Past Adversity Protects Against the Numeracy Bias in the Face of Numerous Suffering Targets

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Abstract of Dissertation

Past research has suggested that one problem with compassion is its seeming resistance to scale appropriately to the number of targets in distress. This insensitivity to numeracy results in people dampening compassion when faced with mass suffering. Given that emerging evidence suggests that experiencing adversity in life may foster compassion and a general prosocial orientation, we explored whether those who have experienced greater adversity show resistance to a numeracy bias that leads to compassion collapse. In a series of three experiments, we demonstrate not only that those who have experienced greater past adversity readily overcome the numeracy bias in compassion, but also that beliefs regarding their ability to help others underlie this link. Of import, we also show that direct manipulation of such efficacy beliefs can remove the numeracy bias in compassion typically found among those who have not endured significant life adversity.
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Chapter 1: Introduction

Compassion is a powerful moral emotion capable of driving decisions and behaviors aimed at alleviating the suffering of others (DeSteno, 2015; Goetz, Keltner & Simon-Thomas, 2010). Unfortunately, however, its emergence in people does not always seem to be objective or logical. As one example, compassion and its precursor of empathy can be parochial in nature, often arising more frequently toward people with whom we share some affiliation than toward others even though, objectively speaking, their plights might be the same (Bloom, 2016; Bruneau, Cikara, & Saxe, 2017; Valdesolo & DeSteno, 2011; Zaki & Cikara, 2015). For instance, at a fundamental level, it seems that self-other similarity between the benefactor and beneficiary is paramount for prosocial behavior to arise (Cialdini, Brown, Lewis, Luce, & Neuberg, 1997; Maner et al., 2002; Valdesolo & DeSteno, 2015) which may be a source of bias when we have to decide to help someone or not. As Zaki and Cikara (2015) had pointed out, the lack of empathy towards those who are dissimilar to us can lead to feelings of callousness, and indifference towards others who are part of an outgroup even in situations where care and aid is much warranted. In some cases, the failure to empathize with the outgroup can lead to the inverse of prosociality as we might choose to ignore, marginalize, or even take pleasure in the suffering of an outgroup member (i.e. schadenfreude). Such inability to empathize can not only bring about unfair moral decision making but also initiate and exacerbate intergroup conflicts (Bruneau, Cikara, & Saxe, 2017).

On the other hand, many have suggested that compassion is limited in its ability to address mass suffering, as it tends to show a numeracy bias such that it does not scale appropriately in accord with the number of people in need. As a result, people frequently experience a disproportionate amount of compassion to a single suffering individual relative to
scores of suffering victims that are part of a larger tragedy (Cameron & Payne, 2011; Slovic, 2010; Small, Loewenstein, & Slovic, 2007). As such, some scholars argue that empathy is not a fair nor rational emotion in guiding our moral actions as it drives a propensity to focus on a select few individuals who are salient to us which leads to an inefficient distribution of aid towards the masses who require help (Bloom, 2016).

Despite these barriers to compassion, there are reasons to believe that not everyone will be limited by them and remain a bystander in the face of larger-scale suffering of others they do not know. One recent hopeful endeavor can be seen in the example of the Cajun Navy – a group of individuals who survived the ravages of Hurricane Katrina in Louisiana and then came to the aid of the citizens of Houston during the flooding caused by Hurricane Harvey (Plott, 2017). However, it is worth noting that such an act of collective kindness is not just a single improbable occurrence. In fact, studies of disaster-stricken establishments show that individuals often band together to form “altruistic communities” that are characterized by mutual helping and cooperation (Kaniasty & Norris, 1995). As such, it may be the that one factor capable of enhancing the compassion people feel for others in the face of greater suffering may involve having had a previous brush with suffering themselves. That is, having successfully faced previous adversity in life might enable people to extend their compassion more readily and, thereby, make them more resistant to the numeracy bias that typically characterizes compassion and can lead to its collapse.

Chapter 2: Adversity, Compassion, and Prosocial Growth

Adversity is often associated with negative psychological phenomena as one is likely to reason that suffering and hardship are likely to bring about negative downstream consequences such as the impairment of psychological and social functioning. As such, it is no surprise that
there is a large body of research examining adversity’s lasting effects, linking it to psychopathology and other maladaptive tendencies, including major depression, posttraumatic stress, and related affective disorders (McCloskey & Walker, 2000; Monroe & Harkness, 2005; Kelleher et al., 2008). Based on a well-establish body of research, one might intuitively infer that the pain and suffering associated with adversity may also reduce individuals’ capacity for empathy; thereby, inhibiting behaviors meant to alleviate the distress of suffering others.

Beyond direct associations with psychopathology, it is often posited that some individuals who had a brush with adversity develop negative perceptions of people and the environment around them. While those who are free from past trauma tend to hold beliefs that the world is just, meaningful, and benevolent, those who were exposed to adverse life events often exhibit a diminished belief in a benevolent or meaningful world characterized by virtue (Janoff-Bulman, 1992). In one instance, Poulin (2006) found that exposure to violence-related events predicted a subsequent decrease in benevolence beliefs. That is, those who had traumatic experiences of being victimized were less likely to harbor humanistic beliefs that the world around them and the people at large are benevolent. In support of this notion, Blum, Silver, and Poulin (2014) conducted a study that demonstrated an association between frequent exposure to different types of negative life events (e.g. illness, violence, victimization, disasters) and altered risk perception. They found that individuals were more likely to perceive an increased likelihood of hazards occurring for oneself, to a close other, or to their community within a two-year period after the onset of negative life events. They suggested that these altered perceptions of increased risk can be attributed to a reduction in benevolent beliefs.

