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When Acute Adversity Improves Psychological Health:

A Social-Contextual Framework

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Abstract

Human beings are routinely exposed to varying forms of acute adversity. Our responses take varying forms too, ranging from chronic distress to resilience. Although this pronounced variability is widely recognized, one possible outcome of acute adversity has been invariably, though understandably, ignored: an *improvement* in psychological and social functioning. In this analysis, I argue that, under some conditions, people can experience marked psychological improvement after acute adversity. I describe this response pattern as *psychosocial gains from adversity (PGA)* and define it as favorable and reliable change on an objective index of psychological functioning from before to after exposure to adversity. In the present article, I first distinguish PGA from traditional perspectives on growth after adversity on the basis of key conceptual differences. I then review empirical evidence for PGA as a replicable response pattern following different forms of adversity, including bereavement, military deployment, and mass trauma. I propose a multi-level theoretical model for PGA that focuses on automatic prosocial affiliative behaviors and group-level contextual factors that are conditioned by acute adversity. I describe moderators and boundary conditions at different levels of analysis that will enhance or detract from the likelihood of PGA. I conclude with the implications of PGA for theory and empirical research on post-adversity outcomes and outline a research agenda to better understand it.

Keywords: trauma; multi-level; individual differences; prospective; psychosocial gains from adversity.

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“It was both a horrible and a wonderful experience at the same time. I felt that sense of collectivity I’ve experienced only rarely in my life, and it’s always been in the face of tremendous horror.” (Temma Kaplan, on the 9/11 terrorist attack; from Solnit, 2010, p. 197)

“What I remember most plainly about the earthquake was the human warmth and kindness of everyone afterward.” (Dorothy Day, 1952, p. 24, on the San Francisco earthquake in 1906)

Human beings are subject to the vicissitudes of fate, an unpredictable and sometimes dangerous natural world, and the depredations of our fellow human beings. A loved one dies, a flood destroys our home, an earthquake levels our city, and a terrorist attack shatters our sense of security. How do we respond to such life-altering events? Historically, it has been assumed that we respond with potentially debilitating distress (Herman, 1997). And yet the impact of adversity is complex. After disasters, for example, we seek the company of friends, family members, neighbors, and even strangers (Abrams, Albright, & Panofsky, 2004). We provide emotional, informational, and material support to others, and receive it in return (Barton, 1969; Drabek & Key, 1976; Kaniasty, Norms, & Murrell, 1990). We volunteer, give money to charities, and donate blood (Morgan, Wisneski, & Skitka, 2011). We even think less about our own besetting worries (Fritz, 1961). If we pause to consider these responses—increased affiliative and prosocial behavior; reduced self-focus and rumination—a surprising question is raised: Can acute adversity improve our psychological adjustment?

In this paper, I will argue that acute adversity can, in fact, improve our psychological adjustment, a phenomenon I describe as *psychosocial gains from adversity* (PGA). To support my argument, I first carefully distinguish the conceptual basis of PGA from traditional

perspectives on growth from adversity, such as posttraumatic growth. I then present empirical evidence, largely ignored, that a subset of people shows reliable and sometimes enduring improvement in psychosocial functioning after widely varying adverse experiences. I propose a social-affiliative and contextual theoretical model to explain these improvements, and describe moderators and potential boundary conditions of PGA. I consider potential alternate explanations of PGA, focusing on statistical and methodological artifacts. In the final sections, I outline the theoretical implications of PGA and propose a research agenda to better understand it.

Heterogeneous Reactions to Acute Adversity

The world is less violent and more peaceful than at any other time in human history (Pinker, 2011), but human beings remain vulnerable to highly disruptive and acutely adverse life stressors. Mass atrocities, terrorist attacks, warfare, and individual-level violence continue to inflict substantial harm on human beings (World Health Organization, 2014), as do natural and man-made disasters such as hurricanes, wildfires, nuclear disasters, and earthquakes (International Federation of Red Cross and Red Crescent Societies, 2015). Approximately 1.5 million American military service-members have been deployed to war zones in Iraq and Afghanistan from 2001 to 2011 (Baiocchi, 2013). Many others will face a life-threatening illness, such as heart disease or cancer. Indeed, most of us will experience at least one violent or life-threatening event during our lifetimes (Ozer, Best, Lipsey, & Weiss, 2003), and almost all of us will experience other disruptive, painful, and stressful life transitions such as bereavement, divorce, or even the birth of a child.

Although in the immediate aftermath of such adversity people often experience marked distress (Shalev, 2002), in the longer term, people's reactions show considerable variability (Bonanno & Mancini, 2012). A crucial point is that most people will experience a modest and

short-lived disruption in overall functioning and a relatively rapid return to baseline functioning, or resilience (Bonanno, Westphal, & Mancini, 2011). Resilience is the most common response to events as varied as terrorist attack, military deployment, mass shooting, flood, bereavement, breast cancer treatment and surgery, traumatic or accidental injury, hip fracture, heart attack, and spinal injury (for reviews, see Bonanno, Brewin, Kaniasty, & La Greca, 2010; Bonanno, et al., 2011; Mancini & Bonanno, 2009), though an alternate perspective on resilience is provided by Infurna and Luthar (2016). By contrast, relatively few people will experience marked and persistent symptoms that would, for example, meet the threshold for posttraumatic stress disorder or other mental disorders. Indeed, rarely if ever do chronic distress reactions exceed the proportion of resilient reactions, even after horrific experiences (Bonanno et al., 2011). Other prototypical responses to acute adversity include gradual recovery and delayed reactions, which have been observed after varying event types and using different methodologies (Andrews, Brewin, Philpott, & Stewart, 2007; deRoon-Cassini, Mancini, Rusch, & Bonanno, 2010; Gray, Bolton, & Litz, 2004; Mancini, Bonanno, & Sinan, 2015; Norris, Tracy, & Galea, 2009).

In addition to these responses, however, increasing attention has been drawn to the possibility that we can benefit or grow from adverse or traumatic experiences, a phenomenon often described as “posttraumatic growth” (Linley & Joseph, 2004; Pals & McAdams, 2004; Seery, 2011; Tedeschi & Calhoun, 2004). This prospect has obvious appeal and a vast and well-cited literature to support it. Nevertheless, controversy persists regarding traditional approaches to growth after adversity, including the methods used to measure it (Tennen & Affleck, 2009), its conceptual basis (Suzanne, Tennen, & Affleck, 2009; Zoellner & Maercker, 2006), and whether it is a veridical phenomenon that reflects real change or a cognitive maneuver that reflects a motivated positive illusion (Frazier, et al., 2009; McFarland & Alvaro, 2000).

Traditional Perspectives on Growth after Adversity

Although a number of theories of growth after adversity have been developed, the dominant paradigm is posttraumatic growth and its variants, which include benefit-finding, adversarial growth, and stress-related growth (Linley & Joseph, 2004; Park, Cohen, & Murch, 1996; Tedeschi & Calhoun, 2004). According to such theories, acute adversity commonly results in “positive psychological change that occurs as the result of one’s struggle with a highly challenging, stressful, and traumatic event” (Tedeschi & Calhoun, 2004), including better relationships, increased psychological well-being, more personal strength, greater appreciation for life, renewed sense of life’s possibility, and deepened spiritual connection (Linley & Joseph, 2004; Park, et al., 1996; Tedeschi & Calhoun, 2004). Growth has been reported after widely-varying experiences, including cancer (Cordova, Cunningham, Carlson, & Andrykowski, 2001), terrorist attacks (Laufer & Solomon, 2006), combat exposure (Maguen, Vogt, King, King, & Litz, 2006), bereavement (Cadell & Sullivan, 2006), and captivity in war (Solomon & Dekel, 2007).

Although theorists have debated the mechanisms of posttraumatic growth, with some arguing that it involves constructing a narrative of positive self transformation (Pals & McAdams, 2004) and others that it involves translating growth cognitions into meaningful action (Hobfoll, et al., 2007), the dominant perspective is that “transformative” growth requires effortful internal struggle with an adverse experience (Tedeschi & Calhoun, 2004, p. 4). That is, a person must rebuild basic belief structures about the self and the world in order to propel him or her “to a higher level of functioning than that which existed prior to the event” (Linley & Joseph, 2004, p. 11). The intensive cognitive processing entailed by growth is “comparable to the physical rebuilding that occurs after an earthquake” (Tedeschi & Calhoun, 2004, p. 5).

Accordingly, “the more an individual ruminates, ‘chews the cud,’ about what happened, actively thinking about the circumstances and ways to make sense out of them, the more likely it is that posttraumatic growth will be experienced” (Calhoun, Cann, Tedeschi, & McMillan, 2000, p. 522). In the absence of this intensive struggle, the mechanisms of growth are not available (Tedeschi & McNally, 2010).

Although an appreciable literature has examined these postulates, the substantive meaning of prior research has been a source of continuing debate (Coyne & Tennen, 2010; Jayawickreme & Blackie, 2014; Tennen & Affleck, 2009; Westphal & Bonanno, 2007; Wortman, 2004). More important for the present proposal, the overwhelming emphasis on internal psychological factors has substantially obscured other important aspects of adjustment in the aftermath of adversity. Of particular note is the often profound impact of acute adversity on the social-contextual environment (Solnit, 2010). In contrast to internal psychological struggle, there is extensive evidence that beneficial changes in the social-contextual environment will improve functioning (Argyle, 2001; Baumeister & Leary, 1995; Diener & Seligman, 2002). These benefits do not entail effortful internal processing or rumination but instead emerge from automatic affiliative tendencies under stress. They are also inherently embedded in and responsive to the broader social context, as I discuss later in this paper. Surprisingly, the possibility that acute adversity can stimulate improved psychological functioning through an improved social environment has been almost entirely ignored.

