnosed in disaster survivors (Neria, Nandi, Galea, 2008). The prevalence of PTSD post-disaster has been estimated from approximately 5 percent to 60 percent in general populations exposed (Galea et al., 2005). For disaster survivors with PTSD or other

psychopathologies, a lower quality of life and functional impairments in social, occupational, and physical domains have been reported (Norris, 2006).

Various factors have been found to place individuals more at risk for developing mental health disorders following disasters. Research (e.g., Bonnano, 2004; Neria et al., 2008) has found that the extent of psychological harm is associated with factors such as the type of disaster (e.g., natural or human-caused), the severity of the disaster (e.g., EF-5 tornado), the degree of exposure (e.g., personal injuries, loss of home), and the magnitude of community destruction (e.g., amount of homes, schools, and hospitals destroyed). Studies investigating the relationship between exposure to disasters and psychological adjustment have reported a dose-response effect, whereby greater exposure is associated with higher levels psychological distress (Neria, Nandi, & Galea, 2008). For example, in a meta-analytic review, Brewin and colleagues (2000) found an association between the severity of the trauma and the subsequent severity of PTSD symptoms. Further, Norris and colleagues (2002) found that the link between severity of the disaster and severity of PTSD symptoms exists across various cultures.

Resilience after disaster. Decades of disaster research have been dedicated to documenting the negative mental health impacts of disasters (McFarlene & Williams, 2012). Recently, there is growing interest in how and why many people who are exposed to disasters do not develop mental disorders. Scholarly literature examining resilience in post-disaster settings is starting to grow to include quantitative and qualitative studies across a variety of disciplines (Bonanno et al., 2007). Post-disaster resilience has been found to be associated with positive outcomes, such as good mental health, well-being, and a lower incidence of posttraumatic stress disorder (PTSD; Masten & Obradovic, 2008). For example, in an adult sample, Osofsky and colleagues (2011) found that higher resilience was associated with lower psychopathologies

(e.g., depression, PTSD) for individuals exposed to both Hurricane Katrina and the Deepwater Horizon oil spill. Likewise, Bonnano and colleagues found an inverse relationship between resilience and PTSD in a post-9/11 population study of New Yorkers (Bonanno et al., 2006).

In terms of conceptualizing the phenomena of resilience after disaster, it has been documented as a trajectory wherein individuals generally experience distress after the event but are able to return to their pre-disaster levels of functioning (Bonanno et al., 2011; Masten & Obradovic, 2008). In Figure 2, Masten and Narayan (2012) illustrate examples of positive adaptation or maladaptation trajectories following exposure to an acute disaster event. The authors categorize dashed lines represent paths of resilience and the solid lines represent maladaptive paths reflected in a variety of patterns. This conceptual view includes three distinct kinds of phenomena: 1.) achieving better than expected outcomes; 2.) sustaining competence or maintaining effective functioning under highly adverse conditions; and, 3.) regaining or attaining effective or normal functioning following adversity (Masten & Narayan, 2012). Both risk and resilience factors are believed to mediate or moderate the impact of exposure to the disaster on physical and mental health outcomes (Palinkas, 2012). See Figure 2 for Masten and Narayan illustration.

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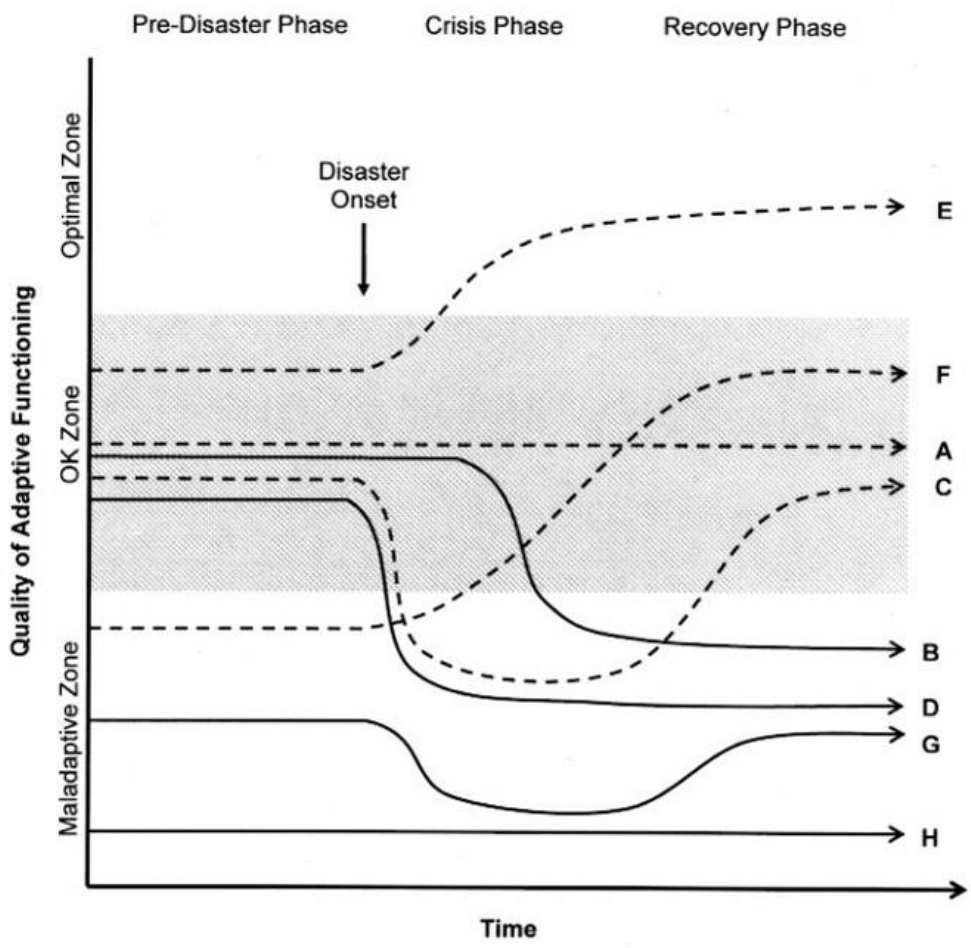
Figure 2. Resilience trajectories following disaster exposure (Masten & Narayan, 2012)



The authors categorize dashed lines represent paths of resilience and the solid lines represent maladaptive paths. The different trajectories with Path A representing stress resistance, Path B representing disturbance with recovery, Path C representing post-traumatic growth, Path D representing breakdown without recovery (yet) and path E representing delayed breakdown without recovery. Paths F and G represent decline in functioning in the context of adversity and then recovery afterwards to restorative function. Path H illustrates a decline in functioning with no state of recovery despite more favorable conditions (Masten & Narayan, 2012)

Shifting the focus of disaster mental health from a pathological paradigm to a resilience perspective affirms the belief that individuals have the potential for survival and growth. Because research has demonstrated that resilience is a valuable construct that promotes well-being after

disaster, many researchers, clinicians, and policy makers are interested in finding ways to measure, foster, and promote resilience to help individuals overcome significant stressors such as disasters (Bonanno, 2004; Doherty & Clayton, 2011). A central piece for conducting resilience research begins with identifying the factors and resources which have been found to protect individuals from developing negative outcomes following adversity. Protective factors in this study are defined as the internal and external factors which have been found to facilitate post-disaster resilience (Werner & Smith, 2001). Access to resources within a post-disaster environment is central to resilience. (Hobfoll et al., 2015). Individuals with strong personal, social, and environmental resources have been found to be better equipped to be protected from adverse outcomes following disaster (Bonnano et al., 2007).

Protective factors utilized in this study. To inform the development of the DARS, a review of the scientific literature was conducted to identify the protective factors and resources that have been identified and contextually specific to disaster events. Protective factors were defined as a variable that protects against an adverse outcome (e.g., psychopathology), or promotes the occurrence of a desirable outcome (e.g., psychological wellness; Henson et al., 2007). Search terms for disaster resilience protective factors included: disaster, disasters, disasters *and* resilience, disasters *and* protective factors, disasters *and* mental health, disasters *and* positive psychology. Scientific literature was searched utilizing PsycINFO, EBSCO, PubMed, and Google Scholar. Sources were retained that adhered to the conceptual definitions of individual resilience, disaster, and protective factor that were used in this study. While the methodological approaches and types of data sets varies, multiple studies identified various protective factors have been found to support pathways of resilience after disaster. Sources of protective factors were then reviewed for common themes and overarching categories. Three

main categories emerged which included: *physical resources, supportive relationships, and adaptive behaviors and skills.* Each of these categories are detailed below.

Physical resources. A growing body of evidence suggests that having physical and economic resources (e.g., financial stability, food, shelter) is associated with positive outcomes and resilience (Brewin et al., 2000) across multiple types of disasters (Bonnano et al., 2007). In a review of the disaster literature, Norris, Friedman, Watson, et al. (2002) examined 14 studies that measured socioeconomic status and post-disaster distress and lower physical and economic resources was consistently a predictor of post-disaster distress. Similarly, lacking in material and economic resources and the loss of resources (e.g., decrease in income) was found to associated with greater post-disaster distress (Bonanno et al. 2005; Brewin, Andrews, & Valentine., 2000; Galea et al., 2005; Hawkins, Zinzow, Amstadter, Danielson, & Ruggiero, 2009; Norris, Friedman, & Watson, 2002). Likewise, Sawada and Shimizutani (2008) found following the 1995 Kobe earthquake in Japan, poorer households were less likely to be able to borrow and withstand the economic impact of disaster and rebuild for the future. In another study by Henderson, Roberto, and Kamo (2009) of 122 displaced older adults, the majority (78%) made USD16,600 or less and experienced delays in receiving their social assistance checks which was reported to contribute to their financial stress during and post-disaster. Furthermore, Kumar et al. (2007) surveyed 314 adult tsunami survivors in the coastal areas of Tamilnadu, India and found that individuals with no household income were three times more likely to develop PTSD symptoms. Finally, Freedy, Shaw, Jarrell, and Masters (1992) evaluated the effects of material and economic loss on psychological functioning following Hurricane Hugo in Charleston, South Carolina, and found that physical resources lessened psychological distress 8 weeks after the Hurricane.

Supportive relationships. A well-studied protective factor linked to post-disaster resilience is having supportive relationships (e.g., social and family; see Kaniasty, 2012 for an overview). For example, Watanabe, Okumura, Chiu, and Wakai (2004) examined the role of supportive relationships and depression among Taiwanese adults following the Taiwan earthquake in 1999. In addition, studies show that individuals who have experienced a major disaster often talk about the event with family and social networks to support positive interpersonal connections and growth (First et al., 2017a; Houston et al, 2015b; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002; Taylor & Stanton, 2007). Family and social connections have been noted as important resources that provide practical assistance and emotional support in coping with a disaster and its aftermath (Landau & Saul, 2004). In fact, Breckenridge and James (2012) state that after disaster events, "family, community and network support are the most important factors in promoting recovery" (p. 244). For example, in Tuohy and colleagues (2014) qualitative study of 10 adult post-disaster experiences of the Canterbury earthquakes, social support was found to be one of the three most important themes relevant to resilience. For example, one the participants reported, "her family's support enabled her to remain independent in the community, because she could rely on her family to provide practical, emotional, advocacy support in the aftermath of the earthquakes" (p. 200). Likewise, Hrostowski and Rehner (2012) found that supportive relationships were a key theme of resilience in adult survivors of Hurricane Katrina as participants reported the benefit of "feeling supported and belonging" in their communities.

Adaptive behaviors and skills. Another protective category that has been found to promote resilience after disasters is having a variety of adaptive behaviors and skills including problem-solving (Benight & Harper, 2002), distress regulation (Norris, 2006; Liao et al., 2002;

Raccanello D, Burro R, & Hall R, 2017; Lowe, S. R., Rhodes, J. E., & Waters, M. C., 2015) and optimism about the future (Cherry et al., 2017; Fredrickson et al. 2003; Bonanno et al. 2005; Norris, 2006; Carbone & Echols, 2017).

Problem-solving is the ability to problem-solve in the face of adversity (Lazarus & Folkman, 1984). In a comprehensive review of disaster-related literature (Norris et al., 2006), post-disaster functioning was affected by having adaptive behaviors and skills such as problem-solving. These factors were significantly and positively related to the mental health of the survivors. In another comprehensive review of 39 studies following adversity, Linley and Joseph (2004) found a consistent link between post-disaster growth and adaptive behaviors including cognitive appraisal variables, positive affect, and problem-solving. Supporting this factor as well, Qouta and colleagues (2001) found in a three-year study of 108 Palestinian children living during the Intifada, mental flexibility and the ability to change perceptions was found to buffer emotional disorders. Furthermore, in a qualitative study by Ibanz and colleagues (2004), among 27 survivors of natural disaster in Mexico, problem-solving was identified as helpful for long-term adaptation.

Distress-regulation is the ability to identify and regulate psychological or emotional distress (Ursin & Eriksen, 2004). Perceptions of self-control and distress regulation assessed after disasters have been found to be associated with better mental-health outcomes (e.g., Karanci, Alkan, Aksit, Sucuoglu, & Balta, 1999; Norris, Perrila, Riad, Kaniasty, & Lavizzo, 1999; Sumer, Karanci, Berument, & Gunes, 2005). In one study with trauma survivors, Liao and colleagues (2002) found that people who are able to regulate distress tend to report lower levels of psychological distress. The authors indicate that individuals with distress regulating behaviors such as self-control, flexibility, and managing challenges, moderated the link between stress and

psychological distress. Likewise, Ullman and Newcomb (1999) found that earthquake survivors who had higher levels of perceived self-control before the disaster experienced lower intensity of intrusive distress symptoms after the event.

Optimism is defined as having a positive outlook or being hopeful about the future (Carver, Scheier, & Segerstrom, 2010). Scholars have also found evidence of the protective role of optimism following a variety of disaster events. For example, Cherry and colleagues (2017) examined the role of optimism and hope in predicting mental health indicators in a sample of disaster survivors who were exposed to Hurricanes Katrina and Rita in 2005. They found evidence of having optimism and hope served as protective factors that positively impact mental health after multiple disasters. Laor and colleagues (2006) also studied optimism and mental health symptoms (e.g., PTSD, dissociation, and grief) among Israeli youth living in areas where youth experienced acute events of collective trauma (e.g., relocation, personal injuring, seeing death or other injuries) and found optimism was related with lower mental health symptoms. Furthermore, among survivors of the Marmara earthquake in Turkey, Sumer and colleagues (2005) found that optimism was related to less PTSD symptoms of intrusions and general distress. Finally, in a longitudinal study of the protective role of optimism following the 2011 Oslo bombing, Birkeland and colleagues (2017) found that optimism had a protective-stabilizing effect on PTSD levels of avoidance, numbing, and dysphoric arousal. Their results suggest that the protective factor of optimism may help to neutralize the effects of PTSD post-disaster.

Implications for measurement. A major finding across the literature is that when protective factors are increased, an individual's ability to positively adapt after disaster increases (Masten & Obradovic, 2008). Likewise, when protective factors are reduced, the risk of maladaptation increases, and post-disaster resilience becomes more difficult (Werner & Smith,

2001). Currently, there is a paucity of disaster resilience scales which operationalize protective processes and factors supporting adaptation for individuals (Bonnano et al., 2007). This study aims to operationalize the protective factors specific to post-disaster resilience. Research has consistently been found to have an association between resilience and well-being in individuals following disaster events. Identifying and measuring the protective factors and processes that support adaptation can lead to interventions that inform disaster mental health recovery programs and policies.

Furthermore, as noted by Windle and colleagues (2011), current measures of resilience have two main limitations, 1.) a lack of breadth and 2.) failure to conduct/report rigorous psychometric information. Masten and Powell also support this measurement goal, stating the need for "field-friendly, research-based tools" assessing both internal and external protective factors that assist individuals in overcoming adversity (p.19, 2003). In order to effectively and rigorously conduct disaster research that includes quantifying changes in the phenomena associated with resilience, it is essential that psychometrically sound measures are developed and included in the process (Cai, et al., 2018).

This chapter provided an overview of resilience theory, current resilience measures, and protective factors supporting resilience after a disaster. A review of the extant literature reveals gaps and opportunities toward furthering research in resilience and disasters and provides a foundation to develop DARS. The next chapter explains the data collection and analysis procedures to develop and validate DARS.

Chapter Three: Methods

Research Design

The principal goal of this research project is to develop, test, and validate a measure of individual resilience to a disaster event. The following chapter overviews the instrument's development process and procedures, methodological rationale, and the statistical analyses used to develop and test the instrument. The Disaster Adaptation and Resilience Scale (DARS) was created in response to a paucity of instruments that measure domains found to support adaptive responses in individuals exposed to disaster events.

Study aims. Specific aims of the study are 1.) to develop and evaluate an item pool for a Disaster Resilience Scale for Individuals based upon a thorough review of the literature, a theory-based definition of the construct, and an expert panel review; and 2.) to evaluate the psychometric performance of the DARS to measure the construct of disaster resilience. The development and validation process of the DARS process occurred across two main study phases. First this chapter explains the methods for Phase I which involves the instrument's development and expert review procedures to establish content validity. Second, this chapter explains the methods for Phase II which includes the study recruitment procedures, participant qualifications, sample size, dimensionality of the construct, the internal structure of the test, and the association among the test scores and other variables. See Table 1 below for an overview of the phases of scale development.

