Spring 5-22-2021

The Influence Of Self-compassion On Perceived Stress Reactivity

Emily C. Helminen
Syracuse University

Abstract

Contemplative psychological traits (e.g., mindfulness and self-compassion) have become a popular area of research in recent years, often in the context of their influence on stress (Creswell & Lindsay, 2014). One promising subset of contemplative science research demonstrates that higher levels of contemplative traits are associated with decreased physiological stress reactivity during psychosocial stress induction. This is important due to the negative health outcomes that are associated with persistently heightened stress reactivity. Research investigating self-compassion has demonstrated that higher levels of trait self-compassion are associated with lower levels of stress reactivity (Breines et al., 2015; Luo et al., 2018). Currently, this area of research is limited to stress induction studies, which can be costly and time-consuming. A cross-sectional self-report measure of stress reactivity, the Perceived Stress Reactivity Scale (PSRS; Schlotz et al., 2013) was recently developed and validated, but it has not yet been examined in relation to trait self-compassion. To evaluate whether self-compassion may be an intervention target to buffer against stress reactivity, it would be helpful to establish how it is related to the PSRS. Thus, this study investigated whether trait levels of self-compassion significantly account for variance in a regression model with self-reported stress reactivity as the dependent variable, while controlling for state stress levels. It also investigated whether self-compassion moderates the relation between state stress and self-reported stress reactivity. Planned post-hoc analyses were conducted to examine these same analyses with each specific subscale of the PSRS (i.e., Prolonged Reactivity, Reactivity to Work Overload, Reactivity to Social Evaluation, Reactivity to Social Conflict, and Reactivity to Failure). Results indicate that

self-compassion significantly accounted for variance in total stress reactivity while controlling for state stress, but it did not moderate the relation between state stress and total stress reactivity. Post-hoc analyses demonstrated that self-compassion significantly accounted for variance in stress reactivity measured via each specific subscale while controlling for state stress. When the Reactivity to Social Evaluation subscale score was the dependent variable, self-compassion accounted for more variance than any other subscale. Further, the post-hoc moderation analyses were only significant for self-compassion moderating the relation between state stress and Reactivity to Social Evaluation, indicating that self-compassion may confer unique stress-buffering properties during social-evaluative situations (e.g., job interviews). Limitations of this study included having a well-educated, upper middle class sample population, the inability to determine causality from a cross-sectional design. Recommendations for future research included examining self-compassion intervention effects on self-reported stress reactivity and investigating the ability of self-compassion to protect against job stress or academic stress by buffering against social-evaluative stress reactivity.

Keywords: self-compassion, stress, stress reactivity

THE INFLUENCE OF SELF-COMPASSION ON PERCEIVED STRESS REACTIVITY

by

Emily C. Helminen

B.S., Michigan Technological University, 2014

Thesis
Submitted in partial fulfillment of the requirements for the degree of
Master of Science in Psychology.

Syracuse University
May 2021

TABLE OF CONTENTS

The Influence of Self-Compassion on Perceived Stress Reactivity

Excessive stress is a public health concern in contemporary society. Evolutionarily, the stress response developed as an adaptive acute mechanism to activate survival instincts in early humans (e.g., running from a predator). In modern life, the stressors that humans face are often chronically activated by one's own thoughts or an imagined situation, rather than being activated by infrequent life-or-death situations. However, the human body physiologically responds the same way to a mental stress as it would to an external threat (Kirschbaum et al., 1993).

When facing any type of stressor, several different bodily systems are activated. The physiological stress response begins with the perception of a threat. This perception triggers a cascade of reactions in the physiological pathway known as the sympathetic-adrenal-medullary (SAM) system. The SAM system is responsible for what is commonly known as our "fight or flight" response. Once the SAM system is triggered, the hypothalamus activates the sympathetic branches of the nervous system known as the autonomic nervous system (ANS). The sympathetic ANS activation leads to secretion of adrenaline and noradrenaline, which are responsible for the bodily reactions that accompany the "fight or flight" response, including increased heart rate and blood pressure. This response is considered our fast-acting stress response, and it is activated in the presence of acute stressors. Conversely, the hypothalamic pituitary adrenal (HPA) axis response to stress is considered our slower response, and it is activated by chronic stressors. The HPA axis is the portion of our stress response that is responsible for secreting cortisol and other hormones indicative of elevated stress (Goldstein, 2010).

Repeatedly responding to varied psychological phenomena (e.g., thoughts, fears, ruminations) with cognitive and physiological stress responses can lead to a host of negative physical and psychological problems. For instance, excessive stress is implicated in the development of cardiovascular disease, upper respiratory diseases, and bodily inflammation (Dimsdale, 2008; Schneiderman et al., 2005). Additionally, psychological well-being is negatively impact by stress, which has been implicated in the development of depression, anxiety, and substance use disorders (Schneiderman et al., 2005). Research has also shown that stress responses in early life are predictive of negative health outcomes later in life (Garfin et al., 2018). An individual's habitual response to stress is important in predicting physical and psychological health outcomes, and much of the contemporary stress research is attempting to understand individual differences in patterns of stress reactivity, and how these patterns may be altered with psychosocial interventions.

Stress Reactivity

Stress reactivity is a person's tendency to respond to stressors and can be measured via physiology, behavior, self-report, and/or cognitive functioning (Schlotz, 2013). Research has demonstrated that abnormal stress reactivity responses to acute stressors are associated with psychopathology and loneliness (Zorn et al., 2017; Brown et al., 2018). Stress reactivity has also been implicated in the development of cardiovascular disease (Chida & Steptoe, 2010; Lovallo, 2005; Sherwood & Turner, 1995).

While excessive stress reactivity is understood as a factor that leads to poor mental and physical health, antecedent factors such as an individual's *state stress* level

prior to stressful event exposure can influence stress reactivity. State stress is the immediate experience of stress that an individual experiences in the present moment and it is considered to be transient and temporary (as oppose to trait stress, which is considered a more consistent and durable experience of stress that does not change over time). Evidence supports that state stress prior to the stress induction may influence stress response on any given day. Pointer et al. (2012) demonstrated that state stress levels measured via the State Trait Anxiety Inventory (STAI; Spielberger, 1983) were significantly correlated with markers of stress reactivity including systolic blood pressure reactivity ($r = 0.37$, $p < 0.05$), diastolic blood pressure reactivity ($r = 0.40$, $p < 0.01$) and heart rate reactivity ($r = 0.37$, $p < 0.01$). Thus, it is to control for potentially confounding variables such as state stress when measuring stress reactivity.

Because stress reactivity encompasses several domains (i.e., physiology, behavior, self-report, and cognitive function), it can be measured in a variety of different ways. A common way that studies measure stress reactivity is to implement a stress induction task and measure change in stress from baseline to the height of stress induction. The most widely used and validated stress induction task is the Trier Social Stress Test (TSST; Kirschbaum et al., 1993). In the original protocol, Kirschbaum et al. (1993) detailed a three-part task that included a speech preparation portion, a speech delivery portion, and an arithmetic portion. Participants are brought into a room with a one-way mirror and seated before two research assistants posing as confederates in white lab coats. They are told to prepare for a speech in which they discuss why they are the perfect candidate for their ideal job. Participants then complete the speech portion and immediately after are told to count backwards from 1024 by 13. Throughout

the entire experiment, confederates are instructed to maintain neutral affect, regardless of what the participant says or does (Birkett, 2011; Kirschbaum et al., 1993). The original protocol effectively induces stress via components of social evaluation and the unpredictability of the confederates' response to the subject's performance (Dickerson & Kemeny, 2004). Dickerson and Kemeny (2004) argue that the combination of public speaking and cognitive components create high levels of social-evaluative threat and unpredictability, and that these elements in turn lead to a reliable stress response.

Much of the stress reactivity literature examines stress reactivity by measuring stress before and after a stress induction task such as the TSST. Recently, a self-report measure of perceived stress reactivity has been developed to examine stress reactivity during a single time point. The Perceived Stress Reactivity Scale (PSRS; Schlotz et al., 2011) includes both an total score and five subscale scores: Prolonged Reactivity, Reactivity to Work Overload, Reactivity to Social Conflict, Reactivity to Failure, and Reactivity to Social Evaluation. This cross-sectional questionnaire is used to ascertain a broader stress response than stress induction studies, which usually only measure one stress-induction time point.

Contemplative Practice

Contemplative practice has become a popular area of research in recent years. Though terminology in the field of contemplative science is often in flux, one broad definition is that contemplative practices are those that target the metacognitive self-regulatory capacity of the mind (Dorjee, 2016). Contemplative practice is an umbrella term that includes a host of varying types of practice, including mindfulness, yoga, and self-compassion. In the literature, contemplative practice is most often studied in the

context of mindfulness interventions. Mindfulness is often defined as “paying attention, on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 1990, p. 145), and is usually practiced during formal sitting meditation. Due to the influx of mindfulness research in the past decade, much is known about mindfulness practice, its purported effects, and the theoretical underpinnings by which it is effective.

Two main types of mindfulness practice are focused attention and open monitoring practice. In focused attention practice, the practitioner sustains attention on a chosen object (e.g., the feeling of the breath), and continues to bring attention back to the object after noticing the attention has wandered. In open monitoring practice, the practitioner aims to be aware of current experience as it unfolds moment by moment rather than focusing on any one thing (Lutz et al., 2008). Mindfulness skills, (i.e., the ability to pay attention in these particular ways) are taught as foundational skills before many of the other types of contemplative practices. In research, mindfulness is studied in a secular context, but the ancient historical roots of these practices can be found in several eastern religions, including Buddhism. Recently, following the path of the secular adaptation of mindfulness practices, other contemplative practices have been secularly adapted for intervention research, including practices associated with mindful movement (e.g., yoga) and feeling cultivation (e.g., compassion, sympathetic joy). It is worth noting that these various practices in and of themselves are secular in nature, however the traditions they come from are non-secular. As a parallel example, the act of fasting is in and of itself secular; however, fasting as a practice is a part of many world

religious traditions and rituals. Similarly, mindfulness and feeling cultivation activities are also practices that are independent from their religious roots.

One area of contemplative practice that has very recently begun to be studied by Western scientists involves practices to cultivate specific positive emotional qualities. Eastern non-secular (i.e., Buddhism) accounts of feeling cultivation practices encompass four main types: 1) loving-kindness, 2) compassion, 3) sympathetic joy, and 4) equanimity. Modern research on these feeling cultivation practices typically implement either loving-kindness and/or compassion practice targeting self and others. Loving-kindness is described as the genuine wish for oneself and others to be happy and to flourish, while compassion is generally described as the ability to feel one's own suffering or the suffering of another, paired with the desire to relieve that suffering. Often in the literature, loving-kindness and compassion-based practices are grouped together, and the terms are (erroneously) used interchangeably and conflated (Hofmann et al., 2011). This may be due to the similarity of these practices both explicitly cultivating the feeling of wishing for happiness for the self and others. The distinction, however, is that compassion practices acknowledge suffering that the practitioner wishes to relieve through action, whereas loving-kindness practices are more generally focused on wishing for health, safety, and happiness. The acknowledgement of suffering in compassion practice requires the ability to sit with the discomfort of that suffering without being overwhelmed by it or wanting to turn away from it. With loving-kindness, the feeling cultivation is generally positive, and there is no need to sit with uncomfortable feelings during this practice.