Along the same lines of investigation (Franklin, Janoff-Bulman, & Roberts, 1990), found that injury and illness related adversity predicted decreases in meaningful beliefs. That is, those
who have suffered much, by way of physical and mental ailments, tend to perceive that life has no meaning or purpose. Similarly, others have found that children who have experienced parental divorce were pessimistic about their future relationship outcomes with their partners and that these pessimistic views were tied to their assumptions about people and their lack of benevolence. In addition to the aforementioned finding, the same researchers found that trust beliefs of these children were diminished when they experienced continuous conflicts within their families (Franklin, Janoff-Bulman, & Roberts, 1990).

Despite the well-documented ill effects of adversity on social functioning, other researchers have found that psychological dysfunction is not always the normative outcome of adversity. In fact, there is a growing body of research to suggest there is much heterogeneity with regards to how individuals respond to potentially traumatic life events. More interestingly, some researchers have found that majority of individuals were able to demonstrate resilience in the face of adversity – 40% to 70% of individuals either show no signs of psychological dysfunction or exhibit rapid recovery upon the onset of potentially traumatic events (Bonanno, 2004; Bonanno & Diminich, 2013).

Even more to the contrary, some have found evidence that attests to adversity’s potential to spur positive growth in social functioning on both an interpersonal and intrapersonal level. For instance, a review of 39 empirical studies revealed that individuals can experience positive changes in the form of increased resiliency and coping towards subsequent stressors (Linley & Joseph, 2004). Moreover, it was observed that as people experience adversity they reported better mental health and well-being related outcomes. However, the nature of this relationship is curvilinear as people who have suffered moderate amounts of life adversity were more likely to report resiliency as opposed to those who had suffered little or severe levels of adversity (Seery,
Holman, & Silver, 2010). While these findings are in no way meant to suggest that experiencing suffering or tragedy can be a good thing for anyone, it does suggest ways in which the mind attempts to adopt strategies meant to help people rebuild their lives and strengthen their relationships. For instance, some qualitative studies have established the notion that social, and intrapersonal growth are possible following experiences of adversity, and can be broadly classified into four categories: (1) changes in self-perception (the ability to feel, express, and process feelings within the self, recognizing one’s own strengths and weaknesses), (2) gaining new perspectives on life (positive changes in worldviews, acceptance of the past and present), (3) changes in relationships (improvement in interpersonal relations), and (4) changes in philosophy of life (Woodward & Joseph, 2003). Moreover, studies that examine medical patients who have had near-death experience found that they have positive changes in the way they relate to others as they report to have greater compassion for others, a better sense of closeness to others, and are willing to put more commitment in building relationships (Royse & Badger, 2017). Such findings suggest that experiences with adversity can alter the way we relate to others in a more positive, and altruistic way. Some posit that this growth is possible because adversity, in itself, challenges the assumptions we have about the world and the people around us. Therefore, episodes of adversity would allow us the opportunity to re-evaluate and redefine our fundamental tenets in life, including the way we relate with other people (Felix et al., 2015; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012).

On the other hand, studies on disaster-struck communities have provided more direct evidence to demonstrated that disaster-affected individuals are likely to become more cooperative. As Kaniasty and Norris (1995) show, exposure to disasters is a primary predictor of offering social (e.g. assurance, affection, and closeness), tangible (e.g. money, and shelter), and
informational (e.g. situational information, and aid-related information) support to others in need. More specifically, they found that members of the community who experienced greater losses and harm during the disaster were more likely to provide social and material support to their community. It was theorized that this increased need to be prosocial, as a function of the severity of adversity experienced, served to enhance preservation and recovery of psychological and material resources that are adaptive to the situation. In line with this reasoning, other studies have found that individuals who were involved in such post-disaster “altruistic communities” continue to be more likely to report feelings of interpersonal connectedness, a greater sense of community, and more trusting attitudes towards other people in general (Barton, 1969; Giel, 1990).

In the same vein of the work done by Kaniasty and Norris (1995), a more recent study found that young children who were affected by major natural disasters (i.e. earthquakes) have an increased tendency to affiliate with others (Vezzali, Drury, Varsari, & Cadamuro, 2015). Upon further investigation, it was revealed that children who were affected by a common stressor in disaster-stricken communities had a sense of psychological closeness to other children within the community. As such, the children of such disaster-stricken communities perceived themselves to be part of a common group which fostered a sense of self-other similarity. This sense of self-other similarity, in turn, predicted affiliative behavior (i.e. intention to befriend, and reach out to others) and prosocial intentions towards other children (i.e. sharing, and cooperative behavior).

Taken together, these findings on disaster-stricken communities suggest that experiences of adversity could increase one’s propensity to engage in prosocial actions that strengthen the social cohesion and likelihood of reciprocal support within a community.
Similarly, victims of sexual assault were also likely to be more prosocial towards others, especially towards other victims of sexual assault (Barnett, Tetreault, & Masbad, 1987). It was suggested that these sexual assault victims reported more empathic responses to a rape victim whose account was presented on a video recording than did women who had not experienced such assaults. It was proposed that this increase in empathy was mediated by perceived self-other similarity which suggested that individuals who have undergone adversity may have increased prosociality when they are able to relate to the suffering of others with their own prior experiences of suffering.

In related work which examined the altruistic proclivities that may arise from past suffering, Vollhardt and Staub (2011) found that individuals who had experienced at least one traumatic life event were more likely to participate in charitable activities (e.g. fundraising, environmental or animal rights movements). Such individuals were also more likely to experience empathy and engage in prosocial behavior toward outgroup members in need (i.e. victims of a tsunami event in Asia). The boost in prosociality associated with past suffering was mediated by increased empathy which accentuated one’s prosocial attitudes. Moreover, past suffering was associated with a reduction of one’s ingroup bias which increased the likelihood of helping an outgroup stranger.