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Table 1

Phases of Development for the Disaster Resilience Scale for Individuals (DARS)

Development Phase	Objective	Method
Phase I	- Identifying construct of disaster resilience and developing the structure of the scale	- Review of literature - Thematic analysis - Item generation - Response selection - Content and face validation of the scale from experts - Finalization of items selection and placement
Phase II	- Conducting a full validation evaluation of the psychometric properties of the scale	- Pilot testing of the finalized scale among adults exposed to disaster (*N*=625) - Factor structure using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) - Internal reliability using Cronbach's alpha and omega - Convergent validity using structural equation modeling (SEM) - Direct and indirect effects using SEM

Phase I: Instrument design and development

The objectives of Phase I were to methodically design and develop an instrument to measure the disaster resilience and establish evidence of its content validity. Phase I included the following steps for instrument development: 1.) determining the construct to be measured; 2.) generating an item pool; and 3.) submitting items to a panel of experts for review (DeVellis, 2012).

Construct Development. In the construct development stage of the instrument, the domains of the construct were specified, items were generated, and a response format was decided upon (DeVellis, 2012). First, to specify the domains of the construct, I developed a definition of disaster resilience among individuals. For the purpose of this instrument design, disaster resilience is operationally defined as *the protective factors, processes, and mechanisms that contribute to good outcomes following disaster exposure, despite experience with disaster stressors that pose risk for developing negative outcomes.* Disaster resilience is not defined as a static, individual trait, but as an adaptive process that is influenced by protective factors in the individual's environment (Bonnano, Galea, Burcciерlli, Vlahov, 2005; Hjemdal, 2007; Rutter, 1985; Werner & Smith, 2001). Protective factors are internal and external resources within an individual's personal and interpersonal areas which are associated with and cumulatively facilitate disaster resilience (Hjemdal, 2007; Werner & Smith, 2001). When protective factors are reduced, the risk of maladaptation becomes higher and reaching recovery after disaster becomes more difficult. When protective factors are increased, the ability to adapt and be resilient become higher. Basic assumptions of the construct of individual disaster resilience are as follow:

1. Disaster events place stress on life, livelihood, health, and well-being for individuals exposed.

2. An individual's ability to positively adapt to disaster stress is influenced by a variety of protective factors possessed by the individual and within the individual's environment.

3. Protective factors increase the ability to adapt and be resilient following a disaster.

Construct domains. DARS domains of protective factors were chosen based on a thorough review qualitative and quantitative research studying resilience in adults in the context of disaster. See Chapter 2 and Table 2 for DARS domain references.

1. Physical resources: The first domain is having access to basic material resources. These items are related to having or attaining food, shelter, and financial sustainability.

2. Supportive relationships: The second domain is having access to informal and formal supportive relationships. These items included both perceived and received social support such as healthy familial, social, and community connections.

3. Problem-solving ability: The third domain is being able to problem-solve in the face of disaster-related adversity. These items focus on strategies and behaviors aimed at responding to problems (e.g., planning, flexibility, critical insight, resourcefulness, problem-focused action plans)

4. Distress regulation: The fourth domain is being able to identify and regulate psychological or emotional distress. These items include actions such as identifying states of distress and being able regulate distress effectively with strategies and activities that provide a sense of well-being.

5. Optimism: The fifth domain is being optimistic or having a positive outlook about the future. These items focus on strategies and behaviors to optimism or having a positive outlook on the future.

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Table 2

Instrument Domain Reference

DARS Domain	Definition	Disaster Study
Physical Resources	Perceived access to economic and material resources (e.g., financial stability, housing)	Brewin, Andrews, & Valentine., 2000; Bonanno et al. 2005; Bonanno et al. 2007; Galea et al., 2007; Hawkins, Zinzow, Amstadter, Danielson, & Ruggiero, 2009; Norris, Friedman, & Watson, 2002; Roberto, and Kamo 2009; Kumar et al. , 2007; Masters, 1992; Sawada and Shimzutani, 2008
Supportive Relationships	Perceived access to informal and formal supportive relationships (e.g., family and friends)	Kaniasty, 2005; Kaniasty & Norris 2009, La Greca et al. 1996; Bonanno et al. 2007, 2008; Leavy, 1983; Norris, 2006; Sattler et al., 2006; Solomon et al., 1988; Watanabe, Okumura, Chiu, and Wakai; 2004; Walsh, 2007; Toya & Skidmore, 2014; Hawkins RL, Maurer K., 2010; First et al., 2018; Houston & Franken, 2015; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002; Taylor & Stanton, 2007; Landau & Saul, 2004. Tuohy et al., 2014; Hrostowski and Rehner, 2012
Problem-solving	Perceived ability to problem-solve in the face of adversity.	Benight and Harper, 2002; Sumer et al., 2005; Norris et al., 2006; Linley and Joseph, 2004; Qouta et al., 2001; Ibanz and colleagues, 2004
Distress Regulation	Perceived ability to identify and regulate psychological or emotional distress.	Norris, 2006; Liao et al. 2002; Raccanello D, Burro R, Hall R, 2017; Lowe, S. R., Rhodes, J. E., & Waters, M. C., 2015; Karanci, Alkan, Aksit, Sucuoglu, & Balta, 1999; Norris, Perrila, Riad, Kaniasty, & Lavizzo, 1999; Sumer, Karanci, Berument, & Gunes, 2005; Maddi & Khoshaba, 2003; Ullman and Newcomb, 1999; Liao et al., 2002
Optimism	Having a positive outlook or being optimistic or hopeful about the future.	Fredrickson et al. 2003; Bonanno et al. 2005; Norris, 2006; Carbone& Echols, 2017; Zeidner & Hammer, 1992; Van der Velden et al. 2007; Cherry et al., 2017; Laor et al., 2006; Sumer et al., 2005; Birkeland et al., 2017

Item generation. After developing the measure's construct and domains, an item pool was generated that included an item list for each the five domains. Utilizing the literature

gathered in chapter two of this study, techniques of thematic analysis (Braun & Clarke, 2006) were employed to extract descriptions underlying each domain. In the review of the literature, each article was first coded for variables/protective factors related to disaster resilience in adults. After coding each article for protective factors, open action codes (e.g., attitudes, behaviors, resources) were assigned as they related to each of the protective factor domains. The comparative method was used to compare how the initial codes were related to other studies. Once the protective factor categories were identified, items were written to represent corresponding concepts identified in the literature. Each individual item was written at a 6th grade reading level and rated on a 5-point Likert scale with response options ranging from "*Not at all*" to "*All the time.*" Likert scaling offers respondents with choices in "equal-appearing intervals" (Abell, Springer, & Kamata, 2009) and an odd number of response categories offers an option of a neutral selection choice and allows the respondent to indicate equal attraction to both sides of the response choices (Devellis, 2012). All of the DARS items were positively worded. According to Hjemdal (2007), all of the positively worded items on a scale are consistent with resilience theory. See Table 3 for a list of initial DARS items.

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Table 3

Descriptive Statistics for Expert Review

Item Pool	Means (SD) Relevance	Clarity
I have enough food to eat.	4.67 (.67)	4.22 (1.31)
I have reliable transportation to get me to where I need to go.	4.44 (.96)	3.89 (1.45)
I have permanent housing.	4.67 (.67)	4.00 (.94)
I have insurance to cover disaster-related damages.	4.44 (.68)	4.11 (1.1)
My utilities are working (e.g., electricity, gas, water).	4.75 (.43)	4.56 (.68)
I can afford to eat balanced meals.	4.00 (1.00)	4.13 (1.05)
I don't have to worry that my food will run out before I get money to buy more.	4.88 (.33)	4.88 (.33)
I have enough money to pay my rent or mortgage when it is due.	4.75 (.43)	4.88 (.33)
I am financially stable.	4.25 (.97)	4.00 (1.00)
I have a safe place to go to in the event of a disaster.	5.00 (0)	4.25 (.83)
My friends are there for me during difficult times.	4.75 (.43)	4.38 (.86)
My family is there for me during difficult times.	4.88 (.33)	4.38 (.86)
I can talk with my family about my problems.	4.25 (.66)	4.63 (.48)
I can talk with my friends about my problems.	4.38 (.70)	4.75 (.43)
I get the support I need from my friends and family.	4.88 (.33)	4.38 (.86)
I have people I can turn to and ask for help.	4.63 (.48)	4.63 (.70)
I feel like I belong in my community.	4.75 (.43)	4.63 (.70)
I am treated fairly by people.	3.88 (1.45)	4.63 (.70)
If I need help, I know where to go in my community.	5.00 (0)	4.75 (.43)
When I am faced with a problem, I think of possible solutions.	4.25 (.66)	4.75 (.43)
I am good at solving problems.	4.50 (.50)	4.50 (.71)
When I encounter a problem, I think about solutions that have worked for me in the past.	4.13 (.93)	4.75 (.43)
I set achievable goals for my problems.	4.25 (.66)	4.13 (.93)
I brainstorm possible options to solve problems.	4.25 (.83)	4.38 (.70)
I look for information or resources to help deal with my problems.	4.75 (.43)	4.75 (.43)
When I have multiple problems, I prioritize which to problem to work on first.	4.50 (.71)	3.63 (1.32)
To resolve problems, I make a plan of action and follow it through.	4.50 (.87)	4.50 (.50)
If I anticipate a future problem happening, I plan in my mind what I could do.	4.13 (1.05)	4.38 (.70)
I am able to adapt to change.	4.88 (.33)	4.50 (.71)
When I feel upset, I pay attention to my feelings.	4.50 (.71)	4.88 (.33)
I am able to manage sad feelings.	4.63 (.48)	4.75 (.43)
When I am upset, I take time to figure out what I'm feeling.	4.25 (.97)	4.5 (.71)

To decrease upsetting thoughts, I change the way I'm thinking about the situation.	4.38 (.48)	4.75 (.43)
I am able to manage angry feelings.	4.5 (.50)	4.63 (.48)
I pay attention to bodily sensations of stress (e.g., heart pounding, fast breathing, sweating).	4.5 (1.00)	4.88 (.33)
When I feel stressed, I do something to help me relax.	4.63 (.70)	4.88 (.33)
If I have flashbacks or upsetting memories, I change my attention to the present moment.	4.63 (.70)	4.5 (.71)
I give myself time to recover from upsetting situations.	4.38 (.86)	4.5 (.87)
I am optimistic about my future.	4.75 (.66)	4.63 (.70)
I believe I will make it through difficult times.	4.88 (.33)	4.88 (.33)
When difficult things happen, I know things will get better with time.	4.75 (.43)	4.56 (.68)
I believe that things will work out.	3.89 (1.29)	4 (1.25)
After difficult situations happen, I tell myself things will get better with time.	4.44 (.50)	4.67 (.47)
I have important goals for my future.	4.33 (.67)	4.38 (.86)
I can achieve my long-term goals.	4.13 (.93)	4.5 (.71)
My life has meaning and purpose.	4.56 (.68)	4.56 (.50)
Overall, I expect more good things to happen than bad things.	4.00 (1.05)	4.5 (.71)

Expert review. One recommendation for establishing content and face validity is to form a panel of content experts or professionals who have worked or published in the field to provide feedback on the quality and appropriateness of the items and domains in the measure (Haynes et al., 1995). To determine if DARS adequately operationalized disaster resilience at the individual level the instrument's construct, domains, and items were reviewed and assessed by experts for content validity. Content validity is the extent to which the domains and items within a measure are relevant and representative of the construct that they are aiming to measure (Haynes, Richard, & Kubany, 1995). Potential threats to a measure's content validity would be items or questions that are irrelevant or inaccurate to the construct.

To establish content and face validity for DARS, the preliminary item pool, response format, and survey instructions were submitted to an expert panel made up of eight to ten

disaster scholars and practitioners for review and feedback (Devellis, 2012). All data collection procedures for the expert review went through the University of Missouri's Institutional Review Board. I sent personal emails to 15 experts inviting them to review DARS elements through a Qualtrics survey. Nine experts reviewed the preliminary item pool and the panel of scholars and practitioners included professionals and researchers in the fields of disaster and mental health/behavioral health, disaster and social work, and emergency management. Expert panel reviewers were provided with the purpose and aims of the research project, instructions on providing ratings and feedback, and a preliminary version of 47 items in the DARS. Expert panel reviewers rated each item on a 5-point scale on clarity with 1 being (*Not Clear*) to 5 being (*Extremely Clear*), and perceived relevance with 1 being (*Not Relevant*) to 5 being (*Extremely Relevant*). In addition to rating each item, the expert panel reviewers were able to provide recommendations for additional items and suggested clarifications to current items. Specifically, the expert reviewers were able to respond to the following open-ended question: Are there any items that need to be changed, clarified, or omitted? If so, please include the item(s) and a brief explanation as to why the item(s) should be modified or omitted.

Data analysis. After the initial DARS items were rated by the expert panel reviewers, descriptive statistics from the ratings (e.g., relevance and clarity) of the DARS were analyzed to provide evidence for the content validity of the DARS (Haynes, Richards, & Kubany, 1995). Mean rating scores for each of the expert responses were calculated for each item (see Table 3). DARS items with low rating means (below a mean of 3) were highlighted for consideration of rewording or deletion. In addition, expert qualitative recommendations from the open-ended questions were considered accordingly.

After establishing content validity of the DARS, the revised items list was then submitted to a larger sample of participants exposed to a disaster. During the second phase of the research project, the DARS's factor structure, internal consistency reliability, discriminant and convergent validity, and direct and indirect effects will be analyzed. The second phase of the research project is detailed in the following section.

Phase II: Full Validation Analysis

Research design. The main purpose of phase two in the research project was to conduct a full validation evaluation of the psychometric properties of DARS to measure disaster resilience in adults exposed to a disaster. To achieve the purpose, a self-reported survey was designed. Given the current goal of the study, this design was considered appropriate since the aim of the study is to describe, explain, and investigate a natural occurring phenomenon such as resilience within a specific population of individuals exposed to disaster.

Participant recruitment. Participants qualified for this study if they are 18 years of age or older and have experienced a disaster within the previous three years (Bonnano et al., 2004). Participants were recruited though purposive online sampling using the Qualtrics' panel aggregator sampling service. The Qualtrics panel aggregator provides researchers with access to market research panels and uses digital technology (e.g., IP address checks, digital fingerprinting) to ensure participants' data are as valid and reliable as possible (Guillory, Kim, Murphy, Bradfield, Nonnemaker, & Hsieh, 2016). In addition, Qualtrics is able to monitor the data collection procedure and controls for issues such as participant inattentiveness or ineligibility, high incompletion rates, duplicate responses, or unreasonably quick completion times (Brandon, Long, Loraas, Mueller-Phillips, & Vansant, 2013). Qualtrics was chosen as the

online data collection platform following research indicating that samples recruited via online panel aggregators represent the U.S. population demography slightly better and are usually less expensive relative to convenience samples (Berinsky, Huber & Lenz, 2012). Qualtrics invited participants to the study by clicking on a link to a screening questionnaire to assess eligibility. Qualtrics recruited from a diverse pool of participants living in a U.S. state or territory that has experienced a natural or human-caused disaster in the last three years. Accordingly, the primary target states for recruitment included California, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Florida, and Texas. Using the online interface of Qualtrics, participants were provided with study instructions and the self-reported questionnaire items. Participants were compensated for their time with incentives through Qualtrics incentive program (e.g., prize drawings and accumulated rewards).

***Data collection procedure*.** All data collection procedures for phase two was approved by the University of Missouri Institutional Review Board (IRB). This study used a Qualtrics online service system. Potential respondents were sent an email invitation from Qualtrics with a secure URL to access the survey and review the study's purpose, duration (15-20 min) and an electronic informed consent indicating that participation is voluntary and their responses will remain anonymous. Potential respondents selected that they meet the study criteria by clicking a button that reads, "I am 18 years or older and live in a U.S. state or territory and have experienced a natural or human-caused disaster in the last three years (e.g., September15, 2015 - September 15, 2018)." Participants then provided consent by clicking a button that reads, "I consent to take the survey" or refused consent by clicking an adjacent button that reads, "I do NOT consent to take the survey." After consenting to the study, participants were provided with a description of what a disaster is defined as and to choose the type of disaster they most recently experienced from a

list of potential disasters (e.g., tornado, hurricane, oil spill). Participants were then directed to the survey questions. In addition to completing the DARS items, participants completed a demographic inventory (e.g., gender, race/ethnicity, income), disaster-related stress exposure questions, the Impact of Event Scale-Revised (Weiss & Marmar, 1996), Patient Health Questionnaire (PHQ; Kroenke, Spitzer, Williams, 2003), and the Connor-Davidson Resilience Scale (Connor & Davidson, 2003). Finally, participants were thanked for their participation and were provided with the researcher's contact information in case participants have questions following the study.

Sample size. Several rules of thumb have been provided for sample size requirements for psychometric methods involving exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). For EFA, Comrey (1973) suggest that 100 cases are poor, 200 is fair, 300 participants is good, and 500 is very good. For CFA, Little (2013) recommends a minimum sample size of 120 while others have recommended closer to 200 to 500 participants (Kline, 1998; Wolf et al., 2013). Based on these recommendations, the projected sample size for Study Two was 600 participants to provide an adequate number of participants for an EFA calibration sample, CFA validation sample, and Structural Equation Modeling analyses (Costello & Osborne, 2005; Henson & Roberts, 2006; Worthington & Whittaker, 2006). A description of the sample is provided below.