To illustrate the differences between compassion and loving-kindness practices, one might consider two scenarios. In the first, one might envision seeing a loved one during an ordinary daily activity and have the feeling that they wish for their loved one to be happy in life (loving-kindness). In another instance, one might envision a loved one in a moment of suffering (e.g., crying and in pain), and both recognize the suffering and wish to relieve it so that their loved one may be happy (compassion). As these scenarios illustrate, compassion and loving-kindness are very similar conceptually and in practice; both involve care for another person and a wish for their happiness. The distinction is that loving-kindness practice is a *general* well-wish for happiness of someone, whereas compassion practice is a *specific* well-wish for happiness of someone during a time of suffering. Compassion practice was chosen for this current investigation (rather than loving-kindness) as being under stress can be conceptualized as a form of suffering, for which compassion seems to be more well-suited contemplative practice.

Another concept that is often conflated with compassion is empathy. Empathy is a construct that has been developed and studied extensively, and has gathered a variety of definitions in the process (Cuff et al., 2016). Most definitions of empathy involve having an understanding of the emotional state of another person, and being able to feel what another is feeling. Conceptualizations of compassion typically include aspects of being able to understand and resonate with the emotional state of others, but it goes beyond this and also includes a motivation to want to end suffering (Singer & Klimecki, 2014). In this way, compassion can be considered a combination of empathy with the intention to act to relieve suffering.

The final two feeling cultivation practices are related to positive emotional experiences, rather than suffering. These practices are sympathetic joy and equanimity and they are less well-known and not as often studied in the intervention literature (but see Zeng et al., 2017 for a review). Briefly, sympathetic joy is a practice of cultivating happiness in seeing another person's joy, whether or not the practitioner had anything to do with or gain from the other's joy. Equanimity is a practice of cultivating balance and even-mindedness (Desbordes et al., 2015). There is some preliminary evidence that different feeling cultivation practices have differential effects (Kok & Singer, 2017), which provides an interesting future direction for the research. However, for the scope of this document, the focus will be on compassion-based practices, and in particular, cultivating these feelings toward the self (i.e., self-compassion).

Self-Compassion

Much of the research in feeling cultivation practices have focused specifically on the cultivation of self-compassion. Neff (2003a) has defined self-compassion as being comprised of three interrelated constituent sub-components: 1) self-kindness, 2) common humanity, and 3) mindfulness. Self-kindness can be understood as being kind and understanding towards oneself when faced with difficulty. Common humanity can be understood as realizing that such difficulties are experienced universally as part of the human condition. Mindfulness in the context of self-compassion can be understood as being able to sit with one's difficult feelings without pushing them away nor over identifying with them (Neff, 2003a).

It is important to distinguish self-compassion from related but distinct concepts in order to understand the important aspects of self-compassion that confer positive health

benefits. Importantly, self-compassion is different from self-esteem, though they are moderately correlated (Neff, 2003b). Self-esteem previously gained traction in psychology research as an important health-promoting trait (Pyszczynski et al., 2004). However, researchers soon learned that self-esteem is not necessarily a beacon of good mental health, and in fact, has many drawbacks as well, particularly when it is associated with narcissistic traits (Baumeister et al., 2003; Neff & Vonk, 2009). A major difference between self-compassion and self-esteem is the component of common humanity. Common humanity is the ability to realized that difficult experiences (i.e., suffering) are a part of the human experience that we share with all other people. One does not have to feel as though they are somehow more or less than anyone else, as is common with high or low self-esteem. Rather, the practice of self-compassion shows us how all beings wish to be free from suffering, and that we are not alone in this wish (Neff, 2003a).

Measurement of Self-Compassion

The most widely implemented measures to assess self-compassion are the 26-item Self-Compassion Scale (SCS; Neff, 2003b) and the 12-item Self-Compassion Scale-Short Form (SCS-SF; Raes et al., 2011) . Both measures consist of six subscales that include positive and negative elements of self-compassion (i.e., self-compassion vs. self-judgment, common humanity vs. isolation, and mindfulness vs. overidentification). Negative subscales are reverse scored, and all subscales are combined to create an overall self-compassion score.

Using the overall self-compassion score from these scales has recently garnered criticism in the field. Pfattheicher et al. (2017) psychometrically examined the scale and

found that the negative subscales (i.e., self-judgment, isolation, and overidentification) seemed to be redundant with measures of neuroticism ($r \geq 0.85$), whereas the positive subscales (i.e., self-kindness, common humanity, and mindfulness) were not. The problem with this is that when these items are reverse scored and included in the overall self-compassion score, this could be artificially inflating the magnitude of association that self-compassion has with mental health variables; it is well known that neuroticism is highly associated with mental health (Ormel et al., 2013).

To quantitatively examine whether the negative subscales may be inflating overall self-compassion scores, Muris and Petrocchi (2017) conducted a meta-analysis of the associations between self-compassion and mental health variables (e.g., anxiety, depression). They compared the strength of relations for the positive subscales of the SCS and the negative subscales of the SCS with mental health variables separately. Associations between the negative subscales and mental health variables were indeed larger than associations between the composite positive scale-only self-compassion score and mental health variables. Thus, authors concluded that using the overall self-compassion score will result in artificial inflation of associations between self-compassion and mental health variables, and recommended discarding the negative subscales in future studies that use the SCS. Researchers in the field that use the SCS have already begun to adopt the use of a composite of positive subscale scores as an overall measure of self-compassion (e.g., see Chan et al., 2020). Due to the evidence that the negative subscales may artificially inflate self-compassion scores, a composite self-compassion score consisting of the positive subscales was used for this investigation.

Benefits of Self-Compassion

Though self-compassion encompasses feelings directed toward the self, preliminary evidence has demonstrated that this quality may be helpful in buffering against physical and psychological illness, creating positive social interactions, and decreasing stress reactivity (MacBeth & Gumley, 2012; Leary et al., 2007; Arch et al., 2014).

Research investigating self-compassion as a trait variable has shown positive correlations between higher levels of self-compassion and a variety of physical and psychological health outcomes. In a meta-analysis examining correlations between self-compassion and well-being, Zessin et al. (2015) found that self-compassion was statistically significantly positively correlated with overall well-being, as well as several different aspects of well-being, including psychological, cognitive, and positive affective well-being. There is also evidence that self-compassion is a protective factor against psychological distress and psychopathology. For example, Marsh et al. (2018) meta-analyzed 19 studies of adolescents that included measures of self-compassion and psychological distress, and found a large effect size for an inverse relation between the two constructs ($r = -0.55$, $p < 0.001$). Additionally, MacBeth and Gumley (2012) found a large, negative effect size for the relation between self-compassion and symptoms of psychopathology ($r = -0.54$, $p < 0.001$).

Several studies evaluating self-compassion and social anxiety demonstrate that socially anxious people tend to have low levels of self-compassion (Gill et al., 2018; Werner et al., 2012). Additionally, having compassion for oneself is associated with less rumination after social interactions (Blackie & Kocovski, 2018). In a series of studies,

Leary et al. (2007) demonstrated the positive implications of self-compassion in interpersonally important situations. In the first study, participants described the most negative event that had happened in the prior four days and subsequently rated the valence of their emotions about the event. Higher self-compassion was associated with lower negative emotions. In the second study, participants were asked about stressful hypothetical scenarios about failing during an evaluative event (e.g., forgetting their part while performing on stage). Higher self-compassion in this study was associated with less catastrophizing and less personalization of the failure. The third study examined participant's reactions to a feedback scenario in which they were led to believe that they were being videotaped and that it would be watched by another participant. They were told to speak for three minutes about themselves and that they would be evaluated based on their performance (similar to the TSST). When participants were given neutral feedback (i.e., scores of 3 to 5 on a 7-point Likert-type scale), those higher in self-compassion demonstrated buffered emotional reactivity to the neutral feedback compared to those lower in self-compassion (Leary et al., 2007).

Self-Compassion and Stress Reactivity

A number of studies have demonstrated that self-compassion is a stress-buffering trait when participants high in trait self-compassion are faced with an acute stressor, such as the TSST. For example, Bluth et al. (2016) demonstrated that -among a sample of adolescents subjected to the TSST, those higher in self-compassion had reduced physiological stress responses measured via cortisol, blood pressure, and heart rate variability relative to those who had lower self-compassion scores. Similarly, Breines et al. (2015) demonstrated reduced stress reactivity measured via salivary

alpha-amylase (an indicator of sympathetic activation) to repeated administrations of the TSST for young adults who were high in self-compassion relative to those who were low in self-compassion. Previous research from the same authors also demonstrated the stress buffering effects of self-compassion via decrease stress reactivity measured via interleukin-6 (an inflammatory biomarker) in participants with higher levels of self-compassion (Breines et al., 2014).

Recently, Luo et al. (2018) demonstrated that men with higher levels of self-compassion have higher vagally mediated heart rate variability (an indicator of parasympathetic activation) and less negative affect after being subjected to the TSST. Similarly, Ewert et al. (2018) demonstrated that participants higher in self-compassion felt less perceived stress and shame after completing an arithmetic task similar to the sequential subtraction task of the TSST. They also demonstrated that higher self-compassion predicted greater use of positive reframing after the stressor in this study. A summary of all self-compassion and stress reactivity studies discussed here can be found in Table 1.

Mounting evidence indicates that high trait levels of self-compassion confer many protective benefits by buffering against negative health outcomes, psychopathology, and stress reactivity. However, within the self-compassion stress reactivity literature, there are several limitations that this study aims to address.

Limitations in the Self-Compassion Stress Reactivity Literature

A notable trend in self-compassion and stress reactivity studies is that all studies thus far have employed stress induction tasks to measure stress reactivity. Although these studies are often experimentally designed and methodologically rigorous, they do

come with several limitations. Such studies only assess a snapshot of stress reactivity and require resources that are costly and time-consuming. Further, as they are beholden to taking place in controlled laboratory environments, they are also susceptible to disruptions in in-person research due to external forces such as the COVID-19 pandemic. Assessing stress reactivity via a self-report measure can address many of these limitations.

A cross-sectional self-report measure of stress reactivity (i.e., the PSRS) has several benefits. Firstly, the measure asks participants how they typically respond in situations they may have encountered within the past month, whereas stress induction studies measure stress reactivity during one stressful instance. Individual factors such as sleep levels, mood, and positive or negative social interactions prior to the stress induction may influence stress reactivity of any given day. Indeed, it has been demonstrated that aggregate responses to repeated instances of stress induction are correlated with more stable participant characteristics (i.e., personality traits); however, when examining just one instance of stress induction, correlations with stable participant characteristics were much smaller (Pruessner et al., 1997). Of course, recommending stress induction studies to aggregate stress reactivity across numerous instances would increase the time and cost to implement an already resource-intensive procedure. A cross-sectional measure of stress reactivity that asks participants how they typically respond may be more indicative of stable levels of stress reactivity without needing repeated stress induction.

Additionally, the PSRS includes various aspects of stress reactivity with each of the five subscales, whereas stress induction studies are typically examining one or two

types of stress reactivity. For example, the TSST is designed as a social evaluative stressor, which would conceptually correlate to the Reactivity to Social Evaluation and Reactivity to Failure subscales of the PSRS, but not necessarily correlate to the other subscales. Indeed, this relation has been empirically demonstrated. Researchers examined associations between each PSRS subscale with cortisol reactivity to the TSST in a sample of 66 men; the Reactivity to Social Evaluation and Reactivity to Failure subscales were statistically significantly correlated with a biomarker for stress (cortisol reactivity), whereas the other subscales were not correlated (Schlotz, Hammerfald, et al., 2011).

