Examining the Relationship Between Self-Compassion and Emotion Regulation Strategies Using Ambulatory assessment Methods

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ABSTRACT

EXAMINING THE RELATIONSHIP BETWEEN SELF-COMPASSION AND EMOTION REGULATION STRATEGIES USING AMBULATORY ASSESSMENT METHODS

Lindsay Mae Miller, Ph.D.
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Northern Illinois University, 2020
Holly K. Orcutt, Director

Self-compassion focuses on how individuals treat themselves during periods of suffering. Overall, self-compassion is positively associated with adaptive mental health outcomes and negatively associated with psychopathology. One potential mechanism by which self-compassion may influence other constructs is emotion regulation. Unfortunately, most research about emotion regulation is conducted using retrospective reporting, meaning that the data are subject to memory biases. Ambulatory assessment methods allow for more frequent sampling, thus decreasing the reliance on recall. Using this methodology, the present study examined how differences in self-compassion were related to emotion regulation in daily life. Contrary to predictions, few ambulatory measures (depression, anxiety, problem solving of depression, avoidance of all three types of distress) were significantly predicted by the corresponding retrospective measures. Baseline self-compassion predicted ambulatory anxiety and stress, but not depression. Although individuals varied in their ambulatory ratings of distress, self-compassion did not significantly predict these ratings. Individuals also varied in the log odds of choosing each emotion regulation strategy; however, self-compassion did not predict these odds. Other exploratory hypotheses were examined regarding intensity of distress and emotion regulation choice, intensity of distress and number of regulatory strategies endorsed, and self-esteem and emotion regulation choice. Intensity of distress predicted selection of most or all of
the regulation strategies, and intensity of anxiety and stress (but not depression) significantly predicted the number of strategies used. Finally, self-esteem negatively predicted avoidance of depression, rumination of all three types of distress, and suppression of depression. Implications and limitations are discussed.
EXAMINING THE RELATIONSHIP BETWEEN SELF-COMPASSION AND EMOTION REGULATION STRATEGIES USING AMBULATORY ASSESSMENT METHODS

BY

LINDSAY MAE MILLER
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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

DEPARTMENT OF PSYCHOLOGY

Doctoral Director:
Holly K. Orcutt
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CHAPTER 1

INTRODUCTION

Self-compassion is the attitude of treating oneself with kindness and understanding in the face of difficult circumstances (Neff, 2003a, 2003b). Very generally, self-compassion is positively associated with desirable mental health outcomes, such as well-being (e.g., Barnard & Curry, 2011), and negatively associated with symptomatology, such as depression and anxiety (e.g., MacBeth & Gumley, 2012). Intervention-based research indicates that self-compassion is malleable and that participation in an intervention leads to changes in the aforementioned outcomes (e.g., Finlay-Jones, Kane, & Rees, 2017). Thus, self-compassion may be an effective target for intervention. Although the present study’s methodology does not employ an intervention, the results of such research are summarized to demonstrate the malleability of self-compassion and its potential as a target for intervention. One potential mechanism by which self-compassion may lead to differences in symptomatology is through emotion regulation, a term for attempts to influence one’s emotional responses (Koole, 2009). However, little is known about the relationship between self-compassion and emotion regulation strategies. To understand this relationship, research about self-compassion and emotion regulation will be examined. First, self-compassion is defined, and empirical findings are summarized. Then common emotion regulation strategies and their relationships (theorized and empirically examined, when available) with self-compassion will be discussed. This is followed by a brief
discussion of ambulatory assessment methods, a data collection procedure which does not rely on retrospective reporting (Trull & Ebner-Priemer, 2013). Research on self-compassion and emotion regulation using ambulatory assessment will be described. The purpose of this review is to outline the need for a better understanding of the relationship between self-compassion and emotion regulation in preparation for the current study examining this question using ambulatory assessment methods.

Defining Self-Compassion

Self-compassion is an emerging construct in Western psychological research and has been defined and operationalized by Neff (2003a, 2003b). It is rooted in Buddhist philosophy (Neff, 2003a, 2003b) and is one example of clinical psychology’s recent emphasis on Buddhist traditions and well-being (Wallace & Shapiro, 2006). Self-compassion is a metacognitive way of relating to the self that was developed as an alternative to self-esteem (Neff, 2003a, 2003b). Although it is correlated with self-esteem (e.g., Breines, Toole, Tu, & Chen, 2014; Kelly, Vimalakanthan, & Miller, 2014; Magnus, Kowalski, & McHugh, 2010; Wasylkiw, MacKinnon, & MacLellan, 2012), which is defined as one’s attitude toward or evaluation of the self (Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004), it is distinct in that it requires neither evaluations nor comparisons (Neff, 2003b, 2009, 2011). Indeed, it has been considered a protective factor against low self-esteem (Marshall et al., 2015). Self-compassion consists of three distinct yet interrelated components, each with its own contrast—self-kindness and self-judgment, common humanity and isolation, and mindfulness and over-identification. The components are strongly correlated with the total score ($r = |.62-.91|, p < .05$) and with each other ($r = |.46-.91|, p < .05$; Neff, 2003a, 2016). Self-kindness is the extension of kindness and
understanding to the self, which engenders a desire to lessen one’s suffering (Neff, 2003a, 2003b). In contrast, self-judgment is characterized by berating oneself and can be considered the “just grin and bear it” approach (Neff, 2003b, 2011). Common humanity refers to the perspective that suffering, failure, and difficult circumstances are part of the human condition (Neff, 2003a, 2003b, 2011). Feelings of isolation occur when an individual feels disconnected from others due to mistakes and struggles (Neff, 2003a, 2003b, 2011). The mindfulness component of self-compassion, which is distinct from general mindfulness (Bluth & Blanton, 2014), is the awareness of painful thoughts and feelings, which allows for increased objectivity and perspective-taking (Neff, 2003a, 2003b, 2011). Over-identification denotes the magnification and exaggeration of negative self-related internal experiences (Neff, 2003b, 2011). Together, these components offer an alternate way of conceptualizing negative experiences and what they mean about the self. Indeed, most research examines total self-compassion rather each component individually. To understand self-compassion, researchers have examined individual differences in self-compassion, correlates, and causal factors.

**Individual Differences in Self-Compassion**

One way to understand self-compassion is to examine how it varies between groups. Some individual difference variables have been associated with higher levels of self-compassion. A meta-analysis found that men reported higher self-compassion than women (Yarnell et al., 2015). This difference was moderated by ethnicity, such that the difference between genders was greater among non-Whites than Whites. The authors suggested that this gender gap may be due to traditional gender roles or stress associated with minority status. Age also moderated this gender difference, which decreased with age (Yarnell et al., 2015). In addition, age was
correlated with self-compassion, showing that older individuals are more self-compassionate than those who are younger (Neff & Pommier, 2013; Neff & Vonk, 2009; Przedzieceki et al., 2013; Werner et al., 2012). This suggests developmental changes in how individuals respond to their own suffering over time. Limited research has also examined cultural differences. An American sample reported lower self-compassion than participants from Thailand but more than those from Taiwan (Neff, Pisitsungkagarn, & Hsieh, 2008). Factors such as cultural norms and values may play a role in how one relates to the self.

Other differences in self-compassion are related to one’s experiences. Meditators reported more self-compassion than non-meditators, a finding that is sensitive to years of meditation experience (Alda et al., 2016; Baer, Lykins, & Peters, 2012; Neff, 2003a; Neff & Pommier, 2013). This finding is to be expected given that meditation and self-compassion both originate in Buddhist traditions that focus on cultivating balanced psychological well-being (Wallace & Shapiro, 2006). Survivors of childhood abuse reported lower levels of self-compassion (Tanaka, Wekerle, Schmuck, Paglia-Boak, & MAP Research Team, 2011), a finding which is sensitive to severity of emotional abuse (Miron, Orcutt, Hannan, & Thompson, 2014). Some experiences, such as regular meditation, appear to bolster the development of self-compassion, whereas others, such as childhood abuse, seem to hamper its development.

**Correlates of Self-Compassion**

Self-compassion has been studied in relation to multiple constructs in clinical psychology, primarily using correlational and cross-sectional designs and employing samples from various populations, such as undergraduate students, graduate students, mental health treatment providers, clergy members, treatment-seeking individuals, and nonclinical community
members (e.g., Barnard & Curry, 2011; MacBeth & Gumley, 2012). Perhaps the most replicated findings are the positive relationships between self-compassion and mindfulness and between self-compassion and well-being (for a review, see Barnard & Curry, 2011). A review identified several additional correlates, including positive and negative affect, life satisfaction, happiness, and emotional intelligence (Barnard & Curry, 2011). A meta-analysis found a large effect size ($r = -0.54$) for the inverse relationships between self-compassion and depression, anxiety, and stress when examining publications employing clinical and nonclinical samples (MacBeth & Gumley, 2012). These results suggest that self-compassion is positively associated with general well-being and negatively with psychopathology. Further, self-compassion mediated the relationships between attachment anxiety and well-being (Wei, Liao, Ku, & Shaffer, 2011), mindfulness and well-being (Hollis-Walker & Colosimo, 2011), and mindfulness and happiness (Hollis-Walker & Colosimo, 2011). Although these studies do not reflect causation, they suggest that self-compassion may explain why other constructs are related to well-being and happiness. In addition, self-compassion was positively associated with quality of life (Duarte, Ferreira, Trindade, & Pinto-Gouveia, 2015), as well as negatively associated with mood disturbance (Birnie, Speca, & Carlson, 2010), anger (Neff & Vonk, 2009), suicide attempts (Tanaka et al., 2011), and physiological symptoms of stress (Birnie et al., 2010). Overall, self-compassion appears to be positively related to adaptive constructs and negatively related to maladaptive ones.

Some researchers have also considered self-compassion’s relationship to biological variables. Individuals with higher self-compassion exhibited lower physiological responses to stress than those with lower levels of self-compassion (Bluth et al., 2016; Breines et al., 2015; Breines, Thoma, et al., 2014). For self-compassionate individuals, but not self-critical individuals, compassion-focused imagery was associated with an increase in heart rate variability.
and a decrease in cortisol, suggesting that engaging in self-compassion is self-soothing (Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008). These findings are consistent with results from self-report measures that associated higher levels of self-compassion with lower levels of stress.

Beyond mindfulness, general well-being, and depression and anxiety, research on self-compassion has also focused on body concerns and disordered eating. In samples of women with body concerns, self-compassion was positively correlated with body appreciation (Wasylkiw et al., 2012) but negatively correlated with disordered eating (Breines, Toole, et al., 2014; Ferreira, Pinto-Gouveia, & Duarte, 2013; Kelly, Carter, Zuroff, & Borairi, 2013; Kelly, Vimalakanthan, et al., 2014; Webb & Forman, 2013), dietary restraint (Kelly, Vimalakanthan, et al., 2014), weight/shape concerns (Wasylkiw et al., 2012), body dissatisfaction (C. Duarte et al., 2015; Ferreira et al., 2013), body shame (Breines, Toole, et al., 2014; Kelly et al., 2013), desire for thinness (Ferreira et al., 2013), and weight gain concern (Breines, Toole, et al., 2014; Kelly, Vimalakanthan, et al., 2014). Overall, self-compassion is negatively associated with body concerns and disordered eating, suggesting that these constructs may be characterized by self-criticism. Self-compassion also mediated the relationship between body preoccupation and depressive symptoms (Wasylkiw et al., 2012), body dissatisfaction and psychological quality of life (C. Duarte et al., 2015), body dissatisfaction and drive for thinness (Ferreira et al., 2013), and external shame and drive for thinness (Ferreira et al., 2013). These findings suggest that self-compassion may account in part for the relationship between body concerns and other mental health outcomes (e.g., depressive symptoms). In a population of patients with eating disorders, only those with high self-compassion and low fear of self-compassion (i.e., not viewing self-compassion as threatening) showed changes in disordered eating and body shame following 12 weeks of specialized treatment, suggesting that self-compassion plays an important role in
recovery (Kelly et al., 2013). Although most research on self-compassion and body concerns was conducted with samples endorsing eating pathology, one study examined a sample of breast cancer survivors. They found that self-compassion was negatively associated with body image difficulties (Przezdziecki et al., 2013). These findings suggest that self-compassion may be an important component in self-related evaluations and associated beliefs and behaviors, particularly among those with bodily concerns.