A Social-Contextual Perspective: Psychosocial Gains of Adversity (PGA)

In this article, I propose a framework for these beneficial effects, which I describe as *psychosocial gains of adversity*. The idea of psychosocial gains from adversity evolved

inductively as a way of understanding a peculiar phenomenon—a subset of people who were exposed to acute and typically damaging forms of adversity who nonetheless showed demonstrably improved functioning based on pre and post-event assessments (not retrospective reports). This response pattern has emerged with remarkable consistency after events as varied as military deployment and interpersonal loss (see Table 1 for a summary).

Nevertheless, the idea of psychosocial gains after adversity has historical precedents. Evidence for the paradoxical effects of acute adversity first emerged in early historical accounts of disaster, such as the Great San Francisco earthquake of 1906, the Halifax ship explosion in 1917, the great Louisville flood of 1937, and then later in accounts of the 9/11 terrorist attacks (for compelling accounts of these disasters, see Solnit, 2010). The response to these and other disasters has been colorfully described by sociologists and historians as a “city of comrades” (Prince, 1920), a “democracy of distress” (Kutak, 1938), a “post-disaster utopia” (Wolfenstein, 1957), and “a paradise built in hell,” (Solnit, 2010), all suggesting that substantial improvements in the social context resulted from acute adversity.

More recently, empirical research has identified a subset of psychologically improved individuals after acute adversity (e.g., Dickstein, Suvak, Litz, & Adler, 2010; Mancini, Littleton, & Grills, 2016; Nash, et al., 2014). Two key methodological advances have allowed these findings to emerge. One advance is a *prospective* design in which people are assessed both *before* and *after* exposure to acute adversity, an approach that was previously exceedingly rare in the trauma literature (Norris, et al., 2002). A second advance is employing various statistical methods for distinguishing subpopulations of individuals who show different patterns of change on a repeated measures outcome (Muthén, 2004; Nagin, 1999). The use of these trajectory methods has grown substantially in trauma research, allowing researchers to distinguish patterns

previously obscured by a reliance on the average response pattern (Bonanno & Mancini, 2012). However, it is not necessary to employ a prospective design to document psychosocial gains. As I review below, evidence for psychosocial gains has emerged using widely varying methods, both qualitative (e.g., historical) and quantitative (e.g., historiometric, cross-sectional, longitudinal, and prospective pre- post).

Although these methodological advances have provided evidence of psychosocial gains, PGA is not a methodologically improved assessment of posttraumatic growth. Rather, PGA is fundamentally conceptually distinct from traditional theories of posttraumatic growth in at least six key ways. First, unlike traditional views of growth after adversity, PGA does not entail effortful internal-psychological processes, such as the rebuilding of shattered beliefs (Tedeschi & Calhoun, 2004) or a reconstructed life narrative (Pals & McAdams, 2004). Instead, the mechanisms of PGA involve automatic affiliative tendencies under stress. Second, PGA does not entail rumination or cognitive processing to achieve gains in functioning.¹ Third, it does not presuppose a preceding period of elevated distress (that is, struggle or traumatization) (Linley & Joseph, 2004; Tedeschi & Calhoun, 2004). Fourth, PGA is embedded in a multi-level perspective on the stress response in which individual functioning is influenced by group-level processes and vice versa. Fifth, PGA is by definition a bounded phenomenon, subject to a variety of moderating conditions and individual differences. Finally, and most important, the mechanisms of PGA are social-contextual rather than internal-psychological.

I define PGA as follows: marked improvement on a dimension of psychological functioning that directly follows exposure to either an isolated and highly adverse event, such as a natural disaster, violent or life-threatening experience, or terrorist attack, or a major stressful life event, such as bereavement, divorce, or major illness. Improvement can occur in distress-

related outcomes, such as reduced depression, anxiety, or posttraumatic stress symptoms, and in adaptive outcomes, such as increased life satisfaction, positive emotion, meaning in life, or feelings of belonging. *Psychosocial gains from adversity* are present when a person demonstrates favorable and reliable change on an objective index of psychological functioning from before to after exposure to adversity. These gains can be large in magnitude and may vary in their duration, but prior research has found that they can persist for a year or longer after the event (Bonanno, et al., 2002; Galatzer-Levy & Bonanno, 2014; Mancini, et al., 2016).

Why would a subset of people experience substantial improvement in functioning after acute adversity? According to the theoretical framework embedded in PGA, the primary mechanism is a beneficial effect of acute adversity on social relationships and on the social environment. Consistent with interpersonal theories of depression (Klerman, Weissman, Rounsaville, & Chevron, 1984) and recent theories of social support (Lakey & Orehek, 2011), social interaction is a key component of improved regulation of affective states. In short, because acute stress can improve the social environment (Bastian, Jetten, & Ferris, 2014; von Dawans, Fischbacher, Kirschbaum, Fehr, & Heinrichs, 2012), it can also, under some circumstances, improve psychological functioning.

In contrast to theories of posttraumatic growth, PGA will be most apparent among the subset of exposed people with suboptimal functioning, because they have the greatest room for improvement. However, PGA can also improve facets of general well-being, as discussed later in this article. Further, it can illuminate, in a broader sense, how people respond adaptively to acute stress. That is, the same social-contextual forces that give rise to PGA can also help to explain adaptive responses to acute adversity (for example, resilience) and chronic stress reactions (for

example, PTSD). These implications will only be touched on in the present paper, however, because my focus is on better understanding this novel and unexpected response to acute stress.

It may be useful at this point to contrast the predictions of the psychosocial gains perspective with those of traditional theories of growth after adversity. First, in contrast to traditional theories, psychosocial gains should occur very soon after the occurrence of the adverse event, because gains are conditioned by largely automatic prosocial and affiliative behaviors. Second, unlike theories of growth after adversity, psychosocial gains should be inversely correlated with ruminative processing, which reflects a continuing preoccupation with the acute stressor. Third, psychosocial gains should be associated with improved perceptions of the social environment (Taylor, et al., 2000). Fourth, psychosocial gains may be short- or long-term. In some cases, if the initial event promotes a more enduringly supportive social environment, the beneficial effects can be long-term (Mancini, et al., 2016). Finally, psychosocial gains should depend on a relatively structurally intact social environment. This implies that acute adversity that disrupts existing social networks or that harms social perceptions will not result in psychosocial gains.

Empirical Evidence of Improved Psychological Functioning after Acute Adversity

What evidence is there to support psychosocial gains from adversity? One relevant source is growing evidence that some people show substantially improved psychological functioning after an acute stressor (Galatzer-Levy, Huang, & Bonanno, 2018). As I review below, this literature has often employed large and population-based samples and outcome measures of both adaptive and maladaptive dimensions of functioning (e.g., life-satisfaction, PTSD, anxiety, and depression). As a result, it provides generally methodologically strong

support for the possibility that people can improve after acute stress, providing a basis for PGA. See Figure 1 for exemplars of this pattern of improved functioning after acute stress.

Bereavement

Prospective studies of bereavement have consistently found evidence of improved functioning after loss. One study assessed bereaved spouses before the loss and at 6 and then at 18 months (Bonanno, et al., 2002). Using mean change and the pooled standard deviation as a metric, 11% of the sample showed substantial reductions in depression after the loss, representing a full standard deviation improvement. The same improved pattern emerged in a follow-up study using a latent trajectory method, growth mixture modeling (Galatzer-Levy & Bonanno, 2012). Another prospective study with a large population-based sample found a pattern of substantial improvement in life satisfaction among bereaved spouses, representing 5.4% of the sample (Mancini, Bonanno, & Clark, 2011). Still another large population-based sample of bereaved parents and spouses found a pattern of substantially improved functioning (reduced depression symptoms) among 9-11% of the sample (Maccallum, Galatzer-Levy, & Bonanno, 2015). Finally, a prospective analysis of bereaved spouses who reported high levels of caregiving strain before a loss reported improved health-risk behaviors after the loss, with no increase in depression (Schulz, et al., 2001).

Divorce

Another stressor that can result in improved functioning is divorce. For example, in a large population-based sample of divorced German citizens, a trajectory of substantially improved life-satisfaction from before to after divorce emerged among 9% of the sample (Mancini, et al., 2011). An almost identical result emerged in a study of American citizens followed both before and after their divorce, with 11% showing sharp reductions in depression

post-divorce (Malgaroli, Galatzer-Levy, & Bonanno, 2017). In addition, women in low-quality marriages show improved life-satisfaction after divorce, suggesting an improvement in their social-relational environment, whereas women in high-quality marriages show reduced life-satisfaction (Bourassa, Sbarra, & Whisman, 2015).

Life-threatening Illness

Studies of life-threatening illness, such as cancer, heart attack, and stroke, have also found evidence of improved functioning. In a prospective study using a large nationally representative sample, 7% of people who suffered a heart attack also reported substantial reductions in depression symptoms from before to after the event (Galatzer-Levy & Bonanno, 2014). A similar result emerged in a prospective study of cancer survivors, which found that 7.8% of the sample reported sharply improved depression symptoms from pre-diagnosis to post-diagnosis and treatment (Burton, Galatzer-Levy, & Bonanno, 2015).