Participants. Six hundred and twenty-five participants who experienced a disaster within the past three years and were included in the final data analysis. In the case of missing data at random, a full information maximum likelihood estimation will be used, which assumes missing data points have an expectation equal to a model-derived value estimated from the remaining data points (Muthén & Muthén, 2006). Missing data in the current study did not exceed 10% for

any variable. Three hundred and thirty participants were female (53%) and 293 were male (47%). The age of participants ranged from 18 to 70 years and older, and the average participant's age was 32.5 (*SD*= 7.88). Three hundred ninety-seven participants identified as White/Caucasian (62.5%), followed by Black/African American/Afro Caribbean (*n* =105, 16.8%), Hispanic/Latino (*n* =55, 8.8%), Multi-racial (*n*= 29, 4.6%) Asian American (*n* =26, 4.2%), Native Hawaiian/Other Pacific Islander (*n* =9, 1.4%), and American Indian/Alaskan Native (*n* =4, .6%). Nearly half of all participants had a bachelor's degree or higher (*n* =146, 49.7%). The average household size was 2.69. Two hundred twenty-one participants reported a prior mental health disorder and/or prior mental health treatment. The most frequent disasters experienced included hurricanes (*n* =423, 68%), followed by tornados (*n* =59, 9.5%), floods (*n* =56, 9%), and wildfires (*n* =54, 8.7%). See Tables 4 and 5 for the complete descriptive statistics of the participants.

Study Measures

In addition to completing the items of DARS, participants completed additional measures including disaster stress exposure, Impact of Event Scale-Revised, Connor-Davidson Resilience Scale, Patient Health Questionnaire, and a series of demographic variables (i.e., sex, race, income level, education level, household size). The study's measures are described below.

Disaster Adaptation and Resilience Scale (DARS). Disaster resilience (*M*=166.51, *SD*= 28.53, α= .96) was measured via the final items retained in the Disaster Adaptation and Resilience Scale (DARS). Participants were prompted to think about the most recent disaster event and answer to report if they possess a specific protective factor (e.g., distress regulation, basic resources) on a 5-point Likert scale ranging from 0 = *not at all true* and 5 = *true nearly all the time*.

Disaster stress exposure. Disaster stress exposure (*M*=9.72, *SD*=1.72, α= .66) was measured by participants rating their perceptions of exposure to five main disaster-related stressors: 1.) did they lose personal belongs, 2.) was their home or property damaged, 3.) did they experience bodily injury, 4.) did their life or loved one's life feel threatened, 5.) did they experience feelings of helplessness, fear, or horror (see Lowe et al., 2015; Norris, Smith, & Kaniasty, 1999; Boscarino et al., 2006). Participants rated their responses on a 4-point Likert scale with response options ranging from 1 = *not at all* to 4 = a *great deal.*

Impact of Event Scale-Revised. Post-traumatic stress disorder (PTSD) symptoms (*M*=34.76, *SD=23.22, α*= .97) were measured via the Impact of Event Scale-Revised (IES-R). The scale consists of three factors of symptoms related to posttraumatic stress: avoidance (eight items), hyperarousal (six items), and intrusion (eight items). Sample items include: "Any reminder brought back feelings about it," "I felt irritable and angry," and "My feelings about it were kind of numb." In the current study participants will be instructed to report how distressing or bothersome each symptom had been within the past seven days with respect to the most recent disaster event. Responses for the IES-R are provided on a 5-point Likert-like scale which ranged from 1= *not at all* to 5= *extremely*.

Patient Health Questionnaire. Depression (*M*=3.93, *SD*=1.97, *α*= .89*)* was measured via the Patient Health Questionnaire (PHQ). The PHQ is a self-report measure about the frequency of depressed mood, with a score ranging from 0 to 6 (Kroenke, Spitzer, Williams, 2003). The PHQ measures the degree to which an individual has experienced depressed mood and anhedonia over the past two weeks in order to screen participants for depression. The PHQ has been validated in multiple studies in which it demonstrated variability in sensitivity (Gilbody, Richards, Brealey, and Hweitt, 2007). The measure's authors identify a cut-off score

of three as the optimal cut point for depression screening purposes and stated that a cut point of two would enhance sensitivity.

Connor-Davidson Resilience Scale. General resilience (M=36.85 SD=8.17, α=.93) was measured via the Connor-Davidson Resilience Scale (CD-RISC) is a 25-item scale that measures the protective factors believed to enhance general resilience in adults (Connor & Davidson, 2003). The CD-RISC is rated on a 5- point Likert scale ranging from 0=*not at all* true to 4=*true nearly all of the time*. Higher levels of the CD-RISC protective factors have been found to be correlated with lower levels of psychological pathology (Connor & Davidson, 2003).

Demographic variables. This study also included demographic variables. These variables included: sex (1=Male, Female=2); race and ethnicity (1=American Indian/Alaskan Native, 2=Black/African American/Afro-Caribbean, 3=Asian American, 4=Hispanic/Latino, 5=Native Hawaiian/Other Pacific Islander, 6=White/Caucasian, and 7=Other); highest level of education obtained (1=Grade school or less, 2=Some high school, 3=High school graduate, 4=Some college, 5=College graduate, 6=Master's degree, 7=Advanced degree); age (in years); household size, prior mental health diagnosis, and income level selected from a list of options. See Tables 4 and 5 for descriptive statistics of demographic variables and disaster type .

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Table 4

Descriptive Statistics for Sex, Race, Age, Income, Education, Household size, Prior Mental Health

Variable		*N*	%	*M*
Sex				
	Male	293	47	
	Female	330	53	
Race				
	American Indian/Alaskan Native	4	.6	
	Black/African American/Afro-Caribbean	105	16.8	
	Native Hawaiian/Other Pacific Islander	9	1.4	
	Asian American	26	4.2	
	Hispanic/Latino	55	8.8	
	White/Caucasian	397	63.5	
	Multi-racial	29	4.6	
Age				32.49
Income				
	Less than $15,000	75	12	
	$15,000 to $29,999	130	15.6	
	$30,000 to $44,999	117	18.7	
	$45,000 to $59,999	91	14.6	
	$60,000 to $74,999	72	11.5	
	$75,000 to $104,999	61	9.8	
	$105,000 or more	79	12.6	
Education				

	Grade School	4	.6
	Some High School	17	2.7
	High School Graduate	137	21.9
	Some College	188	30.1
	College Graduate	196	31.4
	Advanced degree	80	12.8
Household Size			
	One	142	22.7
	Two	185	29.6
	Three	131	21
	Four	100	16
	Five	40	6.4
	Six	18	2.9
	Seven	6	1
	Eight or more	3	.5
Mental Health			
	Prior mental health disorder	131	21
	Prior mental health treatment	90	14.4

Table 5

Descriptive Statistics of Disaster Type

Disaster Type	*N*	Frequency
Hurricane	423	68%
Tornado	59	9.5%
Wildfire	54	8.7%
Flood	56	9%
Earthquake	12	1.9%
Chemical Spill	4	.6%
Civil Unrest	7	1%
Mass Shooting	4	.6%
Other	5	.8%

Data Analysis

The goal of this project is to develop a self-report viable measure that accurately assesses individual protective factors supporting disaster resilience. All data analysis was conducted using the statistical software package R and packages psych, hornpa, lavaan, GPArotation (R Core Team, 2016). For descriptive statistics, data was analyzed to determine the distribution of gender, age, education, race/ethnicity, income, employment status, and household size. For the psychometric analysis, data was analyzed to examine the structure and dimensionality of DARS and to determine the scale's psychometric properties to confirm test its measurement reliability

and validity. Each of the psychometric methods utilized in this research project are outlined in detail below.

Exploratory factor analysis. Before conducting an exploratory factor analysis (EFA), several tests were conducted to determine if the respondent data was suitable for factor analysis including Bartlett's test of sphericity (Bartlett, 1951) and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO; Kaiser, 1974). Bartlett's test examines if the null hypothesis is true, by determining if the data's correlation matrix is an identity matrix where all the diagonal elements are one and all the off diagonal are zero, indicating no relationship between variables (Bartlett, 1951). The desire with Bartlett's test is to reject this null hypothesis and the X^2 test to be found significant (less than 0.05) indicating that a factor analysis may be useful for the data. After conducting Bartlett's test, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was utilized to determine if factor analysis was adequate for the data. The KMO is a statistic that indicates the proportion of variance in the variables that might be caused by underlying factors (Kahn, 2006). Higher values greater than 0.50 indicate that factor analysis would be useful for the data, while values less than 0.50 indicate that factor analysis would not be useful for the data (Kahn, 2006).

After data was found to be suitable for factor analysis, exploratory factor analysis (EFA) was conducted to determine the number of factors to retain. Scree tests are often conducted in determining the number of factors to retain in an EFA. A scree test provides a graph of the eigenvalues in order to find the natural bend in the data before the plot flattens which is usually an indication of the number of factors to retain (Cattell, 1966). However, visual inspection of the scree test has been criticized for its subjectivity, since there is not an objective definition of the cutoff point between the factors (Ledesma & Valero-Mora, 2007). To address issues of

subjectivity with visual inspection of the scree test, it is recommended to use a parallel analysis as a more accurate method for determining the number of factors to retain from a scree plot (Howard, 2016). In a parallel analysis, a random data simulation of eigenvalues (e.g., Monte Carlo simulation technique) is generated and compared to the observed eigenvalues on the scree plot of the measured data. Current recommendations for using parallel analysis are to retain the eigenvalues that correspond to the 95th percentile of the distribution of eigenvalues derived from the random data set (Ledesma & Valero-Mora, 2007). Based on these recommendations, a parallel analysis was performed to determine the number of factors to retain from the EFA based on the eigenvalues that correspond to the 95th percentile in the simulated data set.

Next, if the parallel analysis provides evidence of more than one factor in DARS, or multidimensionality, then a factor rotation will be performed for interpreting and clarifying the meaning of the factors (Costello & Osborne, 2005). The two main types of factor rotation are orthogonal and oblique rotation. Orthogonal rotations produce factors that are uncorrelated (e.g., the angle of the axis is maintained at 90 degrees) while oblique methods allow the factors to correlate (e.g., the angle of the axis is allowed to be different than 90 degrees; Costello & Osborne, 2005). Consistent with the nature of resilience the oblique rotation method was used to analyze the data. The coefficient loading values will then be examined for refinements and to ascertain the dimensionality of the scale. Based on Fabrigar, MacCallum, Wegener, and Strahan's (1999) criteria, DARS items were removed if the item loadings were low (e.g., $\lambda < .40$) or if they had a high cross-loadings (e.g., $\lambda > 40$).

Reliability estimates. Once the overall structure of the DARS was determined from the EFA, the reliability of the DARS was estimated for the global scale and subscales. Establishing reliability in an instrument is to achieve stability, repeatability, or internal consistency as

opposed to measurement error (Jack & Clarke, 1998). One of the most widely used tests of reliability is the Cronbach's alpha statistic (Cronbach, 1951). Cronbach's alpha utilizes inter-item correlations to determine if an instrument's items are measuring a specified domain/factor (Cronbach, 1951). Items are considered demonstrating good internal consistency when alpha coefficient exceeds 0.70 (Bowling 1997).

However, one main criticism of Cronbach's alpha is that it has been found to underestimate the degree of internal consistency when a scale does not display tau equivalence (Osburn, 2000). Tau equivalence is when the standardized factor loadings of each item is nearly identical to all other items on the scale (McNeish, 2017). Most empirical scales do not display tau equivalence, wherein items measure the same construct, but they do so with different standardized factor loading values (McNeish, 2017). To have less risk of misestimation of alpha reliability estimates, researchers have recommended the benefit of using alternative reliability measures that use a congeneric model over the tau equivalence model (McNeish, 2017; Revelle & Zinbarg, 2009; Zinbarg, Revelle, & Yovel, 2007). In a congeneric model, item variances are allowed to vary and are not assumed to be constant (McNeish, 2017). Coefficient omega is a reliability measure that uses a congeneric model and has been recommended by researchers as having a more accurate estimation over alpha (Dunn et al., 2014). The cutoff values for an acceptable reliability estimate in omega are similar values to the alpha level cutoff (e.g., coefficient exceeds 0.70). Based on these recommendations, this study performed both alpha and omega reliability estimates for DARS.

Structural equation modeling. After estimating reliability for DARS, structural equation modeling (SEM) was employed to test the relationships between indicators and latent variables. SEM is able to estimate both the proportion of variance common to multiple indicators of a given

construct and the structural relations among latent constructs while correcting for measurement error (Kline, 2016). Following this two-step procedure recommended by Kline (2016), a confirmatory factor analysis (CFA) of the measurement structure first tested the relationships between latent variables and indicators. After the measurement model was established, a structural model tested the direct and indirect relationships among latent and observed variables.

Measurement model. To confirm the factor structures indicated in the EFA analysis, a CFA was conducted to establish the baseline measurement model. While the method of EFA does not require a prior specification of the factor structures, the method of CFA specifies the factor structures. Based on the EFA, the CFA dimensions and latent variables were specified as five main factors to underlie the scale's items. To obtain standardized, unit-free estimates that reflect the indicator reliabilities, the scale was set by the fixed factor method which fixes the latent variance to one (e.g., $\psi = 1.0$). In the CFA, each parameter of the measurement model was estimated to produce a predicted variance-covariance matrix (e.g., Σ) that resembles the sample variance-covariance matrix (e.g., *S*). The objective in a CFA was to find a set of factor loadings that produce the predicted Σ matric using the input of *S* matrix.

Once the overall structure of DARS was confirmed, the measure's five factor loadings were tested for evidence of convergent validity against unrelated criterion variables (e.g., PTSD, depression). Evidence of convergent validity is established if there is acceptable model fit and DARS items load onto their respective factor and correlated with tests of related constructs (Garson, 2010; Kline, 2005). Evidence of discriminant validity is established if there is acceptable model fit and DARS items load onto their respective factor rather than the psychopathology factors (Campbell & Fiske, 1959). To further test discriminant and convergent

validity, a correlation-based analytic method was also conducted to assess convergent and discriminant validity on related and unrelated constructs.

Structural model. After establishing the measurement model and providing evidence of discriminant and convergent validity, the structural relationships between disaster stress, resilience (via DARS), and mental health (e.g., PTSD and depression) was analyzed for evidence of construct validity. Specifically, paths were analyzed using SEM to explore how an individual's level of resilience, represented by the DARS, can impact the relationship between disaster stress and mental health outcomes: PTSD and depression. This study hypothesizes a direct relationship between disaster stress and mental health and an indirect relationship between disaster stress and mental health through disaster resilience. The model will analyze whether the impact of disaster stress on PTSD, can be filtered or mediated by the individual's level of disaster resilience. See Figure 3 for the hypothesized model.

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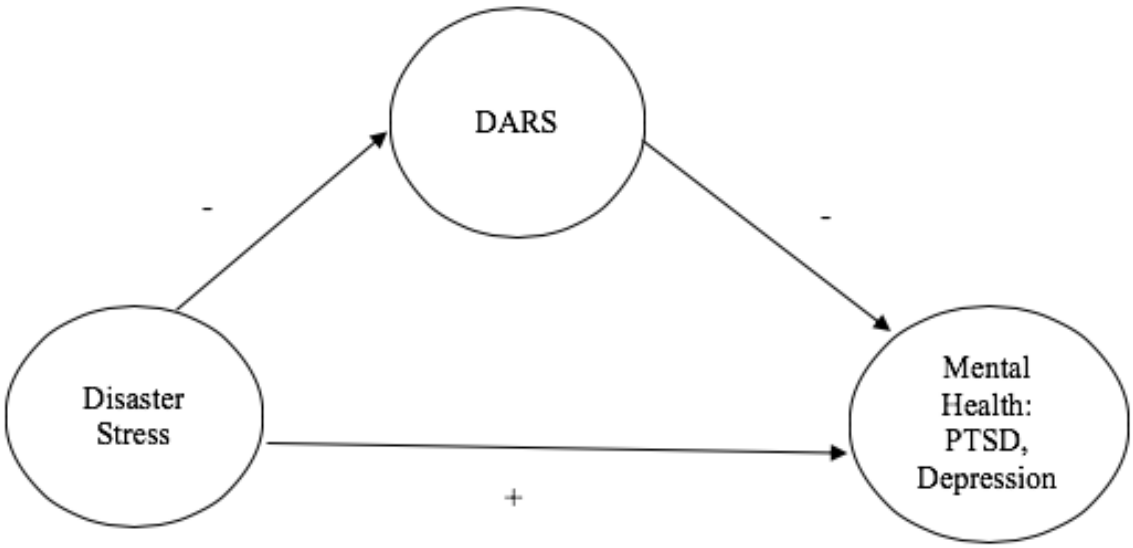
Figure 3. Hypothesized model of direct and indirect effects on mental health



Researchers have suggested that to test the significance of a mediation model or indirect effects, bootstrapping procedures should be used to determine the appropriate standard error to test for significance (Shrout & Bolger, 2002). Therefore, 1,000 bootstrap samples were generated for this analysis to get distribution of estimates from samples. Confidence intervals were set at the 95th percentile and if the confidence intervals do not cross zero, then the finding was considered significant.