Research on self-compassion has also expanded to other areas. Among individuals with chronic pain, patients with more self-compassion reported greater activity engagement and acceptance of their pain than those with less self-compassion (Costa & Pinto-Gouveia, 2011). Studies focused on personality traits have found that conscientiousness, extroversion, and agreeableness were positively associated with self-compassion (Baker & McNulty, 2011; Neff, Rude, & Kirkpatrick, 2007). Neuroticism was negatively correlated with self-compassion (Neff, Rude, et al., 2007). These findings suggest that some personality traits may be more compatible with the natural development of self-compassion than others. For example, individuals with high trait levels of neuroticism may be more likely to have the tendency to be critical of themselves than those with low levels of the same personality characteristic. This is not to suggest that these individuals are incapable of treating themselves with compassion, but rather that they may require additional support or guidance to do so consistently.

Correlational methods have also been used to examine self-compassion in samples of helping professionals, such as clergy, nurses, and psychologists. In these samples, self-compassion was positively correlated with emotional intelligence (Heffernan, Quinn Griffin, McNulty, & Fitzpatrick, 2010) as well as negatively correlated with anxiety (Finlay-Jones, Rees, & Kane, 2015) and burnout (Barnard & Curry, 2012; Dev, Fernando, Lim, & Consedine, 2018).
One review recommended self-compassion and mindfulness-based stress reduction trainings for health care professionals in order to decrease perceived stress and burnout, as well as to increase self-compassion and empathy for clients (Raab, 2014). Self-compassion is positively correlated with adaptive constructs across various populations, including nonclinical individuals, patients with eating disorders and chronic pain, and helping professionals. However, these results merely capture relationships between self-compassion and other variables at one point in time and do not provide evidence for its effects over time.

**Longitudinally Examining Self-Compassion**

Few studies have examined the longitudinal effects of self-compassion. One study of nonpatient undergraduates \((N = 347)\) found that self-compassion predicted changes in depressive symptoms five months later (Raes, 2011). Specifically, higher initial self-compassion longitudinally predicted greater decreases and/or smaller increases in depression. In addition, self-compassion remained stable across observations. Another study of nonpatient undergraduates \((N = 462)\) found that self-compassion moderated the relationship between perceived stress at baseline and depression and anxiety six months later (Stutts, Leary, Zeveney, & Hufnagle, 2018). The stability of self-compassion was not examined. Among adolescent survivors of a natural disaster, self-compassion (measured within four weeks of the event) predicted fewer depressive, suicidality, posttraumatic stress, and panic symptoms at the three-month follow-up, and self-compassion measured at the three-month follow-up predicted these symptoms six months following the event (Zeller, Yuval, Nitzan-Assayag, & Bernstein, 2015). However, the stability of self-compassion was not tested. These findings suggest that self-
compassion may play a role in the development and maintenance of psychological distress following a traumatic event.

Among divorcing individuals (N = 109), higher initial self-compassion (M = 3.8 months after marital separation, SD = 2.1 months) was associated with less emotional intrusion of the divorce, somatic hyperarousal following the divorce, and avoidance behaviors in the following nine months (Sbarra, Smith, & Mehl, 2012). Thus, self-compassion may affect how individuals recover from stressful life events. It should be noted that a modified version of a self-report measure of self-compassion was used. Specifically, raters scored a 4-minute stream-of-consciousness audio recording during which participants described their relationships and subsequent separations. Rather than assessing global, trait-level self-compassion, this method appears to have measured self-compassion specific to the current marital separation. In addition, self-compassion was not measured at nine-month follow-up, so stability could not be evaluated. Lastly because self-compassion was first assessed following the stressful events (i.e., the natural disaster and marital separations), these studies were unable to examine the effects of trauma exposure on self-compassion or the extent to which pre-event self-compassion predicts post-event symptomatology. Although there is limited longitudinal research, it suggests that self-compassion’s causal role should be further examined using experimental designs.

The Effects of Short- and Long-Term Self-Compassion Interventions

Some researchers have experimentally induced self-compassion as a state or mood. For example, self-compassion was induced by admonishing dieters to treat themselves with compassion after eating a doughnut (Adams & Leary, 2007). This temporary self-compassion
induction was associated with more self-compassionate eating attitudes in response to diet breaking (Adams & Leary, 2007). The authors hypothesized that the effects were due to the intervention rather than experiment demand because participants who received the intervention also ate less candy than those who did not, meaning that they did not engage in the restriction-binge cycle that they hypothesized was caused by self-criticism (Adams & Leary, 2007). It appears that temporarily increasing self-compassion may be easily accomplished by merely instructing people to adopt this stance. Other researchers induced self-compassion by asking participants to identify thoughts that would lead them to agree with each of the three components of self-compassion (i.e., self-kindness, mindfulness, common humanity) or approach a situation from a compassionate perspective (Baker & McNulty, 2011; Breines & Chen, 2012; Johnson & O’Brien, 2013; Leary, Tate, Adams, Allen, & Hancock, 2007; Odou & Brinker, 2014).

Compared to a group that completed a self-esteem reflection, those who received this induction reported greater motivation to change a weakness and to make amends following a moral transgression (Breines & Chen, 2012). These results were not due to differences in positive affect following the interventions. They also reported lower negative affect, state shame, and mood following negative and/or shame-focused mood inductions (Johnson & O’Brien, 2013; Leary et al., 2007; Odou & Brinker, 2014). Participants in the intervention group more strongly believed that the negative event they described was caused by the kind of person they are and that they were similar to others (Leary et al., 2007). Two weeks after the self-compassion induction, participants reported increased self-compassion and decreased depression (Johnson & O’Brien, 2013).

In one study of undergraduates in romantic relationships ($M = 15.41$ months, $SD = 14.53$ months), self-compassion and conscientiousness interacted such that higher levels of both traits
were associated with greater motivation to correct interpersonal mistakes and willingness to engage in accommodation behaviors (Baker & McNulty, 2011). This interaction was only significant for male participants. Overall, this brief intervention appeared to change how participants felt about themselves and difficult situations. Self-compassion appears to be malleable and may play a causal role in how individuals view themselves and painful experiences. Most of these experiments focused on immediate changes in self-compassion and its effects. When considering self-compassion as a potential causal factor in the development and maintenance of symptomatology, it is important to know if it is possible for an intervention to lead to a sustainable increase in self-compassion.

To answer this question, further research has been conducted with additional samples to understand whether interventions can lead to changes in self-compassion that endure beyond the laboratory session. Trait-level (i.e., long-term) changes to self-compassion have been induced through self-compassion exercises and training (Albertson, Neff, & Dill-Shackleford, 2015; Arch et al., 2014; Finlay-Jones et al., 2017; Mosewich, Crocker, Kowalski, & DeLongis, 2013; Shapira & Mongrain, 2010; Smeets, Neff, Alberts, & Peters, 2014; Wong & Mak, 2016), mindful self-compassion programs (Germer & Neff, 2013; Neff & Germer, 2013), compassion-focused therapy (Gilbert, 2014; Kelly, Carter, & Borairi, 2014; Kelly, Zuroff, Foa, & Gilbert, 2010; Lucre & Corten, 2013; Sommers-Spijkerman, Trompetter, Schreurs, & Bohlmeijer, 2018), mindfulness-based stress reduction programs (Birnie et al., 2010; Edwards, Adams, Waldo, Hadfield, & Biegel, 2014; Newsome, Waldo, & Gruszka, 2012), mindfulness-based cognitive therapy (Proeve, Anton, & Kenny, 2018), the Gestalt two-chair exercise (Neff, Kirkpatrick, & Rude, 2007), and even smartphone application-based self-compassion programs (Mak, Wong, Chan, & Lau, 2019; Rodgers et al., 2018). Interventions ranged from four days (Arch et al.,
2014) to twelve weeks (Kelly, Carter, et al., 2014). Participation in an intervention led to increases in self-compassion at post-intervention (Albertson et al., 2015; Arch et al., 2014; Birnie et al., 2010; Edwards et al., 2014; Finlay-Jones et al., 2017; Mosewich et al., 2013; Neff & Germer, 2013; Proeve et al., 2018; Smeets et al., 2014; Sommers-Spijkerman et al., 2018), one-month follow-up (Mak et al., 2019; Mosewich et al., 2013; Newsome et al., 2012), three-month follow-up (Albertson et al., 2015; Mak et al., 2019; Sommers-Spijkerman et al., 2018), four-month follow-up (Rodgers et al., 2018), six-month follow-up (Neff & Germer, 2013), and twelve-month follow-up (Neff & Germer, 2013). Overall, effect sizes were medium to large and ranged from $d = 0.65-1.67$ at post-intervention (Albertson et al., 2015; Birnie et al., 2010; Finlay-Jones et al., 2017; Mosewich et al., 2013; Neff & Germer, 2013; Smeets et al., 2014) and $d = 0.82-1.15$ at follow-up (Finlay-Jones et al., 2017; Mosewich et al., 2013). This indicates that self-compassion is malleable and that these increases are sustained after the intervention has ended.

Mindfulness-based interventions also lead to increases in mindfulness, which has a well-documented relationship with self-compassion (Birnie et al., 2010; Edwards et al., 2014; Neff & Germer, 2013; Newsome et al., 2012; Smeets et al., 2014). Self-compassion and mindfulness are considered to be mechanisms of change of mindfulness-based interventions (Keng, Smoski, Robins, Ekblad, & Brantley, 2012). Completing a self-compassion intervention has led to increases in life satisfaction (Neff & Germer, 2013), happiness (Finlay-Jones et al., 2017; Shapira & Mongrain, 2010), and smoking cessation (Kelly et al., 2010), as well as decreases in depression (Edwards et al., 2014; Finlay-Jones et al., 2017; Lucre & Corten, 2013; Neff & Germer, 2013; Shapira & Mongrain, 2010; Sommers-Spijkerman et al., 2018), anxiety (Finlay-Jones et al., 2015; Neff, Kirkpatrick, et al., 2007; Sommers-Spijkerman et al., 2018), stress
Self-compassion’s positive relationships with adaptive constructs and negative relationships with maladaptive constructs appear to be causal. In other words, increases in self-compassion lead to improved daily functioning and decreased symptoms of common psychopathology. Changes in mindfulness and stress were maintained or improved at one-month follow-up, indicating that the effects of increased self-compassion persisted after the intervention was concluded (Newsome et al., 2012). The self-compassion meditations also increased self-compassion in response to social stressors and decreased biological and subjective anxiety responses (Arch et al., 2014). This is consistent with the aforementioned correlational findings. Compared to those in the control or waitlist groups, eating disorder patients who completed a self-compassion meditation intervention reported greater increases in body appreciation as well as greater reductions in body dissatisfaction, body shame, and appearance-based self-worth (Albertson et al., 2015). Patients who evidenced greater increases in self-compassion early in compassion-focused therapy saw greater overall decreases in shame (Kelly, Carter, et al., 2014).