Military Deployment

Prospective research on military samples, even those with significant combat exposure, has provided consistent evidence of improved functioning pre- and post-deployment. For example, one early prospective study followed 540 Dartmouth College graduates, of whom about half went on to serve in the Vietnam war (Schnurr, Rosenberg, & Friedman, 1993). This study was unusual in having both a prospective design and a well-matched control group. Compared to civilians with no combat exposure, participants with peripheral combat exposure showed clear positive gains on clinical scales of the Minnesota-Multiphasic Personality Inventory from before to after deployment.

More recent trajectory-based studies of military deployment have also documented PGA. In a study of US peacekeepers deployed to Kosovo, for example, Dickstein and colleagues identified a group of soldiers with high levels of PTSD symptoms before deployment and a sharp reduction during and after their deployment (Dickstein, Suvak, et al., 2010). Another study of Danish soldiers deployed to Iraq found an improvement trajectory of reduced PTSD symptoms from before to after deployment, which they labeled as “low-fluctuating in 7.5% of the soldiers (Andersen, Karstoft, Bertelsen, & Madsen, 2014). An analysis that used earlier waves of these data also identified a group of soldiers who experienced distinct patterns of “temporary benefit” from their combat experiences (Berntsen, et al., 2012). Consistent with these results, improvement has been identified in military samples with single and with multiple deployments (Bonanno, et al., 2012). For example, an improvement pattern emerged among a large population-based sample of single deployers (8%) and was replicated in a separate independent sample of multiple deployers (8.4%). Consistent with these results, Nash and colleagues (2014) found a marked improvement pattern among one cohort of Marines (9.0%) deployed to Afghanistan, and this pattern replicated in a separate independent sample of Marines (9.4%) deployed to the high-combat Helmand province in Afghanistan. To my knowledge, only one prospective group-based trajectory study of military deployment has *failed* to identify an improvement pattern (Eekhout, Reijnen, Vermetten, & Geuze, 2016).

Mass Trauma

Acute adversity that afflicts large numbers of people simultaneously is particularly likely to activate the mechanisms of psychosocial gains. Natural disasters, technological disasters, mass shootings, and terrorist attacks can take a substantial toll on human life, and immobilize entire communities, cities, and regions. They often require outside help to address the sequelae of the

event, which may persist for weeks, months, and even years (Bonanno, et al., 2010). Despite these considerable consequences, mass traumas have at least two distinctive characteristics that enhance the possibility of improved psychological functioning. First, they allow for greater opportunities for shared experience and are therefore inherently less isolating. Second, they are likely to promote pro-social behaviors on a broad scale that may result in synergistic and contagious prosocial environments (Fowler & Christakis, 2010).

Natural Disaster. Historical and sociological examinations of disaster strongly suggest that natural disasters transform the social environment and potentially create the conditions for improvement (Barton, 1969; Prince, 1920; Solnit, 2010; Wolfenstein, 1957). Although prospective empirical investigations of natural disaster are relatively rare, largely because of their sudden nature, preliminary evidence for PGA has emerged in extant research. One recent prospective study of Hurricane Katrina survivors found that 9% of survivors reported improved functioning after the storm, seeing their distress fall below an empirical cut-point after the hurricane (Lowe, Chan, & Rhodes, 2010). A separate trajectory analysis of these data confirmed this result, finding two trajectories that showed marked improvement (“decreased distress” and “improvement”) comprising 7.1% of the sample (Lowe & Rhodes, 2013). In another prospective trajectory study of youth exposed to the Deepwater Horizon Oil Spill in Louisiana, 21% of the sample showed a substantial reduction in PTSD symptoms from before to after the oil spill (Osofsky, Osofsky, Weems, King, & Hansel, 2015). Finally, another prospective study of the Great East Japan Earthquake and nuclear disaster in 2011 found that a greater proportion of Japanese participants reported increases in subjective well-being than decreases from before to after the disaster (Ishino, Kamesaka, Murai, & Ogaki, 2015). Moreover, just thinking about the

disaster resulted in higher levels of reported subjective well-being (Uchida, Takahashi, & Kawahara, 2014).

Mass Shootings. Another mass trauma for which there is evidence of PGA is mass shootings. To my knowledge, two prospective studies of mass shootings have employed a trajectory approach (Mancini, et al., 2016; Orcutt, Bonanno, Hannan, & Miron, 2014). In one study, my colleagues and I found a clear pattern of psychological improvement among 368 female survivors of the Virginia Tech campus shootings (Mancini, et al., 2016), the third-most deadly civilian massacre in US history. This improved pattern emerged in separate analyses of anxiety and depression symptoms among 13.2% and 7.4% of the sample, respectively. Combining these two patterns resulted in 15% of the sample being classified as improved. In a similar prospective design after a school shooting at Northern Illinois University (Orcutt, et al., 2014), PTSD symptoms increased at 2 months across the whole sample but then showed a sharp decline from their pre-event levels at 8 months, continuing this decreasing pattern across the duration of the three-year study.

Summary

A growing empirical database indicates that acute adversity can result in improved psychological functioning among a subset of exposed persons, including after bereavement, divorce, life-threatening illness, military deployment, natural disaster, and mass shootings. Historical examinations of disaster have long suggested that human beings may experience improved well-being and a dramatically enhanced sense of community and common purpose in the aftermath of disaster. These findings provide evidence that people can show a surprising degree of psychological improvement in the aftermath of adversity, but what are the origins of

this improvement? Next I discuss the specific mechanisms of improved psychological functioning after exposure to acute adversity.

Theoretical Model for Psychosocial Gains from Adversity

Why and when would someone experience psychosocial gains from adversity? I propose that the mechanisms of psychosocial gains include automatic social-affiliative and prosocial tendencies, substantively meaningful social interactions, and a more cooperative social environment itself. These mechanisms operate at the biological, situational, and group levels. As I discuss below, this model integrates ideas from three distinct theoretical perspectives: the “tend-and-befriend” response to acute stress (Taylor, et al., 2000), the importance of social influences on our emotion regulation (Lakey & Orehek, 2011), and theories of emotion contagion and cooperative behavioral cascades in social networks (Christakis & Fowler, 2009; Fowler & Christakis, 2010). The theoretical model is depicted in Figure 1.

Mechanisms

Adversity Stimulates Automatic Social-Affiliative and Prosocial Behaviors. There is substantial evidence that acute stress can promote affiliation and prosociality automatically and effortlessly (Schachter, 1959; Taylor, 2006; Taylor, et al., 2006). Prosociality has been shown to result from automatic behavioral responses (Lotito, Migheli, & Ortona, 2013), and some suggest this automaticity has even played a role in the evolution of human cooperation (Rand, Greene, & Nowak, 2012; Rand, et al., 2014). When people are induced to experience stress, they exhibit increased sharing and trust, and appear more trustworthy to others (von Dawans, et al., 2012). Under stress, people are more accurate in assessing the mental states of others (Smeets, Dziobek, & Wolf, 2009), and when subjected to pain in a group, they tend to experience stronger bonds,

suggesting that a kind of “social glue” emerges from shared painful experiences (Bastian, Jetten, & Ferris, 2014). After 9/11, for example, Americans spent more time with friends and family, were more likely to interact with strangers (Morgan, et al., 2011), and also reported higher levels of trust in neighbors and community leaders (Putnam, 2002, February). Consistent with these findings, death awareness stimulates increased attention to close relationships (Vail, et al., 2012), increasing the desire for committed relationships (Florian, Mikulincer, & Hirschberger, 2002), perceptions of a partner’s positive regard (Cox & Arndt, 2012), and even willingness to engage in social interaction (Taubman-Ben-Ari, Findler, & Mikulincer, 2002). One formal theoretical framework describes these effects as the “tend and befriend” response to acute stress, an evolutionarily-driven tendency to engage in prosocial affiliative behavior after acute stress (Taylor, 2006; Taylor, et al., 2000).

What gives rise to our increased affiliative tendencies after stress? According to Taylor (2006), a bio-behavioral system regulates these affiliative behaviors in a manner similar to other appetitive needs. The release of the hormone oxytocin appears to play a key role. Oxytocin is highly responsive to stress and strongly implicated in approach-related social behavior (Bartz, 2016; Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003). Although oxytocin may have the most marked effects on people with less dispositional motivation to affiliate, such as those high in attachment avoidance, various evidence supports a generalized main effect of oxytocin on affiliative behavior (Bartz, 2016; Cardoso, Ellenbogen, Serravalle, & Linnen, 2013). Specifically, it sensitizes us to social information, induces greater motivation to affiliate, and renders us more receptive to others. When social overtures are reciprocated, people feel better and their biological stress response is ramped down (Taylor, 2006), resulting in an anxiolytic effect. However, an important point is that any beneficial effect of oxytocin will depend on

whether affiliative gestures are favorably received. If a person experiences negative responses in their efforts at affiliation, it will exacerbate their distress and isolation (Lepore, Ragan, & Jones, 2000; Taylor, 2006). This suggests that environments that support more favorable responses from others, such as post-adversity ones, are also more likely to result in beneficial psychological effects.

One implication of the tend-and-befriend perspective is that exposed people who felt isolated and depressed before adversity may benefit from it, because it can help to remediate perceived gaps in relationships. That is, adversity may activate their efforts to connect with others. In addition, the social context of adversity may increase the likelihood of favorable responses from others, lowering the bar, in effect, for others to be receptive. Again, this would be particularly beneficial for people who were depressed and isolated. Consistent with the link between improved social relationships and reduced distress, my colleagues and I found that the survivors of the Virginia Tech campus shootings who displayed a PGA pattern also experienced marked increases in perceived social resources (Mancini, et al., 2016). In addition to remediating gaps in relationships, however, it is also plausible that acute adversity can have more widespread beneficial effects on aspects of positive functioning, such as meaning in life, positive emotion, and life satisfaction.