Further, a study by Jackowska et al. (2018) examined the associations between an total stress reactivity score from the PSRS and cortisol reactivity to the TSST in a sample of 120 men. They found no significant association between the total stress reactivity score and cortisol reactivity. This may indicate that the total score is assessing stress reactivity more broadly, whereas the cortisol reactivity may just be applicable to one or two types of stress reactivity (e.g., Reactivity to Social Evaluation and Reactivity to Failure). Notably, these two studies were in samples of men, so they are not fully representative of general samples. Thus, further research on the correlation between self-reported stress reactivity and cortisol reactivity is necessary, but these studies serve as preliminary evidence that reactivity to specific stressors (e.g., the TSST) may not capture all types of stress reactivity.

Results from Schlotz, Hammerfald et al. (2011) and Jackowska et al. (2018) indicate that when research focuses on social-evaluative stress-induction studies, we are only understanding a limited view of stress reactivity. A broader measure such as

the PSRS allows us to understand many different types of stress reactivity. This is important for understanding the mechanisms by which heightened stress leads to negative health outcomes. While it is generally accepted that stress reactivity is one of these mechanisms (Chida & Steptoe, 2010; Lovallo, 2005; Sherwood & Turner, 1995), stress reactivity is often treated as a monolithic concept. When we only measure one type of stress reactivity, we may be missing information regarding which types of stress reactivity are operating as mechanisms underlying poor health.

Pragmatic disadvantages also exist for stress induction studies that can be remedied with a cross-sectional self-report measure. Stress induction tasks such as the TSST require numerous physical resources (e.g., at least two different rooms, props such as video cameras), personnel (e.g., at least one experimenter and two confederates to carry out the task), and time (i.e., 15 minutes for the task itself, plus ample time prior to the task to acquire baseline stress levels and after to acquire stress recovery measurements). Many labs may not feasibly be able to carry out such resource-intensive experiments. Further, even if research labs have been able to implement such protocols in the past, current disruptions due to the COVID-19 pandemic have interrupted many researchers' ability to conduct in-person research indefinitely.

This section describes the limitations of assessing stress reactivity via stress induction and the practical barriers to implementation of stress-induction studies for many researchers. Given these issues, this current study fills a gap by examining the influence of self-compassion on a more stable self-reported measure of stress reactivity,

and allows for the examination of how self-compassion may be associated with different types of stress reactivity.

Summary and Aims

Excessive stress reactivity to psychosocial stressors is associated with poor physical and psychological health outcomes. Individuals higher in self-compassion have demonstrated reduced physiological and self-reported stress reactivity to psychosocial stressors during stress-induction studies. However, this protective quality of self-compassion has not yet been demonstrated with a cross-sectional self-report measure of stress reactivity that encompasses a variety of stress reactivity types. The purpose of the proposed study is to cross-sectionally examine the relation between self-compassion and self-reported stress reactivity, and to understand whether self-compassion may be more strongly associated with different types of stress reactivity.

Aim 1

Evaluate whether state stress and self-compassion account for variance in total stress reactivity using the PSRS total score as a dependent outcome. The extant literature has not yet established this relation with the PSRS.

Aim 2

Evaluate whether self-compassion moderates the relation between state stress and stress reactivity, with the hypothesis that greater levels of self-compassion will dampen the effect of state stress on stress reactivity.

Aim 3

Conduct post-hoc analyses examining whether self-compassion is more strongly associated with different types of stress reactivity using the five PSRS subscale scores

(i.e., prolonged reactivity, reactivity to work overload, reactivity to social evaluation, reactivity to failure, and reactivity to social conflict) as dependent outcomes in regression models. The extant literature has not yet examined how self-compassion is related to different types of stress reactivity.

Method

Participants

Undergraduate students in an introductory psychology course (n = 160) filled out online questionnaires for course credit from October 2019 to February 2020; data collection was completed prior to nationwide university shutdowns due to the COVID-19 pandemic. Five attention check questions (e.g., “For this question, please select as your answer ‘quite stressful’”) were dispersed throughout the survey. Participants who answered more than one attention check question incorrectly (n = 15) were removed prior to analysis. This decision was made to balance the possibility of Type I or Type II error due to either removing too many participants or not removing enough inattentive participants (Abbey & Meloy, 2017). This resulted in a sample size of 145 participants. Chi-squared tests and independent sample non-parametric t-tests revealed that participants who were removed were not different in terms of gender, year in school, number of adverse childhood experiences (ACEs; Felitti et al., 1998), or age (ps < 0.05). The chi-square test for race/ethnicity did not meet the minimum count (i.e., 5 people) for each cell in the chi-square table. However, when comparing the race/ethnicity categories for the removed and retained participants, it appears that those that were removed were overrepresented by Asian participants (i.e., 11 out of the 15 participants

that were removed identified as Asian). The final sample was over half white (57.2%), predominantly women (60%), and had a mean age of 19.4 years (*SD* = 0.98). Additional sample characteristics, including year in school, household income, and number of ACEs are displayed in Table 2. Participants were instructed to include their parent/caregivers' income if they were predominantly supported by their parents/caregivers. If they were not predominantly supported by their parents/caregivers, participants reported only their own income (and a partner's income, if applicable) as household income.

Procedures and Measures

Students signed up for the study online and were able to complete the survey at their leisure. Measures were completed in the order of questionnaires detailed in this section. The 26-item Self-Compassion Scale (SCS) was used to measure self-compassion. The shortened 6-item State—Trait Anxiety Inventory (STAI-6) was used to measures state stress. The 23-item Perceived Stress Reactivity Scale (PSRS) was used to measure stress reactivity.

Self-Compassion Scale

The Self-Compassion Scale (SCS) is the most widely used self-report measure of self-compassion. It consists of 26 questions aimed at assessing three distinct opposing pairs of constructs (i.e., six separate subscales) that make up self-compassion: self-kindness vs. self-judgment, common humanity vs. isolation, and mindfulness vs. over-identification. Self-compassion in this study will be measured with a composite score of the positive subscales (i.e., self-kindness, common humanity, and mindfulness). Examples of items from the positive subscales include "I try to be loving

towards myself when I'm feeling emotional pain" and "When something upsets me I try to keep my emotions in balance". All questions are answered on a 6-point Likert scale from 1 (almost never) to 6 (almost always).

The possible range for the composite score comprised of the positive subscales is 13 to 65, with higher values indicating greater self-compassion. The SCS demonstrated convergent validity with other self-related measures and was significantly correlated with measures of self-esteem (r = 0.59), self-acceptance (r = 0.62), and self-determination (r = 0.43), and self-criticism (Neff, 2003b). The SCS also demonstrated good internal consistency (α = 0.92) and test-retest reliability (r = 0.93) in the original psychometric study (Neff, 2003b). Cronbach's alpha for the current study was 0.88.

Shortened State—Trait Anxiety Inventory

The STAI is a widely used and validated measure that is sensitive to changes in stress. The original STAI consists of both a state and a trait questionnaire. Marteau and Bekker (1992) created a shortened version of the state questionnaire portion that includes six questions (STAI-6). Example items from the STAI-6 include "I feel calm" and "I am tense". Participants are asked to rate how they feel "right now, in this moment" for each of the statements. Each item is scored on a 4-point Likert scale from 1 (not at all) to 4 (very much so). The possible range for the total state stress score is from 6 to 24, with higher values indicating greater state stress. The STAI-6 demonstrated convergent validity with the original 20-item scale. Paired *t*-tests between the full-scale scores and prorated STAI-6 scores demonstrated no statistically significant differences (Marteau & Bekker, 1992). The STAI-6 also demonstrated good

internal consistency in the original study (α = 0.82; Marteau & Bekker, 1992). Cronbach's alpha for the current study was similar (α = 0.83).

Perceived Stress Reactivity Scale

Stress reactivity was measured with the 23-item Perceived Stress Reactivity Scale (PSRS). The PSRS asks about participants reactions to situations that they may have experienced in the past month. Each question has three answers that indicate varying magnitudes of stress reactivity. For example, one question says: "When I make a mistake…" and offers the following options as answers: "In general, I remain confident", "I sometimes feel unsure about my abilities", or "I often have doubts about my abilities." These answers are scored from 0 to 2, with 0 being less reactive and 2 being more reactive. Items on this scale are summed to create a total stress reactivity score and each of the five subscale scores. The possible range for the total stress reactivity score is 0 to 46, with higher values indicating greater stress reactivity.

Schlotz et al. (2011) defined each subscale as follows: Reactivity to Work Overload refers to feeling nervous, agitated, irritated in response to high workload; Reactivity to Social Conflict refers to feeling affected, annoyed, upset in response to social conflict, criticism, rejection; Reactivity to Social Evaluation refers to feeling nervous, losing self-confidence in response to social evaluation; Reactivity to Failure refers to feeling annoyed, disappointed, and down in response to failure; and Prolonged Reactivity refers to difficulty relaxing/unwinding after high workload.

The PSRS demonstrated convergent validity with state stress (r = 0.62) and neuroticism (r = 0.71) and discriminant validity with other personality constructs such as openness (r = -0.18) and agreeableness (r = -0.18). Cronbach's alpha and test-retest

reliability for the full-scale score in the original U.S. sample were good (α = 0.87, r = 0.85). Cronbach's alpha for subscales in the original study were 0.62 for Prolonged Reactivity, 0.65 for Reactivity to Failure, 0.71 for Reactivity to Social Conflict, 0.77 for Reactivity to Work Overload, and 0.63 for Reactivity to Social Evaluation (Schlotz et al., 2011). Cronbach's alpha for the total stress reactivity score in the current study was 0.83. Cronbach's alphas for the subscales in the current study were as follows: 0.59 for Prolonged Reactivity, 0.77 for Reactivity to Work Overload, 0.64 for reactivity to Failure, 0.66 for Reactivity to Social Conflict, and 0.63 for Reactivity to Social Evaluation.

Data Analysis

Descriptive statistics were conducted using IBM SPSS Statistics Version 26 (IBM Corp., 2019), and all other analyses were conducted in R version 3.6.2 (R Core Team, 2019). Multiple regression analyses were conducted with total stress reactivity as the outcome variable and gender, state stress, and self-compassion as predictor variables (Aim 1). Gender was dummy coded (0 = women, 1 = men), and it was included because Schlotz et al. (2011) found that women consistently endorsed greater levels of stress reactivity on the PSRS. Self-compassion was examined as a moderator between state stress and stress reactivity by including the interaction term comprised of state stress and self-compassion into the aforementioned regression model (Aim 2). Post-hoc analyses were conducted to examine the relations between self-compassion and the PSRS subscales to further understand how self-compassion and stress reactivity are related (Aim 3).

Data Preparation

Predictor variables (i.e., state stress and self-compassion) were plotted against the dependent variable (i.e., stress reactivity) to ensure variables were linearly related. Residuals were visually assessed for normality via histograms and plotted against predicted values to check for heteroscedasticity. Bivariate correlations between study variables were calculated to determine associations between variables and to investigate potential collinearity between the predictor variables. Correlations between the outcome variable (i.e., stress reactivity) and potential covariates (i.e., age, household income, number of ACEs) were also conducted with the plan to control for any significant associations in the subsequent regression analyses.