As indicated by longitudinal research, self-compassion appears to play a key role in psychotherapy for eating disorders. In addition, a review of the efficacy of mindfulness- and loving-kindness-based interventions in mental health professionals reported that they increased self-compassion in this population (Boellinghaus, Jones, & Hutton, 2014). Self-compassion appears to be malleable in nonpatients, eating disorder patients, and helping professionals alike. Self-compassion has been shown to be sensitive to short- and long-term intervention. The results of these intervention-based studies indicate that self-compassion is malleable and plays a causal
role in daily functioning and the development and maintenance of key mental health-related constructs, such as symptoms of common psychopathology. Although the present study did not include an intervention component, evidence that self-compassion can be increased bolsters the clinical implications of the current study. One possible mechanism by which self-compassion influences these outcomes is through emotion regulation.

Emotion Regulation

Emotion regulation refers to “the activation of a goal to up- or down-regulate either the magnitude or duration of the emotional response” (Gross, 2013, p. 359). In other words, it is a deliberate effort to overrule or change one’s naturally occurring emotional response (Koole, 2009). Gross's (1998) process model of emotion regulation asserts that there are five opportunities in the emotion generative process for an individual to self-regulate. These five points are situation selection (i.e., approaching or avoiding a situation due to its anticipated emotional impact), situation modification (i.e., changing a situation to modify its emotional impact), attentional deployment (i.e., directing one’s attention within a situation to alter one’s emotions), cognitive change (i.e., reevaluating the situation to alter one’s emotions), and response modulation (i.e., altering emotional response tendencies after the emotion has been elicited; Gross, 1998, 1999, 2002, 2013). Because no one strategy is universally optimal, the flexible use of emotion regulation strategies is considered integral to adaptive psychological functioning, which is referred to as regulatory flexibility (Aldao, 2013; Bonanno & Burton, 2013; Gross, 2015). Regulatory flexibility is significantly related to outcomes such as psychological adjustment ($r = .24, p < .05$; for a meta-analysis, see Cheng, Lau, & Chan, 2014) and is thought to be a prominent feature of many psychological diagnoses (e.g., depression,
anxiety; for a review, see Sheppes, Suri, & Gross, 2015). Emotion regulation is associated with many psychological disorders, such as anxiety, depression, eating disorders, substance use disorders, and borderline personality disorder (Aldao & Nolen-Hoeksema, 2010; Aldao, Nolen-Hoeksema, & Schweizer, 2010; Amstadter, 2008; Berking, Wirtz, Svaldi, & Hofmann, 2014; Berking & Wupperman, 2012; Berman, Wheaton, McGrath, & Abramowitz, 2010; Cisler, Olatunji, Feldner, & Forsyth, 2010; Duarte, Matos, & Marques, 2015; Hofmann, Sawyer, Fang, & Asnaani, 2012). There are at least 400 identified strategies, and it would be impossible for any one study to assess all of them at once (Skinner, Edge, Altman, & Sherwood, 2003). However, meta-analytic and factor-analytic designs tend to focus on the same six strategies—acceptance, avoidance, problem solving, reappraisal, rumination, and suppression (e.g., Adrian, Zeman, & Veits, 2011; Aldao, 2013; Aldao et al., 2010; Augustine & Hemenover, 2009; Koole, 2009; Seligowski & Orcutt, 2015). Each of these strategies has similarities to one or more components of self-compassion. However, the research examining the relationships between self-compassion and these emotion regulation strategies is limited.

Acceptance

Acceptance is more than mere tolerance, but rather the “active nonjudgmental embracing of experience in the here and now” as it is rather than as one perceives it or wishes it to be (Hayes, 2004, p. 656). The common humanity and mindfulness components of self-compassion appear to be particularly relevant to this emotion regulation strategy. First, the mindfulness component involves acknowledging one’s thoughts and feelings without judgment, experiencing them as they are (Neff, 2003a, 2003b, 2011). This appears to be similar to the aspect of acceptance in that one must be aware of one’s inner experiences before they can be embraced.
Second, the common humanity component recognizes that suffering is part of the human condition rather than isolating (Neff, 2003a, 2003b, 2011). In other words, struggling is universal. Although this is not the same as embracing one’s experience, it may make doing so easier by making suffering less threatening. Theoretically, self-compassion and acceptance should be positively related.

Research in this area consistently supports this hypothesis. Immediately after learning that they had failed their midterm exams ($N = 110$ university students), self-compassion predicted the use of acceptance to cope with failure (Neff, Hsieh, & Dejitterat, 2005). In a sample of treatment-seeking couples diagnosed with infertility ($N = 100$ heterosexual couples), self-compassion was positively correlated with acceptance (Pinto-Gouveia, Galhardo, Cunha, & Matos, 2012). Among clinically depressed outpatients ($N = 69$), self-compassion was positively correlated with acceptance (Diedrich, Burger, Kirchner, & Berking, 2017). Acceptance mediated the relationship between self-compassion and depressive symptoms in a sample of community adults with a history of recurrent depression (Bakker, Cox, Hubley, & Owens, 2018). Compared to a traditional cognitive behavioral intervention, an affect regulation treatment (i.e., a transdiagnostic intervention that focuses on adaptive emotion regulation), which included components of self-compassion interventions, led to greater increases in acceptance among inpatients with depression ($N = 432$; Berking, Ebert, Cuijpers, & Hofmann, 2013; Berking et al., 2008). A similar intervention had a medium, positive effect on acceptance ($d = .63$) in a sample of police officers (Berking, Meier, & Wupperman, 2010). Overall, self-compassion appears to be positively associated with acceptance.
Avoidance is an emotion regulation strategy that refers to escaping, or moving away from, an undesirable situation or emotion (Skinner et al., 2003). Avoidance may be behavioral (Ottenbreit & Dobson, 2004) or experiential (Bond et al., 2011) in nature. The mindfulness component of self-compassion involves being aware of one’s own thoughts and emotions (Neff, 2003a, 2003b, 2011). One cannot move away from one’s experiences while also holding them in conscious awareness (Allen & Leary, 2010). Thus, self-compassion and avoidance are incompatible.

Research indicates that self-compassion and avoidance are negatively related. In a sample of treatment-seeking couples diagnosed with infertility (same as above), self-compassion was negatively correlated with avoidance for the men ($r = -.33, p < .01$) but not the women (Pinto-Gouveia et al., 2012). Among university students who just learned that they had failed a midterm exam (same as above), self-compassion was negatively associated with avoidance (Neff et al., 2005). In a treatment-seeking sample of survivors of interpersonal violence ($N = 27$), self-compassion was significantly correlated with avoidance ($r = .78, p < .01$; McLean, Fiorillo, & Follette, 2018). Among outpatients with depression ($N = 142$), self-compassion was negatively correlated with avoidance ($r = -.30, p < .01$), and avoidance significantly mediated the relationship between self-compassion and depressive symptoms (Krieger, Altenstein, Baettig, Doerig, & Holtforth, 2013). Avoidance also mediated the relationship between self-compassion and depressive symptoms in a sample of community adults with a history of recurrent depression (Bakker et al., 2018). In a sample of undergraduates who endorsed a trauma history ($N = 100$), self-compassion was uniquely related to avoidance symptoms ($r = -.24, p \leq .05$) but not
reexperiencing \( r = -.16, p = ns \) or hyperarousal symptoms (Thompson & Waltz, 2008). One intervention-based study found that community nonpatients reported decreased avoidance \( d = .50 \) after completing a mindful self-compassion program (Neff & Germer, 2013). Indeed, self-compassion and avoidance appear to be inversely related.

**Problem Solving**

Problem solving involves actively changing the situation or stressor to produce a more desirable outcome (Skinner et al., 2003). The most relevant self-compassion component is self-kindness, which leads to a desire to decrease one’s suffering (Neff, 2003a, 2003b). Suffering may be decreased through various methods, including problem solving. However, because there are other, emotion-focused techniques, one may decrease suffering without engaging in problem solving. Theoretically, the relationship between self-compassion and problem solving is unclear. Yet previous studies (see below) suggest that they are positively related or unrelated.

Research on the relationship between self-compassion and problem solving is mixed. In a sample of treatment-seeking couples diagnosed with infertility (same as above), self-compassion was positively correlated with problem solving for the women \( r = .51, p < .01 \) but not the men (Pinto-Gouveia et al., 2012). Among undergraduate students \( N = 117 \), self-compassion was not significantly related to a one-item measure of “[taking] steps to fix the problem” (Leary et al., 2007). Similarly, another study of university students (same as above) found that there was no correlation between self-compassion and the use of problem solving to cope with academic failure \( r = -.10-.05, p = ns \); Neff et al., 2005). These mixed findings may be due to the role of context (Aldao, 2013). Various situations may place distinct emotional demands, thus leading the same individual to employ regulatory flexibility and selectively
choose different regulatory strategies while continuing to be motivated by self-kindness.

**Reappraisal**

Reappraisal is an emotion regulation strategy that involves changing one’s perception or interpretation of a situation (Allen & Leary, 2010). It seems most related to common humanity, the recognition that one’s painful experiences are part of the human condition rather than isolating (Neff, 2003a, 2003b, 2009). Rejecting self-criticism and isolation in favor of self-kindness and common humanity could be considered reappraisal. As such, self-compassion should be positively related to reappraisal.

Research is limited and has mixed findings. In a sample of nonclinical community members ($N = 424$), the common humanity component of self-compassion was positively correlated with reappraisal (Petrocchi, Ottaviani, & Couyoumdjian, 2014). Following the failure of their midterm exams, self-compassion was positively correlated with the use of reappraisal to cope with their grades ($r = .24, p \leq .01$) in a group of undergraduates (Neff et al., 2005).

However, in a sample of community members ($N = 100$), participation in a compassion-focused therapy intervention did not lead to a significant increase in reappraisal (Jazaieri et al., 2014). Reappraisal did not mediate the relationship between self-compassion and depressive symptoms in a sample of community adults with a history of recurrent depression (Bakker et al., 2018). More research is needed to understand the relationship between self-compassion and reappraisal.

**Rumination**

Rumination is a “a repetitive and passive focus on one’s negative emotions” (Treynor, Gonzalez, & Nolen-Hoeksema, 2003, p. 247). Over-identification, the magnification and
exaggeration of negative experiences, is similar to rumination in that both focus on negativity (Neff, 2003b, 2011). The distinction is that over-identification focuses on the experiences, rather than the emotional responses to those experiences. The contrasting component is mindfulness, holding painful thoughts and feelings in awareness without repetitive focus characteristic of rumination (Neff, 2003a, 2003b, 2011). Thus, self-compassion should be negatively related to rumination.

In the context of self-compassion, rumination is perhaps the most frequently studied emotion regulation strategy. Self-compassion was significantly negatively correlated with rumination in samples of undergraduate students (Hasking, Boyes, Finlay-Jones, McEvoy, & Rees, 2018; Odou & Brinker, 2014; Raes, 2010; Samaie & Farahani, 2011; Smeets et al., 2014), nonpatient community members ($r = -.51, p < .01$; C. J. Robins, Keng, Ekblad, & Brantley, 2012), and outpatients diagnosed with depression (Krieger et al., 2013). Rumination mediated the relationship between self-compassion and anxiety and depression in samples of nonclinical undergraduates, outpatients with depression, and nonpatient community members (Bakker et al., 2018; Krieger et al., 2013; Raes, 2010). Rumination also mediated the relationship between self-compassion and sleep quality among nonclinical undergraduates (Butz & Stahlberg, 2018). In a sample of nonpatient community members (same as above), those who completed a mindfulness-based stress reduction reported greater decreases in rumination at two-month follow-up compared to the waitlist control group (Robins et al., 2012). Another study with a sample of patients with social anxiety disorder ($N = 14$) reported similar results (Goldin & Gross, 2010). In another experiment, undergraduate students ($N = 40$) who completed the Gestalt two-chair exercise reported increases in self-compassion, which were negatively correlated with rumination at one-month follow-up (Neff, Kirkpatrick, et al., 2007). Female student athletes
who participated in a self-compassion intervention \((N = 29)\) reported decreases in rumination immediately following the intervention and at one-month follow-up (Mosewich et al., 2013). A similar significant change was found in a sample of undergraduate women (Smeets et al., 2014). A mindfulness-based intervention that included a loving-kindness meditation led to a significant decrease in rumination for a sample of undergraduate women (Caldwell & Shaver, 2015) and in a sample of patients with bipolar disorder (Deckersbach et al., 2012). Overall, self-compassion appears to be consistently negatively associated with rumination.