Adversity Increases Substantively Meaningful Social Interactions. A key situational contributor to PGA is an increased likelihood of substantive social interactions. Substantive social interactions, which involve meaningful topics of mutual interest, promote well-being and the regulation of affect (Lahey & Orehek, 2011; Mehl, Vazire, Holleran, & Clark, 2010). By contrast, small talk, which involves trivial information exchanges, does not benefit well-being or the regulation of affect (Mehl, et al., 2010). Acute adversity provides a situational context for

substantive interactions to occur with greater frequency and intensity, reducing the likelihood of small talk (Abrams, et al., 2004). The enhancing effects of adversity were particularly apparent after the 9/11 disaster, when residents in New York City not only increased their contact with friends and family but also had spirited conversations with strangers. As one person reported, “The coolest thing, the coolest and the scariest, was everybody on the street was talking to each other” (Abrams et al., 2004, p. 198). These conversations often involved exchanges of news about the attacks and discussions of where each person was when the attack occurred, but they also touched on substantive topics unrelated to the attacks, facilitating connections among people. For example, one person said, “It was really good to be around people and a lot of conversations kept coming back to it . . . But it was good to be around people who were talking about something other than that, too. I actually had some good discussions on film and music and forgot for two seconds about all this” (Abrams et al., 2004, p. 199). According to Lakey and Orehek’s relational regulation theory (2011), a key source of affect regulation is substantive conversations that do not necessarily involve “troubles talk” but that do involve reciprocal elaborations of meaningful topics of shared concern. By providing a platform for meaningful exchanges, adversity can increase the likelihood of substantive interactions and in that way contribute to effective regulation of affect.

Adversity Promotes a Cooperative Prosocial Environment. On a group-level, these factors can contribute to a radically altered and enhanced social environment (see Penner, Dovidio, Piliavin, & Schroeder, 2005). Although this most clearly applies to mass traumas because of their shared nature, it also contributes to individual-level stressors, such as bereavement, that alter the nature and degree of social interaction. After an interpersonal loss, for example, family and friends offer intensive support, sometimes for months after a loss (Didion,

2007). A particularly compelling and vivid source of evidence for an enhanced social environment after mass trauma is historical. First-person accounts, sociological exegeses, and historical descriptions all document a transformed social environment in the aftermath of disaster and mass trauma. Prosocial behaviors are ratcheted upward; volunteerism increases; material support is readily proffered; and overall social contact increases (Kaniasty & Norris, 2004; Solnit, 2010). As one survivor of the 1906 San Francisco earthquake, in a letter to her relatives, wrote: “The spirit of this people is the most wonderful thing I ever dreamed of, cheerful, happy, laughing while they were fleeing from the flames, saying nothing of what they had lost but rejoicing over their lives. I have seen one woman fainting and one in tears, that is all. I have been in the center of things for a week. Humanity has showed up well” (as quoted in Watkins, 1981).

Similar observations emerged in Prince’s groundbreaking study of the cataclysmic Halifax ship explosion in 1917 (Prince, 1920), considered the largest man-made conventional explosion in history. According to Prince, a Halifax native, survivors “seemed to draw all together into a fellowship of suffering as victims of a common calamity. There was neither male nor female, just nor unjust, bond nor free” (Prince, 1920, p. 63). Other observers have found that disaster can make distinctions between classes of people less marked. For example, Kutak describes the aftermath of the 1937 Louisville flood: “The inhibitions and the formalities of social life tend to disappear.... People are taken out of their families and the special-interest groups in which they live in normal times, and brought into often close and intimate contact with many different types of individuals” (Kutak, 1938, p. 67).

Prospective survey data support these observations. After the Great East Japan Earthquake and nuclear disaster in Fukushima in 2011, a particularly devastating event, people assessed before and after the disaster reported an increase in valuing social connections and

ordinary life, and this increase was associated with prosocial behaviors, such as making donations and volunteering (Uchida, et al., 2014). Another study found a substantial increase in Japanese participants' reported altruism from before to after the Fukushima earthquake, and this effect was strongest in the areas most affected (Ishino, et al., 2015). And after the 9/11 terrorist attacks, the worst foreign attack on American soil in history, 60% of Americans in a Gallup poll reported that their relationships were stronger one month later (Saad, 2001). Finally, morale and unit cohesion increase from before to after military deployment (Maguen & Litz, 2006).

At the group level, widespread prosociality can transform a social environment. When your neighbor helps you to discard furniture damaged from a flood, you are more likely to do the same for another neighbor. A growing literature has documented that cooperation is uniquely sensitive to the social context and is not simply an individual-differences characteristic. In a longitudinal study of hunter gatherers in Tanzania, for example, an individual's level of cooperation was most strongly predicted by the level of cooperation of others in their camp (Smith, Larroucau, Mabulla, & Apicella, 2018). Another study found significant variation in trust between neighborhoods, even after you accounted for key demographics (Subramanian, Lochner, & Kawachi, 2003). A compelling body of research on social networks suggests further that these changes are indeed mutually reinforcing at the group level. As people act in a prosocial manner, cooperative cascades can propagate across social networks from person to person to person (Fowler & Christakis, 2010). Similar effects have been observed for other phenomena, including happy emotional states (Fowler & Christakis, 2008; Pugh, 2001). One implication of these cooperative cascades is that post-adversity environments can strengthen "weak" ties, which stitch loosely acquainted people into a closer network (Granovetter, 1973).

At the same time that shared adversity strengthens ties among people, it also facilitates

group formation and group identity itself. Even shared neutral experiences, such as movement synchrony, have effects on social bonding (Boothby, Clark, & Bargh, 2014; Mogan, Fischer, & Bulbulia, 2017; Tunçgenç & Cohen, 2016). But shared negative experiences, especially highly demanding, painful, or perilous ones, appear to have particularly marked effects, facilitating social bonds among people (Bastian, Jetten, Hornsey, & Leknes, 2014), the sense of a common fate (Vollhardt, 2009), group formation, and self-sacrificial behavior (Whitehouse & Lanman, 2014). During the rebellion against the Qaddafi regime in Libyan, for example, volunteer civilian fighters reported a remarkably high degree of “identity fusion” with their battalions, a phenomenon that was enhanced among combat fighters when compared to non-combat fighters and that increased their willingness to sacrifice for the group (Whitehouse, McQuinn, Buhrmester, & Swann, 2014). Extreme religious rituals appear to have similar effects. In one study of the Hindu festival of Thaipusam in Mauritania, adherents who engaged in high ordeal rituals, such as body-piercing and dragging heavy carts with hooks attached to the skin, reported a higher degree of group identification and donated more money to the Hindu temple than adherents who engaged in a low ordeal ritual of singing and prayer (Xygalatas, et al., 2013). Across these studies, the degree of group identification was related to the intensity of the negative experience, underscoring that particularly intense forms of acute adversity may have more beneficial effects on social bonds.

In summary, these findings suggest that acute adversity can enhance automatic prosocial cooperative behavior, strengthen bonds among people, and facilitate group formation and group identity. As a result, post-adversity environments may counter the widely-documented trend toward increasing loneliness and isolation from friends and family, and toward estrangement from shared activities and civic institutions (Putnam, 2001).

Adversity Can Benefit Psychological Functioning. Do the effects of acute stress on the social environment improve psychological functioning? Most broadly, we know that the quality of our relationships and our well-being are tightly linked (Argyle, 2001; Diener & Seligman, 2002; Freedman, 1978). People function better when they have closer and more consequential relationships (Baumeister & Leary, 1995; Lakey & Orehek, 2011) and when they have more frequent social interactions (Diener & Seligman, 2002). One reason is that social relationships play a key role in regulating negative affective states and promoting positive ones (Lakey & Orehek, 2011). Consistent with the link between improved social relationships and reduced distress, my colleagues and I found that the survivors of the Virginia Tech campus shootings whose depression and anxiety improved also reported more social resources (Mancini, et al., 2016). Also consistent with this possibility is prospective research on the Great East Japan Earthquake and resulting nuclear accident in 2011. For example, Japanese participants were more likely to report an increase in life satisfaction than a decrease after the earthquake (Ishino, et al., 2015). Moreover, Japanese participant's level of trust was more strongly related to their happiness after the earthquake than it was before (Yamamura, Tsutsui, Yamane, Yamane, & Powdthavee, 2015), and among those who reevaluated ordinary life and their connectedness with others, there was also an increase an increase in well-being (Uchida, et al., 2014).

Can acute adversity also improve well-being and positive aspects of functioning? Thus far, PGA has been documented among people with sub-optimal clinical functioning before the event, rarely exceeding 15% of the sample. However, it is plausible that this is a consequence of the almost exclusive reliance on measures of clinically relevant distress, such as depression, anxiety or PTSD symptoms. Because participants with pre-existing low or absent symptoms will experience a floor effect, there would be little room for many exposed people to improve.

However, facets of well-being, such as life satisfaction, positive emotion, meaning in life, and feelings of belonging (Diener, 1984; Ryff & Keyes, 1995), would not be subject to floor effects and could show more widespread improvement in the aftermath of certain forms of adversity.

Moderators of PGA

Under what circumstances is PGA possible, and what influences its likelihood? A central contention of the present proposal is that acutely adverse events, at both the individual and the collective level, can be productively understood in terms of their impact on the social environment itself. Because this impact varies along a number of dimensions, it is straightforward that PGA must be subject to moderating influences and boundary conditions. Indeed, acute adversity has double-edged effects on the social environment, potentially enhancing or detracting from it. As a result, there are a number of theoretically-derived moderators of PGA. Next I describe these moderators, which occur at different levels of analysis, the group, the event (or situation), and the individual. They involve structural alterations in the social environment, neighborhood demographic factors, the postevent context, the experience of direct interpersonal violence, and the individual's degree of susceptibility to environmental influence.