Multiple Regression and Moderation Analyses

Gender and state stress were added as the first step in the multiple regression analysis, and self-compassion was added as second step. Changes in R^2 were evaluated to understand the magnitude and statistical significance of accounted variance for by self-compassion. The moderation analysis was conducted by adding an interaction term comprised of state stress and self-compassion to the final model to evaluate whether it significantly explained additional variance in the model.

Post-Hoc Analyses

Post-hoc multiple regression analyses were conducted with each PSRS subscale as the dependent outcome variable. Variance accounted for across models were compared to assess whether self-compassion is more associated with certain types of stress reactivity than others. Post-hoc moderation analyses were conducted with each PSRS subscale to examine whether self-compassion moderates the relation between state stress and specific subscales. The plan was only to conduct these analyses if the

main analysis with total stress reactivity was statistically significant. Thus, a correction for family-wise error was not applied to these analyses because they are exploratory in nature and are meant to further determine how self-compassion and stress reactivity are related.

Results

All variables appeared to be linearly related. Scatter plots demonstrating linear relations between variables are depicted in Figure 1. Residuals were normally distributed, and plots of residuals against predicted values demonstrated homoscedasticity. Pearson correlations between self-compassion and total stress reactivity (r = -0.37, p < 0.01), self-compassion and stress reactivity subscales, except for Reactivity to Social Conflict were statistically significant (r range = -0.25 to -0.37, ps < 0.01). Self-compassion was also significantly associated with state stress (r = -0.32, p < 0.01). State stress was significantly associated with total stress reactivity (r = 0.46, p < 0.01), along with all PSRS subscales (r range = 0.21 to 0.43, ps < 0.05). None of the potential covariates (i.e., age, household income, or number of ACEs) were significantly associated with stress reactivity, and thus, were left out of the regression models. Bivariate correlations between study variables are displayed in Table 3.

Multiple Regression and Moderation

Multiple regression analyses were conducted in several steps with total stress reactivity as the outcome variable. Results of each step are presented in Table 4. Gender and state stress were entered as a predictor in Step 1, and gender, state stress, and self-compassion were entered in Step 2. The final model was significant and

accounted for over 40% of the variance in total stress reactivity (R^2 = 0.407, F(3, 141) = 32.24, p < 0.001). Gender (b = -5.36, t = -5.68, p < 0.001) and state stress (b = 0.56, t = 4.47 p < 0.001) significantly predicted total stress reactivity. Self-compassion explained a significant amount of variance in the final model beyond gender and state stress (ΔR^2 = 0.096, b = -0.77, t = -4.78, p < 0.001).

To test whether self-compassion moderated the relation between state stress and stress reactivity, a self-compassion/state stress interaction term was added to the model in Step 3 (see Table 4). The interaction term was marginally statistically significant (ΔR^2 = 0.015, b = 0.07, t = 1.90, p = 0.059).

Post-Hoc Analyses

Since self-compassion accounted for significant variance in total stress reactivity, planned post-hoc analyses examining self-compassion as a predictor variable for each of the stress reactivity subscales were conducted. Self-compassion emerged as a statistically significant predictor for each subscale (ps < 0.05), except for Reactivity to Social Conflict. When self-compassion was added, change in variance accounted for was greatest for Reactivity to Social Evaluation (ΔR^2 = 0.12, b = -0.30, t = -5.08, p < 0.001), followed by Reactivity to Failure (ΔR^2 = 0.046, b = -0.11, t = -2.72, p = 0.007), Reactivity to Work Overload (ΔR^2 = 0.029, b = -0.14, t = -2.30, p = 0.02), Prolonged Reactivity (ΔR^2 = 0.027, b = -0.10, t = -2.25, p = 0.03), and Reactivity to Social Conflict (ΔR^2 = 0.020, b = -0.11, t = -1.85, p = 0.07). Gender was a statistically significant predictor variable (p < 0.05) for all subscales except for Reactivity to Failure, so it was removed only from the final model for Reactivity to Failure.

For post-hoc moderation analyses, a self-compassion/state stress interaction term was added to the model for each subscale. The moderation analysis was statistically significant for only the Reactivity to Social Evaluation subscale ($\Delta R^2 = 0.022$, $b = 0.03$, $t = 2.12$, $p = 0.036$). Participants with self-compassion scores in the upper and lower 25% of the sample were selected. State stress and Reactivity to Social Evaluation scores were graphed for each of these groups to visually examine the moderation effect. This graph is displayed in Figure 2. Visual interpretation of this graph indicates that self-compassion may buffer against Reactivity to Social evaluation at relatively lower levels of state stress.

To further understand whether the moderation effect may have been due to other factors, demographic characteristics of participants with self-compassion scores in the upper and lower 25% were compared. Chi-squared tests and independent samples *t*-tests revealed that participants between groups were not statistically significantly different in terms of gender, race/ethnicity, age, year in school, or number of ACEs (ps < 0.05).

Discussion

This study demonstrated that self-compassion significantly accounted for variance in a regression model with total stress reactivity as the dependent variable, even when controlling for gender and state stress levels. Self-compassion was only marginally significant as a moderator of the relation between current stress and total stress reactivity. This was the first study to demonstrate these findings with a cross-sectional measure of stress reactivity.

These data indicate that self-compassion may be an important coping factor for stressful situations, and should be tested in future experimental studies. Although the moderation analysis was only marginally significant, this could be due to the fact that the total stress reactivity score is an amalgamation of many different types of stress reactivity. Self-compassion may be more protective against certain types of reactivity and not others, which seems to be corroborated by the additional analyses.

Post-hoc analyses provided further information about the relationship between self-compassion and stress reactivity. Self-compassion had the strongest correlation and predictive association with Reactivity to Social Evaluation compared to all other subscales. These results corroborate previous study findings demonstrating that higher levels of self-compassion are associated with less physiological stress reactivity to the most widely implemented laboratory task for social-evaluative stress, the TSST (Breines et al., 2015; Luo et al., 2018). Further, the post-hoc moderation analysis examining whether self-compassion moderated the link between state stress and stress reactivity was also significant for the Reactivity to Social Evaluation subscale, and not for any other subscales.

To further understand this moderation effect, participants with the highest and lowest self-compassion scores were divided, and the relation between state stress and Reactivity to Social Evaluation were plotted (see Figure 2). Results indicate that at relatively low levels of state stress, those with higher self-compassion have lower levels of Reactivity to Social Evaluation. Said differently, when participants endorsed lower levels of state stress, those with higher self-compassion were buffered against excessive social-evaluative stress reactivity. When participants were under higher levels

of state stress, even higher levels of self-compassion were not adequate to buffer against high levels of social-evaluative stress reactivity. These findings are consistent with Lazarus' (1966) conceptualization of stress as demands versus resources. When state stress demands are relatively low, self-compassion seems to be able to buffer against strong stress reactions (i.e., stress reactivity). However, when state stress demands are relatively high, these demands outweigh the coping resources that may be provided by self-compassion, and participants exhibit stronger stress responses regardless of their self-compassion levels.

These findings related to Reactivity to Social Evaluation may indicate that self-compassion could be a more potent coping skill when it comes to stressful situations that include a social-evaluative component (e.g., school presentations, job interviews) than stressful situations that do not have a social-evaluative component (e.g., having too much work to do). The Reactivity to Social Evaluation subscale asks participants how they react to being criticized by others, having to speak in public, and how they feel when they make a mistake (Schlotz et al., 2011). Self-compassion may be particularly buffering against social-evaluative stress reactivity because the self-kindness and nonjudgement toward oneself may temper social identity threat (Steele et al., 2002), in which one may feel that their identity is devalued. The fact that self-compassion is more strongly associated with social-evaluative stress reactivity has many practical implications, as social evaluation plays a large role throughout academic and career trajectories. Based on these results, it may be important for future research to examine whether self-compassion may promote resiliency to academic and job stress by buffering against stress reactivity in social-evaluative situations.

Limitations

This study has several limitations. Firstly, this was a well-educated, upper middle-class sample of participants; all participants were recruited from a university setting and nearly half of the sample (*n* = 69) reported a household income of over $100,000 (see Table 2). The results from this study may not necessarily generalize to less educated and lower socioeconomic populations; further research with participants from diverse educational and financial backgrounds is necessary to determine generalizability. This is particularly important when examining stress reactivity, as there is evidence that stress reactivity may be altered in populations from disadvantaged background (e.g., those with higher ACEs, higher poverty; Fearon et al., 2017). Further, participants who were removed from analyses due to answering attention check questions incorrectly were overrepresented by Asian students, which may indicate some sample bias in this study.

Another limitation is the cross-sectional nature of this study. Cross-sectional studies make it impossible to determine causality; namely, whether higher self-compassion leads to lower stress reactivity or lower stress reactivity leads to higher self-compassion. Experimental intervention studies manipulating self-compassion and measuring stress reactivity pre- to post-intervention are needed to clarify the causal direction.

There were also some limitations related to the measures in this study. The self-report measure of stress reactivity does have some strengths; in particular, it reduces the time- and resource-intensiveness of typical stress reactivity studies that implement stress induction protocols. However, measuring self-reported stress reactivity comes

with its own limitations. This method relies on participants to report on their stress reactivity to situations within the past month, rather than assessing reactivity through more objective measures (e.g., heart rate, cortisol). Future research should incorporate both self-report and physiological measures to establish consistency across measures. This would provide more confidence in self-report measures of stress reactivity. Importantly, this has been done in one study thus far, but the sample was limited to men only (Schlotz, Hammerfald, et al., 2011). Thus, there is a need for more studies to establish consistency across cross-sectional self-report measures like the PSRS and physiological measures.

The way in which state stress is measured may also be considered a limitation. State stress was measured with the STAI-6 (Marteau & Bekker, 1992), which asks participants how they felt in the moment they were filling out the study questionnaire. This may be an overly narrow time window that could introduce a level of imprecision to the measurement of state stress. Future research should consider implementing a more general state stress scale that measures a broader time period, such as the past-month's state stress (e.g., the Perceived Stress Scale; Cohen et al., 1983). However, research demonstrates that in-the-moment and past-month state stress are strongly correlated (r = 0.60; Lee, 2012), a fact which mitigates this limitation.

An additional limitation related to the self-report measures is with the measure for self-compassion (i.e., the Self-Compassion Scale; Neff 2003b). Research has demonstrated issues with this scale in that it may overlap with different constructs. This issue was corrected for by creating a composite of only the positive subscales of the SCS as recommended by numerous researchers (Pfattheicher et al., 2017; Muris &

Petrocchi, 2017). However, the scale was not originally developed for this purpose. Recently, a different self-compassion scale was developed and psychometrically validated based on solid theoretical underpinnings of the construct of self-compassion (Gu et al., 2020), and may be a better option for future studies to implement.

Another limitation of this study is the lack of consideration for confounding variables. While the analyses in this investigation examined whether age, history of ACEs, or income were associated with study variables, and controlled for gender and state levels of stress, other variables may also be important to control for (e.g., personality traits like neuroticism).

Conclusion

Trait self-compassion significantly accounted for variance in all types of self-reported stress reactivity. It also moderated the relation between state stress levels and Reactivity to Social Evaluation. This indicates that self-compassion may be a possible stress-buffering factor for social-evaluative stress. These results warrant future intervention research in self-compassion to experimentally examine whether training self-compassion is able to reduce stress reactivity levels.