**Suppression**

Suppression involves repressing one’s emotion-expressive behavior or thoughts, which are termed expressive suppression and thought suppression, respectively (Gross & John, 2003; Wegner & Zanakos, 1994). In other words, an individual engages in suppression when he or she makes an effort not to display one’s emotions or to think about something that is eliciting an undesirable emotion. The most relevant component of self-compassion appears to be mindfulness, awareness of one’s painful thoughts or feelings (Neff, 2003a, 2003b, 2011). When considering this component, self-compassion and suppression appear to be incompatible.

Research in this area is limited and inconsistent. In a sample of community members (same as above), compassion-focused therapy led to a significant reduction in suppression (Jazaieri et al., 2014). The Gestalt two-chair exercise led to increases in self-compassion, which were negatively correlated with suppression at one-month follow-up \((r = -55, p < .01)\) in a sample of university students (Neff, Kirkpatrick, et al., 2007). However, in a sample of nonpatients (same as above), self-compassion was unrelated to suppression (Petrocchi et al., 2014), and a mindfulness-based intervention that included a loving-kindness meditation did not
affect suppression (Caldwell & Shaver, 2015). More research is needed to clarify the relationship between self-compassion and suppression.

**Self-Compassion as an Emotion Regulation Strategy**

Self-compassion has been conceptualized as an emotion regulation strategy (Diedrich, Grant, Hofmann, Hiller, & Berking, 2014; Diedrich, Hofmann, Cuijpers, & Berking, 2016; Neff, 2003a, 2003b). Neff (2003a, 2003b) defined self-compassion as an emotional-approach coping strategy because it involves the mindful awareness of negative emotions with self-kindness and shared humanity. Self-compassion permits “the clearer apprehension of one’s immediate situation and the adoption of actions that change oneself and/or the environment in appropriate and effective ways” (Neff, 2003b, p. 92). Although self-compassion was characterized as an emotion regulation strategy, further explanation seems to imply that it influences emotions indirectly through the use of adaptive regulatory strategies (i.e., “appropriate and effective ways”).

Little research has examined self-compassion’s potential role as an emotion regulation strategy. In a study by Diedrich and colleagues (2014), participants completed a low mood induction and were instructed to regulate feelings of depression with self-compassion, reappraisal, or acceptance. In the self-compassion condition, the instructions provided were similar to Neff’s Self-Compassion Break and Taking Care of the Caregiver exercises (https://self-compassion.org) and directed participants to become aware of and acknowledge suffering, engage in self-soothing, and repeat supportive phrases. The self-compassion condition was more effective at decreasing feelings of depression following the low mood induction than
waiting, and it was equally as effective as the reappraisal or acceptance conditions (Diedrich et al., 2014).

In another study with similar methodology employing a sample of individuals with depression, the self-compassion condition was more effective than the acceptance condition following the same low mood induction (Diedrich et al., 2016). Although self-compassion was treated as an emotion regulation strategy, it was discussed as an attitude that encourages individuals to engage in “adaptive” emotion regulation strategies (Diedrich et al., 2016). For example, the authors asserted that a self-compassionate response increases motivation to engage in “self-help strategies” (Diedrich et al., 2016). The efficacy of the self-compassion condition in decreasing induced feelings of depression may be because a self-compassionate response evokes the use of adaptive emotion regulation strategies or encourages the flexible use of multiple strategies rather than a single, predetermined strategy. Individuals with greater self-compassion may also be more willing to engage with their negative emotions, which could allow for more adaptive regulation. However, it should be noted that the adaptiveness of a regulatory strategy is dependent upon the situation.

Further research found that adaptive emotion regulation skills (a composite of awareness, sensations, clarity, understanding, tolerance, readiness to confront distressing situations, and modification) mediated the relationship between initial self-compassion and depressive symptoms one week later in a sample of treatment-seeking individuals with depression (Diedrich et al., 2017). A reverse mediation was nonsignificant; in other words, self-compassion did not mediate the relationship between adaptive emotion regulation skills and depressive symptoms (Diedrich et al., 2017). These findings suggest that self-compassion decreases depressive symptoms through changes in emotion regulation. Emotion regulation may be a mechanism
through which self-compassion decreases depressive symptomatology. This is theoretically consistent with the definition of self-compassion (Neff, 2003a, 2003b) and the role of self-compassion in emotion regulation (Diedrich et al., 2017, 2014, 2016). Self-compassionate individuals appear to regulate their emotions differently than those with low trait self-compassion, and emotion regulation choice may be a mechanism through which self-compassion affects other constructs, such as psychopathology and general well-being.

**Ambulatory Assessment**

One limitation of much research examining emotion regulation is that retrospective reporting is subject to memory and other biases (e.g., Shiffman, Stone, & Hufford, 2008; Stone et al., 1998). Ambulatory assessment (which is also referred to as ecological momentary assessment and experience sampling, among others) addresses this limitation by collecting multiple data points over time rather than one retrospective report (for reviews, see Carpenter, Wycoff, & Trull, 2016; Ebner-Priemer & Trull, 2009; Fahrenberg, Myrtek, Pawlik, & Perrez, 2007; Shiffman et al., 2008; Trull & Ebner-Priemer, 2013; Wilhelm & Grossman, 2010). Advances in technology, such as the high prevalence of smartphone ownership, have made it easier to collect this data (Carpenter et al., 2016; Kuntsche & Labhart, 2013). Researchers have used this method to assess mood fluctuations in daily life (Wilhelm & Schoebi, 2007), including among cancer patients (Wu, Johnson, Schepp, & Berry, 2011) and patients prescribed psychotropic medications (Bos, Schoevers, & aan het Rot, 2015; Conner & Barrett, 2012), as well as emotions in multiple contexts, such as mindfulness (Keng & Tong, 2016).

These methods are extremely versatile and have been used to better understand the natural course of anxiety (Alpers, 2009; Pfaltz, Michael, Grossman, Margraf, & Wilhelm, 2010;
Thielsch et al., 2015; Walz, Nauta, & aan het Rot, 2014), depression (Ebner-Priemer & Trull, 2009; Sowislo, Orth, & Meier, 2014; Wichers, Lothmann, Simons, Nicolson, & Peeters, 2012; Wichers et al., 2010, 2011), borderline personality disorder (Ebner-Priemer, Kuo, et al., 2007; Ebner-Priemer et al., 2008; Ebner-Priemer & Sawitzki, 2007; Ebner-Priemer, Welch, et al., 2007; Reisch, Ebner-Priemer, Tschacher, Bohus, & Linehan, 2008; Trull et al., 2008), other personality disorder symptoms (Wright & Simms, 2016), substance use disorders (for a review, see Shiffman, 2009), attention-deficit/hyperactivity disorder (Skirrow et al., 2014), and psychotic symptoms (Schlier, Moritz, & Lincoln, 2016; van Os, Latater, Delespaul, Wichers, & Myin-Germeyns, 2014). Ambulatory assessment has also been used to examine the real-time relationships between emotions and emotional appraisals (Tong et al., 2007), stress and fatigue (Doerr et al., 2015), negative affect and cortisol levels (Jacobs et al., 2007), mood and being on-call for work (Dettmers, Vahle-Hinz, Bamberg, Friedrich, & Keller, 2016), mood and memory (Fahrenberg, Brügner, Foerster, & Käppler, 1999), emotions and mindfulness (Hill & Updegraff, 2012), positive and negative affect and a history of nonsuicidal self-injury (Bresin, 2014), and negative affect and binge eating behavior (for a meta-analysis, see Haedt-Matt & Keel, 2011).

Ambulatory assessment allows researchers to address a variety of hypotheses in realtime as they naturally occur without the limitations associated with memory biases and other biases (e.g., availability heuristic).

**Ambulatory Assessment Methods in the Study of Emotion Regulation**

Studies examining emotion regulation strategies (e.g., avoidance, problem solving) in daily life using ambulatory assessment are fairly uncommon. Stone, Kennedy-Moore, and Neale (1995) assessed the use of eight coping categories (distraction, situation redefinition
[reappraisal], direct action [problem solving], catharsis, acceptance, seeking social support, relaxation, and religion) regarding “the most bothersome event or issue of the day” in a group of adolescents. They found that negative affect was positively associated with catharsis and seeking social support and negatively associated with acceptance. Positive affect was positively associated with distraction, acceptance, and relaxation. Stone and colleagues (1998) collected information from participants every 20 – 60 minutes for 48 hours about stressors at work, in their marriage, or in other contexts. If a participant endorsed a stressor since the previous reporting, he or she indicated the extent to which each of 33 coping strategies was used. Researchers compared the ambulatory assessment data to retrospective reporting of the same information. There were considerable discrepancies between the regulatory strategies endorsed with ambulatory assessment methods and with retrospective self-report (e.g., failing to report stressors, over- and under-reporting how frequently regulatory strategies were used).

Silk, Steinberg, and Morris (2003) signaled adolescents six or seven times per day for one week to identify an emotionally salient event that occurred in the 60 minutes prior to the signal. Emotion regulation strategies were assessed when a participant reported an affect rating of 3 or greater on a 5-point scale. They assessed the use of 13 strategies, which comprised four subscales (primary control, secondary control, disengagement, and involuntary engagement). They found that disengagement and involuntary engagement were ineffective at decreasing negative affect. Tan and colleagues (2012) employed a method similar to the previous two studies with adolescents with and without an anxiety disorder diagnosis. Researchers called participants twice per day for one week and asked them to report their affect and its intensity. The use of six categories of emotion regulation strategies (distraction, cognitive restructuring, problem solving, acceptance, avoidance, and rumination) were assessed when a participant
reported an affect rating of 3 or greater on a 5-point scale. They found that anxious and nonanxious adolescents used the coping strategies with equal frequency. Problem solving and distraction were effective for both groups. Acceptance was less effective and rumination was more detrimental to those with an anxiety disorder than those without in predicting decreases in emotional intensity (e.g., anxiety).

Short, Boffa, Clancy, and Schmidt (2018) examined emotion regulation in the context of posttraumatic stress disorder. Participants with this diagnosis reported whether they experienced a stressor since the last signal four times per day for eight days. Those who indicated that they experienced “anything upsetting or stressful” reported whether they used each of seven emotion regulation strategies (reappraisal, acceptance, problem solving, suppression, rumination, impulsive behaviors, avoidance) and responded to ten items assessing posttraumatic stress symptoms. Results indicated that the use of maladaptive emotion regulation strategies (suppression, rumination, impulsive behaviors, avoidance) predicted greater posttraumatic stress symptoms later in the day. Visser, Esfahlani, Sayama, and Strauss (2018) examined differences in emotion regulation choice between individuals with schizophrenia or schizoaffective disorder and control participants. All participants were signaled to report their emotional intensity (anger, fear, sadness, shame, anxiety), emotion regulation use (suppression, reappraisal, relaxation, distraction, talking about feelings with others, avoidance), and contextual information four times per day for six days. Results found that those with schizophrenia or schizoaffective disorder reported stronger negative emotions, and less effective use of emotion regulation strategies and used more strategies in a given context than those in the control group. These findings suggest that quality of regulatory strategies is more effective at decreasing distress than quantity of strategies.
Ambulatory assessment methods have also been used to examine the effects of the induction of rumination, an emotion regulation strategy (Huffziger et al., 2013; Huffziger, Ebner-Priemer, Koudela, Reinhard, & Kuehner, 2012). The inductions increased rumination and decreased positive mood and calmness, and greater increases in rumination were associated with greater decreases in positive mood (Huffziger et al., 2013, 2012). Using similar methods, the potential regulatory effects of other behaviors have been studied. For example, listening to music decreased subjective stress ratings (Linnemann, Ditzen, Strahler, Doerr, & Nater, 2015), physical activity led to increased positive affect (for a review, see Liao, Shonkoff, & Dunton, 2015), nonsuicidal self-injury decreased negative affect (Armey, Crowther, & Miller, 2011), and binge eating increased negative affect (for a meta-analysis, see Haedt-Matt & Keel, 2011). Ambulatory assessment methods are an effective way to examine emotion regulation in daily life.