Structural Alterations in the Social Environment. Acute adversity can have significant effects on the social environment. Acutely adverse events that alter the availability, quality, or frequency of social interaction will therefore have corresponding effects on the likelihood of PGA. For example, events that afflict groups of people simultaneously are particularly likely to result in PGA, because they stimulate natural opportunities for shared effort (e.g., teamwork), prosocial behaviors (e.g., volunteering), beneficial social exchange (e.g., conversations with strangers), and ritual (e.g., memorials). For this reason, disasters are particularly likely to result

in PGA (Solnit, 2010). In one of the few prospective studies of disaster, survivors showed increased contact with family members from before to after a destructive and lethal tornado, a shift attributed to the “residue from the exposure and participation in the post-disaster therapeutic community” (Drabek, Key, Erickson, & Crowe, 1975, p. 491). Military deployment is also likely to result in PGA because it intensifies the nature and degree of social interaction and requires frequent cooperative behavior. As a result, social-relational support or “morale” increases from pre- to post-deployment among service members (e.g., Maguen & Litz, 2006). Not surprisingly, higher levels of unit cohesion and morale are strongly associated with lower levels of PTSD symptoms and general distress (Dickstein, McLean, et al., 2010; Jones, et al., 2012).

By the same token, PGA depends on a relatively structurally intact social environment. For example, natural disasters that result in dislocation or extensive rebuilding will reduce the likelihood of PGA, because such events disrupt social networks, impede access to close others, and reduce the likelihood, in the longer term, of meaningful social interaction (Fran H Norris, Baker, Murphy, & Kaniasty, 2005). This phenomenon has been described as the “deterioration model” (Kaniasty & Norris, 1993). In the aftermath of the Buffalo Creek Dam disaster, for example, whole communities were uprooted, relegated to temporary housing, and often separated from families and friends (Erikson, 1976). Hurricane Katrina had similarly devastating effects on existing social support networks, because the hurricane dislocated large numbers of people and impeded access to close others (Kessler, et al., 2008). However, when people remained in their communities and retained sources of support, the impact of the hurricane on psychological functioning was substantially reduced (Kessler, et al., 2008), increasing the likelihood that some people would evidence PGA (Lowe & Rhodes, 2013).

Neighborhood Demographic Characteristics. Demographic factors influence the social environment in complex ways (Putnam, 2007), and it is likely they would have corresponding effects on the likelihood of experiencing psychosocial gains. For example, more affluent neighborhoods might be less likely to experience PGA, because affluence is associated with less communal orientation and less empathy (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). At the same time, low-income neighborhoods are more resource-scarce and tend to have lower levels of trust (Subramanian, et al., 2003), which could also impair helping behavior and other mechanisms of PGA. This implies the interesting possibility that the likelihood of PGA is moderated in a curvilinear fashion by neighborhood income level, with middle-class neighborhoods being most likely to evidence psychosocial gains.

Religiosity represents another factor that could influence the likelihood of psychosocial gains at the group level. Neighborhood religiosity is strongly associated with civic engagement, volunteerism, and cooperative behavior (Putnam & Campbell, 2012). This suggests that social contexts characterized by high religiosity would be more likely to experience psychosocial gains, because acute adversity would promote greater helping and cooperative behavior. However, it is also possible that, because such environments are already cooperative in nature, they would have less room to improve and thus the benefits would be fewer. A final factor is neighborhood ethnic heterogeneity. There is evidence that ethnically homogeneous neighborhoods have higher levels of trust (Putnam, 2007) and, as a result, may be more likely to experience PGA, because in-group loyalties could reinforce helping behavior, a key mechanism of PGA (Yamagishi & Kiyonari, 2000). On the other hand, some recent evidence suggests a different picture. For example, one recent study found that more ethnically heterogeneous neighborhoods showed more helping behavior than ethnically homogeneous neighborhoods, perhaps because changing values of

tolerance and diversity stimulate the desire to reinforce those beliefs through cooperative prosocial behaviors (see particularly Nai, Narayanan, Hernandez, & Savani, 2018).

Postevent Context. The aftermath of individual-level events, such as bereavement, divorce, illness, or injury, can also significantly alter the quality and availability of social-relational support, both enhancing and detracting from it. For example, the intensely grieving spouse who feels isolated and alone will obviously not experience gains in functioning, because the loss will deprive him or her of a key source of relational support and regulation, which the supportive attention of friends and family cannot replace (Anusic & Lucas, 2014). However, the spouse who had a conflictual relationship with a spouse or experienced burdensome caregiving may indeed experience better functioning, because the loss could provide an opportunity for relational sources of support to improve (see Bonanno, et al., 2002; Bonanno, Wortman, & Nesse, 2004; Schulz, et al., 2001). The same is true of divorce, with people in conflictual relationships more likely to experience PGA because of an enhanced social environment (Bourassa, et al., 2015; Mancini, et al., 2011). Similarly, people who respond to a life-threatening illness by altering their social environment, deciding to work less and spend more time with friends and family are also likely to experience PGA.

Direct Interpersonal Violence as a Boundary Condition. At the level of the event or situation, direct interpersonal violence, such as sexual assault, domestic violence, or physical assault, would substantially influence the likelihood of PGA. Although direct interpersonal violence is particularly harmful for psychological functioning for a number of reasons, I focus here on how it influences the social and environmental mechanisms of PGA. Interpersonal traumatic events, are particularly likely to damage the perceptions of others (e.g., Harris & Valentiner, 2002), and, as a result, are likely to result in less social-affiliative behaviors. Indeed,

people exposed to these stressors may not disclose their experiences to others (Bonanno, et al., 2002), increasing their sense of isolation, and if they do disclose them, they risk negative social consequences, such as being blamed and treated differently (Ullman & Filipas, 2001).

Interpersonal violence is also more likely to evoke ambivalent responses in others that contribute to stress reactions (Ullman, Townsend, Filipas, & Starzynski, 2007). Moreover, when interpersonal violence undermines the perceived benevolence of others, it is particularly likely to be associated with psychopathology (Harris & Valentiner, 2002). Indeed, interpersonal violence is substantially more likely to result in PTSD than other forms of acute adversity (Breslau, Davis, Andreski, & Peterson, 1991), likely in part because of the profound effects it has on the social environment. On the other hand, mass traumas, such as a shooting or terrorist attack, have less damaging effects on adjustment (Galea, et al., 2002; Mancini, et al., 2016), likely in part because they by definition afflict many people at once. As a result, they permit shared experiences of suffering and grief, promote greater solidarity, and enhance feelings of community, all of which are conducive to PGA.

Susceptibility to Environmental Influence. At the level of the individual, variation in the degree to which people are susceptible to environmental forces could also exert an impact on the likelihood that a person will experience PGA (Belsky & Pluess, 2009). Traditionally, environmental susceptibility was posited as a vulnerability factor in stress responses (Monroe & Simons, 1991). Although there is certainly evidence that some people are more vulnerable to stressful experiences (Karg, Burmeister, Shedden, & Sen, 2011), this tells only part of the story. Not only are some people more susceptible to stressful experiences, they are also more responsive to beneficial ones, as gene x environment studies have found (Belsky, et al., 2009). A key point is that greater environmental susceptibility appears to represent an individual

difference in itself. It can be indexed with genetic markers (e.g., 5-HTTLPR: Pezawas, et al., 2005) and assessments of temperament. But it also appears to have roots in environmental and developmental experiences (Hartman, Freeman, Bales, & Belsky, 2018). Differential environmental susceptibility implies that the essential mechanisms of PGA—an improved social-contextual environment—may be more beneficial to some than to others. If differential susceptibility does moderate PGA, it also suggests the counterintuitive possibility that neuroticism, a marker of plasticity (Belsky & Pluess, 2009) usually associated with stress reactions (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014), may be associated with PGA. Some evidence supports this possibility. For example, neuroticism predicted an improvement pattern after loss (Bonanno, et al., 2002) and an analogue neuroticism assessment predicted an improvement pattern after military deployment (Dickstein, Suvak, et al., 2010).

Are Psychosocial Gains from Adversity Real? Alternate Explanations

Although there is growing empirical evidence for PGA, rival alternate explanations exist, including other causes, regression to the mean, and methodological artifacts.

Other Causes

One clear alternative explanation is that post-adversity psychological improvement could be the result of many other and potentially unknown causes that are unrelated to acute adversity. This basic threat to internal validity is present in all quasi-experimental designs, which are of necessity used in the study of acute adversity. Note, however, that much of the evidence cited here relies on variations of an interrupted time series design (Shadish, Cook, & Campbell, 2002), which strengthens internal validity. Such designs allow the researcher to compare a repeated measures outcome before and after an acutely adverse event (or “interruption”). As a result, the most compelling explanation for improvement on an assessment of psychological functioning is

a proximal and high magnitude event, such as a natural disaster, a school shooting, or military deployment. In a recent study of the Virginia Tech shootings, improved participants were assessed just two months following the tragedy (Mancini, et al., 2016). In studies of military deployment, improved participants have typically been assessed directly following their deployment (Berntsen, et al., 2012; Dickstein, Suvak, et al., 2010; Nash, et al., 2014). The absence of experimental designs precludes the unambiguous assignment of cause in these studies. Nevertheless, the use of interrupted time-series designs strengthens potential causal inferences, improves internal validity, and provides evidence against the possibility of alternate causes (Shadish, et al., 2002).