For both the measurement and structural SEM models, a maximum likelihood estimation with robust standard errors was performed using R software and the *lavaan* package (R Development Core Team, 2011; Rosseel, 2012, Finney & DiStefano, 2008). Guidelines for goodness of fit indices were used to evaluate model fit based on the recommendations of Little (2013) included the root mean square error of approximation (RMSEA; values of .08 or less

indicate adequate fit), standardized root mean square residual (SRMR; values of .08 or less indicate adequate fit), and comparative fit index (CFI; values equal to, or greater than .90 indicate adequate fit) and the Tucker-Lewis Index (TLI; values equal to or greater than .90 indicate adequate fit). Model fit evaluation also included inspection of standardized residuals and modification indices. Residuals were inspected for outliers, which can indicate a model misfit that is not due to chance (Tate, 1998). In addition, modification indices were inspected for high values indicating the possible need to remove an item or change the path of an indicator (Kline, 2005). If the event that the model fit was still not adequate after appropriate inspections and modifications have been made, the parceling of indicators can be a valuable alternative technique to improve parameter estimates (Kline, 2005; Little, Cunningham, Shahar, & Widaman, 2002). Facet-representative parceling averages items within each dimension so that each parcel represents a single facet of the construct, while domain-representative parceling averages items across each dimension so that each parcel represents the entire domain of the construct (Little et al., 2013).

Chapter Four: Results

This chapter provides the results for the research questions and hypotheses introduced in Chapter One. First, I will describe the quantitative and qualitative responses from the expert review conducted in Phase I to establish content and face validity. Next, I present the quantitative results from the full validation study *(N*=625) in Phase II including the factor structures generated from exploratory factor analyses (EFA) and the reliability estimates. Finally, I explain the structural equation modeling (SEM) analyses that confirm the Disaster Adaptation and Resilience Scale (DARS) factor structures and support DARS relationship with other mental health and disaster constructs.

Content validity. To provide evidence of content validity for the Disaster Adaptation and Resilience Scale (DARS). A panel of 9 disaster scholars and mental health practitioners evaluated DARS initial item pool (47 items) on relevance and clarity using a 5-point Likert scale. To determine which items were sufficient or needed to be refined, I ran descriptive statistics on each item response (Haynes, Richards, & Kubany, 1995). To establish clarity and relevance of each item, each had to meet the criterion of a mean score of three or above (the items all had a maximum value of five) in order to be included in the Phase II. All items had mean scores of 3 or above. The quantitative expert review results indicated the proposed question items were sufficient and could be submitted for Phase II full validation study. Expert review also included qualitative feedback to open-ended questions addressing any items that needed to be changed, clarified, or added to the item pool. Based on expert qualitative feedback, four items were eliminated or combined with other items. The quantitative and qualitative findings resulted in 43 expert-approved items. See Table 3 for the initial items submitted for expert review and descriptive statistics for each item. See Table 6 for the final items submitted for EFA.

Table 6

Disaster Adaptation and Resilience Scale Items Submitted for EFA

I have insurance to cover disaster-related damages.
I have enough food to eat.
I have stable or permanent housing.
My utilities are working (e.g., electricity, gas, water).
I have reliable transportation to get me to where I need to go.
I have enough money to pay my rent or mortgage when it is due.
I have access to clean water.
I have access to medical professionals and services (e.g., doctors, hospital, pharmacy etc.)
I have a plan for safety in the event of a disaster.
My friends are there for me during difficult times.
My family is there for me during difficult times.
I am treated fairly by people in my community.
I have people I can turn to and ask for help.
I get the support I need from my friends and family.
I feel like I belong in my community.
I appreciate my cultural and family traditions.
If I need help, I know where to go in my community.
I can talk with my family about my problems.
I can talk with my friends about my problems.
When I am faced with a problem, I think of possible solutions.
I am good at solving problems.
I look for information or resources to help deal with my problems.
When I have multiple problems, I prioritize which to problem to work on first.
I set achievable goals for my problems.
I brainstorm possible options to solve problems.
When I encounter a problem, I think about solutions that have worked for me in the past.
To resolve problems, I make a plan of action and follow it through.
When I feel upset, I pay attention to my feelings.
I am able to manage sad feelings.
When I am upset, I take time to figure out what I am feeling.
To decrease upsetting thoughts, I change the way I am thinking about the situation.
I am able to manage angry feelings.
I pay attention to bodily sensations of stress (e.g., heart pounding, fast breathing, sweating).
When I feel stressed, I do something to help me relax or feel less stressed.
If I have flashbacks or upsetting memories, I change my attention to the present moment.
I give myself time to recover from upsetting situations.
I believe I will make it through difficult times.
I am optimistic about my future.
When difficult things happen, I know things will get better with time.
I have important goals for my future.
I believe I can achieve my long-term goals.
My life has meaning and purpose.
After difficult situations happen, I tell myself things will get better with time.

EFA results. Before conducting the EFA, the Kaiser-Meyer-Olkin measure of sampling adequacy was found to be above .60, at .958. Additionally, Bartlett's test of sphericity was significant [$\chi^2(905) = 15{,}843.262$, $p < .001$]. These statistics provided justification for conducting an exploratory factor analysis (Bartlett, 1951; Kaiser, 1974). An EFA using the principle-axis factor extraction was conducted to determine the factor structure of the DARS. Looking at Figure 4 for the parallel analysis scree plots, the dotted line indicates the averaged eigenvalues from 500 simulations based on simulated data. In the scree plot the fifth observed eigenvalue is the last above the dotted line, indicating retaining five factors in the DARS structure. See Figure 4 for the parallel analysis scree plot for DARS items.

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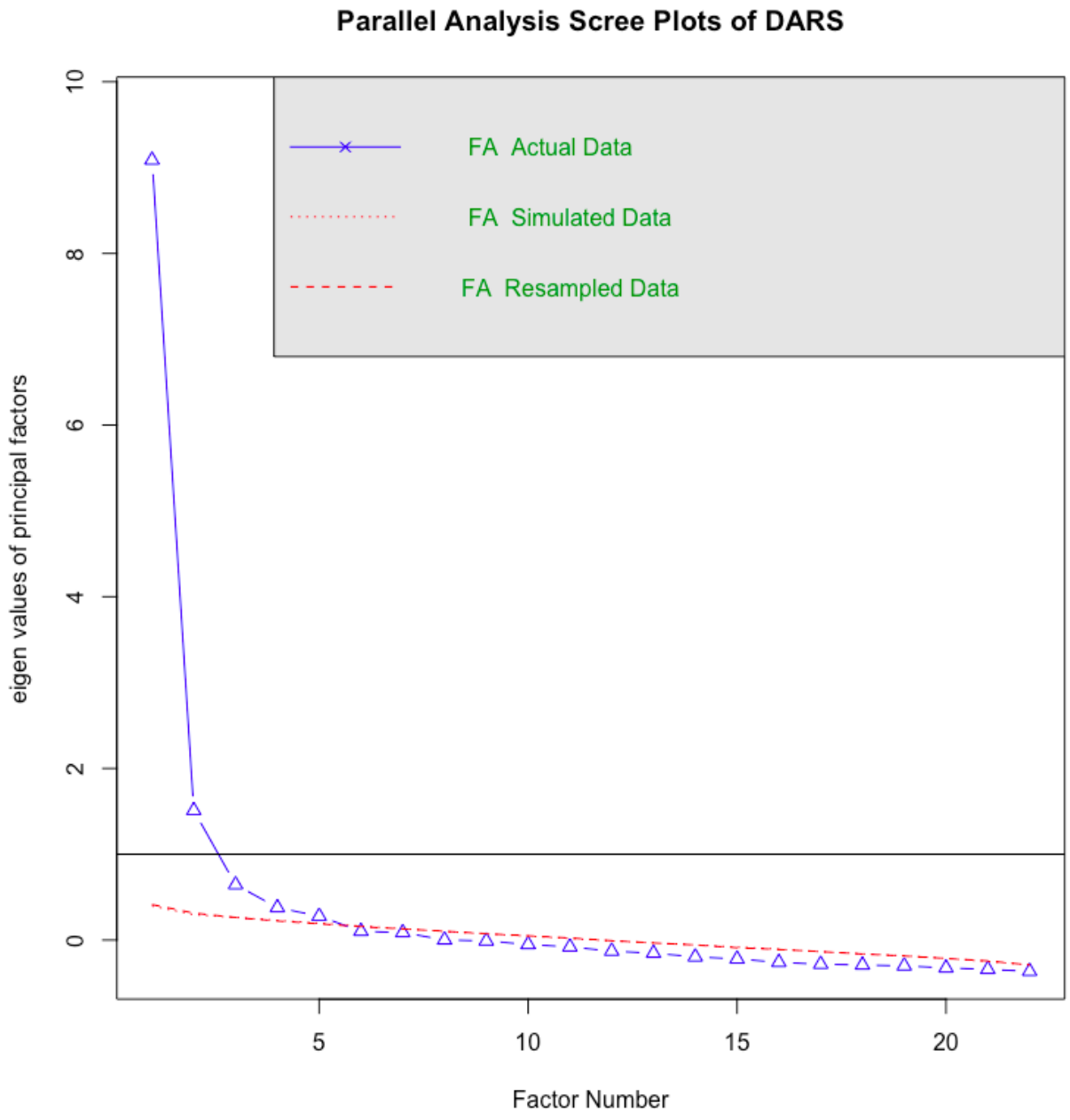
Figure 4. DARS Parallel Analysis Scree Plots



After determining the structure of DARS, individual items were then subject to removal if the item loadings were low (e.g., $\lambda < .40$) or if there are high cross-loadings (e.g., $\lambda > 40$;

Fabrigar et al., 1999). DARS five dimensions were viewed as nonorthogonal and an oblique rotation (Kaiser, 1958) was employed. Based on the item loadings, EFA results indicated retaining all 43-items with a five-factor solution that explained 59.925% of the variance for DARS. See Table 7 for EFA loadings.

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Table 7

EFA Loadings for Disaster Adaptation and Resilience Scale

	Factor				
Item	Social Support	Distress Regulate	Optimism	Physical Resources	Problem Solve
I have insurance to cover disaster-related damages.	.349	.201	.149	**.410**	.007
I have enough food to eat.	.273	.120	.136	**.608**	.086
I have stable or permanent housing.	.264	.137	.040	**.727**	.066
My utilities are working (e.g., electricity, gas, water).	.127	.097	.062	**.646**	.166
I have reliable transportation to get me to where I need to go.	.255	.095	.116	**.549**	.265
I have enough money to pay my rent or mortgage when it is due.	.332	.146	.113	**.612**	.022
I have access to clean water.	.160	.029	.113	**.694**	.288
I have access to medical professionals and services (e.g., doctors, hospital, pharmacy etc.)	.219	.108	.194	**.670**	.225
I have a plan for safety in the event of a disaster.	.312	.232	.229	**.412**	.116
My friends are there for me during difficult times.	**.618**	.144	.175	.265	.158
My family is there for me during difficult times.	**.631**	.128	.133	.227	.148
I am treated fairly by people in my community.	**.556**	.174	.175	.231	.249
I have people I can turn to and ask for help.	**.735**	.103	.174	.236	.184
I get the support I need from my friends and family.	**.768**	.126	.138	.229	.190
I feel like I belong in my community.	**.658**	.219	.229	.142	.090
I appreciate my cultural and family traditions.	**.544**	.193	.120	.230	.185

If I need help, I know where to go in my community.	**.601**	.218	.153	.192	.083
I can talk with my family about my problems.	**.720**	.265	.120	.132	.065
I can talk with my friends about my problems.	**.682**	.168	.139	.159	.155
When I am faced with a problem, I think of possible solutions.	.137	.259	.304	.339	**.454**
I am good at solving problems.	.165	.272	.322	.241	**.544**
I look for information or resources to help deal with my problems.	.183	.382	.193	.225	**.572**
When I have multiple problems, I prioritize which to problem to work on first.	.266	.286	.234	.198	**.559**
I set achievable goals for my problems.	.272	.308	.282	.175	**.509**
I brainstorm possible options to solve problems.	.187	.264	.215	.176	**.666**
When I encounter a problem, I think about solutions that have worked for me in the past.	.172	.292	.204	.254	**.686**
To resolve problems, I make a plan of action and follow it through.	.197	.320	.278	.183	**.612**
When I feel upset, I pay attention to my feelings.	.260	**.541**	.126	.154	.136
I am able to manage sad feelings.	.154	**.588**	.370	.199	.123
When I am upset, I take time to figure out what I am feeling.	.208	**.635**	.191	.119	.201
To decrease upsetting thoughts, I change the way I am thinking about the situation.	.212	**.601**	.287	.053	.213
I am able to manage angry feelings.	.149	**.569**	.229	.138	.181
I pay attention to bodily sensations of stress (e.g., heart pounding, fast breathing, sweating).	.186	**.580**	.114	.124	.287
When I feel stressed, I do something to help me relax or feel less stressed.	.169	**.595**	.227	.127	.278

If I have flashbacks or upsetting memories, I change my attention to the present moment.	.125	**.491**	.171	.060	.142
I give myself time to recover from upsetting situations.	.217	**.652**	.234	.070	.179
I believe I will make it through difficult times.	.176	.296	**.635**	.243	.177
I am optimistic about my future.	.177	.297	**.701**	.130	.163
When difficult things happen, I know things will get better with time.	.193	.313	**.671**	.186	.243
I have important goals for my future.	.269	.183	**.618**	.096	.299
I believe I can achieve my long-term goals.	.299	.226	**.667**	.091	.255
My life has meaning and purpose.	.219	.276	**.697**	.121	.159
After difficult situations happen, I tell myself things will get better with time.	.185	.333	**.673**	.167	.242
Eigenvalue	17.031	3.296	2.289	1.675	1.477
% Variance Explained	39.608	7.665	5.385	3.895	3.434

Internal consistency reliability results. After the overall structure of the DARS was determined from the EFA, reliability was estimated for the DARS global scale and subscales. Reliability ensures that a scale is able to achieve internal consistency as opposed to measurement error (Jack & Clarke, 1998). To estimate reliability, both Cronbach's alpha (α) which uses a tau equivalence model and coefficient omega (ω) which uses a congeneric model were implemented. For both alpha and omega reliability estimates, items are considered demonstrating good internal consistency when alpha and omega coefficients exceed 0.70 (McNeish, 2017). Reliability estimates for DARS global scale (43 items, α= .96, ω= .97) and subscales (see Table 8) were found to demonstrate good internal consistency from both the alpha and omega estimates.

Table 8

DARS Reliability Estimates

Scale	Alpha Coefficient	Omega Coefficient
DARS (43 items)	.96	.97
Physical Resources (9 items)	.87	.91
Supportive Relationships (10 items)	.92	.94
Problem Solving (8 items)	.92	.94
Distress Regulation (9 items)	.90	.91
Optimism (7 items)	.93	.95

For DARS subscales, the first factor, labeled Physical Resources included nine items (α= .87, ω= .91): "I have insurance to cover disaster-related damages," "I have enough food to eat," "I have stable or permanent housing," "My utilities are working (e.g., electricity, gas, water)," "I have reliable transportation to get me to where I need to go," "I have enough money to pay my rent or mortgage when it is due," "I have access to clean water," "I have access to medical professionals and services (e.g., doctors, hospital, pharmacy etc.)," and "I have a plan for safety in the event of a disaster." See Figure 5 for first factor loadings and variances.