**Ambulatory Assessment Methods in the Study of Self-Compassion**

The use of ambulatory assessment methods in the study of self-compassion is even less common. In one study, researchers asked participants ($N = 9$) to record their self-critical thoughts each day for two weeks while participating in a group-based self-compassion intervention (Gilbert & Irons, 2004). Over treatment, there were no changes in self-criticism, but there was a significant increase in the use of self-compassion to soothe self-critical thoughts. However, it could be argued that this methodology still relies on retrospective reporting (i.e., indicating what happened previously rather than the current experience). In addition, the extremely small sample size limits the generalizability of these findings. A similar study asked participants ($N = 95$ female undergraduates) to complete a survey every evening for four days
(Breines, Toole, et al., 2014). The survey assessed appearance-related self-compassion, self-esteem, and disordered eating behaviors. Researchers found that self-compassion, but not self-esteem, significantly predicted disordered eating. In a more recent study, participants \((N = 100)\) reported their affective states and their desire to change or maintain these states twice per day throughout a nine-week compassion training intervention (Jazaieri et al., 2017). They also completed weekly assessments of how frequently they used five emotion regulation strategies (e.g., acceptance, suppression). There was a significant decrease in anxiety and a significant increase in calm over the course of the intervention. There was also a decrease in the use of suppression and an increase in the use of acceptance as emotion regulation strategies.

Another study using ambulatory assessment and self-compassion was conducted by Krieger, Hermann, Zimmermann, and grosse Holtforth (2015). They assessed self-compassion and global self-esteem in the laboratory as trait-level variables and then asked participants \((N = 101)\) nonclinical community members to report positive affect, negative affect, and perceived stress twice daily for two weeks. Higher self-compassion was associated with greater positive affect and less negative affect and perceived stress. When controlling for global self-esteem, higher self-compassion was associated with more positive affect and less negative affect during periods of higher levels of perceived stress. Self-compassion, but not global self-esteem, was found to buffer the effects of perceived stress on negative affect. Further research is needed to understand self-compassion’s role in daily functioning.

**Statement of the Problem**

Self-compassion is an emerging construct that was defined and operationalized by Neff (2003a, 2003b). It is distinct from self-esteem and was developed as an alternate way of relating

Self-compassion has been studied in relation to multiple constructs. A review of self-compassion identified several correlates of self-compassion, including positive and negative affect, well-being, life satisfaction, happiness, emotional intelligence, coping strategies, and mindfulness (Barnard & Curry, 2011). The review also identified multiple studies showing that self-compassion is negatively associated with depression and anxiety (Barnard & Curry, 2011). A meta-analysis reported a large effect size for the inverse relationships between total self-compassion and depression, anxiety, and stress (MacBeth & Gumley, 2012). Results of further studies have been consistent with these findings. Intervention-based research indicates that self-compassion can be increased (e.g., Kuyken et al., 2010; Mosewich et al., 2013; Robins et al., 2012) and that its relationship with many of these psychopathology and well-being outcomes may be causal (e.g., Neff & Germer, 2013; Shapira & Mongrain, 2010; Smeets et al., 2014). Because self-compassion is sensitive to intervention and causally affects therapeutic outcomes of interest, the results of the present study may have clinical implications.

One mechanism by which self-compassion may lead to lower levels of psychopathology and greater well-being is emotion regulation. Self-compassion is positively associated with acceptance (Diedrich et al., 2017; Neff et al., 2005; Pinto-Gouveia et al., 2012) and negatively associated with avoidance (Krieger et al., 2013; Neff et al., 2005; Pinto-Gouveia et al., 2012) and rumination (Odou & Brinker, 2014; Raes, 2010; Samaie & Farahani, 2011; Smeets et al., 2014). There are mixed findings regarding the relationships between self-compassion and problem solving (Leary et al., 2007; Pinto-Gouveia et al., 2012), reappraisal (Jazaieri et al., 2014; Neff et
al., 2005; Petrocchi et al., 2014), and suppression (Jazaieri et al., 2014; Neff, Kirkpatrick, et al., 2007; Petrocchi et al., 2014). Although self-compassion has been characterized as an emotion regulation strategy, it appears to be a factor that influences emotion regulation choice and enables individuals to adaptively regulate their emotions (Diedrich et al., 2017, 2014, 2016; Neff, 2003a, 2003b). Although little research has examined this distinction, one study found that adaptive emotion regulation mediated the relationship between self-compassion and depressive symptoms, but a reverse mediation was insignificant (Diedrich et al., 2017). Emotion regulation appears to be a mechanism by which self-compassion leads to decreases in symptomatology and increases in functioning. However, before such research can be conducted, it is important to know if emotion regulation choice varies by trait self-compassion and, if so, the nature of these differences.

One limitation of much research examining emotion regulation is that retrospective reporting is subject to memory and other biases (Shiffman et al., 2008). Ambulatory assessment addresses this limitation by collecting multiple data points over time rather than one retrospective report (for reviews, see Carpenter, Wycoff, & Trull, 2016; Shiffman et al., 2008; Trull & Ebner-Priemer, 2013). Although studies examining emotion regulation strategies (e.g., experiential avoidance, problem solving) in daily life using ambulatory assessment are uncommon, findings suggest that regulation choice and the efficacy of these strategies varies across individuals (Silk et al., 2003; Stone et al., 1995; Tan et al., 2012).

The use of ambulatory assessment methods in the study of self-compassion is even less common. Participation in a self-compassion intervention led to a significant increase in the use of self-compassion to soothe self-critical thoughts over treatment, and self-compassion significantly predicted decreased anxiety, perceived stress, negative affect, and disordered eating,
as well as increased calm and positive affect (Breines, Toole, et al., 2014; Gilbert & Irons, 2004; Jazaieri et al., 2014; Krieger et al., 2015). Self-compassion also predicted a decrease in the use of suppression and an increase in the use of acceptance as emotion regulation strategies (Jazaieri et al., 2014). More research is needed to understand the effects of self-compassion on emotion regulation choice in daily life.

The purpose of the present study was to use ambulatory assessment methodology to examine how differences in self-compassion were associated with the use of emotion regulation strategies in daily life through replicating and extending previous methodology to also assess emotion regulation choice, depression, and anxiety (Krieger et al., 2015).

Hypotheses

See Appendix A for additional information and the statistical equations associated with each of the hypotheses.

Measure Check Hypothesis

Hypothesis 0

Initial ratings of baseline distress (depression, anxiety, stress) will predict total average ambulatory levels of distress (depression, anxiety, stress). Initial ratings of baseline emotion regulation (acceptance, avoidance, problem solving, reappraisal, rumination, suppression) will predict average ambulatory log odds of choosing each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression).
A Priori Hypotheses

Hypothesis 1

In replication of previous findings, baseline self-compassion will significantly negatively relate to initial distress (depression, anxiety, stress).

Hypothesis 2

Individuals will vary significantly in their total average ambulatory levels of distress (depression, anxiety, stress).

Hypothesis 3

In replication of previous findings, baseline self-compassion will predict total average levels of ambulatory distress (depression, anxiety, stress).

Hypotheses 4-6

Individuals will differ in the log odds that they select each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression) to regulate distress (depression, anxiety, stress).

Hypotheses 7-12

When regulating ambulatory distress (depression, anxiety, stress), self-compassion will predict the log odds that individuals choose each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression). Self-compassion was
expected to positively predict the log odds of using acceptance to regulate distress (depression, anxiety, stress). Self-compassion was expected to negatively predict the log odds of using avoidance to regulate distress (depression, anxiety, stress). No directionality was predicted in the relationship between self-compassion and the log odds of using problem solving or reappraisal to regulate distress (depression, anxiety, stress). Self-compassion was expected to negatively predict the log odds of using rumination to regulate distress (depression, anxiety, stress). No directionality was predicted in the relationship between self-compassion and the log odds of using suppression to regulate distress (depression, anxiety, stress).

**Exploratory Hypotheses**

**Hypotheses 13-15**

Intensity of ambulatory distress (depression, anxiety, stress) may predict the log odds of choosing to use each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression). No predictions were made regarding directionality or significance.

**Hypothesis 16**

There may be between-subjects variance in the number of emotion regulation strategies chosen when coping with ambulatory distress (depression, anxiety, stress). No predictions were made regarding directionality or significance.
Hypothesis 17

Ambulatory distress severity (depression, anxiety, stress) may predict the number of emotion regulation strategies chosen. No predictions were made regarding directionality or significance.

Hypotheses 18-23

When regulating ambulatory distress (depression, anxiety, stress), self-esteem may predict the log odds that individuals choose each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression). No predictions were made regarding directionality or significance.
Participants were 40 undergraduate students enrolled in an introductory psychology course, all of whom were recruited from the SONA website and received four research participation credits. All participants were 18 years of age or older ($M_{age} = 19.28$ years, $SD_{age} = 1.52$ years). Most participants were female (65.0%) and did not identify as Hispanic (87.5%). The sample was also primarily White (62.5%; 27.5% Black, 7.5% Other [Hispanic], 2.5% Asian or South Asian). The only inclusion criterion was smartphone ownership, and the majority of participants used a device with an iOS operating system (70.0%). No participants dropped out of the study, and all participants responded correctly to at least one of three catch questions (92.5% responded correctly to all three questions). Thus, the entire sample of 40 participants was included in the analyses.
Measures

Initial Laboratory Visit

Potential Demographic Covariates

Age (in years), gender (1 = male, 2 = female), and race (1 = American Indian/Alaskan Native, 2 = Asian or South-Asian, 3 = Black or African American, 4 = Native Hawaiian/Pacific Islander, 5 = White or Caucasian, 6 = not listed) have been identified as demographic correlates of self-compassion. As such, data about these variables were gathered using a self-report questionnaire (see Appendix B).

Self-Compassion Scale (SCS; Neff, 2003a)

The SCS is a 26-item measure assessing self-compassion (e.g., “I try to be loving towards myself when I’m feeling emotional pain”; see Appendix C). Participants indicated the extent to which each statement is reflective of how they usually behave towards themselves by selecting one of five Likert-type response options (1 = almost never to 5 = almost always). Although there is some disagreement over the factor structure of the SCS (Costa, Marôco, Pinto-Gouveia, Ferreira, & Castilho, 2016; López et al., 2015), up to 95% of the variance in self-compassion can be explained by a general factor of self-compassion (Neff, 2016; Neff et al., 2019). Furthermore, it has been concluded that the self-compassion and self-criticism components cannot be separated into distinct subscales due to considerable overlap (Neff, 2019). As such, most research using the SCS uses the one-factor model (López et al., 2015). Given these findings and precedents set by previous researchers, the total score was used to quantify self-compassion in
the present study. This score was determined by reverse scoring the self-critical items and calculating the mean of all items. A higher score is indicative of greater self-compassion. The SCS has been used in samples of undergraduates and has demonstrated excellent test-retest reliability over a one-week period ($r = .93, p < .05$; Neff, 2003a) and internal consistency ($\alpha = .83 – .95$; e.g., Albertson et al., 2015; Arimitsu & Hofmann, 2015; Baer et al., 2012). In the present study, the SCS demonstrated comparable internal consistency to previous research ($\alpha = .91$). Furthermore, the SCS total score has demonstrated convergent validity with the Social Connectedness Scale ($r = .41, p < .05$) and the self-criticism scale of the Depressive Experiences Questionnaire ($r = -.65, p < .05$) and discriminant validity with the Narcissistic Personality Inventory ($r = .11, p = ns$; Neff, 2003a).

Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965)

The RSE is a ten-item measure of global self-esteem (e.g., “On the whole, I am satisfied with myself”; see Appendix D). Participants indicated the extent to which they agree with each statement by selecting one of four Likert-type response options (1 = Strongly Agree to 4 = Strongly Disagree). The RSE was scored by reverse scoring the appropriate items and summing the responses; a higher score is indicative of greater global self-esteem. The RSE is a well-established measure of self-esteem and has been used frequently with samples of undergraduate students (Aspinwall & Taylor, 1993; Gonzales & Hancock, 2011; Neff, 2003a). It has demonstrated excellent internal consistency ($\alpha = .80 - .87$), and scores from this instrument have demonstrated convergent validity evidence when compared with well-known measures of the Overall Life Satisfaction Scale ($r = .54, p < .01$) and discriminant validity evidence with
perceived general intellectual ability \( (r = .20, p > .01; \text{Aspinwall & Taylor, 1993; Gonzales & Hancock, 2011; Krieger et al., 2015; Robins, Hendin, & Trzesniewski, 2001}) \). The RSE demonstrated comparable internal consistency in the present study \( (\alpha = .894) \).

**Depression, Anxiety, and Stress Scales 21 (DASS-21; Henry & Crawford, 2005)**

The DASS-21 is a 21-item measure assessing three subscales, each consisting of seven items (see Appendix E). The three subscales are depression (e.g., “I felt down-hearted and blue”), anxiety (e.g., “I felt I was close to panic”), and stress (e.g., “I felt that I was using a lot of nervous energy”). Responses were provided by selecting one of four ordinal response options \( (0 = \text{did not apply to me at all} \text{ to } 3 = \text{applied to me very much or most of the time}) \). Subscale scores are calculated by summing the items, and a higher score is indicative of greater symptoms. The DASS-21 has been used in samples of undergraduates (e.g., Samaie & Farahani, 2011) and scores from this instrument have demonstrated excellent internal consistency \( (\alpha = .82 - .90) \) and good convergent validity when the corresponding subscale was compared to the Beck Depression Inventory-II \( (r = .80, p < .001) \), the Beck Anxiety Inventory \( (r = .69, p < .001) \), and the Perceived Stress Scale \( (r = .73, p < .001; \text{Henry & Crawford, 2005; Osman et al., 2012}) \). The DASS-21 demonstrated comparable internal consistency in the present study \( (\alpha = .850 - .935) \).

**Five Facet Mindfulness Questionnaire, Nonjudgmental Acceptance Subscale (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006)**

The Nonjudgmental Acceptance subscale of the FFMQ (see Appendix F) is an eight-item subset of the 39-item measure and has been used independent of the remaining items (Seligowski & Orcutt, 2015). This subscale measures acceptance (e.g., “I criticize myself for having
irrational or inappropriate emotions,” reverse scored), and responses were indicated by selecting one of five Likert-type response options (1 = never or very rarely true to 5 = very often or always true). This subscale score was calculated by reverse scoring all items and calculating the sum; a higher score is indicative of greater acceptance. The FFMQ was developed using a sample of undergraduates (Baer et al., 2006) and has been used with similar samples since (Baer et al., 2008). The Nonjudgmental Acceptance subscale has demonstrated excellent internal consistency (α = .87-.93) and good convergent validity when compared to the Self-Compassion Scale (r = .48, p < .001), the Difficulties with Emotion Regulation Questionnaire (r = -.52, p < .001), and the Acceptance and Action Questionnaire (r = -.49, p < .001; Baer et al., 2006, 2008). The Nonjudgmental Acceptance scale demonstrated divergent validity with the openness to experience domain of the NEO-Five Factor Inventory (r = -.07, p = ns; Baer et al., 2006). This subscale demonstrated similar internal consistency in the present study (α = .953).

Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011)

The AAQ-II is a seven-item measure assessing experiential avoidance (e.g., “I’m afraid of my feelings”; see Appendix G). Participants indicated the extent to which each statement was true for them by selecting one of seven Likert-type response options (1 = never true to 7 = always true). The measure was scored by summing all items, and a higher score is indicative of greater avoidance. The AAQ-II was developed using samples from various populations, including undergraduate students (Bond et al., 2011). It has demonstrated good to excellent internal consistency (α = .78-.88) and good convergent and discriminant validity when compared to the Mental Health Continuum-Short Form (r = -.45; p < .01) and the Marlowe-Crowne Social
Desirability Scale \((r = -.09, p = ns)\), as well as the previous version of the AAQ-II \((r = .97, p < .001; \text{Bond et al., 2011; Fledderus, Oude Voshaar, ten Klooster, & Bohlmeijer, 2012})\). In the present study, the AAQ-II demonstrated a slightly higher level of internal consistency \((\alpha = .924)\).

Coping Strategies Inventory, Problem Solving Scale (CSI; Tobin, Holroyd, & Reynolds, 2001)

The Problem Solving scale of the CSI is a nine-item subset of the 72-item measure, and previous research has administered only a subset of the scales (Hansel & Wittrock, 1997; Yoo & Lee, 2005). This subscale measures problem solving (e.g., “I worked on solving problems in the situation”; see Appendix H), and responses were indicated by selecting one of five Likert-type response options \((0 = \text{not at all} \text{ to } 4 = \text{very much})\). The scale score was calculated by summing the items, and a higher score is indicative of greater use of problem solving. The original measure instructs participants to identify and write about “an event or situation that has been very stressful for you during the last month.” However, given the more generalized aims of the present study, instructions were altered to direct participants to indicate how they “usually handle troubling events.” Previous studies have made similar alterations to the measure’s instructions to better align with the hypotheses (Su, Lee, & Vang, 2005; Yoo & Lee, 2005). The CSI was developed using samples of undergraduates (Tobin, Holroyd, Reynolds, & Wigal, 1989). The Problem Solving scale has demonstrated excellent internal consistency \((\alpha = .82)\), and the CSI has predicted depressive symptoms in participants under high stress (Tobin et al., 2001, 1989). The scale demonstrated similar internal consistency in the present study \((\alpha = .833)\).
Emotion Regulation Questionnaire (ERQ; Gross & John, 2003)

The ERQ (see Appendix I) is a ten-item measure designed to assess the use of two emotion regulation strategies—the reappraisal facet (e.g., “When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm”) and the suppression facet (e.g., “I control my emotions by not expressing them”). Participants indicated the extent to which they agreed with each item by selecting one of seven Likert-type response options (1 = strongly disagree to 7 = strongly agree). Facet scores were calculated by summing responses; a higher score is indicative of greater use of the respective strategy. The ERQ was developed using samples of undergraduate students (Gross & John, 2003). The scales have demonstrated good to excellent internal consistency (α = .68-.82), good convergent validity when compared to the reinterpretation (reappraisal; β = .43, p < .05) and venting (suppression; β = -.43, p < .05) scales from the COPE, and divergent validity when compared to each other (r = -.06-.06, p = ns; Gross & John, 2003). Both facets demonstrated similar levels of internal reliability in the present study (α = .726-.782).

Rumination-Reflection Questionnaire, Rumination Factor (RRQ; Trapnell & Campbell, 1999)

The Rumination factor of the RRQ is a 12-item measure of rumination (e.g., “Long after an argument or disagreement is over with, my thoughts keep going back to what happened”; see Appendix J). Participants’ responses reflect the extent to which they agreed with each statement by selecting one of five Likert-type response options (1 = Strongly Disagree to 5 = Strongly Agree). The factor score was calculated by reverse coding the appropriate items and averaging the responses; a higher score is indicative of greater rumination. The RRQ was developed using
samples of undergraduate students (Trapnell & Campbell, 1999). The Rumination factor demonstrated excellent internal consistency (α > .90), good convergent validity when compared to the self-reflectiveness subscale of the Private Self-Consciousness Scale (r = .53, p < .05), and discriminant validity when compared to the internal state awareness subscale of the Private Self-Consciousness Scale (r = .05, p = ns; Trapnell & Campbell, 1999). This factor demonstrated comparable internal reliability in the present study (α = .899).

Ambulatory Assessment Signals

See Appendix K for the measures provided at each signal.

Depression, Anxiety, and Stress

Methodology from previous studies was used to assess state depression, anxiety, and stress. At each signal, participants were asked, “How depressed did you feel since the last assessment?” (Krieger et al., 2015). Similar questions were used to assess anxiety and stress. Participants responded using a 101-point scale (0 = not at all to 100 = completely). Higher scores indicated greater distress.

Emotion Regulation Strategies

Methodology from previous studies was used to assess emotion regulation choice. After each rating of depression, anxiety, and stress, participants were asked to report their responses to these emotions from a list of six strategies (acceptance, avoidance, problem solving, reappraisal, rumination, and suppression). This is similar to previous studies (Short et al., 2018; Silk et al., 2003; Tan et al., 2012; Visser et al., 2018).
Procedure

Participants enrolled in the study using an online study sign-up website (i.e., SONA), where they were provided with a brief description of the study. During the initial laboratory visit, each participant provided informed consent, completed the initial laboratory visit measures, received psychoeducation about the emotions (i.e., depression, anxiety, and stress) and emotion regulation strategies assessed in this study (i.e., acceptance, avoidance, problem solving, reappraisal, rumination, and suppression; see Appendix L), downloaded the PACO application (PACO, 2016) to his or her Apple- or Android-based smartphone, and received a brief tutorial on how to use the application.

After the laboratory visit, participants were signaled by the PACO application to complete the ambulatory assessment measures. Similar to previous methodology (Silk et al., 2003; Stone et al., 1995), they were signaled approximately every two to three hours for the rest of the day of the initial laboratory visit and six times daily for the next five days. Participants had a one-hour window during which to complete the measures (Silk et al., 2003), after which time the signal was classified as missed. The 40 participants completed an average of 78.10% of scheduled signals ($SD = 22.11\%$), resulting in an average of 27.5 completed signals each ($SD = 9.8$), meeting the 30/30 recommendation (i.e., 30 data samplings from 30 participants) to ensure sufficient data for multilevel modeling (Maas & Hox, 2005; McNeish & Stapleton, 2016; Scherbaum & Ferreter, 2009).
CHAPTER 3

RESULTS

Missing Data, Testing of Potential Covariates, and Tests of Normality

At baseline, one participant chose “Prefer not to respond” in response to one item (item 11 of the SCS). There was no additional missing data or selection of the “Prefer not to respond” option. Chi-square tests indicated that total self-compassion did not significantly vary by gender ($X^2 (31, N = 40) = 31.94, p = ns$) or race ($X^2 (93, N = 40) = 90.47, p = ns$), and a bivariate correlation determined that self-compassion and age were not significantly related ($r = -.030, p = ns$). Because these covariates were not significant, they were not included as Level 2 variables in any of the analyses. See Table 1 for means, standard deviations, Cronbach’s alphas, and bivariate correlations of all measures completed during the initial laboratory visit. As would be expected, self-compassion was positively correlated with self-esteem and negatively correlated with depression (though nonsignificant), anxiety, and stress. Most of the relationships between self-compassion and emotion regulation strategies were consistent with predictions made in Hypotheses 7 – 12. As anticipated, self-compassion positively predicted acceptance, negatively predicted avoidance and rumination, and was unrelated to problem solving and reappraisal. Contrary to predictions, self-compassion was unrelated to suppression. Self-esteem was similarly related to the other variables of interest, though its correlation with depression was significant. Depression, anxiety, and stress were significantly correlated with each other. When
Table 1
Means, Standard Deviations, Cronbach’s Alphas, and Bivariate Correlations of Initial Laboratory Visit Measures