Regression to the Mean

Another possible alternate explanation is that post-adversity psychological improvement involves the inherent tendency of extreme scores to regress to the mean. Regression to the mean is a purely statistical phenomenon premised on an asymmetrical sampling of extreme scores of a single homogeneous population. Empirical and theoretical evidence suggest that reactions to acute stress do not conform to a single homogeneous population and are instead best understood as a mixture distribution (Bonanno, 2004; Bonanno & Mancini, 2012). As a result, extreme scores (such as elevated pre-event distress) do not represent the tails of the distribution but rather a distribution of their own. Even if acute stress responses did represent a single homogeneous distribution, regression to the mean is premised on underlying stability in pre- and post-test scores (that is, no real change). This premise is highly unlikely in the context of acute adversity. Finally, even if we relax the assumption of no change, a final key point is that regression to the mean can be precisely quantified assuming a normal distribution and a known correlation between observations at two time points. For example, given a correlation of .5 between a pre-

and post-test measure of an outcome (a relatively conservative criterion), a group of scores that is 1 standard deviation from the mean would be expected to show only a 50% movement toward the sample mean. In some cases, the degree of change observed in PGA approaches or exceeds two standard deviation units of within-person change (e.g., Burton, et al., 2015; Mancini, et al., 2016; Nash, et al., 2014) and would qualify as reliable and clinically significant, according to conventional standards (Jacobson & Truax, 1991).

Methodological Artifact

A final alternate explanation is that PGA does not represent a meaningful pattern but is instead a methodological artifact of trajectory analyses themselves. Although various trajectory methods have identified PGA, this potential artifact is most applicable to group-based latent trajectory analyses (Muthén, 2004; Nagin, 1999), an approach that has grown substantially in use across many disciplines (Jung & Wickrama, 2008). (Note that this concern is generic to trajectory analyses themselves and does not bear specifically on PGA.) The essential insight of group-based latent trajectory approaches is that groups of people can show different patterns of change over time, and these differences can be modeled when you allow for subpopulations with different growth patterns (Muthén, 2004). However, one important concern is that such analyses to over-extract trajectories because of non-normality in the underlying distribution for an outcome and not because of true sub-populations of individuals (Bauer & Curran, 2003). If this is the case, a given trajectory pattern solution could group individuals into arbitrary patterns, not meaningful ones (Bauer & Curran, 2003). A further concern is that the proportions of people grouped into a given trajectory can depend on modeling decisions, such as the degree to which the variance of the slope and the intercept are allowed to vary across individuals and trajectories (Infurna & Luthar, 2016).

How can these concerns be addressed in a trajectory analysis? Muthén (2003) argues that essential elements of a trajectory analysis are the presence of a) substantive theory that informs interpretation of the trajectory structure; and b) auxiliary information to support the meaningfulness and theoretical relevance of the observed trajectories. In terms of a), theorists have long offered explanatory frameworks for why people's responses to acute adversity should be heterogeneous (Belsky & Pluess, 2009) and should comprise distinct response patterns (Bonanno & Mancini, 2012). Moreover, the present article offers a theoretical explanation for why PGA is veridical. With respect to b), a variety of theoretically expected relationships have been observed in trajectory analyses of acute adversity, including the relationship of dependency and chronic grief (Bonanno, et al., 2002), just-world beliefs and resilience (Bonanno, et al., 2002), anger and chronic posttraumatic stress (deRoon-Cassini, et al., 2010), increases in social support and PGA (Mancini, et al., 2016), and conflictual marital relationships and PGA (Bonanno, et al., 2002; Schulz, et al., 2001). In sum, although methodological artifacts are critical to bear in mind when conducting trajectory analyses, it is unclear that they offer a compelling alternative account of PGA.

Implications for Theory

Psychosocial gains have been hinted at in various theoretical frameworks, but these frameworks have focused on early life stress (e.g., the silver-lining of adversity; Seery, 2011), training effects of stress on physiology (e.g., toughening; Dienstbier, 1989), the development of altruism (e.g., altruism born of suffering; Vollhardt, 2009), or the deleterious consequences of resource loss (e.g., conservation of resources; Hobfoll, 1989). Another relevant body of research has explored the positive consequences of pain, underscoring the ironic effects of negative experiences and their contribution to social cohesion (Bastian, Jetten, & Ferris, 2014; Bastian,

Jetten, Hornsey, et al., 2014).

Nevertheless, our understanding of psychosocial gains after adversity is substantially circumscribed. One important goal of the present article, therefore, is to draw attention to PGA as a veridical response to acute adversity, to encourage a broader theoretical conceptualization of the human stress response, and to stimulate research focused on improvement after acute stress. What follows are some implications of the present analysis for theory and empirical research on PGA after potential trauma.

A “Valence-Neutral” Theoretical Perspective on Trauma

A central claim of the present proposal is that putative “traumatic” events can have paradoxically favorable effects under some circumstances. Although this claim contradicts fundamental assumptions about trauma’s presumed uniformly negative effects, we can resolve this apparent contradiction by considering traumatic events as *perturbations* in a person’s current state of functioning. I call this a “valence-neutral” perspective, because a perturbation can allow for both positive and negative change, each of which is possible depending on the current state of the individual and other factors. On epistemological grounds, we cannot know the valence of a given experience for a given individual, because this valence is subjectively determined by the person. Painful experiences, for example, can be experienced as pleasurable (Bastian, Jetten, Hornsey, et al., 2014). Even the extreme stress of combat can result in substantially different affective responses in the moment, with some experiencing exhilaration and others profound apprehension (see the documentary film “Restrepo” for a apt demonstration of this phenomenon; Junger & Hetherington, 2010). This is not to argue that acute adversity is, on balance, neutral in its impact. It is obviously more likely to result in negative emotional and other consequences, but more likely does not mean invariably. A valence-neutral perspective underscores that

presumably negative environmental forces can have unexpected effects, including positive ones, depending on the person those forces are acting upon and other aspects of the surrounding context.

However, not everyone is equally susceptible to influence. There are marked individual differences in this susceptibility, and some people's self-organization is more robust and thus more difficult to perturb (Belsky & Pluess, 2009). A common metaphor used in dynamic systems theory is that of a basin and a ball, with the basin representing a particular organization and the ball representing our current state (Thelen, 1989). Stable organizations are represented by deep basins in which it is more difficult to dislodge the ball into a new organizational state. By contrast, less stable organizations are represented by shallow basins in which the ball is more easily dislodged into an alternate organizational state. Consequently, among some people, a pathological state may be more easily dislodged into a healthy one or vice versa. In short, some people will be more susceptible to adversity than others, in both positive and negative ways, and this individual difference may explain why some distressed people improve after acute adversity whereas others remain mired in a syndrome of continuous distress (see Mancini et al., 2016 for evidence supporting this perspective). Consistent with this perspective, some recent work suggests that personality change occurs as the result of short-term situational forces that interact with dispositional tendencies (Wrzus & Roberts, 2017)

Theories of Social Support: Buffering and “Bolstering”

Another theoretical implication of the present proposal concerns the role of social support in buffering stress (Cohen & Wills, 1985). Stress buffering occurs when people draw on close relationships to ameliorate that stress (Cohen, 2004). Although the buffering perspective has substantial empirical support (Uchino, Cacioppo, & Kiecolt-Glaser, 1996), one key implication

of the present proposal is that adversity shapes the social environment itself. Not only do people actively regulate social relationships according to their needs, but under conditions of acute stress, they should inherently seek to increase their stock of social resources (Taylor, 2006). This implies that social support does not just buffer stress; it should also be “*bolstered*” in times of stress. Indeed, people who respond to stress with prosocial behavior substantially reduce its negative impact (Raposa, Laws, & Ansell, 2016).

Some component of the buffering effect of social support is likely then attributable to a changed social environment. My colleagues and I found that pre-shooting perceptions of social support increased across the sample exposed to the Virginia Tech Campus shootings, but these increases were not apparent when participants with poor adjustment were considered separately (Mancini et al., 2016). This implies the capacity to enlist social resources is a coping capacity unto itself. In line with this possibility, one recent study found that as we become aware of supportive resources, such as group membership, our willingness to report distressing experiences (i.e., pain) increases at the same time that our subjective experience of it decreases (Ferris, Jetten, Molenberghs, Bastian, & Karnadewi, 2016), suggesting that we can benefit inherently from eliciting support. However, it could also be theorized that this capacity is best applied flexibly, so that we expand and contract our social overtures according to the specific contexts we find ourselves in (Bonanno & Burton, 2013). Excessive reassurance seeking under stress, for example, can easily become maladaptive, as it does among people who are high in attachment anxiety. Nevertheless, there are obvious reasons to think that a general tendency to increase affiliative behavior is adaptive under stress (Taylor, 2006).

A Preliminary Research Agenda for Psychosocial Gains from Adversity

A richer and more contextually bound understanding of the human stress response has been substantially constrained by methodological and conceptual limitations in our existing database on acute adversity. What follows are some suggestions for future research that would advance our understanding of PGA and help to rule out alternate explanations of it.

Prospective Naturalistic Designs

The primary limitation of the overwhelming majority of trauma research is the absence of a pre-event assessment. Despite the practical difficulties of obtaining such assessments—acute adversity is usually sudden and unexpected—it is startling, in the broad scope of the scientific literature, to see just how rare prospective designs are. In a comprehensive review of the disaster literature, Norris and colleagues (Norris, et al., 2002) found that only 7 of the 160 studies they examined included prospective or pre-event data. A clear imperative for a better understanding PGA, as well as the full range of responses to acute adversity, is an increased attention from funders and scientists to prospective research. Indeed, the only way to better understand PGA is to create the methodological conditions that allow us to identify it.