Guided by this prior work, Lim and DeSteno (2016) conducted a set of studies to examine the links between adversity, empathy, compassion, and prosociality in the general population. In the first study, an online population (Amazon’s Mechanical Turk) was sampled to maximize external validity as the Mechanical Turk population was more diverse in age, and social economic status when compared to college convenience sample (Buhrmester, Kwang, & Gosling, 2011). Participants answered a series of self-report measures on their trait levels of
empathy, and compassion alongside a checklist that measured the level of adversity they have accumulated during their lifetime so far. The adversity checklist was broad and captured adverse life experiences across six broad domains: (1) illness and injury (e.g. injury and illness to the self and close others), (2) victimization (e.g. physical and sexual assault), (3) bereavement (e.g. death of a family member or friend), (4) relationships (e.g. divorce, forced separation), (5) social-environmental (e.g. financial hardship, discrimination), and (6) disasters (man-made and natural disasters). In addition, each of these adverse life events were examined on three levels: (1) frequency (i.e. how often an individual experienced the events), (2) recency (i.e. how recent they have last experienced an episode of a potentially traumatic event), and (3) severity (i.e. to what extent the potentially traumatic events had affected their lives). Lastly, at the very end of the study before the participants were debriefed, participants were given the option to donate up to a dollar of their compensation to the American Red Cross in increments of 25 cents. By way of structural equation modeling, it was found that individuals who have suffered severely in the past were more concerned with the welfare of others via increase empathic concern, and were more ready to take the perspective of suffering others. In other words, those who have experienced major events of adversity in the past seem to be more empathic at a trait level. This increased empathy, in turn, predicted greater dispositional compassion (i.e. the tendency to alleviate the suffering of others) which is positively associated with the amount donated to the American Red Cross.

To take this finding a step further, Lim & DeSteno (2016) replicated these results in a controlled experiment in the laboratory using a confederate-based paradigm of measuring prosocial behavior. Participants of this study were basically brought into the lab to complete a series of tasks with a confederate pretending to be another participant. The confederate was
assigned a laborious and time-consuming task during this study while pretending to be ill. The participants, who had prior knowledge that the confederate was not feeling well, were then given the opportunity to share the workload of this confederate. The amount of time the participant spent helping the confederate was recorded and operationalized as a measurement of prosocial behavior. Once more, by utilizing structural equation modeling, results from this study suggest that those who had suffered severely in the past were higher in trait empathy (empathic concern and perspective-taking) and dispositional compassion. Moreover, the elevated dispositional compassion that resulted from increased empathy predicted more compassion in the moment when faced with a confederate in need. This heightened state of compassion was subsequently linked to more time spent helping the ill-feeling confederate (see Figure A. for a conceptualization of the model).

Across both online and lab-based studies, they found that increased severity of past adversities in life led to increased empathy (here defined by greater motivations to perspective take and express concern for the suffering of others), which mediated feelings of compassion toward people in need, which then mediated engagement in costly efforts to help them. Of import, this work also demonstrated the generality of the effect. All types of adversity were found to enhance compassion and helping behavior. That is, people were not more likely to feel compassion only toward others who were suffering from a similar malady or tragedy.

However, on the contrary, recency of adverse life experiences (i.e. how recently one had experienced an adverse life event) was negatively associated with empathic concern and perspective taking. Moreover, there was no association between recency of adverse life experiences with charitable giving or dispositional compassion. This finding is theoretically sound as individuals who have recently experienced adversity are more likely to be preoccupied
with their own distress. That is, recent adversity would likely have individuals prioritize their own psychological, and material resources to their own coping efforts. As such, they might be less inclined to engage in empathy as vicarious emotional responding to suffering others might be overwhelming to individuals who are in a psychologically depleted state. Even if these individuals decided to exercise empathy in their already distressed and depleted state, they are more likely to fail and experience empathic overarousal instead which may lead individuals to focus on their own distress as opposed to the distress of others (Eisenberg et al., 1994; Hoffman, 1982).

Additional analyses of results suggested that the frequency of adversity was not linked with self-report measures of trait empathy (i.e. perspective taking or empathic concern). It also did not predict an increase in dispositional compassion (the tendency to alleviate the suffering of others) or charitable giving. This finding, however, does not preclude the possibility that frequency of adversity might facilitate prosocial behavior. It is entirely plausible that people who have suffered frequently might choose to help in other ways. That is, those who suffered often may choose to provide social or informational support instead of tangible material support. Moreover, the driving force behind such preferences for prosociality may not be driven by empathy but instead by other mechanisms such as self-other similarity or communal orientation (Staub & Vollhardt, 2008; Vezzali et al., 2015).

Taken together, this accumulating body of evidence indicates that experiencing previous adversity increases the tendency to respond compassionately to the suffering of others. This enhanced ability for compassion, in turn, raises the possibility that past adversity might also buttress individuals against the tendency to exhibit the numeracy bias when compassion is needed most: in the face of increased numbers of people in distress. Moreover, it is worth noting
that compassionate growth that results from adversity may only arise under certain conditions. We observed that it is not the frequency of which one suffers or the recency of one’s suffering, but the severity of the suffering that elicits positive compassionate growth. It may be the case that minor events of suffering, even if they happen frequently, are not powerful enough to change one’s worldview and their attitudes towards other people. Instead, it might be the severe episodes of hardship that have a meaningful impact on our lives which may ultimately alter the way we see the world and relate to others.