<table>
<thead>
<tr>
<th>Scales</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SCS</td>
<td>(.910)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. RSE</td>
<td>.615*</td>
<td>(.894)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. DASS_D</td>
<td>-.375</td>
<td>-.736*</td>
<td>(.935)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. DASS_A</td>
<td>-.466*</td>
<td>-.565*</td>
<td>.649*</td>
<td>(.850)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. DASS_S</td>
<td>-.580*</td>
<td>-.579*</td>
<td>.599*</td>
<td>.734*</td>
<td>(.858)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. FFMQ_A</td>
<td>.586*</td>
<td>.645*</td>
<td>-.514*</td>
<td>-.667*</td>
<td>-.614*</td>
<td>(.953)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. AAQ-II</td>
<td>-.621*</td>
<td>-.649*</td>
<td>.704*</td>
<td>.715*</td>
<td>.709*</td>
<td>-.734*</td>
<td>(.924)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. CSI_PRS</td>
<td>.088</td>
<td>.243</td>
<td>.087</td>
<td>.078</td>
<td>.144</td>
<td>-.035</td>
<td>.073</td>
<td>(.833)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. ERQ_R</td>
<td>.340</td>
<td>.341</td>
<td>-.060</td>
<td>.107</td>
<td>-.028</td>
<td>-.069</td>
<td>-.039</td>
<td>.336</td>
<td>(.726)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. ERQ_S</td>
<td>-.090</td>
<td>-.011</td>
<td>.319</td>
<td>.348</td>
<td>.222</td>
<td>-.220</td>
<td>.340</td>
<td>.391</td>
<td>.068</td>
<td>(.782)</td>
<td></td>
</tr>
<tr>
<td>11. RRQ_Ru</td>
<td>-.605*</td>
<td>-.412*</td>
<td>.378</td>
<td>.608*</td>
<td>.644*</td>
<td>-.495*</td>
<td>.589*</td>
<td>.075</td>
<td>.003</td>
<td>.241</td>
<td>(.899)</td>
</tr>
</tbody>
</table>

Mean          2.72  28.70  5.70  6.00  7.83  26.37  25.68  22.98  29.30  16.05  3.76  
SD            0.67  6.06  6.11  5.38  5.35  9.45  11.24  6.26  5.91  5.72  0.77

Note:  N = 40. Cronbach’s alphas are presented on the diagonal. *p < .01. SCS = Self-Compassion Scale. RSE = Rosenberg Self-Esteem Scale. DASS_D = Depression, Anxiety, and Stress Scales 21, Depression Subscale. DASS_A = Depression, Anxiety, and Stress Scales 21, Anxiety Subscale. DASS_S = Depression, Anxiety, and Stress Scales 21, Stress Subscale. FFMQ_A = Five Facet Mindfulness Questionnaire, Nonjudgmental Acceptance Subscale. AAQ-II = Acceptance and Action Questionnaire-II. CSI_PRS = Coping Strategies Inventory, Problem Solving Scale. ERQ_R = Emotion Regulation Questionnaire, Reappraisal Facet. ERQ_S = Emotion Regulation Questionnaire, Suppression Facet. RRQ_Ru = Rumination-Reflection Questionnaire, Rumination Factor.
distress and emotion regulation were significantly correlated, the relationships were as expected (e.g., anxiety was positively correlated with rumination). When the regulatory strategies were significantly correlated with each other, the relationships were as expected (e.g., acceptance was negatively correlated with avoidance). See Table 2 for means and standard deviations of all ambulatory assessment variables. After the models were fitted for the following hypotheses, the multilevel modeling assumptions were tested. If any of these assumptions were not met, this was noted, and robust standard errors were used when testing the hypotheses. A significance level of $\alpha = .01$ was used to determine significance for all tests.

**Measure Check, A Priori, and Exploratory Hypotheses**

All models estimated are detailed in Appendix A. Except when specified, all hypotheses were tested using multilevel modeling, where the repeated measures were clustered within individuals. A significance level of $\alpha = .01$ was used. Null models were fitted for each outcome variable, and the intraclass correlation coefficient (ICC) and design effect (DEFF) were computed to assess the importance of clustering.

**Measure Check Hypothesis 0**

To test whether baseline ratings of distress (depression, anxiety, stress) predicted total average ambulatory levels of distress (depression, anxiety, stress), the ambulatory distress measures were entered as the outcome variables. Initial ratings of distress were entered as the Level 2 predictors in separate models. To test whether initial ratings of baseline emotion regulation (acceptance, avoidance, problem solving, reappraisal, rumination, suppression) predicted total average ambulatory log odds of choosing each emotion regulation strategy
Table 2

Means and Standard Deviations of Ambulatory Assessment Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>12.70</td>
<td>23.55</td>
</tr>
<tr>
<td>Acceptance</td>
<td>0.27</td>
<td>0.44</td>
</tr>
<tr>
<td>Avoidance</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.10</td>
<td>0.29</td>
</tr>
<tr>
<td>Rumination</td>
<td>0.10</td>
<td>0.30</td>
</tr>
<tr>
<td>Suppression</td>
<td>0.12</td>
<td>0.33</td>
</tr>
<tr>
<td>Number of Strategies</td>
<td>0.87</td>
<td>1.28</td>
</tr>
<tr>
<td>Anxiety</td>
<td>15.49</td>
<td>24.65</td>
</tr>
<tr>
<td>Acceptance</td>
<td>0.30</td>
<td>0.46</td>
</tr>
<tr>
<td>Avoidance</td>
<td>0.16</td>
<td>0.37</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.17</td>
<td>0.38</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.11</td>
<td>0.31</td>
</tr>
<tr>
<td>Rumination</td>
<td>0.10</td>
<td>0.30</td>
</tr>
<tr>
<td>Suppression</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Number of Strategies</td>
<td>0.99</td>
<td>1.28</td>
</tr>
<tr>
<td>Stress</td>
<td>20.29</td>
<td>27.47</td>
</tr>
<tr>
<td>Acceptance</td>
<td>0.38</td>
<td>0.49</td>
</tr>
<tr>
<td>Avoidance</td>
<td>0.20</td>
<td>0.40</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.28</td>
<td>0.45</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.13</td>
<td>0.34</td>
</tr>
<tr>
<td>Rumination</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Suppression</td>
<td>0.17</td>
<td>0.38</td>
</tr>
<tr>
<td>Number of Strategies</td>
<td>1.30</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Note: N = 1099. Emotion regulation strategies are coded 0 = did not use and 1 = did use. Scores for all distress ratings ranged 0 – 100, scores for all emotion regulation ranged 0 – 1, and scores for number of strategies for all distress types ranged 0 – 6.
(acceptance, avoidance, problem solving, reappraisal, rumination, suppression) for each type of distress (depression, anxiety, stress), the emotion regulation strategies were entered as the outcome variables, and initial emotion regulation scores were entered as the Level 2 predictors. If the data supported this hypothesis, the model term of interest was significantly different from zero and positive (see Appendix A for all models and specified model terms of interest). In addition, each of these models was compared to their corresponding null model, and $R^2$ was computed to determine the percent of variance explained by ambulatory distress and ambulatory emotion regulation choice.

**Hypothesis 0.1**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 2 residuals were not normally distributed, and the Level 1 residuals were not homogeneous across the clusters. As predicted, initial ratings of depression (DASS-21) predicted total average ambulatory depression ($\beta_{01} = 1.918$, $p < .001$). When compared to the corresponding null model, initial depression increased the model variance by 0.01%.

**Hypothesis 0.2**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 2 residuals were not normally distributed, and the Level 1 residuals were not homogeneous across the clusters. As predicted, initial ratings of anxiety (DASS-21) predicted total average ambulatory anxiety ($\beta_{01} = 2.185$, $p < .001$). When
compared to the corresponding null model, initial anxiety predicted 0% of the variance in 
ambulatory anxiety.

Hypothesis 0.3

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 2 residuals were not normally distributed, and the Level 1 residuals were not homogeneous across the clusters. Initials ratings of stress (DASS-21) did not significantly predict total average ambulatory stress ($\beta_{01} = 1.468, p = .015$).

Hypothesis 0.4

Initial ratings of acceptance (FFMQ) did not significantly predict the log odds of using acceptance to cope with depression ($\beta_{01} = -0.064, p = .173$).

Hypothesis 0.5

Initial ratings of acceptance (FFMQ) did not significantly predict the log odds of using acceptance to cope with anxiety ($\beta_{01} = -0.055, p = .154$).

Hypothesis 0.6

Initial ratings of acceptance (FFMQ) did not significantly predict the log odds of using acceptance to cope with stress ($\beta_{01} = -0.052, p = .209$).
Hypothesis 0.7

As predicted, initial ratings of avoidance (AAQ-II) significantly predicted the log odds of using avoidance to cope with depression ($\beta_{01} = 0.123$, $p = .001$). The odds ratio was 1.130.

Hypothesis 0.8

As predicted, initial ratings of avoidance (AAQ-II) significantly predicted the log odds of using avoidance to cope with anxiety ($\beta_{01} = 0.122$, $p < .001$). The odds ratio was 1.129.

Hypothesis 0.9

As predicted, initial ratings of avoidance (AAQ-II) significantly predicted the log odds of using avoidance to cope with stress ($\beta_{01} = 0.098$, $p < .001$). The odds ratio was 1.102.

Hypothesis 0.10

Initial ratings of problem solving (CSI) did not significantly predict the log odds of using problem solving to cope with depression ($\beta_{01} = 0.170$, $p = .046$).

Hypothesis 0.11

Initial ratings of problem solving (CSI) did not significantly predict the log odds of using problem solving to cope with anxiety ($\beta_{01} = 0.049$, $p = .354$).
Hypothesis 0.12

Initial ratings of problem solving (CSI) did not significantly predict the log odds of using problem solving to cope with stress ($\beta_{01} = 0.038, p = .482$).

Hypothesis 0.13

Initial ratings of reappraisal (ERQ) did not significantly predict the log odds of using reappraisal to cope with depression ($\beta_{01} = 0.090, p = .309$).

Hypothesis 0.14

Initial ratings of reappraisal (ERQ) did not significantly predict the log odds of using reappraisal to cope with anxiety ($\beta_{01} = 0.069, p = .275$).

Hypothesis 0.15

Initial ratings of reappraisal (ERQ) did not significantly predict the log odds of using reappraisal to cope with stress ($\beta_{01} = 0.078, p = .211$).

Hypothesis 0.16

Initial ratings of rumination (RRQ) did not significantly predict the log odds of using rumination to cope with depression ($\beta_{01} = 0.699, p = .190$).
Hypothesis 0.17

Initial ratings of rumination (RRQ) did not significantly predict the log odds of using rumination to cope with anxiety ($\beta_{01} = 0.676, \ p = .136$).

Hypothesis 0.18

Initial ratings of rumination (RRQ) did not significantly predict the log odds of using rumination to cope with stress ($\beta_{01} = 0.630, \ p = .154$).

Hypothesis 0.19

Initial ratings of suppression (ERQ) did not significantly predict the log odds of using suppression to cope with depression ($\beta_{01} = 0.064, \ p = .270$).

Hypothesis 0.20

Initial ratings of suppression (ERQ) did not significantly predict the log odds of using suppression to cope with anxiety ($\beta_{01} = 0.020, \ p = .720$).

Hypothesis 0.21

Initial ratings of suppression (ERQ) did not significantly predict the log odds of using suppression to cope with stress ($\beta_{01} = -0.022, \ p = .658$).
A Priori Hypothesis 1

To test whether baseline self-compassion was significantly negatively related to initial distress (depression, anxiety, stress), linear regression analyses were used. The measures of initial distress were the outcome variables, and the total self-compassion score was the predictor. If the data supported this hypothesis, the model term of interest was significantly different from zero and negative.