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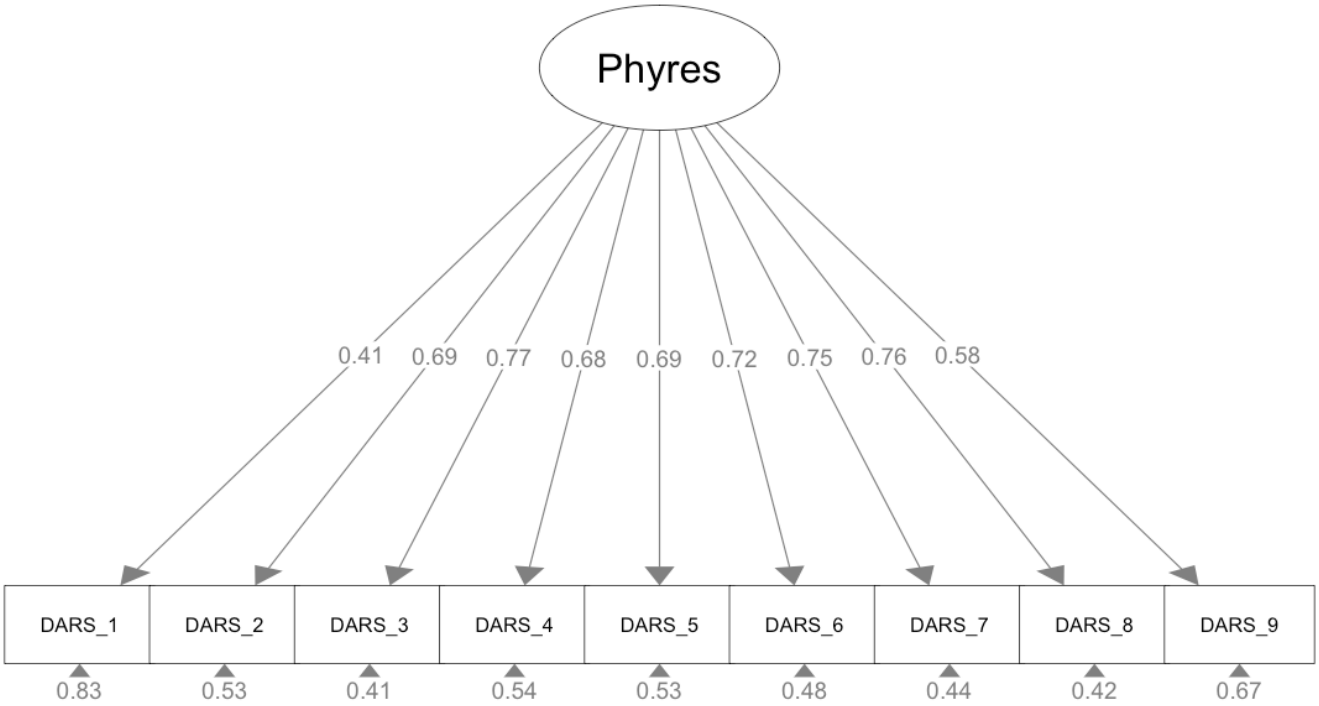
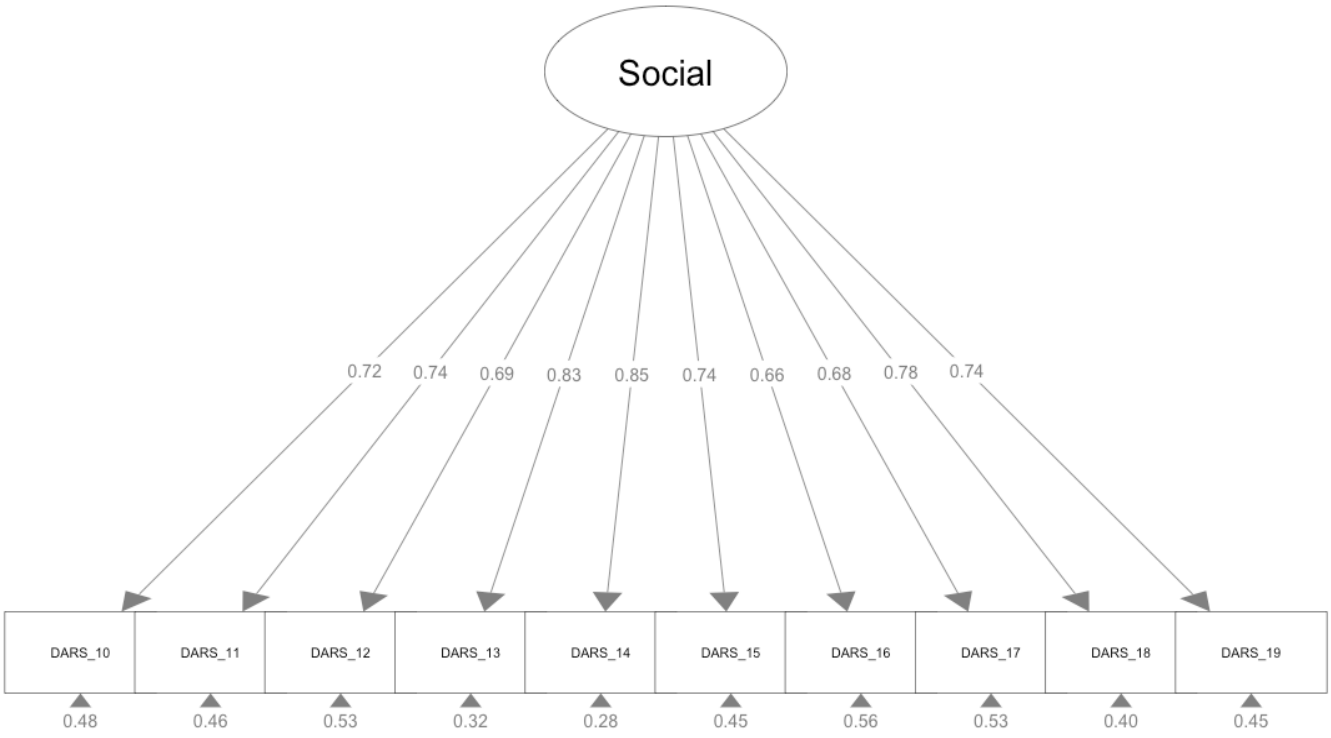
Figure 5. DARS Latent Factor One: Physical Resources Loadings and Variances



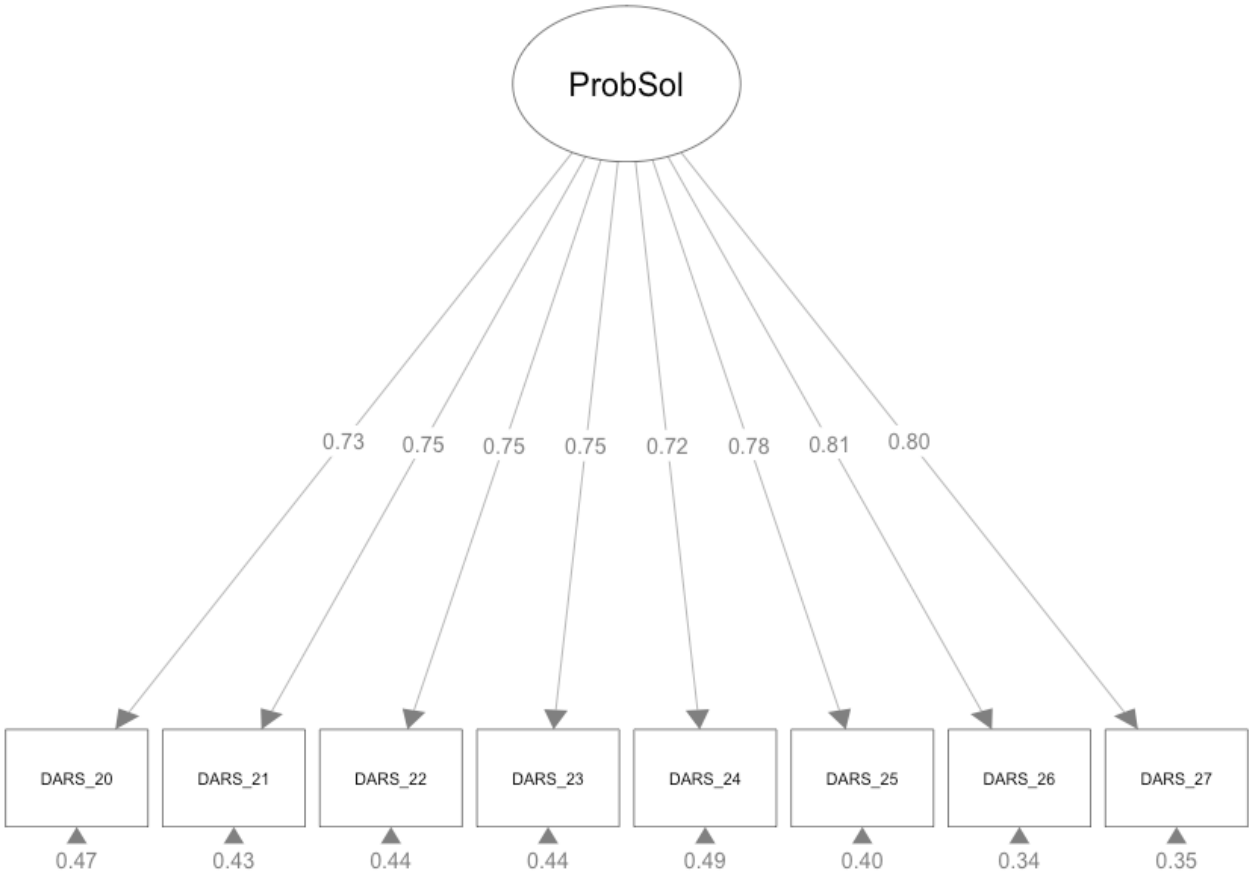
The second factor, labeled Supportive Relationships ($\alpha = .92$, $\omega = .94$), included 10 items: "My friends are there for me during difficult times," "My family is there for me during difficult times," "I am treated fairly by people in my community." "I have people I can turn to and ask for help," "I get the support I need from my friends and family," "I feel like I belong in my community," I appreciate my cultural and family traditions," "If I need help, I know where to go in my community." "I can talk with my family about my problems," and "I can talk with my friends about my problems." See Figure 6 for second factor loadings and variances.

Figure 6. DARS Latent Factor Two: Supportive Relationships Loadings and Variances



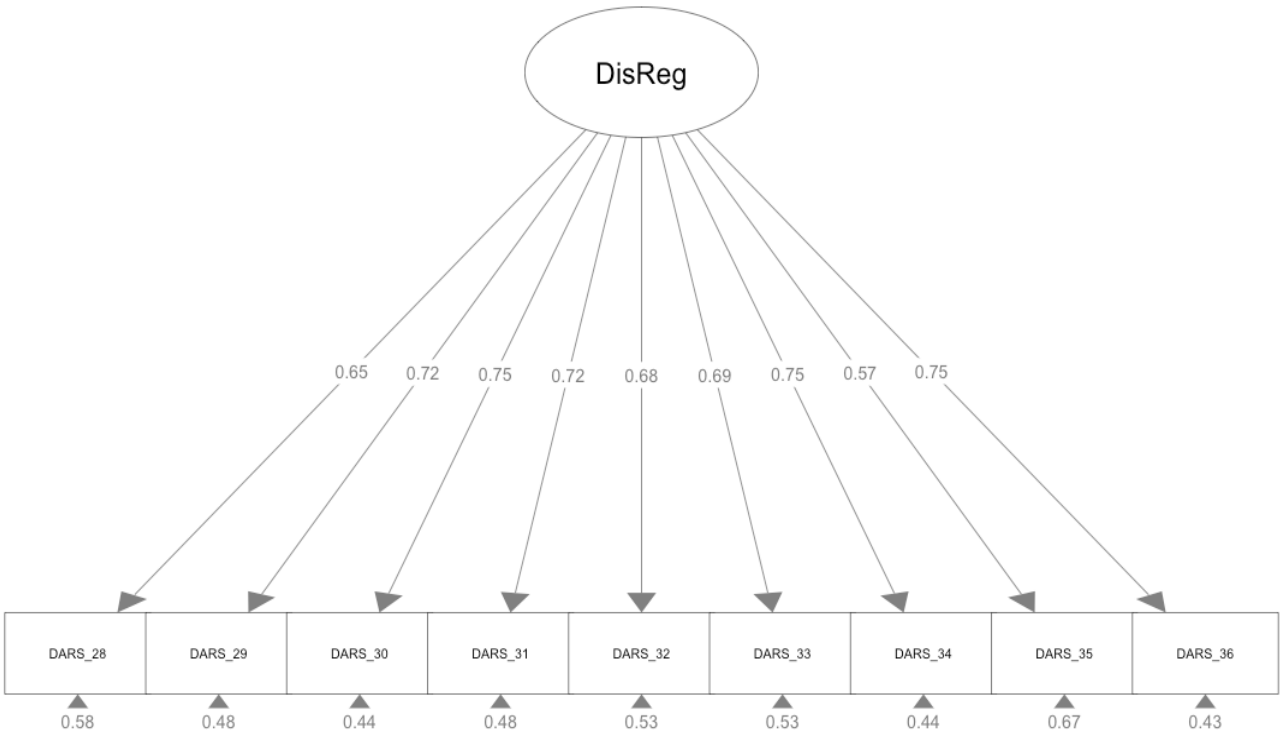
The third factor, labeled Problem Solving (α = .92, ω = .94), included 8 items: "When I am faced with a problem, I think of possible solutions," "I am good at solving problems," "I look for information or resources to help deal with my problems," "When I have multiple problems, I prioritize which to problem to work on first," "I set achievable goals for my problems," "I brainstorm possible options to solve problems," "When I encounter a problem, I think about solutions that have worked for me in the past," and "To resolve problems, I make a plan of action and follow it through." See Figure 7 for third factor loadings and variances.

Figure 7. DARS Latent Factor Three: Problem Solving Loadings and Variances



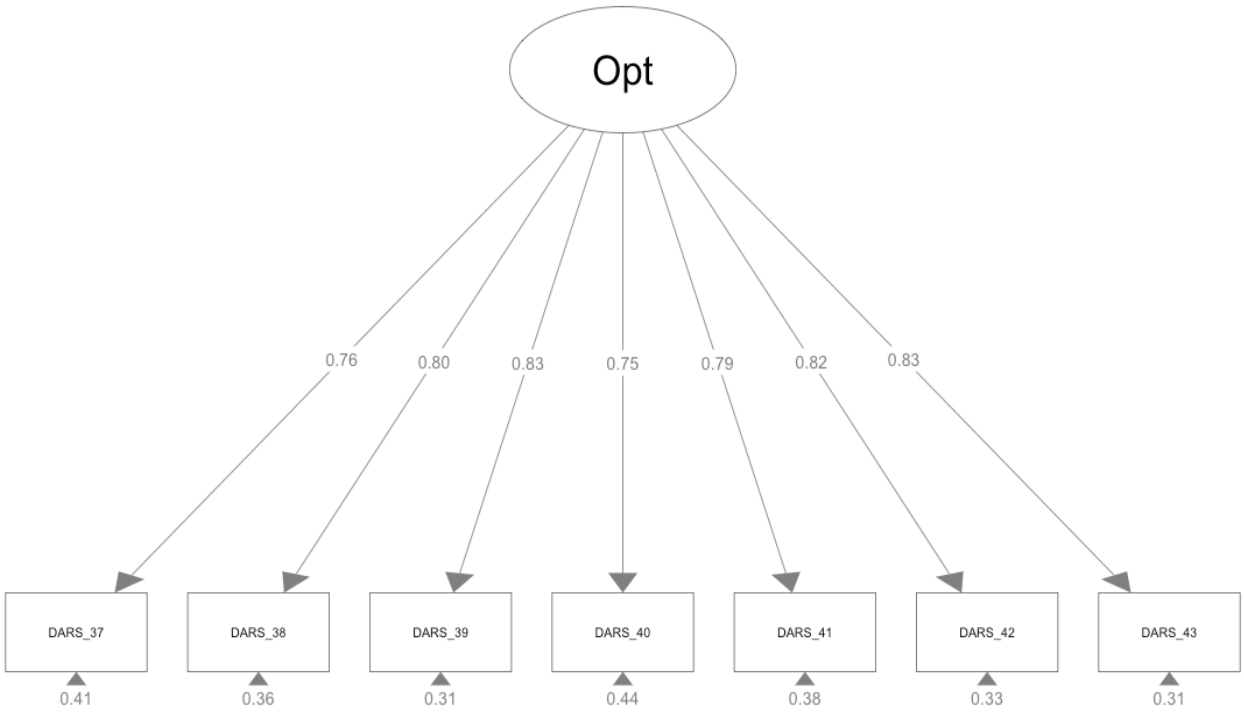
The fourth factor, labeled Distress Regulation (α = .90, ω = .91), included nine items: "When I feel upset, I pay attention to my feelings," "I am able to manage sad feelings," "When I am upset, I take time to figure out what I am feeling," "To decrease upsetting thoughts, I change the way I am thinking about the situation," "I am able to manage angry feelings," "I pay attention to bodily sensations of stress (e.g., heart pounding, fast breathing, sweating)," "When I feel stressed, I do something to help me relax or feel less stressed," "If I have flashbacks or upsetting memories, I change my attention to the present moment," and "I give myself time to recover from upsetting situations." See Figure 8 for fourth factor loadings and variances.

Figure 8. DARS Latent Factor Four: Distress Regulation Loadings and Variances



The fifth factor, labeled Optimism (α = .93, ω = .95), included seven items: "I believe I will make it through difficult times," "I am optimistic about my future," "When difficult things happen, I know things will get better with time," "I have important goals for my future," "I believe I can achieve my long-term goals," "My life has meaning and purpose," and "After difficult situations happen, I tell myself things will get better with time." See Figure 9 for fifth factor loadings and variances.

Figure 9. DARS Latent Factor Five: Optimism Loadings and Variances



CFA results. After estimating reliability for DARS, structural equation modeling (SEM) was tested the relationships between indicators and latent variables. A two-step procedure (Kline, 2016) was implemented. First I conducted a confirmatory factor analysis (CFA) of the measurement structure to test the relationships between latent variables and indicators. After the measurement model was established, I implemented a structural model to test the direct and indirect relationships among latent and observed variables.