Chapter 3: Compassion Collapse: A Numeracy Bias

The numeracy bias, a phenomenon in which compassion is down-regulated as the number of its potential targets increases, is often referred to as “compassion collapse” (Slovic, 2007). It is precisely because of the pervasiveness of this phenomenon that charitable organizations typically find their most successful strategies for fundraising rely on focusing potential donors on the tragedy and pain experienced by one individual as opposed to the tragedy and pain of many (cf. Small & Loewenstein, 2003; Small, Loewenstein, & Slovic, 2007). Indeed, research has documented exposure to mass suffering can counterintuitively lead to the numbing of compassion (Cameron & Payne, 2011; Small & Loewenstein, 2003).

One theory put forth to explain the failure of compassion to scale in the face of mass suffering is the “identifiable victim effect,” which posits that individuals are more likely to alleviate the suffering of a single discernable person as opposed to a group of anonymous others (Kogut & Ritov, 2005; Slovic, 2007; Small, Loewenstein, & Slovic, 2007). One mechanism proffered for this effect is affective saliency. That is, observing a single identifiable sufferer may more easily evoke automatic emotional responses than would a group of sufferers about whom only statistical data are presented. In accord with this view, Small, Lowenstein, and Slovic
(2007) found that individuals who were presented with a single identifiable victim felt more sympathy toward the situation than did individuals who were presented with facts describing a greater number of victims about whom no personal information was supplied. As one might suspect, prosocial behavior was in line with reported feelings; participants donated more money to the single identifiable victim than to the group of anonymous victims even though that group, as a whole, consisted of more people in need. Apart from affective saliency, another complementary explanation for the collapse of compassion is *psychophysical numbing* which posits that as the number of suffering victims increase, our ability to appreciate their suffering and value their lives diminish. In fact, researchers who studied charitable giving have found that we are more likely to view our humanitarian efforts as more valuable when it benefited smaller proportions of individuals as opposed to larger suffering population (Fetherstonhaugh, Slovic, Johnson, & Friedrich, 1997)

An alternative explanation for the collapse of compassion put forth by Cameron and Payne (2011) suggests that compassion’s seeming insensitivity to numeracy may stem from motivational and self-protective concerns as opposed to ones involving decreased affective salience or ease of simulation. In a series of studies, Cameron and Payne (2011) demonstrated not only that compassion fails to scale with increasing numbers of victims only when people expect that they will be called upon to help, but also that its diminishment is better exhibited by those more skilled in emotion regulation. In addition, they also showed that the collapse of compassion among skilled regulators was reduced when these individuals were instructed to inhibit emotion regulation.

As a whole, the series of experiments conducted by Cameron and Payne (2011) supports the notion that the collapse of compassion can be attributed to emotion regulatory processes.
This account of compassion collapse as a motivated choice makes good sense given the sometimes aversive and costly nature of empathy and compassion. While many view compassion as a positive emotion in a neutral context, it is perceived as unpleasant by those who are in the midst of being exposed to suffering others (Condon & Barrett, 2013). Therefore, many people might prefer to avoid experiencing compassion in an effort to guard themselves against feeling emotionally overwhelmed and unable to make a difference by lending support. Indeed, recent work has clearly identified empathizing with others as an act people perceive to be costly and, if possible, to be avoided under normal circumstances (Cameron, Hutcherson, Ferguson, Scheffer, Hadjiandreou, & Inzlicht, 2017).

Taken together, these findings suggest that individuals who feel better equipped to deal with the suffering of others, and their own reactions to it, might not show a numeracy bias, but rather allow their compassion to scale appropriately. Based both on their own overcoming of past adversity and the established propensity of past adversity to enhance a willingness to feel and act compassionately (Lim & DeSteno, 2016; Staub & Vollhardt, 2008; Vollhardt & Staub, 2011), we theorized that those who have experienced greater adversity in life would show a resistance to the usual numeracy bias in the face of numerous targets in distress.

**Chapter 4: The Present Studies**

The studies presented here begin with a basic investigation of whether those who have faced past adversity in life are less susceptible to the numeracy bias in compassion. As noted above, we suspected that people who have experienced suffering in the past would scale their levels of compassion in accord with the magnitude of others’ distress. Accordingly, in the first study, we examined this question through adopting the paradigm established by Cameron and
Payne (2011), where we expected to find that the experience of adversity would moderate the degree of compassion felt toward single versus multiple targets.

If, as we suspect, people who have suffered in the past are less susceptible to the effects of the numeracy bias, the next set of studies were meant not only to replicate the basic finding, but to begin to explore potential explanations for the mediating mechanism. One promising candidate for such an effect would be the sense of efficacy people felt for alleviating the suffering of others. As research on human resilience has documented, a majority of people who have experienced adversity recover from it relatively unscathed (Bonanno, 2004; Bonanno & Diminich, 2012). In light of such findings, it is reasonable to assume that the majority of individuals who had experienced adversity were able to overcome it and develop adaptive ways of coping with the material, social, and emotional problems it caused (Seery, Holman, & Silver, 2010). Such successes, in turn, might endow these individuals with a greater sense of efficacy both in dealing with trying situations and in helping others to likewise overcome them. Indeed, the links of feelings of efficacy to help others has been shown in normal populations to predict greater charitable giving to multiple beneficiaries as opposed to single ones (Sharma and Morwitz, 2016). With this in mind, we planned to examine if past adversity enhances feelings of efficacy to be compassionate, and if so, whether such feelings mediate enhanced compassion toward multiple targets.