Tables and Figures

Table 1. Effects of trait self-compassion on stress reactivity

Study	Participants	Stress Reactivity Measures	Outcomes (↑ significantly higher; ↓ significantly lower; ↔ no significant differences)
Bluth et al., (2016)	Adolescents *N* = 28	Psychophysiology Cortisol HR SBP DBP HRV Self-report STAI	Stress reactivity measured via all variables demonstrated ↔ based on levels of self-compassion
Breines et al., (2015)	Young adults *N* = 33	Psychophysiology sAA Self-report None	sAA reactivity was ↓ in participants with higher self-compassion for both initial exposure to TSST and repeated exposure the next day
Breines et al., (2014)	Young adults *N* = 41	Psychophysiology IL-6 Self-report None	IL-6 reactivity was ↓ in participants with higher self-compassion for initial exposure to TSST IL-6 reactivity demonstrated ↔ between high and low self-compassion groups to second TSST exposure on Day 2 Note: Although self-compassion did not predict lower levels of IL-6 reactivity on Day 2, the starting baseline level of IL-6 on Day 2 was ↓ for the higher self-compassion group

Ewert et al., (2018)	Young adults *N* = 105	<u>Psychophysiology</u> None <u>Self-report</u> VAS for perceived stress	Self-reported stress reactivity was ↓ in participants with higher self-compassion
Luo et al., (2018)	Healthy male Asians *N* = 34	<u>Psychophysiology</u> HR vmHRV <u>Self-report</u> None	Heart rate reactivity demonstrated ↔ between the high self-compassion group and the low self-compassion group Stress reactivity measured via vmHRV was ↓ in participants with higher self-compassion

Table 2. Sample characteristics

Variable	*N*	%
Sample Size	145	100
Gender		
Women	87	60.0
Men	58	40.0
Race/Ethnicity		
American Indian or Alaska Native	5	3.4
Asian	28	19.3
Black or African American	9	6.2
Hispanic/Latino	14	9.7
Native Hawaiian or Other Pacific Islander	3	2.1
White	83	57.2
Multiracial	3	2.1
Year in School		
1	95	65.5
2	31	21.4
3	13	9.0
4	5	3.4
5+	1	0.7
Income		
Under $20,000	7	4.8
$20,000 – $34,999	5	3.4
$35,000 – $49,999	12	8.3
$50,000 – $74,999	21	14.5
$75,000 – $99,999	31	21.4
Over $100,000	69	47.6
Number of ACEs		
0	35	24.1
1	42	29.0
2	24	16.6
3	11	7.6
4	8	5.5
5	12	8.3
6	4	2.8
7+	9	6.2

Table 3. Bivariate correlations and descriptive statistics for study variables

	Age	Income	ACEs	SC	State Stress	Total SR	PrR	RWO	RSC	RFa	RSE
Age	-										
Income	0.07	-									
ACEs	0.06	-0.15	-								
SC	-0.07	-0.03	-0.11	-							
State Stress	0.23*	-0.002	0.14	-.32*	-						
Total SR	0.02	-0.12	0.10	-.37*	.46*	-					
PrR	0.06	-0.14	0.06	-.26*	.43*	.64*	-				
RWO	-0.02	0.02	0.15	-.25*	.41*	.76*	.37*	-			
RSC	-0.004	-0.12	-0.12	-.13	.21*	.71*	.21*	.45*	-		
RFa	0.09	0.09	-0.08	-.29*	.27*	.56*	.41*	.25*	.31*	-	
RSE	-0.01	-0.11	-0.11	-.37*	.29*	.73*	.34*	.41*	.41*	.22*	-
Mean	19.4	4.9	2.17	13.1	12.0	21.5	3.4	4.4	5.2	4.1	4.4
SD	0.98	1.4	2.31	3.0	3.85	6.9	1.8	2.3	2.1	1.4	2.3

ACEs = Adverse Childhood Experiences; SCS = Self-Compassion; Mind = Mindfulness; Total SR = Total Stress Reactivity; PrR = Prolonged Reactivity; RWO = Reactivity to Work Overload; RSC = Reactivity to Social Conflict; RFa = Reactivity to Failure; RSE = Reactivity to Social Evaluation

[a]Income was coded such that: 0 = Under $20,000; 1 = $20,000 – $34,999; 2 = $35,000 – $49,999; 3 = $50,000 – $74,999; 4 = $75,000 – $99,999; 5 = Over $100,000

**indicates $p < 0.05$*

Table 4. Multiple regression results with total stress reactivity as the outcome variable

Steps	Predictor	*b*	*b* 95% CI [LL, UL]	Fit	Difference
1				R^2 = .311*	
	(Intercept)	14.02*	[10.68, 17.35]		
	Gender	-4.40*	[-6.36, -2.44]		
	State Stress	0.77*	[0.52, 1.02]		
2				R^2 = .407*	ΔR^2 = .096*
	(Intercept)	27.02*	[20.82, 33.23]		95% CI [.02, .17]
	Gender	-5.36*	[-7.23, -3.49]		
	State Stress	0.56*	[0.31, 0.81]		
	Self-Compassion	-0.77*	[-1.09, -0.45]		
3				R^2 = .422*	ΔR^2 = .015
	(Intercept)	37.97*	[25.03, 51.91]		95% CI [-0.02, 0.05]
	Gender	-5.53*	[-7.39, -3.67]		
	State Stress	-0.34	[-1.31, 0.63]		
	Self-Compassion	-1.61*	[-2.53, -0.68]		
	SC*State Stress	0.07	[-0.00, 0.15]		

Note. SC = Self-Compassion; *b* represents unstandardized regression weights. LL and UL indicate the lower and upper limits of a confidence interval, respectively. * indicates $p < .05$

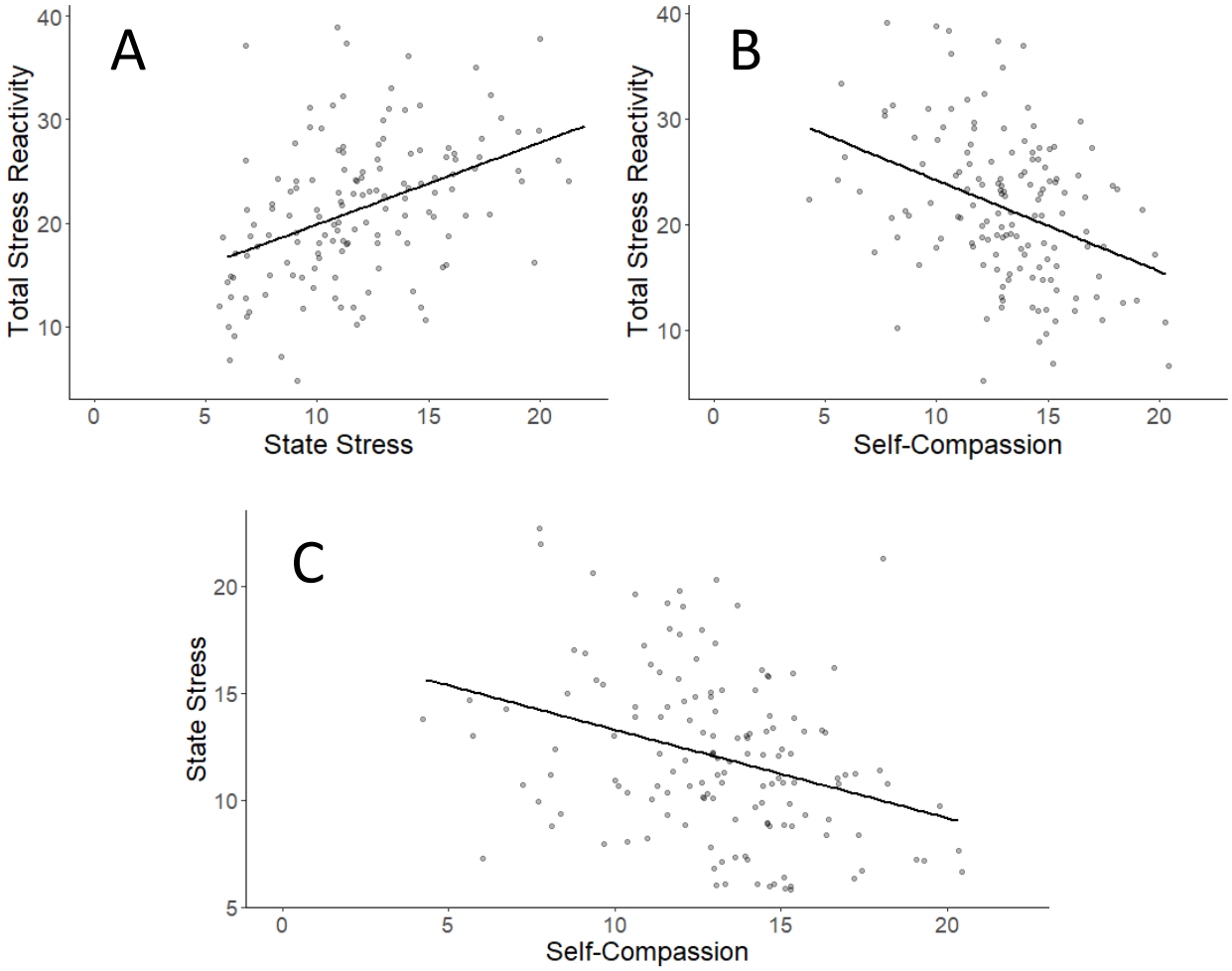

Figure 1. Linear relations between total stress reactivity and state stress (A), total stress reactivity and self-compassion (B), and state stress and self-compassion (C).

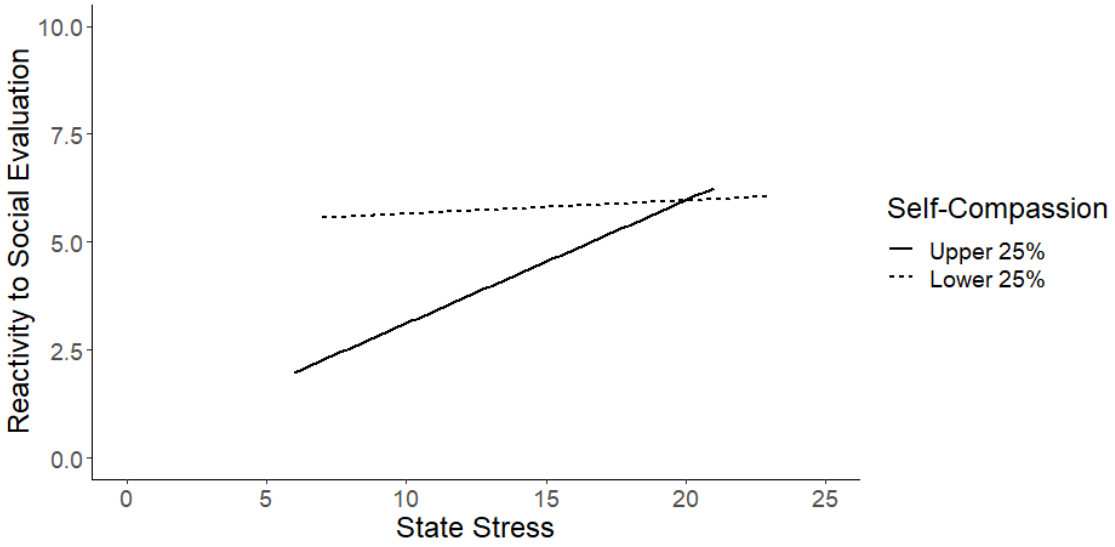

Figure 2. Moderation effect of self-compassion on the relation between state stress and Reactivity to Social Evaluation.