To confirm the factor structure indicated in the EFA analysis, I ran a confirmatory factor analysis (CFA). The CFA dimensions and latent variables were specified as five main factors to underlie the scale's 43 items. The CFA model fit criteria were based on the recommendations of Little (2013), which suggests the CFI should range from .90-.99, the RMSEA from .05-.08, and

the TLI from .90-.99. The CFA five-factor model had acceptable model fit: $\chi 2(849) = 1953.194$, $p < .01$, CFI= .91, TLI = .91, RMSEA= .05 [CI .050-0.056], SRMR= .05. These results indicate items for domain loaded onto their respective factors previously confirmed in EFA (Sinclair & Wallston, 2004) and all item loadings were found to be within good ranges (e.g., are 0.71 are excellent, 0.63 very good, 0.55 good, 0.45 fair, and 0.32 poor). See Table 9 for and Figure 10 for DARS CFA results.

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Table 9

CFA Loadings and R squares

Latent Factors	λ	R^2
DARS: Physical Resources		
PR 1	0.41	0.19
PR 2	0.69	0.47
PR 3	0.77	0.57
PR 4	0.68	0.44
PR 5	0.69	0.48
PR 6	0.72	0.52
PR 7	0.75	0.54
PR 8	0.76	0.59
PR 9	0.58	0.36
DARS: Supportive Relationships		
SR 1	0.72	0.52
SR 2	0.74	0.54
SR 3	0.69	0.49
SR 4	0.83	0.68
SR 5	0.85	0.71
SR 6	0.74	0.55
SR 7	0.66	0.45
SR 8	0.68	0.47
SR 9	0.78	0.59
SR 10	0.74	0.55
DARS: Problem Solving		
PS 1	0.73	0.54
PS 2	0.75	0.57
PS 3	0.75	0.57
PS 4	0.75	0.57
PS 5	0.72	0.52
PS 6	0.78	0.58
PS 7	0.81	0.65
PS 8	0.80	0.64
DARS: Distress Regulation		
DR 1	0.65	0.41
DR 2	0.72	0.54
DR 3	0.75	0.55
DR 4	0.72	0.53
DR 5	0.68	0.47
DR 6	0.69	0.47

DR 7	0.75	0.56
DR 8	0.57	0.33
DR 9	0.75	0.56
DARS: Optimism		
O 1	0.76	0.60
O 2	0.80	0.65
O 3	0.83	0.71
O 4	0.75	0.52
O 5	0.79	0.58
O 6	0.82	0.66
O 7	0.83	0.69
IES-R PTSD		
PTS 1	0.808	0.654
PTS 2	0.809	0.654
PTS 3	0.833	0.695
PTS 4	0.814	0.662
PTS 5	0.495	0.245
PTS 6	0.832	0.693
PTS 7	0.759	0.577
PTS 8	0.731	0.534
PTS 9	0.805	0.648
PTS 10	0.855	0.731
PTS 11	0.622	0.387
PTS 12	0.828	0.685
PTS 13	0.776	0.602
PTS 14	0.839	0.704
PTS 15	0.853	0.727
PTS 16	0.874	0.763
PTS 17	0.760	0.578
PTS 18	0.871	0.760
PTS 19	0.850	0.723
PTS 20	0.831	0.691
PTS 21	0.837	0.700
PTS 22	0.787	0.619
PHQ: Depression		
DP 1	0.915	0.837
DP 2	0.882	0.779
Connor-Davidson Scale: General Resilience		
GR 1	0.709	0.539
GR 2	0.818	0.669
GR 3	0.685	0.479
GR 4	0.746	0.548
GR 5	0.801	0.623

GR 6	0.768	0.580
GR 7	0.713	0.516
GR 8	0.693	0.473
GR 9	0.789	0.614
GR 10	0.760	0.577

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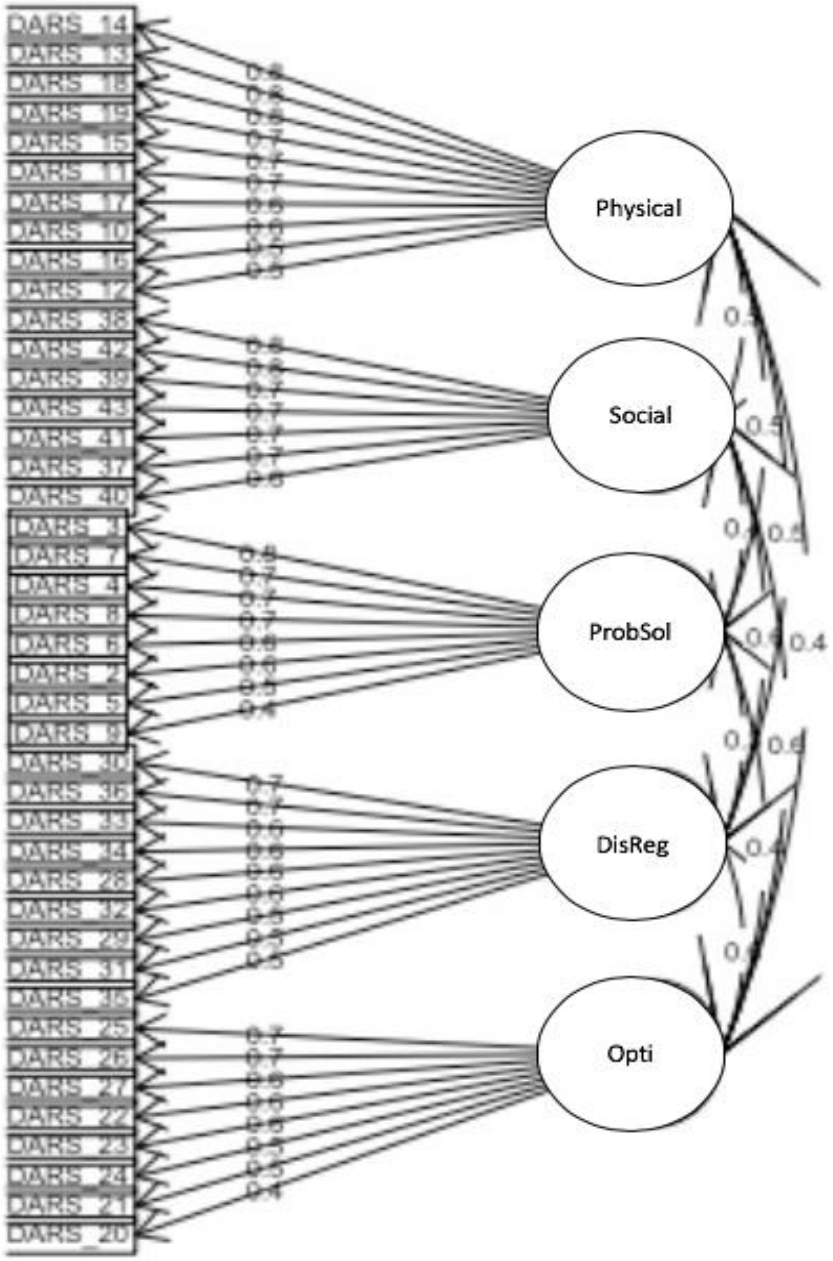
Figure 10. Diagram of DARS Five Factor Model



Model Fit: $\chi 2(849) = 1953.194$, $p < .01$, CFI= .91, TLI = .91, RMSEA= .05 [CI .050-0.056], SRMR= .05

Discriminant and convergent validity results. Once the overall structure of DARS was confirmed, the measure's five factor loadings were tested for evidence of construct and discriminant validity against related (e.g., general resilience) and unrelated criterion variables (e.g., PTSD, depression). Evidence of discriminant validity is established if there is acceptable model fit and DARS items load onto their respective factor rather than the psychopathology factors (Furr & Bacharach, 2014). The CFA model testing discriminant validity had acceptable fit and DARS items loaded onto their factors rather than psychopathology factors, model fit: $\chi 2(2108) = 4588.933$, $p < .01$, CFI= .90, TLI = .90, RMSEA= .05 [CI . 046 - .050], SRMR= .05. See Table 9 for CFA of all latent factors and indicator loadings.

Pearson Product Moment Correlations were also conducted to further confirm convergent and discriminant validity for DARS and related and unrelated variables. The participants' DARS scores were compared with the Impact of Event Scale (IES-R), Connor Davidson Resilience Scale (CD-RISC), and Patient Health Questionnaire (PHQ). Results indicated the CD-RISC was significantly correlated with DARS (r=.679, p <.05) and evidenced a positive direction as hypothesized. It was also hypothesized that the participants' disaster resilience (via DARS) responses would present as negatively correlated with PTSD and depression (r= -.003, p >.05; r= -.157, p <.05) . In accordance with the hypothesis, both PTSD and depression had a negative correlation with DARS. However, the PTSD correlation was not statistically significant with disaster resilience. See Table 10 for latent variables standardized correlations.

Table 10

Latent Variables Standardized Correlations

	General Resilience	DARS	PTSD	Depression
General Resilience	1			
DARS	.679**	1		
PTSD	.007	-.003	1	
Depression	-.143**	-.157**	.731**	1

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

Structural model results. After providing evidence of DARS five factor structure and convergent and discriminant validity, the structural relationships between disaster stress, resilience (via DARS), and mental health outcomes (e.g., PTSD and depression) were analyzed for further evidence of construct validity. A structural model was analyzed using SEM to test if an individual's level of resilience, represented by the DARS, can impact the relationship between disaster stress and mental health outcomes: PTSD and depression. This study hypothesized a direct relationship between disaster stress and mental health and an indirect relationship between disaster stress and mental health outcomes through disaster resilience. To test this hypothesis, two mental health structural SEM models were conducted to examine the direct and indirect relationships between disaster stress, DARS, and mental health (PTSD, depression).

The initial structural model for the PTSD Model did not achieve acceptable model fit as both the CFI and TLI were less than .90. Parceling items, or combining indicators, can be a valuable method to improve model fit when latent variables have a high number of indicators (Little, Cunningham, Shahar, & Widaman, 2002). A parceled model can provide information about the relationships among the latent variables (Little et al., 2013). After parceling DARS 43 indicators and PTSD 22 indicators into three equal-sized domain parcels, the PTSD Model achieved acceptable fit: $\chi 2(45) = 155.432$, $p < .01$, CFI= .97, TLI = 0.96, RMSEA=.08, SRMR= 0.05. In the PTSD model, results found the hypothesis disaster stress being associated with higher PTSD was supported ($\beta = .60$, $p < .01$, *SE*=.09), but the hypothesis predicating disaster resilience would have a mediating relationship between disaster stress and PTSD was not supported in the current study ($p > .05$). See Table 11 and Figure 11 below for structural model results for the PTSD model. See Table 12 for model fit statistics for structural models.

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Table 11

Structural Models: Regression Paths

Regression Paths	Unstandardized Estimate	Standard Error	Standard Estimate
Disaster Resilience (R^2=.11)			
Disaster Stress	-.107	.052	-.106*
MH1: PTSD (R^2=.36)			
Disaster Stress	.750	.096	.600***
Disaster Resilience	.027	.047	.022
MH2: Depression (R^2=.33)			
Disaster Stress	.678	.097	.553***
Disaster Resilience	-.146	.050	-.120**

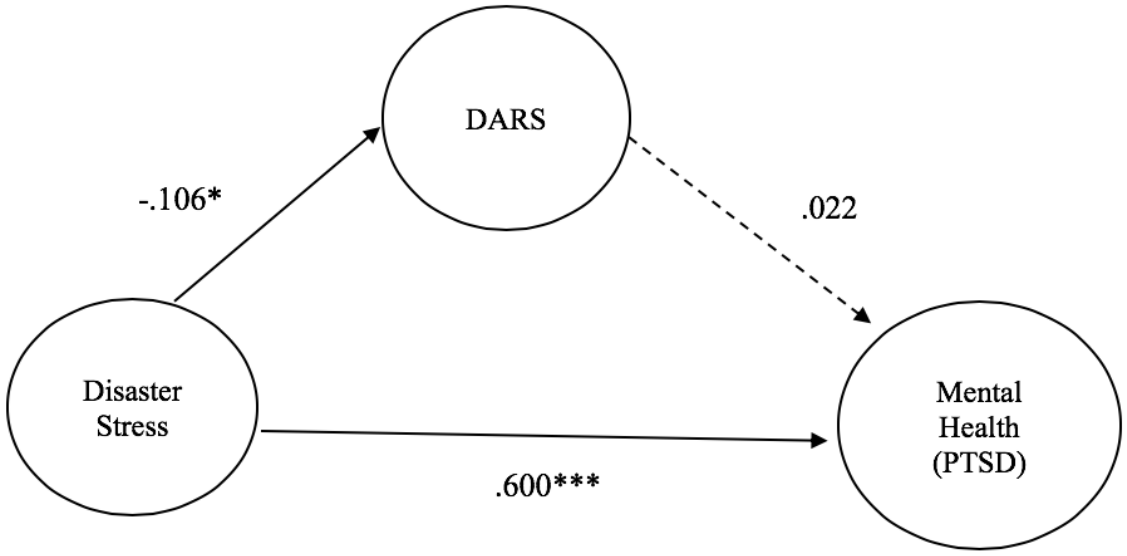
Note: Model controlling for gender, age, prior MH diagnosis
*p <.05, **p<.01, ***p<.001

Table 12

Model Fit for SEM Models

Model	X^2(DF)	RMSEA	RMSEA 95% CI	CFI	TLI
Measurement					
DARS 5 Factors	1953.194(849)	.05	.050, .056	.91	.90
All Latent Variables	5804.33(2804)	.04	.040, .043	.90	.90
Structural					
MH1 PTSD	155.432(45)	.08	.067, .091	.97	.96
MH2 Depression	120.245(36)	.08	.069, .099	.97	.95

Figure 11. Diagram of Structural Model for Mental Health Outcome: PTSD



Model Fit: $\chi 2(45) = 155.432$, $p < .01$, CFI= .97, TLI = 0.96, RMSEA=.08, SRMR= 0.05

A second mental health model was conducted to examine the direct and indirect relationships between disaster stress, DARS, and Depression. The initial structural model for the Depression Model also did not achieve acceptable model fit as both the CFI and TLI were less than .90. After parceling DARS 43 items into three equal size domains, the model achieved acceptable model fit : $\chi 2(36) = 120.245$, $p < .01$, CFI= .97, TLI = 0.95, RMSEA=.08, SRMR= 0.05. In the Depression Model, results found that the hypothesis of disaster stress being positively associated with depression was supported ($\beta = .55$, $p < .01$, *SE*=.09). In addition, results supported the hypothesis that disaster resilience (via DARS) demonstrated a significant inverse relationship with depression ($\beta = -.12$, $p < .01$, *SE*= .05) and disaster stress ($\beta = -0.11$, $p < .05$, *SE*=.05). Results also supported the hypothesis that disaster resilience would have a significant mediating

relationship between disaster stress and depression with the 95% confidence interval from 1,000 bootstrapped resamples were found significant (β = -.07, $p<.05$, *SE*= .03, CI 95%= -.166, -.008). See Table 11 (above) and Figure 12 below for structural model results for the depression model.

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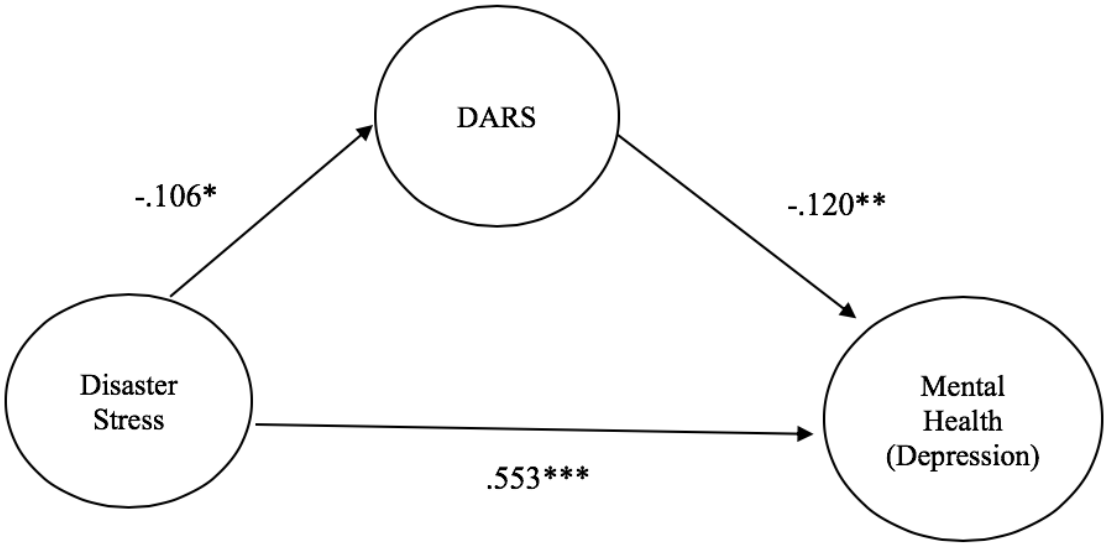
Figure 12. Diagram of Structural Model for MH Outcome: Depression



Model Fit: $\chi 2(36) = 120.245$, $p < .01$, CFI= .97, TLI = 0.95, RMSEA=.08, SRMR= 0.05

Chapter Six: Discussion

In response to the increasing prevalence and severity of natural and human-caused disaster events in the United States and world-wide (Kousky, 2012) numerous calls have been issued to identify key factors and measures of disaster resilience (FEMA, 2018; UNISDR, 2017). Current measures assess disaster resilience at the community level (Norris et al., 2008; Cutter et al., 2014) and individual-based disaster resilience has yet to be operationalized and tested in the disaster field (Ostadtaghizadeh et al., 2015; Höfler, 2014). The purpose of this study was to systematically develop and validate the disaster adaption and resilience scale (DARS), which measures the protective factors that contribute to good outcomes following disaster exposure, despite experience with disaster stressors that pose risk for developing negative outcomes. The two phases of this research project included scale development and scale validation. This project yielded several significant findings that provide evidence of a robust, reliable, and empirically derived disaster resilience measure that informs our understanding of the mechanisms and resources assisting individuals in adapting and demonstrating resilience following disaster events. This chapter discusses each phase of developing and validating DARS and the research, practice, and policy implications of this work. Limitations and directions for future research are also discussed.