One way to remedy this problem is through panel designs in which large representative samples are repeatedly assessed at regular intervals. A number of the prospective studies reviewed here employed just such a panel design, allowing researchers to follow people who experienced unanticipated acute stressors such as bereavement, divorce, or life-threatening illness. Nevertheless, panel designs possess important limitations. They typically have year-long intervals between assessments, are not yoked to a marker event, employ brief assessments that are psychometrically less sound, and do not include biological, neurobiological or genetic assessments. One way to remedy these limitations is to increase the frequency and comprehensiveness of assessments, so that instead of being conducted once a year they are

conducted two, three or even four times yearly. Although this would require more resources, the benefits would be considerable in mapping patterns of adaptation over time.

A key point is that panel designs can be leveraged to address the rival alternate explanations identified in the present article. One way to improve research using panel data is to construct control (or comparison) groups that are roughly equivalent to the exposed group. A control group would strengthen internal validity and address alternate explanations of PGA, such as regression to the mean or a methodological artifact. It would also help to rule out other causes. An interesting application of this approach would be to separately model exposed and control groups in a latent trajectory framework, such as latent growth mixture modeling, latent class growth analysis, or semi-parametric group modeling. The prediction would be that theoretically anticipated patterns would emerge in the exposed but not the control group. Considered together, these suggestions point to a kind of gold standard for research on acute adversity. This gold standard would include: a pre-event assessment, a proximal post-event assessment, at least one additional follow-up, and a well-matched control group. Unfortunately, studies that include all of these design features are extremely rare.

Positive Functioning after Acute Adversity

For sound reasons, prior research has focused on clinical symptomatology. But this focus has come at a cost. Indeed, excluding assessments of posttraumatic growth, which are retrospective assessments of functioning, rarely has the impact of acute stress on positive aspects of functioning been examined from before to after adversity. This suggests that future prospective research designs should expand the range of outcomes that are typically assessed to include positive functioning. One focus should be social functioning as a repeated measures outcome in its own right, including perceptions of social support, perceptions of trust, and

embeddedness in a social network. Another focus should be well-being, including life satisfaction, meaning in life, and positive emotions (Ryff & Keyes, 1995). In my lab, we are currently exploring change in social variables using a large prospective dataset before and after Hurricane Sandy. Another priority is to examine the covariation of social variables and psychological functioning. For example, it would be of interest to use cross-lagged panel designs to examine the prediction that change in social variables should precede improvements in both positive and negative aspects of psychological functioning.

A critical further step is identifying the circumstances under which these adaptive psychosocial gains are most likely. To do that requires examining potential moderating influences, including but not limited to the moderators described here. A number of research strategies can be used to address these moderating influences. For example, to address structural intactness, social network approaches can be used to detect changes in the structural availability of close relationships and their impact on well-being (Christakis & Fowler, 2009). To address neighborhood effects, multi-level analyses can employ cross-level interactions that test, for example, whether neighborhood characteristics moderate individuals' psychosocial functioning after adversity. To examine the possibility that direct interpersonal violence renders psychosocial gains unlikely, longitudinal epidemiological approaches could compare whether event type (direct interpersonal violence versus mass trauma) moderates pre-event and post-event measures of social variables. Finally, to address the possibility that susceptibility to the environment moderates psychosocial gains after acute adversity, various measurement strategies and research designs could be employed. One way of operationalizing susceptibility to the environment is genetic markers (e.g., the 5-HTTLPR short allele). Another is self-report measures of reactivity, such as neuroticism, dispositional fearfulness, or anxiety (Lengua, 2008). One prediction would

be that acute adversity's potentially beneficial effects would be enhanced among those with higher susceptibility to the environment. This could be tested in longitudinal designs of acute adversity using standard regression techniques. It also could be tested in group-based latent trajectory analyses of acute adversity in which an index of susceptibility is used as a predictor of the trajectory pattern.

Experimental Investigations of Theory-driven Mechanisms

The mechanisms of PGA can also be studied in the laboratory using experimental techniques. Laboratory research permits random assignment, pre-study measures (similar to a prospective design), and experimental manipulation. This combination of design features is not possible in naturalistic studies of acute adversity. Another obvious advantage is that causal mechanisms can be directly examined (Campbell & Stanley, 1963), putting theoretical postulates to the test, while hewing to newly evolving standards for the conduct of research (Simmons, Nelson, & Simonsohn, 2011).

One theoretically relevant target of an experimental research program on PGA is self-focus, which can be operationalized as rumination. By enhancing affiliative tendencies, acute adversity plausibly disrupts self-focus (ruminative preoccupations), increases other focus, and, through that mechanism, promotes PGA. This proposal is readily tested in an experimental framework. For example, rumination inductions in which people are asked to focus on how they feel and on their personal characteristics have been widely used in research (for a review, see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Future research could explore the potential of laboratory stressors to reduce awareness of high level generalized aspects of the self and thus promote mood repair among those with a high degree of pre-existing self focus (Bastian, Jetten, Hornsey, et al., 2014). Consistent with the proposal here, analogue stressors, such as a trauma

film, could be used to test the possibility that such stimuli improve mood by activating affiliative instincts and distracting from repetitive self-focused cognitions. A similar approach could be used with social pain manipulations, which can reduce aspects of self-focus and increase awareness of others (Durlak & Tsakiris, 2015; Hess & Pickett, 2010).

Another target of future research, currently being explored in my lab, is the possibility that the impact of acute adversity is embedded in shared or solitary experience. Although historical evidence suggests that group cohesion, trust, and cooperation are increased after a shared trauma (Solnit, 2010), programmatic experimental research has been limited. Indeed, given that various sources of evidence suggest that stressful experiences enhance cooperativeness and trust, it would be informative to assess whether these effects are modified by shared or solitary experiences of stress. For example, feelings of humiliation after an initiation rite are enhanced when experienced individually and reduced when experienced in a group, an effect mediated by expected support from co-initiates (Mann, Feddes, Doosje, & Fischer, 2016). These findings suggest that our experience of stress is embedded in a social context. One way of examining the role of shared stressful experiences is to randomize participants to experience an analogue stressor either in a group or individually and then assess its impact immediately following the stimuli and in the week that follows. This procedure could also assess whether shared experience ameliorates negative mood among dysphoric participants but not among non-dysphoric participants, a hypothesis suggested by the present analysis. Note that recent evidence suggests that negative and positive experiences are accentuated when they are shared with others (Boothby, et al., 2014). But this accentuation in itself may be salutary in the context of disrupting self-focused concerns.

Concluding Thoughts

An implicit question raised by the present analysis is why PGA has been essentially ignored. One explanation is the tendency of a dominant paradigm to inhibit the development of new ideas (Kuhn, 1962). A traditional trauma perspective on acute adversity has understandably focused on the presumed substantial and negative impact of acute adversity. Even posttraumatic growth extends conventional ideas about acute adversity's uniformly traumatizing effects, because growth is presumed to result from having been traumatized. Although both perspectives have had difficulty accounting for anomalous findings (for example, the common prevalence of resilience to trauma; the failure of perceived growth to correspond with actual growth), dominant paradigms are difficult to dislodge (Kuhn, 1962). As a result, PGA, even when found, is typically ignored, because few explanations exist for it to occur. Another reason that PGA has been ignored is the inherent difficulty of identifying it. Acute adversity often strikes suddenly and without warning. This simple fact has severely constrained our ability to study it. Indeed, the extent to which psychological theories are shaped by our ability to study them has almost certainly been underestimated.

Enormous progress has been made in understanding acute adversity's impact on human being's functioning in the last few decades. Early emphases on psychopathological outcomes, driven by an understandable focus on clinically significant distress, have given way to a growing recognition of human beings' impressive capacity to withstand and even thrive after acute and highly disruptive experiences (Bonanno, 2004). However, as our knowledge base has grown, besetting methodological and conceptual limitations have resulted in a picture that is askew. The present review proposes that a fuller understanding of the human stress response demands consideration of the potential salutary effects of acute adversity, however paradoxical such a position may seem at first glance. The present proposal questions the assumption that acute

adversity (or trauma) is invariably damaging and outlines the ways in which it can stimulate improved psychological health. Moreover, the present review provides an additional explanatory lens for better understanding the ebb and flow of depressive and anxiety symptoms and their relationship to the social context. Indeed, the novelist George Eliot once described these effects as “the remedial influences of pure, natural human relations.” More research on PGA as a legitimate response to acute stress is an important priority, helping to shed light on the sometimes surprising beneficial consequences of acute adversity and the ways we can help human beings to realize them.

Endnotes

¹However, this does not preclude some level of cognitive awareness. For example, identity management processes are implicated in stress responses and would often involve conscious awareness. One result is that acute adversity may provide a respite from abstract self-focused concerns, replacing them with more immediate low-level sensory ones (Bastian, Jetten, Hornsey, et al., 2014). In the process, acute adversity may thus have the ironic effect of allowing new representations of the self to emerge, including those that involve conscious awareness of others' needs or conscious virtue demonstration motives, both of which could impel people to seek affiliation and opportunities for helping (see Bastian et al., 2014 for an interesting discussion of these processes).”

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Table 1.