References

Abbey, J. D., & Meloy, M. G. (2017). Attention by design: Using attention checks to detect inattentive respondents and improve data quality. *Journal of Operations Management*, *53–56*, 63–70. https://doi.org/10.1016/j.jom.2017.06.001

Arch, J. J., Brown, K. W., Dean, D. J., Landy, L. N., Brown, K., & Laudenslager, M. L. (2014). Self-compassion training modulates alpha-amylase, heart rate variability, and subjective responses to social evaluative threat in women. *Psychoneuroendocrinology*, *42*, 49–58. https://doi.org/10.1016/j.psyneuen.2013.12.018

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does High Self-Esteem Cause Better Performance, Interpersonal Success, Happiness, or Healthier Lifestyles? *Psychological Science in the Public Interest: A Journal of the American Psychological Society*, *4*(1), 1–44. https://doi.org/10.1111/1529-1006.01431

Blackie, R. A., & Kocovski, N. L. (2018). Examining the Relationships Among Self-Compassion, Social Anxiety, and Post-Event Processing. *Psychological Reports*, *121*(4), 669–689. https://doi.org/10.1177/0033294117740138

Bluth, K., Roberson, P. N. E., Gaylord, S. A., Faurot, K. R., Grewen, K. M., Arzon, S., & Girdler, S. S. (2016). Does Self-Compassion Protect Adolescents from Stress? *Journal of Child and Family Studies*, *25*(4), 1098–1109. https://doi.org/10.1007/s10826-015-0307-3

Breines, J. G., McInnis, C. M., Kuras, Y. I., Thoma, M. V., Gianferante, D., Hanlin, L., Chen, X., & Rohleder, N. (2015). Self-compassionate young adults show lower

salivary alpha-amylase responses to repeated psychosocial stress. *Self and Identity*, *14*(4), 390–402. https://doi.org/10.1080/15298868.2015.1005659

Breines, J. G., Thoma, M. V., Gianferante, D., Hanlin, L., Chen, X., & Rohleder, N. (2014). Self-compassion as a predictor of interleukin-6 response to acute psychosocial stress. *Brain, Behavior, and Immunity*, *37*, 109–114. https://doi.org/10.1016/j.bbi.2013.11.006

Brown, E. G., Gallagher, S., & Creaven, A.-M. (2018). Loneliness and acute stress reactivity: A systematic review of psychophysiological studies. *Psychophysiology*, *55*(5), e13031. https://doi.org/10.1111/psyp.13031

Chan, B. S. M., Deng, J., Li, Y., Li, T., Shen, Y., Wang, Y., & Yi, L. (2020). The Role of Self-Compassion in the Relationship between Post-Traumatic Growth and Psychological Distress in Caregivers of Children with Autism. *Journal of Child and Family Studies*, *29*(6), 1692–1700. https://doi.org/10.1007/s10826-019-01694-0

Chida, Y., & Steptoe, A. (2010). Greater Cardiovascular Responses to Laboratory Mental Stress Are Associated With Poor Subsequent Cardiovascular Risk Status. *Hypertension*, *55*(4), 1026–1032. https://doi.org/10.1161/HYPERTENSIONAHA.109.146621

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 385–396.

Cuff, B. M. P., Brown, S. J., Taylor, L., & Howat, D. J. (2016). Empathy: A Review of the Concept. *Emotion Review*, *8*(2), 144–153. https://doi.org/10.1177/1754073914558466

Desbordes, G., Gard, T., Hoge, E. A., Hölzel, B. K., Kerr, C., Lazar, S. W., Olendzki, A., & Vago, D. R. (2015). Moving beyond Mindfulness: Defining Equanimity as an Outcome Measure in Meditation and Contemplative Research. *Mindfulness*, *6*(2), 356–372. https://doi.org/10.1007/s12671-013-0269-8

Dimsdale, J. E. (2008). Psychological Stress and Cardiovascular Disease. *Journal of the American College of Cardiology*, *51*(13), 1237–1246. https://doi.org/10.1016/j.jacc.2007.12.024

Dorjee, D. (2016). Defining Contemplative Science: The Metacognitive Self-Regulatory Capacity of the Mind, Context of Meditation Practice and Modes of Existential Awareness. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.01788

Ewert, C., Gaube, B., & Geisler, F. C. M. (2018). Dispositional self-compassion impacts immediate and delayed reactions to social evaluation. *Personality and Individual Differences*, *125*, 91–96. https://doi.org/10.1016/j.paid.2017.12.037

Fearon, R. M. P., Tomlinson, M., Kumsta, R., Skeen, S., Murray, L., Cooper, P. J., & Morgan, B. (2017). Poverty, early care, and stress reactivity in adolescence: Findings from a prospective, longitudinal study in South Africa. *Development and Psychopathology*, *29*(2), 449–464. https://doi.org/10.1017/S0954579417000104

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, *14*(4), 245–258. https://doi.org/10.1016/S0749-3797(98)00017-8

Garfin, D. R., Thompson, R. R., & Holman, E. A. (2018). Acute stress and subsequent health outcomes: A systematic review. *Journal of Psychosomatic Research*, *112*, 107–113. https://doi.org/10.1016/j.jpsychores.2018.05.017

Gill, C., Watson, L., Williams, C., & Chan, S. W. Y. (2018). Social anxiety and self-compassion in adolescents. *Journal of Adolescence*, *69*, 163–174. https://doi.org/10.1016/j.adolescence.2018.10.004

Goldstein, D. S. (2010). Adrenal Responses to Stress. *Cellular and Molecular Neurobiology*, *30*(8), 1433–1440. https://doi.org/10.1007/s10571-010-9606-9

Gu, J., Baer, R., Cavanagh, K., Kuyken, W., & Strauss, C. (2020). Development and Psychometric Properties of the Sussex-Oxford Compassion Scales (SOCS). *Assessment*, *27*(1), 3–20. https://doi.org/10.1177/1073191119860911

Hofmann, S. G., Grossman, P., & Hinton, D. E. (2011). Loving-Kindness and Compassion Meditation: Potential for Psychological Interventions. *Clinical Psychology Review*, *31*(7), 1126–1132. https://doi.org/10.1016/j.cpr.2011.07.003

Jackowska, M., Fuchs, R., & Klaperski, S. (2018). The association of sleep disturbances with endocrine and perceived stress reactivity measures in male employees. *British Journal of Psychology*, *109*(1), 137–155. https://doi.org/10.1111/bjop.12250

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. Delacorte.

Kirschbaum, C., Pirke, K.-M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test' – A Tool for Investigating Psychobiological Stress Responses in a Laboratory Setting. *Neuropsychobiology*, *28*(1–2), 76–81. https://doi.org/10.1159/000119004

Kok, B. E., & Singer, T. (2017). Phenomenological Fingerprints of Four Meditations: Differential State Changes in Affect, Mind-Wandering, Meta-Cognition, and Interoception Before and After Daily Practice Across 9 Months of Training. *Mindfulness*, *8*(1), 218–231. https://doi.org/10.1007/s12671-016-0594-9

Kothgassner, O. D., Goreis, A., Glenk, L. M., Kafka, J. X., Beutl, L., Kryspin-Exner, I., Hlavacs, H., Palme, R., & Felnhofer, A. (2021). Virtual and real-life ostracism and its impact on a subsequent acute stressor. *Physiology & Behavior*, *228*, 113205. https://doi.org/10.1016/j.physbeh.2020.113205

Lazarus, R. S. (1966). *Psychological stress and the coping process*. McGraw-Hill.

Leary, M. R., Tate, E. B., Adams, C. E., Batts Allen, A., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: The implications of treating oneself kindly. *Journal of Personality and Social Psychology*, *92*(5), 887–904. https://doi.org/10.1037/0022-3514.92.5.887

Lee, E.-H. (2012). Review of the Psychometric Evidence of the Perceived Stress Scale. *Asian Nursing Research*, *6*(4), 121–127. https://doi.org/10.1016/j.anr.2012.08.004

Lovallo, W. R. (2005). Cardiovascular reactivity: Mechanisms and pathways to cardiovascular disease. *International Journal of Psychophysiology*, *58*(2), 119–132. https://doi.org/10.1016/j.ijpsycho.2004.11.007

Luo, X., Qiao, L., & Che, X. (2018). Self-compassion Modulates Heart Rate Variability and Negative Affect to Experimentally Induced Stress. *Mindfulness*, *9*(5), 1522–1528. https://doi.org/10.1007/s12671-018-0900-9

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*, *12*(4), 163–169. https://doi.org/10.1016/j.tics.2008.01.005

MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review*, *32*(6), 545–552. https://doi.org/10.1016/j.cpr.2012.06.003

Marsh, I. C., Chan, S. W. Y., & MacBeth, A. (2018). Self-compassion and Psychological Distress in Adolescents—A Meta-analysis. *Mindfulness*, *9*(4), 1011–1027. https://doi.org/10.1007/s12671-017-0850-7

Marteau, T. M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State—Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology*, *31*(3), 301–306. https://doi.org/10.1111/j.2044-8260.1992.tb00997.x

Minkel, J., Moreta, M., Muto, J., Htaik, O., Jones, C., Basner, M., & Dinges, D. (2014). Sleep deprivation potentiates HPA axis stress reactivity in healthy adults. *Health Psychology*, *33*(11), 1430–1434. https://doi.org/10.1037/a0034219

Muris, P., & Petrocchi, N. (2017). Protection or Vulnerability? A Meta-Analysis of the Relations Between the Positive and Negative Components of Self-Compassion and Psychopathology. *Clinical Psychology & Psychotherapy*, *24*(2), 373–383. https://doi.org/10.1002/cpp.2005

Neff, K. (2003a). Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self and Identity*, *2*(2), 85–101. https://doi.org/10.1080/15298860309032

Neff, K. (2003b). The Development and Validation of a Scale to Measure Self-Compassion. *Self and Identity*, *2*(3), 223–250. https://doi.org/10.1080/15298860309027

Neff, K., & Vonk, R. (2009). Self-Compassion Versus Global Self-Esteem: Two Different Ways of Relating to Oneself. *Journal of Personality*, *77*(1), 23–50. https://doi.org/10.1111/j.1467-6494.2008.00537.x

Ormel, J., Jeronimus, B. F., Kotov, R., Riese, H., Bos, E. H., Hankin, B., Rosmalen, J. G. M., & Oldehinkel, A. J. (2013). Neuroticism and Common Mental Disorders: Meaning and Utility of a Complex Relationship. *Clinical Psychology Review*, *33*(5), 686–697. https://doi.org/10.1016/j.cpr.2013.04.003

Pfattheicher, S., Geiger, M., Hartung, J., Weiss, S., & Schindler, S. (2017). Old Wine in New Bottles? The Case of Self-compassion and Neuroticism. *European Journal of Personality*, *31*(2), 160–169. https://doi.org/10.1002/per.2097

Pointer, M. A., Yancey, S., Abou-Chacra, R., Petrusi, P., Waters, S. J., & McClelland, M. K. (2012). State Anxiety Is Associated with Cardiovascular Reactivity in Young, Healthy African Americans. *International Journal of Hypertension*, *2012*, 1–7. https://doi.org/10.1155/2012/268013

Pruessner, J. C., Gaab, J., Hellhammer, D. H., Lintz, D., Schommer, N., & Kirschbaum, C. (1997). Increasing correlations between personality traits and cortisol stress responses obtained by data aggregation. *Psychoneuroendocrinology*, *22*(8), 615–625. https://doi.org/10.1016/s0306-4530(97)00072-3

Pyszczynski, T., Greenberg, J. A., Solomon, S. D., Arndt, J. L., & Schimel, J. (2004). Why do people need self-esteem? A theoretical and empirical review.