Phase I. A central piece for developing a disaster resilience measure began with identifying the factors and resources which have been found to protect individuals from developing negative outcomes following disaster-related adversity (Hjemdal, 2007; Werner & Smith, 2001). The first aim in this phase was to ensure the measure developed was supported by disaster resilience literature and theory. Therefore, a thorough review of the scientific literature

was conducted to identify the protective factors and resources that have been studied contextually specific to disaster events. A second aim of this phase was to determine the construct to be measured. Disaster resilience was operationally defined as the protective factors, processes, and mechanisms that contribute to good outcomes following disaster exposure, despite experience with disaster stressors that pose risk for developing negative outcomes. Disaster resilience was therefore not defined as a static, individual trait, but as an adaptive process that is influenced by protective factors in the individual's environment (Bonanno et al. 2005; Masten & Obradovic, 2008; Werner & Smith, 2001). Protective factors were viewed as internal and external resources within an individual's personal and interpersonal areas which are associated with and cumulatively facilitate disaster resilience (Hjemdal, 2007; Werner & Smith, 2001). Inherent to the construct of individual disaster resilience was the following assumption: disaster events place stress on life, livelihood, health, and well-being for individuals exposed, and an individual's ability to positively adapt to disaster stress is influenced by a variety of protective factors possessed by the individual and within the individual's environment. For example, disasters pose risks such as property loss, displacement, fatalities, injuries, and trauma for individuals exposed. These risks can be off-set by internal protective factors (e.g., adaptive behaviors and skills) and external protective factors (e.g., access to physical and social resources) and therefore individual-based assessment is fundamental (Ostadtaghizadeh, et al., 2015; Höfler, 2014).

Domains for protective factors were chosen based on a thorough review of qualitative and quantitative research studying resilience in the context of disaster. These domains included having access to physical resources such as having food, shelter, and financial sustainability; having access to informal and formal supportive relationships; being able to problem-solve in the

face of disaster-related adversity; distress regulation or being able to identify and regulate psychological or emotional distress; and being optimistic or having a positive outlook about the future. Results from the current study support previous work identifying disaster-context protective factors including access to physical resources (Brewin, Andrews, & Valentine., 2000; Bonanno et al. 2005; Bonanno et al. 2007; Galea et al., 2007); supportive relationships from friends, family, and the community (Kaniasty, 2005; Kaniasty & Norris 2009, La Greca et al. 1996; 2008; Leavy, 1983; Norris, 2006; First et al., 2018); ability to problem-solve in the face of adversity (Benight and Harper, 2002; Sumer et al., 2005; Norris et al., 2006; Linley and Joseph, 2004); ability to regulated psychological or emotional distress (Norris, 2006; Liao et al. 2002; Lowe, S. R., Rhodes, J. E., & Waters, M. C., 2015) and being optimistic or have a positive outlook about the future (Birkeland et al., 2017; Fredrickson et al. 2003). Prior disaster and resilience studies have not examined these protective areas simultaneously and therefore this study's consolidation of these domains into a disaster resilience framework is an original contribution to the literature.

The final aim of Phase I was to generate a pool of items to capture disaster resilience domains, responses and feedback from disaster scholars and practitioners were used to inform the clarity and relevance of the items used in the validation study in Phase II. Items generated in Phase I were based on theoretical concepts included in previous disaster and resilience studies (Kaniasty, 2005; Kaniasty & Norris 2009, La Greca et al. 1996; 2008; Leavy, 1983; Norris et al., 2006; First et al., 2018). For each of the five domains of protective factors, a pool of items was generated and submitted for expert review to establish content, or the extent to which the domains and items within DARS are relevant and representative of the construct of individual disaster resilience (Haynes, Richard, & Kubany, 1995). Utilizing experts in the field to inform

the development of DARS provides an advantage over measures that rely solely on theory-based scales (DeVellis, 2012).

Phase II. While disaster events have the ability to disrupt functioning across multiple levels (e.g., individual, family, community), disaster resilience measures have focused on measuring adaptive functioning at the community level (Ostadtaghizadeh, Ardalan, Paton, Jabbari, Khankeh, 2015). Disaster resilience requires assessment at the collective, community level to ensure that a community has strengths and resources to cope with and recover from disasters. However, measures that only assess community-level resilience neglect insight into how individuals in a community perceive their access to resources and their ability to cope and recover from disaster events (Doorn, Gardoni & Murphy, 2018). Prior resilience research has shown that protective factors change in different contexts and disaster-context measures are individual disaster resilience are needed (Bonanno, 2004). The purpose of Phase II was to conduct a full validation evaluation of the psychometric properties of DARS to measure disaster resilience at the individual level by assessing various physical and social resources available to an individual, and adaptive behaviors and skills an individual possesses.

A cross-sectional study was conducted with 625 participants to examine the structure and dimensionality of DARS and to determine the scale's psychometric properties to test its measurement reliability and validity. Various rounds of empirical validation including an exploratory factor analysis, confirmatory factor analysis and reliability analysis supported a five-factor disaster resilience scale. Development and validation of DARS revealed that individual disaster resilience is a multi-dimensional construct. After the factor structure was confirmed, the measure's factor loadings were tested for evidence of convergent and discriminant validity. Evidence of convergent validity was estimated following acceptable model fit and DARS items

loading onto their respective factors. All appropriate SEM fit indicators: $\chi 2/ df$, TLI, CFI, RMSEA, and SRMR were tested until they were within acceptable thresholds, lending an overall picture of good model fit (Little, 2013).

In addition to creating a robust and empirically derived measure, this research provides furthering theoretical understanding of the phenomena of resilience and how it operates in the specific context of disaster events. Disasters are considered potentially traumatic events that pose various risk factors including PTSD and depression for individuals exposed to events (Norris, Murphy, Baker, Perilla, 2004; Galea, Nandi, & Vlahov, 2005). Disaster resilience has been found to be associated with positive outcomes, such as good mental health, well-being, and lower incidences of PTSD and depression (Masten & Obradovic, 2008; Osofsky et al., 2011). Within the process of a resilience model, protective factors typically as mediators (Kim et al., 2016; Li et al., 2016; Piertzak et al., 2009, 2010; Threlfell et al., 2017; Yu & Stiffman, 2010) between risk factors (e.g., disaster stress) and negative outcomes (e.g., PTSD, depression). To test whether the impact of disaster stress on PTSD and depression can mediated by the individual's level of disaster resilience, this study examined direct and indirect relationships between disaster stress, disaster resilience (via DARS), and mental health using structural equation modeling.

In the first mental health model, results from this study found that disaster stress exposure was associated with higher PTSD, but disaster resilience did not have a significant mediating relationship between disaster stress and PTSD. This is a surprising finding given that prior research has found that protective factors significantly mediated between collective trauma risk factors and PTSD (Kim et al., 2016; Piertzak et al., 2009). One explanation for this study's non-significant mediation result may have been due to 68% of the study's sample for disaster type was hurricanes, and a significant difference in PTSD scores for hurricane exposed participants

(*M*=30.69, *SD*=1.11) and other disaster type participants (e.g., tornados, wildfires, floods) was found in the data (*M*=43.23, *SD*=1.77, *t*(565)= 6.082, *p*< .01). Prior research indicates that the severity of traumatic impact of a disaster is influenced substantially by the amount of warning time individuals and communities receive (Houston et al., 2015; McFarlane & Williams, 2012). For example, warnings and evacuation systems can be put in to place if the type of disaster allows for adequate time for planning such as with hurricanes and tropical storms. This suggests that the lower mean scores for PTSD among hurricane participants in comparison to other disaster types (e.g., tornados, wildfires, and flooding) in this study may be related to participants having more advanced warning of hurricanes. More generally, the sample utilized in the current study constituted individuals who has self-identified as experiencing a variety of disasters in different locations. Disasters can range greatly in severity, from more minor to catastrophic. At the same time, the potential for PTSD among victims in the community can range from less likely to more likely depending on the level of disaster severity. Thus, in the future a sample purposely recruited from a specific area directly impacted by a significant disaster might help further elucidate how disaster resilience (as measured by DARS) mediates the impact of disaster exposure on PTSD. Further studies should continue to investigate relationships between disaster types, disaster locations, disaster resilience, and PTSD.

In the second mental health model, results from this study found the hypothesis of disaster stress being positively associated with depression was supported and that disaster resilience (via DARS) demonstrated a significant mediating relationship with depression and disaster stress exposure. This finding provided empirical support for theoretical models and conceptualizations (e.g. Houston et al., 2015; First et al., 2017) of disaster resilience (via DARS) essential role in contributing to better mental health outcomes, specifically associated with less

depression. This finding also supports prior research findings in which greater resilience predicted the presence of fewer symptoms of depression individuals following collective traumatic events (Bonanno et al., 2007; Kukihara, et al., 2014; Piertzak et al., 2012).

Implications for social work. According to the American Academy of Social Work and Social Welfare (2017) climate change and other environmental challenges pose profound risks to human well-being as they threaten physical and mental health and contribute to greater social and environmental inequities. In response to these growing risks, *strengthening the social responses to the human impacts of environmental change* has been targeted as a Grand Challenge for Social Work (Kemp & Polinkas, 2015). Addressing the human impacts of environmental challenges includes the role of social work addressing key core areas including building local, national, and international disaster preparedness and response; and capacity building to mobilize and strengthen resilience (Kemp & Polinkas, 2015). In addition to the growing acknowledgement of potential risks and adverse impacts from disasters, is the increased recognition of the importance of developing methods and assessment of disaster resilience (Cutter, 2016). Measuring disaster resilience at the individual level is an essential step toward reducing individual disaster risk and enhancing disaster preparedness and strengthening resilience (Höfler, 2014). The results from this study found that individual disaster resilience is a quantifiable construct and is associated with better mental health outcomes (e.g., less depression). DARS therefore, provides researchers with a reliable and valid instrument specifically designed to measure the protective factors supporting disaster adaptation and resilience among individuals.

In regard to practice implications, nearly half of the disaster mental health services in the United States have been delivered by social workers affiliated with programs like the Federal Crisis Counseling Assistance Training program (CCP; Bauwens & Natural, 2017). The CCP is

one of the largest disaster mental health programs and supports short-term interventions that seek to mitigate stress, assist survivors in reviewing their disaster recovery options, promote the use or development of coping strategies, provide emotional support, and link individuals and agencies who may help survivors in their recovery process (SAMHSA, 2009). DARS could easily be incorporated into the CCP's disaster mental health program as an assessment tool to help identify individuals that may need additional protective factors and resources following a disaster. Findings from this study can also assist practitioners in identifying protective factors that guide a framework for interventions and practice models that build resilience in disaster settings. DARS could also be used to evaluate disaster resilience-building programs and provide a measure of the efficacy of such universal interventions and practice models.

In regard to policy implications, this dissertation has direct implications for integrating individual disaster resilience assessment into disaster policies. In light of the growing recognition that resilience is a valuable construct that promotes well-being after disaster, many stakeholders and policy makers are interested in finding ways to measure, foster, and promote resilience to help individuals overcome significant stressors such as disasters (Schulenberg, Drescher, & Baczwaski, 2014; Stallard & Buck, 2013). A central piece for developing resilience-building programs is the ability to identify the factors and resources that have been found to protect individuals following disaster adversity. This study found that individuals with personal, social, and environmental resources were better equipped to be protected from adverse mental health outcomes following disaster events. In other words, the ability to adapt and be resilient following a disaster event cannot be abstracted from the material circumstances of people's lives. For example, when Hurricane Katrina struck the Gulf Coast of the United States in August 2005, floodwater surged into low-lying areas in New Orleans that were mostly populated by the

economically marginalized, African-American communities. These communities and individuals experienced social inequalities and injustices in disaster mitigation, preparation, evacuation, and recovery (Laska & Morrow, 2006). Prior measures and concepts of resilience have received criticism for failing to address material and social vulnerabilities that engage with issues of equity and power (Matin, Forrester, Ensor, 2018). This dissertation highlights that disaster resilience at the individual level is not defined as a personal characteristic or trait, but rather a process that takes into account broader person–environment factors. Specifically, DARS items extend beyond personality or individual characteristics to include assessment of a person's ecology, such as material resources, social equity, and inclusion. For example, DARS items capture material circumstance such as "I have enough food to eat," "I have permanent housing," "I have access to reliable transportation," "I have a safe place to go in the event of a disaster." DARS items also measure social equity and inclusion such as "I feel like I belong in my community" and "I am treated fairly by people in my community."

DARS conceptualization of individual disaster resilience therefore recognizes that structural factors and social inequalities (e.g., race, class, age, gender, ability) place human populations at increased risk for negative or adverse consequences resulting from a disaster (Tierney, 2014). Social workers interested in policy advocacy can utilize DARS to work with local, state, and federal governments to create and evaluate policies that enhance disaster resilience and facilitate appropriate protective factors and equitable resources. In order to make much-needed changes in disaster risk policy and engage stakeholders, measurement of resilience outcomes in a disaster context must be testable and measurable. Indicators and measures of resilience provide data and help policy-makers and planners make decisions to invest in building resilience at local, state, and federal levels. To date, measures of disaster resilience have not

included individual-level assessment and DARS will be able to help policy-makers and stakeholders make informed decisions and invest in strengthening responses to the human impacts of environmental change.

Limitations and Future Research

In regard to study limitations, this project was limited by non-probability sampling, by self-report measures, by cross-sectional design, and the sample's disaster experiences (e.g., majority natural disasters, hurricanes). First, this study utilized non-probability sampling and therefore the results may not be generalizable to all individuals experiencing a disaster event. Second, this study utilized self-report measures that may not be accurate as a full clinical evaluation of PTSD or depression symptomology. A third limitation is that this study is cross-sectional in design and therefore the collected data precludes causal claims of temporal order (Maxwell & Cole, 2007). However, the present study presents a model that is grounded in the theoretical resilience literature and was supported by previous disaster research investigations, all of which provide a compelling case for investigating the indirect relationships that were conducted in the structural model. Despite these limitations, this study found the presence of important associations that were consistent with theoretical predictions (e.g., disaster exposure had direct associations with PTS and depression symptoms). A fourth limitation is that the majority of participants (e.g., 97%) in this sample responded based on natural disaster experiences, with the exception of 15 participants with human-caused (e.g., chemical spills, mass shootings, civil unrest) disaster experiences. DARS was developed be an all-hazards measure (i.e. both natural and human-caused disasters), but the current study has mostly utilized the assessment in a natural disaster context.

Despite these limitations, this dissertation takes an important first step towards identifying and testing specific protective factors that protect against an adverse mental health outcome and support resilience in adults following a disaster. DARS provides a foundation for future disaster resilience measurement and theoretical work. Future research should be conducted to provide further validation of DARS in various settings and populations. First, future research could build upon the current study's findings by testing additional convergent and discriminant validity with additional populations and samples. Specifically, DARS could be tested alongside additional variables like anxiety, PTSD, and resilience/coping strategies. Second, measurement invariance (MI) or the degree to which DARS is measuring disaster resilience the same way across group membership (e.g., age, race, gender) of participants should be tested. Future studies should conduct analyses multiple group confirmatory factor analysis (CFA) and differential item functioning (DIF) to evaluate the measurement equivalence of DARS across various group membership. Third, DARS is intended for use in both natural and human-made disasters. However, with the exception of 15 participants in this study DARS was tested in a sample primarily experiencing natural disasters (i.e., hurricanes, floods, wildfires, tornados). Therefore, future validation research should examine DARS in the context of human-made disasters like chemical spills, mass shootings, and civil unrest. Fourth, the current study's cross-sectional limitation could be improved upon by future studies employing a longitudinal design that collects data at several points and could, for example, assess resilience at one month, six months, and one year to increase further knowledge about disaster resilience.

Conclusion

Disaster and community crisis events are increasing in prevalence and severity in the United States and world-wide and their range of negative consequences has the potential to

threaten life, livelihood, health, and well-being among individuals exposed (MacFarlane & Norris, 2006). In response to the growing threats of disasters, the U.S. Federal Emergency Management Agency has issued calls to identify key factors and measures supporting resilience in the event of disasters (FEMA, 2018). In order to effectively empower humans to combat the growing impacts of disasters, measures must be developed and validated that are specifically designed to measure protective factors supporting disaster adaptation and resilience in individuals. By developing and validating the Disaster Adaptation and Resilience Scale (DARS), this dissertation fills a measurement gap and furthers theoretical understanding of the phenomena of individual disaster resilience.