Summary of Prospective Trajectory Studies of Acute Adversity

Author (year)	<i>N</i>	Stressor type	Analysis type	Outcome	Time-points (before + during + after)	Time lag (marker event to final follow-up)	<i>K</i> trajectories (<i>k</i> improved)	Improvement yes/no (%)
Andersen et al. (2012) _a	561	Military deployment	LGMM	PTSD symptoms	6 (1+0+5)	2.5 years	6 (1)	Yes (7.5%) "symptom fluctuating" [†]
Berntsen et al. (2012) _a	746	Military deployment	LGMM	PTSD symptoms	5 (1+1+3)	7 months	6 (2)	Yes (7%) "late benefit"; ^{††} (4%) "mild benefit" ^{††}
Bonanno et al. (2012)	3,393	Military deployment (single deployment)	LGMM	PTSD symptoms	3 (1+0+2)	6 years	4 (2)	Yes (8%) "moderate-improving"; [†] (2.2%) "high-improving" [†]
	4,394	Military deployment (multiple deployments)	LGMM	PTSD symptoms	3 (1+0+2)	6 years	4 (1)	Yes (8.5%) "moderate-improving" [†]
Bonanno et al. (2002) _b	205	Bereavement	MCSD	Depression symptoms	3 (1+0+2)	18 months	5 (1)	Yes (10.2%) "depression-improvement" ^{††}
Burton et al. (2014)	1,294	Cancer	LGMM	Depression symptoms	4 (1+0+3)	6 years	4 (1)	Yes (7.8%) "depressed-improved" [†]
Dickstein et al. (2010)	635	Military deployment	LCGA	PTSD symptoms	4 (1+ 2 + 2)	9 months	4 (1)	Yes (9%) "unrealized anxiety" [†]
Eekhout et al. (2016)	1,007	Military deployment	LGMM	PTSD symptoms	6 (1+0+5)	5 years	3 (0)	No

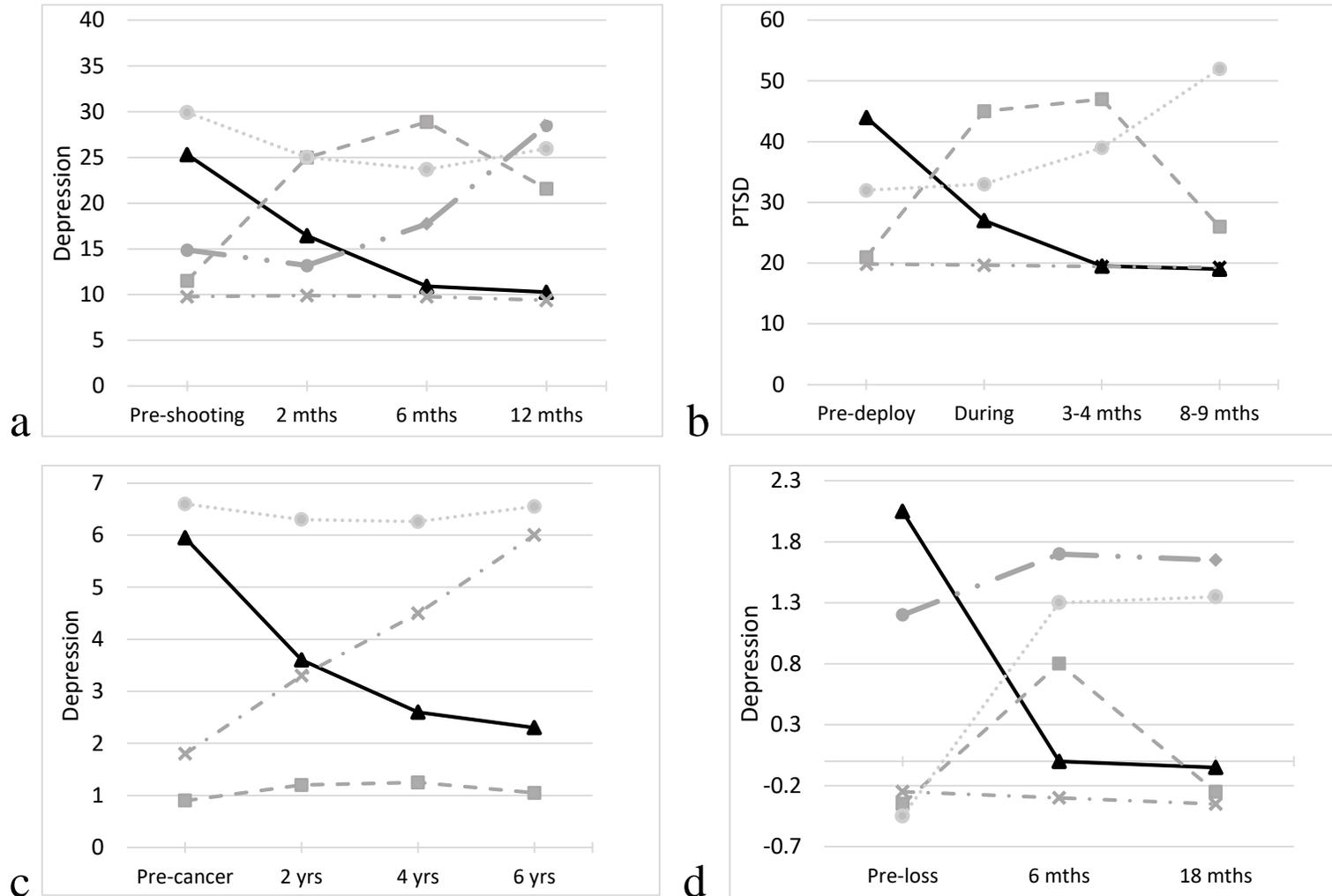
Galatzer-Levy et al. (2014)	2,147	Myocardial infarction	LGMM	Depression symptoms	5 (2+0+3)	4 years	4 (1)	Yes (6.8%) "depressed-improved" [†]
Galatzer-Levy et al. (2011) _b	301	Bereavement	LGMM	Depression	4 (1+0+3)	4 years	4 (1)	Yes (10.1%) "depressed-improved" [†]
Infurna & Luthar (2016) _c	1,214	Bereavement	LGMM	Life satisfaction	11 (5+1+5)	5 years	a. 3 (1) b. 2 (0) c. 2 (0)	a. Yes, (5%) "improvement" [†] b. No (second analysis) c. No (third analysis)
Infurna & Luthar (2016)	421	Bereavement	LGMM	A. Life satisfaction; b. positive affect; c. negative affect; d. general health; e. physical functioning	11 (5+1+5)	5 years	a. 2 (0) b. 3 (0) c. 2 (0) d. 2 (0) e. 3 (0)	No
Lowe et al. (2013)	386	Hurricane	LCGA	General psychological distress	3 (1+0+2)	4 years	6 (2)	Yes (3.9%) "decreased distress"; [†] (3.2%) "improved" [†]
Mancini et al. (2011) _c	464	Bereavement	LGMM	Life satisfaction	9 (4+1+4)	4 years	4 (1)	Yes (5.4%) "improved" [†]
	629	Divorce	LGMM	Life satisfaction	9 (4+1+4)	4 years	3 (1)	Yes (9.1%) "low-increasing" [†]
MaCallum et al. (2016)	2,512	Loss of a spouse or child	LGMM	Depression symptoms	4 (1+0+3)	6 years	3 (1)	Yes (9.2%) "depressed-improved spouse"; [†] (11.2%) "depressed-improved child" [†]
Malgaroli et al. (2017)	559	Divorce	LGMM	Depression symptoms	4 (2+0+2)	8 years	3 (1)	Yes (11%) "decreasing depression"; [†]

Mancini et al. (2015)	368	School shooting	LGMM	Anxiety symptoms	4 (1+0+3)	12 months	4 (1)	Yes (13.2%) "improvement" [†]
				Depression symptoms	4 (1+0+3)	12 months	5 (1)	Yes (7.4%) "improvement" [†]
Nash et al. (2014)	867	Military deployment (high combat)	SOGMM	PTSD symptoms	4 (1+0+3)	8 months (1 month)	3 (1)	Yes (9.4%) "pre-existing PTSD symptoms" [†]
				PTSD symptoms	4 (1+0+3)	8 months	2 (1)	Yes (9.0%) "pre-existing PTSD symptoms" [†]
Orcutt et al. (2014)	660	School shooting	LGMM	PTSD symptoms	7 (1+0+6)	31 months	4 (0)	No
Osofsky et al. (2015)	4,619	Oil spill and hurricane	Cluster analysis	PTSD symptoms	4 (1+0+3)	31 months	4 (1)	Yes (21%) "decreasing" ^{††}

Note: Studies that share a subscript employ overlapping (non-independent) samples. [†]Improvement trajectory (yes/no) determined on the basis of a significant linear growth parameter that represented improved functioning from pre- to post-event. ^{††}Improvement (yes/no) determined on the basis of descriptive statistics and/or visual inspection because no growth parameter was tested or reported. LGMM = latent growth mixture modeling; LCGA = latent class growth analysis; MCSD = mean change and standard deviation; SOGMM = second order growth mixture model

Figure 1.

Illustrative examples of improved functioning after adversity.



Note: PGA pattern in **bold**. Mths = months. Yrs = years. a) mass shooting (7.4%; based on Figure 1., Mancini et al., 2016); b) military deployment (9%; based on Figure 1., Dickstein et al., 2009); c) cancer (7.8%; based on Figure 1., Burton et al., 2014); d) bereavement (10.2%; based on Figure 1., Bonanno et al., 2002).

Figure 2.

Theoretical model of psychosocial gains from adversity.