Psychological Bulletin, *130*(3), 435–468. https://doi.org/10.1037/0033-2909.130.3.435

R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the Self-Compassion Scale. *Clinical Psychology & Psychotherapy*, *18*(3), 250–255. https://doi.org/10.1002/cpp.702

Schlotz, W. (2013). Stress Reactivity. In M. D. Gellman & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine* (pp. 1891–1894). Springer New York. https://doi.org/10.1007/978-1-4419-1005-9_64

Schlotz, W., Hammerfald, K., Ehlert, U., & Gaab, J. (2011). Individual differences in the cortisol response to stress in young healthy men: Testing the roles of perceived stress reactivity and threat appraisal using multiphase latent growth curve modeling. *Biological Psychology*, *87*(2), 257–264. https://doi.org/10.1016/j.biopsycho.2011.03.005

Schlotz, W., Yim, I. S., Zoccola, P. M., Jansen, L., & Schulz, P. (2011). The Perceived Stress Reactivity Scale: Measurement invariance, stability, and validity in three countries. *Psychological Assessment*, *23*(1), 80–94. https://doi.org/10.1037/a0021148

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). STRESS AND HEALTH: Psychological, Behavioral, and Biological Determinants. *Annual Review of Clinical Psychology*, *1*, 607–628. https://doi.org/10.1146/annurev.clinpsy.1.102803.144141

Sherwood, A., & Turner, J. R. (1995). Hemodynamic responses during psychological stress: Implications for studying disease processes. *International Journal of Behavioral Medicine*, *2*(3), 193–218. https://doi.org/10.1207/s15327558ijbm0203_1

Singer, T., & Klimecki, O. M. (2014). Empathy and compassion. *Current Biology*, *24*(18), R875–R878. https://doi.org/10.1016/j.cub.2014.06.054

Spielberger, C. D. (1983). Manual for the State-Trait Anxiety Inventory (STAI). *Consulting Psychologists Press*.

Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image: The psychology of stereotype and social identity threat. In *Advances in experimental social psychology, Vol. 34* (pp. 379–440). Academic Press. https://doi.org/10.1016/S0065-2601(02)80009-0

Werner, K. H., Jazaieri, H., Goldin, P. R., Ziv, M., Heimberg, R. G., & Gross, J. J. (2012). Self-compassion and social anxiety disorder. *Anxiety, Stress, & Coping*, *25*(5), 543–558. https://doi.org/10.1080/10615806.2011.608842

Zeng, X., Chio, F. H. N., Oei, T. P. S., Leung, F. Y. K., & Liu, X. (2017). A Systematic Review of Associations between Amount of Meditation Practice and Outcomes in Interventions Using the Four Immeasurables Meditations. *Frontiers in Psychology*, *8*, 141. https://doi.org/10.3389/fpsyg.2017.00141

Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The Relationship Between Self-Compassion and Well-Being: A Meta-Analysis. *Applied Psychology: Health and Well-Being*, *7*(3), 340–364. https://doi.org/10.1111/aphw.12051

Zorn, J. V., Schür, R. R., Boks, M. P., Kahn, R. S., Joëls, M., & Vinkers, C. H. (2017). Cortisol stress reactivity across psychiatric disorders: A systematic review and meta-analysis. *Psychoneuroendocrinology*, *77*, 25–36. https://doi.org/10.1016/j.psyneuen.2016.11.036

Vita

Emily C. Helminen

426 Ostrom Avenue, Syracuse, NY 13210
(906) 281 – 3663 ▪ ehelmine@syr.edu

EDUCATION

Doctor of Philosophy Student – School Psychology **2018 – Present**

Syracuse University, Syracuse, NY

Advisor: Joshua Felver, PhD, ABPP, Licensed Psychologist

- APA accredited
- NASP approved

Bachelor of Science – Biomedical Engineering **2014**

Michigan Technological University, Houghton, MI

Minor: Ethics & Philosophy

AWARDS AND HONORS

Women in Science and Engineering Future Professionals Program Associate	2019 – Present
Mind and Life Institute New Investigator	2019, 2020
Departmental Scholar for Biomedical Engineering	2014
Honorable Mention, Michigan Technological University Design Expo	2014
Presidential Excellence Scholarship	2010 – 2014
Robert C. Byrd Honors Scholarship	2010 – 2011

RESEARCH EXPERIENCE

Concussion Clinic, Department of Rehabilitation Psychology **2020 – Present**

Upstate Medical University, Syracuse, NY

Supervisors: Dr. Brian Rieger, Clinic Director and Licensed Psychologist

- Evaluated profiles of patient reported outcomes using the Patient Reported Outcomes Information System (PROMIS) in pediatric concussion, psychiatric, and orthopedic samples
- Conducted investigations into stress reactivity of pediatric patients with mild traumatic brain injury

Mind Body Lab, Department of Psychology **2017 – Present**

Syracuse University, Syracuse, NY

Supervisor: Dr. Joshua Felver, Assistant Professor and Licensed Psychologist

Psychophysiology Research

- Contributed to the research, setup, and execution of multiple experiments studying the effects of various contemplative practices on the physiological stress response
- Wrote standardized protocols for using physiological recording equipment and analyzing physiological data
- Trained and supervised undergraduate research assistants

School-Based Mindfulness Intervention Research

- Programmed ecological momentary assessment (EMA) text messages in REDCap to assess daily mindfulness practice and stress levels
- Administered cognitive batteries to children in a local elementary and high schools
- Performed fidelity coding for school-based mindfulness interventions

ADHD and Machine Learning Research, Department of Psychiatry **2017 – 2018**

Upstate Medical University, Syracuse, NY

Supervisor: Dr. Yanli Zhang-James, Assistant Professor

- Collaborated with Dr. Stephen Faraone and Dr. Yanli Zhang-James on a research paper using machine learning to diagnose ADHD from structural MRI data

Virtual Modeling Research, Department of Biomedical Engineering **2013 – 2014**

Michigan Technological University, Houghton, MI

Supervisor: Dr. Jingfeng Jiang, Assistant Professor

- Built a virtual solid model of a breast and all underlying tissues to use for an ultrasound simulation in MATLAB
- Developed a program that tested the ability of simulated palpation to detect breast lesions of different sizes and densities

Leadless Pacemaker Project, Department of Biomedical Engineering **2013 – 2014**

Michigan Technological University, Houghton, MI

Supervisor: Dr. Rupak Rajachar, Senior Lecturer

- Designed a catheter delivery tool for a leadless pacemaker as part of a senior design team project sponsored by Medtronic

Process Engineer Intern, Medical Device Research and Development **2012**

SurModics, Inc., Eden Prairie, MN

Supervisor: Tim Kloke, Senior Manager

- Designed and executed experiments for coating and testing medical devices

CLINICAL EXPERIENCE

Neuropsychology Intern **2020 – Present**

Center for Children's Cancer and Blood Disorders, Upstate Medical University, Syracuse, NY

Supervisors: Dr. Brian Rieger, Licensed Psychologist; Laura Jenkins, Educational Specialist

- Conducted comprehensive neuropsychological assessments and wrote integrated reports for children with history of cancer
- Assessments: WISC-V, WAIS-IV, WPPSI-IV, WIAT-III, BASC-3, ABAS-3, BRIEF-2, Children's Memory Scales, California Verbal Learning Test for Children, Conners Continuous Performance Test (CPT-3), NEPSY-II, Rey Complex Figure Test, Trail Making Test, Grooved Pegboard Task, Beery Visual Motor Integration, Beery Visual Perception, Beery Motor Coordination, Beck Youth Inventories (BYI-2)

Mental Health Counseling Intern **2019 – 2020**

Syracuse University Counseling Center, Syracuse, NY

Supervisor: Dr. Carrie Brown, Licensed Psychologist

- Provided intake consultation assessments and conducted risk assessments
- Provided individual and group therapy to college student population

- Co-led an anxiety skills group and process observed a sexual and gender identity affirmative therapy group
- Assessments: Alcohol Use Disorder Identification Test (AUDIT), Beck Scale for Suicidal Ideation (BSS), Counseling Center Assessment of Psychological Symptoms (CCAPS), Eating Disorder Examination Questionnaire (EDE-Q), Risk Assessment

Systems Consultation Practicum **2020**

Soule Road Elementary School, Liverpool, NY

Site Supervisor: Kimberly Loughlin, School Psychologist

Practicum Supervisor: Dr. Bridget Hier, BCBA

- Provided systems-level consultation to aide an elementary school in implementing data-based decision making with universal screening data
- Wrote a policies and procedures manual for the behavior team to implement tiered systems of support
- Provided a professional development training on behavior management practices for 140 teaching assistants as part of a consultation team
- Assessments: Curriculum Based Measurement of Reading (R-CBM), Behavior Intervention Monitoring Assessment System (BIMAS-2)

Group Therapist for Mathematics Test Anxiety **2018 – 2019**

Syracuse University, Syracuse, NY

Supervisor: Dr. Joshua Felver, Licensed Psychologist

- Implemented a mindfulness intervention, a cognitive-behavior therapy intervention, and a psychoeducational workshop to Calculus I students with test anxiety
- Administered cognitive batteries from the NIH Toolbox to undergraduate students aged 18+
- Assessments: Flanker Inhibitory Control and Attention Test, Dimensional Change Card Sort (DCCS), Pattern Comparison Processing Speed Test

Individual and Group Mindfulness Interventionist **2018 – 2019**

Syracuse City School District, Syracuse, NY

Supervisor: Dr. Joshua Felver, Licensed Psychologist

Henninger High School, Syracuse, NY

- Led a 12-week mindfulness intervention in five classes in an urban high school
- Administered cognitive batteries from the NIH Toolbox to students between the ages of 13 and 17
- Assessments: Flanker Inhibitory Control and Attention Test, Dimensional Change Card Sort, Pattern Comparison Processing Speed Test

Elmcrest School, Syracuse, NY

- Led a 6-year-old child with behavior problems through the Soles of the Feet mindfulness intervention
- Observed and recorded off-task behavior for students with behavior problems

Syracuse City School District, Syracuse, NY

- Co-led two brief mindfulness trainings to 13 elementary school principals
- Recorded a mindfulness track for the principals to listen to daily for two months
- Assessments: Beck Symptoms Inventory-18 (BSI-18)

Mindful Schools Program Support **2017 – 2018**

Meachem Elementary School, Syracuse, NY

Supervisor: Dr. Joshua Felver, Licensed Psychologist

- Administered cognitive batteries from the NIH Toolbox to students aged 5 to 10
- Worked one-on-one with special education students to assist with reading
- Assessments: Flanker Inhibitory Control and Attention Test, Dimensional Change Card Sort, Pattern Comparison Processing Speed Test

TEACHING EXPERIENCE

Psychology Recitation Instructor **2018 – 2019**

Syracuse University, Syracuse, NY

Supervisor: Dr. Shannon Houck, Assistant Teaching Professor

- Taught seven recitation sections of introductory psychology to undergraduate students

Undergraduate Teaching Assistant **2013 – 2014**

Michigan Technological University, Houghton, MI

Supervisor: Dr. Madhukar Vable, Professor Emeritus

- Graded weekly homework and exams and provided assistance for Mechanics of Materials classes of 50+ students

PROFESSIONAL EXPERIENCE

Technical Writer, Software Development **2014 – 2017**

Schneider Electric (now AVEVA), Lake Forest, CA

Supervisor: Kristen Cogburn, Head of Technical Communications

- Wrote and edited documentation for process engineering software products
- Wrote and edited internal policies and procedures for the technical publications team

Freelance Nonprofit Consultant **2015 – 2017**

Telecommute

- Managed project websites for the Worldwatch Institute and the Global Citizens' Initiative
- Wrote and distributed weekly e-newsletters for various projects from the Goethe Institute, the Worldwatch Institute, and the Global Citizens' Initiative

EDITORIAL EXPERIENCE

Editorial Board, *Mindfulness* 2019 – Present

Ad Hoc Reviewer

Journal of School Psychology 2020
Mindfulness 2018 – 2019
International Journal of School & Educational Psychology 2019

PUBLICATIONS

Peer Reviewed (*denotes undergraduate mentee)

6. Zhang-James, Y., **Helminen, E. C.**, Franke, B., Hoogman, M., & Faraone, S. V. (in press). Evidence for similar structural brain anomalies in youth and adult attention-deficit/hyperactivity disorder: A machine learning analysis. *Translational Psychiatry*.