**Chapter 5: Study One**

To test the hypothesis that individuals who have suffered more severely in the past are less susceptible to the numeracy bias, we utilized a quasi-experimental design, crossing the severity of experienced life adversity (low vs. high) with exposure to single versus multiple individuals in distress. Following a procedure used by Cameron and Payne (2011), we presented
participants with a short paragraph describing the suffering that is afflicting children in the Darfur civil war conflict and noted that the participants would be offered an opportunity to help. After reading the paragraph, we had participants view the picture(s) of one child or eight children who were suffering due to the conflict. After viewing the image(s), we had participants rate their feelings towards the children before having them report the level of severity of any past adverse life experiences.

Method

Participants. Given the absence of a pre-existing effect size estimate to allow an informed calculation of power, we decided to recruit as many participants as we could with a goal of obtaining at least 20 per condition. In order to ensure that we had truly distinct subsets of participants with respect to past life adversity, we planned to use participants from the top and bottom thirds of the life adversity distribution found in our sample. Therefore, our recruitment goal was a minimum of 120 participants (which would result in approximately 80 for use after removing the middle third), as screening of the sample could not occur until all data were collected. We ultimately recruited one hundred and twenty-two students, which after a division into the top and bottom third, resulted in a sample of eighty-two students (40 men, 42 women; mean age = 18.73, range = 18 – 22, SD = 1.07),

Procedure. Data collection occurred in a lab equipped with individual cubicles containing desktop computers. Upon participants’ arrival, the experimenter collected informed consent before proceeding with a detailed briefing regarding instructions. During the briefing, participants were led to believe that the study concerned how feelings and attitudes could affect the perception of current world events. Following a paradigm used by Cameron and Payne (2011), participants were then randomly assigned via their computer to see and read about one or
eight suffering children who were affected by the civil war in the West Darfur region of Sudan. Prior to the presentation of information about and images of the child (or children), participants were informed via that they would be asked to report their willingness to make a monetary donation to help the depicted individual(s). Next, they were presented with the following paragraph:

“In the West Darfur region of Sudan, there has been a civil war raging for the past five years. The Sudanese government and allied militias have been in intense conflict with various rebel groups. This conflict has resulted in unchecked violence against civilians, who have been killed, abducted, or driven from their homes. These civilians suffer from malnutrition, unsanitary living conditions, and are at risk for a variety of deadly diseases such as malaria, dysentery, and cholera. Here is a picture of one child [eight children] from Darfur.”

Immediately after the paragraph was presented, the image of one child would be displayed on the screen for participants assigned to the single-victim condition and images of eight children would be simultaneously displayed for participants assigned to the multiple-victim condition. After the presentation of the images, participants were asked to rate their feelings towards the children. Finally, participants were asked to complete a measure of experiences with traumatic events that captured the severity levels of these past life events. Once these measures had been completed, the participants were debriefed and dismissed from the session.

**Measures**

**Compassion.** Feelings of compassion toward the child[ren] were assessed utilizing a nine-item self-report measure developed by Cameron and Payne (2011) (see supplementary materials). Responses were recorded using a nine-point Likert-type scale (1 = *Not at all* to 9 =
Extremely), and included items such as: “How sympathetic do you feel toward the child [children]”, “How compassionate do you feel toward the child [children]”, and “How important is it to you that this child [these children] whose picture(s) you saw not suffer?” The measure demonstrated excellent internal consistency in this sample (Cronbach’s $\alpha = .91$).

**Adverse Life Experiences.** To measure the severity level of adverse life experiences, we utilized a modified version of the Diagnostic Interview Schedule section on trauma that has been employed in past research in this domain (cf. Blum, Silver, & Poulin, 2014; Lim & DeSteno, 2016; Seery et al., 2010; see supplementary materials). There measure consists of 28 items that assess adversity people have experienced in six different domains: (1) illness/injury, (2) violence/victimization, (3) bereavement, (4) relationship events, (5) socio-environmental stressors, and (6) disasters. Within each domain, participants were asked to indicate the degree to which each type of adversity affected them using the following scale: 0 = *Never*; 1 = *barely*; 2 = *a little*; 3 = *moderately*; 4 = *severely*. Final adversity scores consisted of the mean across these responses.

**Results**

To determine whether past adversity moderated the typical numeracy bias in compassion, we conducted a 2 (Adversity: High vs. Low) X 2 (Number of Victims: Single vs. Multiple) ANOVA on participants feelings of compassion. Although the analysis revealed that there was no main effect of the number of victims, $F(1, 78) = 0.66, p = .42$, it did show a main effect for the severity of past adversity $F(1, 78) = 6.67, p = .012$. As expected, however, this main effect was entirely driven by the predicted interaction between the number of victims and severity of participants’ life adversity, $F(1, 78) = 4.60, p = .035$, partial $\eta^2 = .06$ (see Figure 1.).
Those who had experienced little adversity in life showed the typical failure of compassion to increase with the number of suffering victims \( t(39) = 0.87, p = .385 \). A Bayesian t-test provided anecdotal evidence for the null hypothesis, suggesting there was weak but inconclusive support for the notion that low adversity individuals did not differ in their levels of compassion between single and multiple suffering victims (Bayes factor = 0.65; effect size = 0.34; 95% High-Density Interval -0.20 – 0.95). However, the compassion felt by those who had experienced greater adversity increased significantly as a function of the number of victims, \( t(39) = 2.28, p = .028, d = 0.71 \). Indeed, when confronted with multiple victims, the compassion experienced by those higher in past adversity was significantly greater than that experienced by those lower in past adversity, \( t(45) = 3.78, p < .001, d = 1.10 \).

**Discussion**

These findings provide initial support for the hypothesis that people who have experienced greater levels of past adversity might show a resistance to the numeracy bias in compassion. As they make clear, such individuals accentuate their feelings of compassion in direct response to the number of targets they observed in distress. However, given the preliminary nature of this finding and limited observed power of .63, a replication of this finding with an appropriate level of power is warranted.