This project also highlights the need for social work profession to be involved in addressing the grand challenge of strengthening the social responses to the human impacts of environmental change and disasters. Individuals with the least resources are the most affected and face greater challenges in being able to recover and be resilient following disaster events. As social workers our values include serving the most vulnerable groups. Through developing and validating a robust and reliable measure of disaster adaptation and resilience, this research project further supports social work's involvement in addressing the human impacts of disasters.

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APPENDIX

Phase I Content Validation Expert Review Packet

Email for Expert Review Recruitment

Dear ___:

My name is Jennifer First, MSW and I am a doctoral candidate at the University of Missouri School of Social Work and a program manager at the Disaster and Community Crisis Center (DCC).

I am seeking experts who would be willing to review a proposed Disaster Resilience Scale for Individuals (DARS) that I am developing and validating for my doctoral dissertation project. Given your professional work related to disasters, I thought you could provide valuable insight into whether or not the proposed DARS clearly reflects adaptive capacities supporting resilience at the individual level.

If you are interested in participating as one of the expert reviewers, you can access the survey link below. The survey should take approximately 10-15 minutes to complete and all responses will remain anonymous. I am hoping to analyze the responses from the expert reviewers by (date).

Link inserted here

If you have any questions about the project, please let me know.
Thank you for your consideration.

Sincerely,
Jennifer First

Doctoral Candidate, School of Social Work at University of Missouri
Mental Health Program Manager, Disaster and Community Crisis Center (DCC)
firstj@missouri.edu

Phase I: Content Validation Expert Review Letter

Thank you for agreeing to help rate items for the Disaster Resilience Scale for Individuals (DARS). Please feel free to ask any questions you may have before choosing to take part in this study. The goal of this study is to create a valid, reliable measure of protective factors associated with adult resilience following a disaster event. As an expert in the field of disasters you will help to refine and pare down the items attached to this email. Refined items will be included in the final scale to later be given to research participants.

I greatly appreciate your help. Although there are no major benefits to you if you rate these items, your help may benefit future participants in both research and clinical settings who have experienced disasters. The final version of this instrument may be made available for professionals to acquire.

The records of this study will remain confidential. Neither your name nor identifying characteristics will be included in final study reports; however, a description of your basic qualifications as an expert will be included. Participation in this study is completely voluntary.

If you have any questions, please feel free to contact me:
Jennifer First, PhD Candidate, University of Missouri, School of Social Work.
Phone: 573-882-9228, Email: firstj@Missouri.edu

Expert Review Packet
Disaster Resilience Scale for Individuals (DARS**)**

Title of Project: The Development and Validation of the Disaster Adaptation and Resilience Scale (DARS)

Principal Investigator: Jennifer First

Faculty Advisor: Dr. Mansoo Yu

Description: Disaster resilience is defined in this study as the protective factors, processes, and mechanisms that contribute to good outcomes in individuals following disaster exposure, despite experience with disaster stressors that pose risk for developing psychopathology. Basic assumptions of the construct of disaster resilience are as follow:

1. Disaster events place stress on life, livelihood, health, and well-being for individuals exposed.
2. An individual's ability to positively adapt to disaster stress is influenced by a variety of protective factors possessed by the individual and within the individual's environment.
3. Protective factors increase the ability to adapt and be resilient following a disaster.

Future participants filling out the DARS will indicate how much they agree with the DARS statements as they apply to the participant over the last month. Response are on a 5-point Likert scale ranging from 0=Not at all true, 1=Rarely true, 2= Sometimes true, 3=Often true, 4=True nearly all of the time.

Expert Review Instructions: Please rate the DARS according to the two criteria below:

Relevance: Does the content of the domain and item accurately reflect the definition of provided?
1 = Not at all
2 = Slightly
3 = Moderately
4 = Very
5 = Extremely

Clarity: After reading each item, please respond to the clarity of each question.
1= Not clear, too difficult to understand.
2= Minimally clear question.
3 = Adequately clear question.
4 = Mostly clear question.
5 = Extremely clear

Disaster Resilience Scale for Individuals (DARS) Domains and Items	Relevance	Clarity
Expert instructions: please mark 1, 2, 3, 4, or 5 for relevance and clarity for each item below.		
I. Physical Resources		
1. I have enough food to eat.		
2. I have reliable transportation to get me to where I need to go.		
3. I have permanent housing.		
4. I have insurance to cover disaster-related damages.		
5. My utilities are working (e.g., electricity, gas, water).		
6. I can afford to eat balanced meals.		
7. I don't have to worry that my food will run out before I get money to buy more.		
8. I have enough money to pay my rent or mortgage when it is due.		
9. I am financially stable.		
10. I have a safe place to go to in the event of a disaster.		
II. Supportive Relationships		
11. My friends are there for me during difficult times.		
12. My family is there for me during difficult times.		
13. I can talk with my family about my problems.		
14. I can talk with my friends about my problems.		
15. I get the support I need from my friends and family.		
16. I have people I can turn to and ask for help.		
17. I feel like I belong in my community.		
18. I am treated fairly by people.		
19. If I need help, I know where to go in my community.		
III. Problem-solving		
20. When I am faced with a problem, I think of possible solutions.		
21. I am good at solving problems.		
22. When I encounter a problem, I think about solutions that have worked for me in the past.		
23. I set achievable goals for my problems.		
24. I brainstorm possible options to solve problems.		
25. I look for information or resources to help deal with my problems.		
26. When I have multiple problems, I prioritize which to problem to work on first.		
27. To resolve problems, I make a plan of action and follow it through.		

28. If I anticipate a future problem happening, I plan in my mind what I could do.
29. I am able to adapt to change.

IV. Distress Regulation
30. When I feel upset, I pay attention to my feelings.
31. I am able to manage sad feelings.
32. When I am upset, I take time to figure out what I'm feeling.
33. To decrease upsetting thoughts, I change the way I'm thinking about the situation.
34. I am able to manage angry feelings.
35. I pay attention to bodily sensations of stress (e.g., heart pounding, fast breathing, sweating).
36. When I feel stressed, I do something to help me relax.
37. If I have flashbacks or upsetting memories, I change my attention to the present moment.
38. I give myself time to recover from upsetting situations.

V. Optimism
39. I am optimistic about my future.
40. I believe I will make it through difficult times.
41. When difficult things happen, I know things will get better with time.
42. I believe that things will work out.
43. After difficult situations happen, I tell myself things will get better with time.
44. I have important goals for my future.
45. I can achieve my long-term goals.
46. My life has meaning and purpose.
47. Overall, I expect more good things to happen than bad things.

Are there any items that need to be changed, clarified, or omitted? If so, please include the item(s) and a brief explanation as to why the item(s) should be modified or omitted.

Phase II: Full Validation Study Packet

Title of Project: The Development and Validation of the Disaster Adaptation and Resilience Scale (DARS)

Principal Investigator: Jennifer First

Faculty Advisor: Dr. Mansoo Yu

Introduction: Researchers at the University of Missouri, Columbia are interested in creating a questionnaire that can measure resilience in adults who have experienced a disaster.

A disaster is defined in this study as a sudden event that causes large-scale destruction and is experienced by many people. Disasters events can be both natural (e.g., tornadoes, hurricanes, floods) or human-caused (e.g., chemical spill, mass violence).

Study purpose: The goal of this study is to create a valid measure of protective factors found to support adult resilience following a disaster.

Duration: The survey will take about 15-20 minutes to fill out.

Number of Participants: The number of anticipated participants is 600 adults. Participants qualify for this study if they are 18 years of age or older, live in the United States or U.S. territory, and have experienced a disaster within the previous three years (e.g., September 2015 – September 2018).

Procedures: This research study consists of completion of a self-administered measurement packet containing the following items: demographic questions, Disaster Resilience Scale for Individuals, Impact of Event Scale-Revised, Disaster Stress Exposure, and the Connor-Davidson Resilience Scale. Participation in this study is voluntary.

Possible Benefits: Your involvement in this study will help to generate a greater understanding of resilience among adults in post-disaster communities. This understanding may lead to the development of programs that can help increase resilience in adults following a disaster.

Possible Risks: Some of the questions are sensitive and may evoke an emotional response. can choose to stop participation in the study at any time.

Confidentiality: You will not be identifiable by name or description in any reports or publications about this study.

Contact Information: If you have questions about the study, contact Jennifer First at 573-882-9228, firstj@missouri.edu. For questions about your rights as a study participant, contact the University of Missouri Institutional Review Board at 573-882-9598 or you may access the website at https://research.missouri.edu/irb/

Participant Questionnaire

Instructions: A disaster is defined in this study as a sudden event that causes large-scale destruction and is experienced by many people. Disasters events can be both natural (e.g., tornadoes, hurricanes, floods) or human-caused (e.g., chemical spill, mass violence, civil unrest).

Please answer the following questions about the most recent disaster event you experienced:

1.) What type of disaster event did you recently experience in your community?

a.) Tornado
b.) Hurricane
c.) Wildfire
d.) Flood
e.) Earthquake
f.) Chemical Spill
g.) Civil unrest
h.) Mass shooting
i.) Other (Specify _____)

2.) What is your sex?
a. Male
b. Female

3.) How old are you?
a. 18-29
b. 30-49
d. 50-69
f. 70 +

4.) What is your racial and ethnic background?
a. American Indian/Alaska Native
b. Asian/ Asian American
c. Black/ African American/ Afro-Caribbean
d. Hispanic/ Latino
e. Native Hawaiian/ Other Pacific Islander
f. White/ Caucasian, not of Hispanic origin
h. Other (Specify:_____)

5.) What is your highest level of education?
a. Grade school
b. Some high school
c. High School/ GED
d. Some college, but no degree

e. College degree (AA, BA, BS, etc.)
f. Advanced degree (MA, PhD, JD, etc.)

6.) What is your marital status?
a. Married
b. Divorced
c. Separated
d. Widowed
e. Unmarried

7.) How many people (including yourself) currently reside in your household?
a. 1
b. 2
c. 3
d. 4
e. 5
f. 6
g. 7
h. 8 or more

8.) What is your household annual income?
a. Less than $15,000
b. $15,000 to $29,999
c. $30,000 to $44,999
d. $45,000 to $59,999
e. $60,000 to $74,999
f. $75,000 to $104,999
g. $105,000 or more

9.) What is your current employment status?
a. Full-time employment
b. Part-time employment
c. Unemployed
d. Self-employed
e. Home-maker
f. Student
g. Retired

Please indicate (yes/no) to the following questions:
10.) Were you displaced from your home for over a week from the recent disaster event?
Yes/No

11.) Have you ever been diagnosed with a mental health disorder (e.g., depression, anxiety, post-traumatic stress disorder, bi-polar, schizophrenia, etc.)?
Yes/No

12. Have you ever been diagnosed or treated with a physical health problem (e.g., cancer, heart disease, diabetes etc.)?
Yes/No

13.) Have you ever been committed to a medical or mental health facility for a mental health condition?
Yes/No

14.) Since the most recent disaster event, have you started or increased using alcohol?
Yes/No

15.) Since the most recent disaster event, have you started or increased using tobacco?
Yes/No

16.) Since the most recent disaster event, have you started or increased using pharmaceuticals?
Yes/No

Disaster Stress Exposure

Instructions: The following is a list of difficulties people sometimes experience during disaster events. Please read each item, and then indicate if you experienced these difficulties during the most recent disaster.

Did you lose important personal belongings in the disaster event?	Not at all	A little bit	Quite a bit	Extremely
Was your home or property damaged in the disaster event?	Not at all	A little bit	Quite a bit	Extremely
Did you experience bodily injury in the disaster event?	Not at all	A little bit	Quite a bit	Extremely
At the time of the disaster event, did you believe that you or someone you know could be killed or seriously harmed?	Not at all	A little bit	Quite a bit	Extremely
At the time of the disaster event did you experience feelings of intense helplessness, fear, or horror?	Not at all	A little bit	Quite a bit	Extremely

Impact of Event Scale-Revised

Instructions: The following is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you *during the past 7 days* with respect to the most recent disaster. How much were you distressed or bothered by these difficulties?

Question	Not at all	A little bit	Moderately	Quite a bit	Extremely
Any reminder brought back feelings about it.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I had trouble staying asleep.	Not at all	A little bit	Moderately	Quite a bit	Extremely
Other things kept making me think about it.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I felt irritable and angry.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I avoided letting myself get upset when I thought about it or was reminded of it.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I thought about it when I didn't mean to.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I felt as if it hadn't happened or wasn't real.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I stayed away from reminders about it.	Not at all	A little bit	Moderately	Quite a bit	Extremely
Pictures about it popped into my mind.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I was jumpy and easily startled.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I tried not to think about it.	Not at all	A little bit	Moderately	Quite a bit	Extremely
I was aware that I still had a lot of feelings about it, but I didn't deal with them.	Not at all	A little bit	Moderately	Quite a bit	Extremely

My feelings about it were kind of numb.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I found myself acting or feeling like I was back at that time.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I had trouble falling asleep.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I had waves of strong feelings about it.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I tried to remove it from my memory.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I had trouble concentrating.

Not at all | A little bit | Moderately | Quite a bit | Extremely

Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I had dreams about it.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I felt watchful and on guard.

Not at all | A little bit | Moderately | Quite a bit | Extremely

I tried not to talk about it.

Not at all | A little bit | Moderately | Quite a bit | Extremely

Patient Health Questionnaire

Instructions: Over the last 2 weeks, how often have you been bothered by the following problems?

Question	0= Not at all	1= Several days	2= More than half the days	3= Nearly every day
Little interest or pleasure in doing things.	Not at all	Several days	More than half the days	Nearly every day
Feeling down, depressed or hopeless.	Not at all	Several days	More than half the days	Nearly every day

Connor-Davidson Resilience Scale

Instructions: Please indicate how much you agree with the following statements as they apply to you over the last month.

Question	0=Not true at all	1=Rarely true	2=Sometimes true	3=Often true	4=True nearly all of the time.
I am able to adapt to change.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
I can deal with whatever comes my way.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
I try to see the humorous side of things when I am faced with problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
Having to cope with stress can make me stronger.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
I tend to bounce back after illness, injury, or other hardships.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
I believe I can achieve my goals, even if there are obstacles.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
Under pressure, I stay focused and think clearly.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
I am not easily discouraged by failure.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

I think of self as strong person when dealing with life's challenges and difficulties.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
I am able to handle unpleasant or painful feelings like sadness, fear and anger.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

Disaster Adaptation and Resilience Scale

Instructions: Please indicate how much you agree with the following statements as they apply to you over the last month.

Question	0=Not true at all	1=Rarely true	2=Sometimes true	3=Often true	4=True nearly all of the time.
DARS_1: I have insurance to cover disaster-related damages.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_2: I have enough food to eat.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_3: I have stable or permanent housing.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_4: My utilities are working (e.g., electricity, gas, water).	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_5: I have reliable transportation to get me to where I need to go.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_6: I have enough money to pay my rent or mortgage when it is due.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_7: I have access to clean water.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_8: I have access to medical professionals and services (e.g., doctors, hospital, pharmacy etc.)	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_9: I have a plan for safety in the event of a disaster.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_10: My friends are there for me during difficult times.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

DARS_11: My family is there for me during difficult times.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_12: I am treated fairly by people in my community.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_13: I have people I can turn to and ask for help.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_14: I get the support I need from my friends and family.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_15: I feel like I belong in my community.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_16: I appreciate my cultural and family traditions.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_17: If I need help, I know where to go in my community.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_18: I can talk with my family about my problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_19: I can talk with my friends about my problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_20: When I am faced with a problem, I think of possible solutions.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_21: I am good at solving problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_22: I look for information or resources to help deal with my problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_23: When I have multiple problems, I prioritize which to problem to work on first.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_24: I set achievable goals for my problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_25: I brainstorm possible options to solve problems.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_26: When I encounter a problem, I think about solutions that have worked for me in the past.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

DARS_27: To resolve problems, I make a plan of action and follow it through.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_28: When I feel upset, I pay attention to my feelings.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_29: I am able to manage sad feelings.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_30: When I am upset, I take time to figure out what I am feeling.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_31: To decrease upsetting thoughts, I change the way I am thinking about the situation.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_32: I am able to manage angry feelings.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_33: I pay attention to bodily sensations of stress (e.g., heart pounding, fast breathing, sweating).	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_34: When I feel stressed, I do something to help me relax or feel less stressed.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_35: If I have flashbacks or upsetting memories, I change my attention to the present moment.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_36: I give myself time to recover from upsetting situations.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_37: I believe I will make it through difficult times.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_38: I am optimistic about my future.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_39: When difficult things happen, I know things will get better with time.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_40: I have important goals for my future.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_41: I believe I can achieve my long-term goals.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

DARS_42: My life has meaning and purpose.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time
DARS_43: After difficult situations happen, I tell myself things will get better with time.	Not true at all	Rarely true	Sometimes true	Often true	True nearly all of the time

Vita

Jennifer M. First earned a Master of Social Work (2012) from University of Missouri. She pursued her doctoral work at the University of Missouri school of Social Work and worked as a research assistant for the MU Disaster and Community Crisis Center (previously known as the MU Terrorism and Disaster Center), a Category II Center in the National Child Traumatic Stress Network. Jennifer earned her Ph.D. in Social Work in 2019. She has accepted a position as an assistant professor of social work at the School of Social Work at the University of Southern Maine.