5. *Becker, M., *Bartalotta, A., Morton, M. L., **Helminen, E. C.**, Clawson, A. J., & Felver, J. C. (2020). The effects of mindfulness-based stress reduction in the higher education workplace: A pilot study. *Journal of Integrated Social Sciences, 10*(1), 136-154.
4. Morton, M. L., **Helminen, E. C.**, & Felver, J.C. (2020). A systematic review of mindfulness interventions on psychophysiological responses to acute stress. *Mindfulness*, *11*(9), 2039–2054. https://doi.org/10.1007/s12671-020-01386-7
3. Felver, J. C., **Helminen, E. C.**, & DiFlorio, R. (2020). Ultra-brief mindfulness intervention for highly stressed professionals: A pilot open trial. *Journal of Alternative and Complementary Medicine, 26*(3), 247–248. http://doi.org/10.1089/acm.2019.0311
2. **Helminen, E. C.**, Morton, M. L., Wang, Q., & Felver, J. C. (2019). A meta-analysis of cortisol reactivity to the Trier Social Stress Test in virtual environments. *Psychoneuroendocrinology*. *110*, 104437. https://doi.org/10.1016/j.psyneuen.2019.104437
1. Wang, Y., **Helminen, E. C.**, & Jiang, J. (2015). Building a virtual simulation platform for quasistatic breast ultrasound elastography using open source software: A preliminary investigation. *Medical Physics*, *42*(9), 5453–5466. http://doi.org/10-.1118/1.4928707

Book Chapters and Book Review

3. Ash, T. L., **Helminen, E. C.**, Morton, M. L., & Felver, J. C. (forthcoming). Yoga for stress. In S. Khalsa, S. Telles, & C. Cook-Cottone (Eds.), *The Principles and Practice of Yoga for Children and Adolescents.* Scotland, UK: Handspring Publishing.
2. **Helminen, E. C.** (2020). Book review of Christina Feldman and Willem Kuyken: Ancient wisdom meets modern psychology. *Mindfulness. 11*(10), 2452-2453. http://doi.org/10.1007/s12671-020-01409-3
1. Felver, J. C., Clawson, A. J., **Helminen, E. C.**, Koelmel, E. L., Morton, M. L., & Sinegar, S. E. (2018). Reconceptualizing the measurement of mindfulness. In D. Grimes, H. Lin, & Q. Wang (Eds.), *Empirical Studies of Contemplative Practices* (pp.19-42). New York, NY: Nova Science Publishers.

Submitted

4. **Helminen, E. C.**, Ducar, D. M., Scheer, J. R., Parke, K. L., Morton, M. L., & Felver, J. C. (under review). Self-compassion, minority stress, and mental health in sexual and gender minorities: A systematic review and meta-analysis. *Health Psychology Review.*
3. Scheer, J. R., Edwards, K. M., **Helminen, E. C.**, & Watson, R. J. (revise and resubmit). Victimization typologies among a large national sample of sexual and gender minority adolescents. *Pediatrics.*
2. **Helminen, E. C.**, Morton, M. L., Wang, Q., & Felver, J. C. (revise and resubmit). Stress reactivity to the Trier Social Stress Test in traditional and virtual environments: A meta-analytic comparison. *Psychosomatic Medicine.*
1. **Helminen, E. C.**, Zhang, X., Clawson, A. J., Morton, M. L., Cary, E. L., Sinegar, S. E., Janack, P., & Felver J. C. (submitted). Stress-buffering effects of mindfulness programming for adolescents in schools during periods of high- and low-contextual stress. *ECNU Review of Education.*

In Progress

3. **Helminen, E. C.**, Scheer, J. R., & Felver, J. C. (in progress). Gender differences in the associations between mindfulness, self-compassion, and perceived stress reactivity.
2. **Helminen, E. C.**, Scheer, J. R., Ash, T. L., & Felver, J. C. (in progress). Discrimination and depressive symptomology among sexual minority and heterosexual college students: Self-compassion as a protective factor.

1. **Helminen, E. C.**, Kaplan-Kahn, E. A., Felver, J. C., & Russo, N. (in progress) School psychologists as facilitators for the transition from pediatric to adult healthcare in sickle cell disease: A scoping review.

PRESENTATIONS

14. ***Helminen, E. C.*** *& Ducar, D. M. (2021, July) Self-Compassion, Minority Stress, and Mental Health in Sexual and Gender Minority Populations. Paper to be presented at the 32nd International Congress of Psychology, Prague, Czech Republic.*
13. ***Helminen, E. C.****, Ducar, D. M., Vigna, A. J., & Felver, J. C. (2020, November) The Potential of Self-Compassion to Promote Individual Flourishing in Sexual and Gender Minority Populations. Symposium presented* at Mind and Life Contemplative Research Conference 2020 Online.
12. *Felver, J. C., Cary, E. L.,* ***Helminen, E. C.****, Schutt, M. K. & Gould, L. (2020, November) Expert consensus of mindfulness-based programming components, practices, and instructor competencies: Results from a Delphi study*. Poster presented at Mind and Life Contemplative Research Conference 2020 Online.
11. ***Helminen, E. C.*** *and Ducar, D. M. (2020, July) The Potential of Self-Compassion for Sexual and Gender Minority Mental Health. Paper presented at Preach 2020: An International LGBTQ Psychology Online Conference.*
10. ***Helminen, E. C.****, Ducar, D. M., Parke, K. L., Morton, M. L., & Felver, J. C. (2020, June) The Importance of Self-Compassion in Sexual and Gender Minority Populations. Poster presented at Mind and Life Summer Research Institute 2020 Online: Cultivating Prosocial Development Across the Lifespan.*
9. **Helminen, E. C.** (2020, April) *Compassion-Focused Therapy for College Student Populations.* Seminar presented at the Barnes Center at the Arch – Counseling, Syracuse University, Syracuse, NY.
8. **Helminen, E. C.** (2020, April) *Understanding Self-Compassion: Benefits and Misconceptions.* Invited lecture presented in the Mindfulness: Science and Practice course at Syracuse University, Syracuse, NY.
7. **Helminen, E. C.**, Morton, M., and Felver, J. (2019, June) *A Pilot Study of the Effects of Brief Daily Mindfulness Training on Stress and Well-Being in Principals*. Poster presented at the 2019 Mind and Life Summer Research Institute, Garrison, NY.
6. Morton, M., **Helminen, E. C.**, and Felver, J. (2019, June) *Learning to BREATHE (L2B) Buffers Adolescent Responses to Stress*. Poster presented at the 2019 Mind and Life Summer Research Institute, Garrison, NY.
5. Felver, J. C, **Helminen, E. C.**, Morton, M. L., and Sinegar S. E. (2019, June) *Reconceptualizing the Measurement of Mindfulness*. Poster presented at the 2019 Mind and Life Summer Research Institute, Garrison, NY.
4. Morton, M. L., *Zhang, X., *Bennett, S., **Helminen, E. C.**, and Felver J. C. (2019, May). *Effects of a Contemplative Intervention for Stress.* Poster presented at the Department of Psychology 26th Annual Poster Session, Syracuse, NY.
3. **Helminen, E. C.**, *Bennett, S., *Zhang, X., Morton, M. L., and Felver, J. C. (2019, May). *Effects of a Brief Mindfulness Program on Stress and Quality of Life for School Administrators.* Poster presented at the Department of Psychology 26th Annual Poster Session, Syracuse, NY.
2. *Becker, M., *Bartalotta, A., **Helminen, E. C.**, Clawson, A. J., and Felver, J. C. (2018, May). *The Effects of Mindfulness-Based Stress Reduction in the Workplace: A Pilot Study*.

Poster presented at the Department of Psychology 25th Annual Poster Session, Syracuse, NY.

1. Wang, Y., **Helminen, E. C.**, and Jiang, J. (2014, October). *Building a virtual breast elastography phantom lab using open source software*. Paper presented at the 2014 IEEE International Ultrasonics Symposium, Chicago, IL.

GRANTS

Funded

Research Grant **2020**

Syracuse University Intelligence Community Center for Academic Excellence

Title: *The influence of discriminatory experiences on career intentions among diverse military-connected students and servicemembers*

Role: Principal Investigator

Amount: Requested – $3,250, Awarded – undetermined

Not Funded

Division 19 Student Research Grant **2020**

APA Division 19 – Society of Military Psychology

Title: *Experiences of minority stress and coping for sexual minority women in the military*

Role: Principal Investigator

Amount: $1,500

Varela Grant **2020**

Mind and Life Institute

Title: *Cultivating self-compassion to protect against stigma-related negative health outcomes in sexual minority people of color*

Role: Principal Investigator

Amount: $11,406

Varela Grant **2019**

Mind and Life Institute

Title: *The effects of self-compassion practice on stress reactivity and recovery in sexual minority young adults*

Role: Principal Investigator

Amount: $19,954

VOLUNTEER AND LEADERSHIP SERVICE

Research Lab Service

Mind Body Lab Training Coordinator	2017 – Present
Mind Body Lab Manager	2019 – 2020

Program Service

Communications Committee Member	2019 – Present
Student Program Representative	2020 – Present
Peer Mentor	2020 – Present
Diversity Committee Member	2019 – 2020

NASP Student Affiliate 2019 – 2020
NYASP Student Affiliate 2019 – 2020

Department Service
Psychology Action Committee Member 2019 – Present

University Service
Student Veteran Liaison 2018 – Present
Transgender Health and Wellness Team Member 2020
Disability Community Group Member 2019

TRAININGS AND COMPETENCIES

Managing Bias Training 2020
Mind and Life Summer Research Institute 2019, 2020
Compassion-Focused Therapy (CFT) Intensive Training Retreat 2019
Trauma Focused Cognitive Behavioral Therapy (TF-CBT) Certification 2018
Learning to BREATHE (L2B) Teacher Training 2018
Mindfulness Training for Teachers 2018
Military Cultural Competency Training 2018
Compassion Cultivation Training (CCT) 2018

PROFESSIONAL AFFILIATIONS

APA Division 16 – School Psychology 2019 – Present
APA Division 19 – Society for Military Psychology 2020 – Present
APA Division 44 – Sexual Orientation and Gender Diversity 2019 – Present
National Center for Faculty Development & Diversity 2019 – Present