**Chapter 6: Study Two**

In study one, we found promising evidence to support the hypothesis that severity of past adversity fosters compassion towards mass suffering. Given that we now possessed an estimate of the effect size for the predicted interaction, we decided to conduct a replication using a sample that would afford increased power. In addition, we wished to examine a favored potential
mechanism that might underlie the ability of adversity to enhance compassion for multiple victims.

As noted, previous investigation of the numeracy bias suggests that participants’ beliefs about their ability to aid others might play a significant role in the amount of compassion they feel. For example, Sharma and Morwitz (2016) found that boosting individuals’ sense of self-efficacy for helping others subsequently led them to engage in more charitable giving toward multiple as opposed to single targets. Similarly, work by Cameron and colleagues demonstrated that increasing people’s beliefs about their efficacy to recognize other’s suffering caused them to engage in more compassionate responding (Cameron, Hutcherson, Ferguson, Scheffer, & Inzlicht, 2017). Given such findings, we suspect that beliefs regarding one’s efficacy to help others stands as a prime candidate for mediating the effects that we observed in study one. In other words, it may be the case that those who have suffered more severely in the past and come through the experience intact might perceive that they are more able to help others and alleviate their suffering (cf. Kaniasty & Norris, 1995; Sharma and Morwitz, 2016). Accordingly, they might allow themselves to feel appropriate levels of compassion based on the amount of suffering they perceive, rendering them less susceptible to the numeracy bias.

Method

Participants. Using the effect size of the predicted interaction obtained in Study 1, we determined via G*Power 3.1 that a sample size of 125 was required to obtain a power of 0.80 with alpha = .05. Given that our protocol again required selection of participants scoring in the top and bottom thirds of the life adversity distribution for the sample, we set 192 as the minimum number of people to be recruited. Ultimately, we were able to recruit 192 participants, which
after removing the middle third of the adversity distribution, resulted in a sample of 127 (58 male, 69 female; mean age = 18.86, range = 18 – 23; SD = 1.19).

**Measures and Procedure**

The procedure closely mirrored that used in Study 1. Participants were randomly assigned to read a paragraph about one or eight children who were suffering in the civil war conflict in Darfur after receiving the same instructions as in the prior study. These paragraphs were accompanied by either one or eight pictures of the suffering child or children. After the pictures were presented, participants feelings of compassion were measured. Next, participants were asked to answer questions about their perceived levels of efficacy in helping the children depicted in the presentation using the following two items: (1) “Do you think you would be effective in helping the child[children] in Darfur?”, (2) “Do you think you would make a difference in helping the child[children] in Darfur?” The internal consistency of this two-item measure was strong (Cronbach’s α = 0.85). Finally, participants completed the life adversity measure.

**Results**

We again conducted a 2 (Past Adversity: High vs. Low) X 2 (Number of Victims: Single vs. Multiple) between-subjects ANOVA to examine whether the severity of past adversity moderated the usual numeracy bias in compassion. As in Study 1, this analysis revealed an absence of a main effect for the number of victims, $F(1, 123) = 3.02, p = .09$, with a significant main effect for the severity of past adversity $F(1, 123) = 7.69, p = .006$. Once again, however, this main effect was driven by the predicted interaction, whereby past adversity moderated the degree of compassion felt toward single versus multiple targets, $F(1, 123) = 9.64, p = .002$, partial $\eta^2 = .07$ (see Figure 2.). More specifically, individuals who have experienced greater past
adversity have increased feelings of compassion when faced with multiple suffering targets as opposed to a single suffering target $t(62) = 3.48, p = .001, d = 0.87$. On the other hand, the compassion felt by individuals who experienced lower levels of past adversity did not differ for single versus multiple suffering targets, $t < 1$. The lack of an effect was again inconclusive as a Bayesian t-test provided anecdotal support for the null hypothesis (Bayes factor = 0.38; effect size = 0.20; 95% High-Density Interval -0.24 – 0.66). Thus, in the case of multiple victims, those who had suffered more severe adversity in the past experienced greater compassion than did their counterparts, $t(68) = 4.482, p < .001, d = 1.07$.

We next turned to an exploration of the potential mediating role of efficacy beliefs. Using a standard mediation analysis employing linear regression, we were able to establish that the severity of past adversity individuals experienced not only predicted the amount of compassion they felt toward the suffering children, $\beta = .33, t(125) = 14.79, p < .001$, but also their feelings of efficacy to help, $\beta = .24, t(125) = 7.46, p = .007$. In addition, we confirmed that beliefs about one’s efficacy to help these children, the proposed mediator, itself predicted felt compassion, $\beta = .33, t(125) = 15.26, p < .001$.

To determine whether efficacy beliefs could serve as a mediating mechanism for compassion, we regressed compassion level on both efficacy beliefs and past adversity. In this model (see Figure 3), efficacy beliefs continued to explain a significant proportion of variance in feelings of compassion, while the magnitude of the direct effect linking severity of past adversity to compassion was reduced. The significance of the indirect effect linking adversity to compassion via efficacy was confirmed using a bias-corrected confidence interval bootstrap procedure, thereby indicating partial mediation, $CI 95\% [.02, .14]$ (Preacher & Hayes, 2008; Shrout & Bolger, 2002).
Discussion

As predicted, we again found evidence to support the hypothesis that those who have experienced greater adversity in the past were able to accentuate their levels of compassion based on the degree of suffering they perceived to be occurring in a given situation. As such, they showed a resistance to the numeracy bias that underlies compassion collapse. In addition, we were able to find evidence, via a mediational analysis, that perceived efficacy to help others, which itself is associated with the experience of past adversity, might partially underlie reduced susceptibility toward the numeracy bias.

Chapter 7: Study Three

Although Study Two produced findings suggestive that a sense of efficacy for helping others might underlie the link between experiences of past adversity and compassion, this causal inference relies on what is essentially a correlational model. Inferring the true causal strength of a proposed mediator requires experimental manipulation of the proposed mechanism. Therefore, in Study 3, we experimentally manipulated efficacy beliefs in participants to determine whether such manipulations would directly influence the downstream variable of compassion.

To examine this question, we conducted an experiment in which past adversity was crossed with manipulated perceptions of efficacy. That is, we randomly assigned half of the participants to experience a brief manipulation meant to boost their perceived efficacy to help others. The resulting sample was then divided into two groups based on their levels of life adversity, following the procedure used in the first two studies. If increased efficacy beliefs are responsible for attenuating the numeracy bias in compassion, we expected to find that low-adversity individuals who experienced an efficacy induction (i.e. a boost to their perceived
ability to help) would show the same level of compassion toward multiple targets as would individuals high in adversity.

Methods

Participants. Based on the average effect size from studies one and two, a power analysis from G*Power suggests that we require 115 participants to replicate the effect with a power = .80 at alpha = .05. We were able to recruit 154 participants, which after removing the middle third of the adversity distribution, resulted in a final sample of 98 (25 male, 73 female; mean age = 18.57, range = 17 – 23, SD = 1.09), which corresponded to an a priori power of .75.

Measures and Procedure. As in the previous studies, participants completed the measures in individual cubicles containing a personal computer. During the initial briefing, participants were told that they would be participating in a study meant to examine attitudes toward current world events.

After being briefed, participants were instructed to complete the Reading the Mind in the Eye test (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), which was described as an emotion recognition test. However, before they began this measure, they were firsts required to read the following as part of the instructions:

“You are about to complete a task that measures empathy. People who are high in empathy are especially good at figuring out how the people around them are feeling. This is a good skill to have—for example, research has shown that people high in empathy are more likely to succeed in the workplace and tend to have stronger personal relationships. They are also known to be good at caring for others and to be more successful in alleviating their pain. All in all, empathy is viewed as a good/useful skill and one that most people want to have.
You will be shown a pair of eyes with four emotion labels around it. You are to select which one of the four emotion words best describes the emotion that the eyes are showing. Please provide one best guess for each item.”

This test served as part of the efficacy induction, as it was a device for providing false feedback regarding empathy-related helping abilities. Half of the participants received feedback on their score indicating that they had high empathy-related skills (i.e., in the 95% percentile). The other half did not receive any feedback.

After the efficacy manipulation, participants completed the compassion probe featuring multiple children suffering from the Darfur civil war conflict that was used in Studies 1 and 2. In addition, participants were also asked to report their perceived level of efficacy towards helping the suffering children by answering the same two efficacy-related questions that were used in Study 2. Here, these items served as a manipulation check of our efficacy manipulation. Following the measurement of compassion and efficacy, participants completed the measure of life adversity used in the previous two studies.

Results

Examination of post-induction efficacy beliefs confirmed that the manipulation was successful, as a two-way ANOVA (Efficacy Induction: Control vs. Boost × Adversity: Low vs. High) revealed the presence of the expected interaction, \( F(1, 94) = 5.58, p = .020 \). Among low adversity participants (i.e., those expected to have lower efficacy), the induction significantly increased perceived efficacy \( t(46) = 2.82, p = .007, d = 0.82 \) (see Figure 4.). Among high adversity individuals, the induction, as expected, had no effect due to their already heightened sense of efficacy, \( t < 1 \).
With respect to compassion, a two-way ANOVA (Efficacy Induction: Control vs. Boost) × Adversity: Low vs. High) revealed a main effect of adversity, $F(1, 94) = 14.53, p < .001$ that was qualified by the predicted interaction, $F(1, 94) = 8.90, p = .004$, partial $\eta^2 = .09$ (see Figure 5.). In the control condition, the usual difference among those high and low in past adversity emerged with respect to the compassion they felt toward multiple targets $t(47) = 5.47, p < .001, d = 1.55$. However, this difference was absent when efficacy was induced. That is, when the level of perceived efficacy to help others among low adversity participants was equal to that among high adversity participants, the usual difference in compassion toward these targets disappeared $t < 1$. Moreover, enhanced efficacy beliefs among those low in adversity produced a significant increase in compassion toward multiple targets $t(46) = 3.28, p = .002, d = 0.93$. A Bayesian t-test provided strong evidence to further confirm that low adversity individuals with enhanced efficacy had greater levels of compassion than low adversity individuals in the control condition (Bayes factor = 35.47; effect size = 0.83; 95% High-Density Interval 0.24 – 1.45).

**Discussion**

To examine whether efficacy is a causal mechanism linking experiences of past adversity to a reduced numeracy bias in compassion, we experimentally boosted the efficacy of low-adversity individuals prior to exposing them to multiple targets in distress. In doing so, we found that people low in adversity demonstrated similar levels of elevated compassion towards multiple suffering targets as did those high in adversity, who already possessed elevated efficacy beliefs. These results confirm enhanced efficacy as one mechanism by which those who have experienced greater past adversity in life overcome the numeracy bias in the face of numerous targets in need.
Those possessing high levels of adversity showed similar levels of compassion regardless of exposure to the efficacy manipulation. That is, the manipulation did not boost their compassion like it did for low-adversity individuals. However, the stability of compassion among these individuals makes sense given that the manipulation check showed that the efficacy manipulation did not elevate these individuals’ already high feelings of efficacy. This fact does not preclude the possibility that stronger efficacy manipulations might produce an enhancement in compassion for those who have experienced greater adversity in life, but given the already elevated sense of efficacy among these individuals, the absence of an additive effect here is to be expected.

Chapter 8: General Discussion

The studies presented here were designed to examine whether individuals who possess an increased proclivity for compassion due to experiencing past adversity would show resistance to the numeracy bias in compassion. Overall, we found converging evidence supporting this view. Across three studies, those who have suffered adversity in the past were more likely to accentuate their levels of compassion when faced with a greater number of targets. As such, they appear able to overcome the more typical phenomenon of the numeracy bias that typically underlies compassion collapse.

With respect to the mechanism underlying this resistance, we identified an increased sense of efficacy in one’s ability to aid others as a partial explanation. In two of the presented studies, we demonstrated that individuals who have experienced past adversity hold beliefs that they would be more able to deal with and help others in distress – beliefs that partially mediate the link of adversity to increased compassion toward multiple targets. Moreover, we also confirmed the causal role played by these beliefs through direct experimental manipulation.
When we enhanced the efficacy beliefs of those lower in adversity to match that of those higher in adversity, the levels of compassion among low adversity individuals rose to equal those of their counterparts.

The findings presented here extend previous work in two important ways. First, they provide additional evidence suggesting that post-adversity growth in the form of compassion is robust and can generalize to a context where compassionate responding is known to be challenging (cf. Lim & DeSteno, 2016). Second, they offer support to the view that empathy and compassion are a choice; they’re not limited by capacity or automatic biases that cannot be overcome (cf. Cameron et al., 2017; Zaki, 2014; Zaki & Cikara, 2015). Indeed, work by Schumann, Zaki, and Dweck (2014) revealed how beliefs regarding the malleability of empathy – whether relevant abilities could change and grow – predicted efforts to be empathic and engage in related compassionate behavior.

Our identification of the role played by efficacy beliefs in fostering increased compassion toward multiple targets dovetails nicely both with these motivational accounts of choice and established findings linking self-efficacy to perseverance in the face of challenges. As Bandura’s (1977, 1982) work makes clear, holding a belief that one possesses the requisite skills required to succeed in challenging situations stands as a primary predictor of whether an individual will engage in a task or withdraw from it. In the case of compassion, we see this playing out in a specific realm. Those who have come to believe they have what it takes to help many others in need will accept the challenge of feeling increased compassion in an effort to aid these others rather than down-regulate their compassion to protect themselves from experiencing failure or stress.
One ambiguity that remains, however, regards the present inability to infer precisely why it is that individuals who have suffered adversity possess increased beliefs in their efficacy to alleviate the suffering of others. Although we believe it is likely that such increased beliefs stem from having successfully lived through adversity, as those in our sample are individuals who have resumed or maintained a normal level of functioning following their trials, other possibilities remain to be explored. For example, it might be that having been helped in the past by others to overcome one’s difficulties might itself lead individuals to embrace a deontological view of their own moral responsibilities to do the same. That is, such individuals may be uncomfortable remaining as neutral, relatively unfeeling bystanders when they see others suffer due to feelings of guilt or the anticipation of guilt at not lending support. As such, feelings of actual or anticipated guilt among those who have been beneficiaries of much-needed assistance stands as an additional mechanism worthy of investigation.

Finally, it would also be fruitful to examine how adversity impacts resistance to the numeracy bias in the minority of individuals who do not recover well from tribulations (cf. Bonanno, 2004). Based on previous work showing a negative link between the recency, as opposed to the severity, of adversity and compassion for others (Lim & DeSteno, 2006), we might well expect that those still experiencing the inimical sequelae of adverse experiences might well continue to succumb to the numeracy bias. If so, then interventions aimed at helping these individuals to regain a normal level of functioning might possess the added benefit of increasing their tendencies to reach out to others and thereby build stronger and more supportive social networks that will further sustain them.
References


Figure 1. A conceptual model which demonstrates how experiences of adversity could lead to prosocial growth (Lim & DeSteno, 2016).
Figure 2. Compassion as a function of target condition and past adversity (error bars represent 95% confidence intervals).
Figure 3. Compassion as a function of target condition and past adversity (error bars represent 95% confidence intervals).
Figure 4. Efficacy beliefs mediates the direct relation between severe past adversity and compassion towards perceived suffering. Zero-order correlations are in parentheses. ** = p < 0.01, *** = p < 0.001.
Figure 5. Efficacy beliefs as a function of adversity and manipulation conditions, manipulation of efficacy in low-adversity individuals was successful (error bars represent 95% confidence intervals).
Figure 6. Compassion as a function of past adversity and efficacy beliefs (error bars represent 95% confidence intervals).
Appendix

Compassion, and Efficacy Scale

Compassion Scale (Cameron & Payne, 2011)

(1 = Not at all to 9 = Extremely)

1. How sympathetic do you feel toward the child [children]?
2. How warm do you feel toward the child [children]?
3. How compassionate do you feel toward the child [children]?
4. How touched were you by the child [children]?
5. How urgent do the needs of the child [children] in Darfur seem?
6. To what extent do you feel that it is appropriate to give money to aid the child [children]?
7. How much do you value the welfare of the child [children] whose picture(s) you saw?
8. How important is it to you that this child [these children] whose picture(s) you saw be happy?
9. How important is it to you that this child [these children] whose picture(s) you saw not suffer?

Efficacy Scale (Cameron & Payne, 2011)

(1 = Not at all to 9 = Extremely)

1. Do you think you would be effective in helping the child [children] in Darfur?
2. Do you think you would make a difference in helping the child [children] in Darfur?