Hypothesis 1.1

Baseline self-compassion did not significantly predict baseline depression ($\beta = -3.436, p = .017$).

Hypothesis 1.2

As predicted, baseline self-compassion significantly predicted baseline anxiety ($\beta = -3.763, p = .002$). Self-compassion predicted 21.7% of the variance in baseline anxiety.

Hypothesis 1.3

As predicted, baseline self-compassion significantly predicted baseline stress ($\beta = -4.654, p < .001$). Self-compassion predicted 33.6% of the variance in baseline stress.
A Priori Hypothesis 2

To determine if individuals varied significantly in their total average ambulatory levels of distress (depression, anxiety, stress), the ambulatory distress measures were entered as the outcome variables in a multilevel model. If the data supported this hypothesis, the random effect of interest was significantly different from zero.

Hypothesis 2.1

As predicted, individuals significantly varied in their average ambulatory depression

\(Var(r_{0l}) = 325.86, p < .001)\).

Hypothesis 2.2

As predicted, individuals significantly varied in their average ambulatory anxiety

\(Var(r_{0l}) = 356.21, p < .001)\).

Hypothesis 2.3

As predicted, individuals significantly varied in their average ambulatory stress \(Var(r_{0l}) = 458.43, p < .001\).

A Priori Hypothesis 3

To determine if baseline self-compassion predicted average levels of ambulatory distress (depression, anxiety, stress), the distress measures were entered as the outcome variables in a multilevel model. The total self-compassion score was entered as the Level 2 predictor. If the
data supported the hypothesis, the model term of interest was significantly different from zero. In addition, each of these models was compared to their corresponding null model, and $R^2$ was computed to determine the percent of variance explained by self-compassion.

**Hypothesis 3.1**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 2 residuals were not normally distributed, and the Level 1 residuals were not homogeneous across the clusters. Baseline self-compassion did not significantly predict average ambulatory depression ($\beta_{01} = -7.483, p = .046$).

**Hypothesis 3.2**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 2 residuals were not normally distributed, and the Level 1 residuals were not homogeneous across the clusters. Baseline self-compassion did not significantly predict average ambulatory anxiety ($\beta_{01} = -6.402, p = .127$).

**Hypothesis 3.3**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 2 residuals were not normally distributed, and the Level 1 residuals were not homogeneous across the clusters. Baseline self-compassion did not significantly predict average ambulatory stress ($\beta_{01} = -8.101, p = .047$).
A Priori Hypotheses 4-6

To determine if individuals varied in the log odds that they selected each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression) when coping with ambulatory distress (depression, anxiety, stress), the emotion regulation strategies were entered as the outcome variables, and null multilevel models were fitted. If the data supported the hypotheses, the model term of interest was significantly different from zero. In addition, the ICC and DEFF were computed to assess the importance of the clustering.

Hypothesis 4.1

As predicted, individuals significantly varied in the log odds of acceptance for depression ($\text{Var}(\pi_{0i}) = 6.42, p < .001$). The ICC (.661) and DEFF (18.51) indicate that clustering is important.

Hypothesis 4.2

As predicted, individuals significantly varied in the log odds of avoidance for depression ($\text{Var}(\pi_{0i}) = 5.31, p < .001$). The ICC (.618) and DEFF (17.35) indicate that clustering is important.
Hypothesis 4.3

As predicted, individuals significantly varied in the log odds of problem solving for depression ($Var(\pi_{0i}) = 7.18, p < .001$). The ICC (.686) and DEFF (19.16) indicate that clustering is important.

Hypothesis 4.4

As predicted, individuals significantly varied in the log odds of reappraisal for depression ($Var(\pi_{0i}) = 5.82, p < .001$). The ICC (.639) and DEFF (17.92) indicate that clustering is important.

Hypothesis 4.5

As predicted, individuals significantly varied in the log odds of rumination for depression ($Var(\pi_{0i}) = 4.02, p < .001$). The ICC (.550) and DEFF (15.56) indicate that clustering is important.

Hypothesis 4.6

As predicted, individuals significantly varied in the log odds of suppression for depression ($Var(\pi_{0i}) = 3.42, p < .001$). The ICC (.509) and DEFF (14.49) indicate that clustering is important.
Hypothesis 5.1

As predicted, individuals significantly varied in the log odds of acceptance for anxiety ($Var(\pi_{0i}) = 4.42, p < .001$). The ICC (.573) and DEFF (16.18) indicate that clustering is important.

Hypothesis 5.2

As predicted, individuals significantly varied in the log odds of avoidance for anxiety ($Var(\pi_{0i}) = 3.78, p < .001$). The ICC (.535) and DEFF (15.16) indicate that clustering is important.

Hypothesis 5.3

As predicted, individuals significantly varied in the log odds of problem solving for anxiety ($Var(\pi_{0i}) = 3.38, p < .001$). The ICC (.507) and DEFF (14.42) indicate that clustering is important.

Hypothesis 5.4

As predicted, individuals significantly varied in the log odds of reappraisal for anxiety ($Var(\pi_{0i}) = 3.84, p < .001$). The ICC (.538) and DEFF (15.26) indicate that clustering is important.
Hypothesis 5.5

As predicted, individuals significantly varied in the log odds of rumination for anxiety 
\( (\text{Var}(\pi_{0i}) = 3.01, p < .001) \). The ICC (.477) and DEFF (13.64) indicate that clustering is important.

Hypothesis 5.6

As predicted, individuals significantly varied in the log odds of suppression for anxiety 
\( (\text{Var}(\pi_{0i}) = 2.90, p < .001) \). The ICC (.468) and DEFF (13.40) indicate that clustering is important.

Hypothesis 6.1

As predicted, individuals significantly varied in the log odds of acceptance for stress 
\( (\text{Var}(\pi_{0i}) = 5.10, p < .001) \). The ICC (.608) and DEFF (17.10) indicate that clustering is important.

Hypothesis 6.2

As predicted, individuals significantly varied in the log odds of avoidance for stress 
\( (\text{Var}(\pi_{0i}) = 3.23, p < .001) \). The ICC (.495) and DEFF (14.12) indicate that clustering is important.
Hypothesis 6.3

As predicted, individuals significantly varied in the log odds of problem solving for stress 
\( Var(\pi_{0i}) = 3.72, p < .001 \). The ICC (.530) and DEFF (15.05) indicate that clustering is important.

Hypothesis 6.4

As predicted, individuals significantly varied in the log odds of reappraisal for stress 
\( Var(\pi_{0i}) = 3.32, p < .001 \). The ICC (.502) and DEFF (14.30) indicate that clustering is important.

Hypothesis 6.5

As predicted, individuals significantly varied in the log odds of rumination for stress 
\( Var(\pi_{0i}) = 3.17, p < .001 \). The ICC (.490) and DEFF (13.99) indicate that clustering is important.

Hypothesis 6.6

As predicted, individuals significantly varied in the log odds of suppression for stress 
\( Var(\pi_{0i}) = 2.31, p < .001 \). The ICC (.412) and DEFF (11.91) indicate that clustering is important.
A Priori Hypotheses 7-12

To determine if baseline self-compassion predicted the log odds that individuals chose each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression) when regulating ambulatory distress (depression, anxiety, stress), the emotion regulation strategies were entered as the outcome variables in generalized multilevel models. The total self-compassion score was entered as the Level 2 predictor. If the data supported the hypotheses, the model term of interest was significantly different from zero for acceptance, avoidance, and rumination, and the coefficient was positive for acceptance and negative for avoidance and rumination.

Hypothesis 7.1

Baseline self-compassion did not significantly predict the log odds that individuals chose acceptance when regulating ambulatory depression ($\beta = -0.143, p = .835$).

Hypothesis 7.2

Baseline self-compassion did not significantly predict the log odds that individuals chose acceptance when regulating ambulatory anxiety ($\beta = -0.142, p = .801$).

Hypothesis 7.3

Baseline self-compassion did not significantly predict the log odds that individuals chose acceptance when regulating ambulatory stress ($\beta = -0.164, p = .784$).
Hypothesis 8.1

Baseline self-compassion did not significantly predict the log odds that individuals chose avoidance when regulating ambulatory depression ($\beta = -1.273, p = .067$).

Hypothesis 8.2

Baseline self-compassion did not significantly predict the log odds that individuals chose avoidance when regulating ambulatory anxiety ($\beta = -1.153, p = .038$).

Hypothesis 8.3

Baseline self-compassion did not significantly predict the log odds that individuals chose avoidance when regulating ambulatory stress ($\beta = -0.908, p = .057$).

Hypothesis 9.1

Baseline self-compassion did not significantly predict the log odds that individuals chose problem solving when regulating ambulatory depression ($\beta = 0.342, p = .641$).

Hypothesis 9.2

Baseline self-compassion did not significantly predict the log odds that individuals chose problem solving when regulating ambulatory anxiety ($\beta = 0.262, p = .595$).

Hypothesis 9.3

Baseline self-compassion did not significantly predict the log odds that individuals chose problem solving when regulating ambulatory stress ($\beta = -0.014, p = .978$).
Hypothesis 10.1

Baseline self-compassion did not significantly predict the log odds that individuals chose reappraisal when regulating ambulatory depression ($\beta = 0.288, p = .688$).

Hypothesis 10.2

Baseline self-compassion did not significantly predict the log odds that individuals chose reappraisal when regulating ambulatory anxiety ($\beta = -0.273, p = .627$).

Hypothesis 10.3

Baseline self-compassion did not significantly predict the log odds that individuals chose reappraisal when regulating ambulatory stress ($\beta = -0.099, p = .846$).

Hypothesis 11.1

Baseline self-compassion did not significantly predict the log odds that individuals chose rumination when regulating ambulatory depression ($\beta = -0.554, p = .353$).

Hypothesis 11.2

Baseline self-compassion did not significantly predict the log odds that individuals chose rumination when regulating ambulatory anxiety ($\beta = -0.685, p = .186$).
Hypothesis 11.3

Baseline self-compassion did not significantly predict the log odds that individuals chose rumination when regulating ambulatory stress ($\beta = -0.540$, $p = .287$).

Hypothesis 12.1

Baseline self-compassion did not significantly predict the log odds that individuals chose suppression when regulating ambulatory depression ($\beta = -0.958$, $p = .074$).

Hypothesis 12.2

Baseline self-compassion did not significantly predict the log odds that individuals chose suppression when regulating ambulatory anxiety ($\beta = -0.666$, $p = .176$).

Hypothesis 12.3

Baseline self-compassion did not significantly predict the log odds that individuals chose suppression when regulating ambulatory stress ($\beta = -0.585$, $p = .160$).

Exploratory Hypotheses 13-15

To determine if intensity of ambulatory distress (depression, anxiety, stress) predicted the log odds of choosing to use each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, suppression), the emotion regulation strategies were entered as outcome variables in generalized multilevel models. The ambulatory distress measures were
entered as time-varying Level 1 predictors. If ambulatory distress predicted the log odds of choosing an emotion regulation strategy, the model term of interest was significantly different from zero, and the coefficient indicated if this relationship was positive or negative.

Hypothesis 13.1

Ambulatory depression significantly predicted the log odds of choosing acceptance ($\beta = 0.016, p < .001$). The odds ratio was 1.016.

Hypothesis 13.2

Ambulatory depression significantly predicted the log odds of choosing avoidance ($\beta = 0.025, p < .001$). The odds ratio was 1.025.

Hypothesis 13.3

Ambulatory depression did not significantly predict the log odds of choosing problem solving ($\beta = 0.006, p = .292$).

Hypothesis 13.4

Ambulatory depression did not significantly predict the log odds of choosing reappraisal ($\beta = 0.003, p = .611$).

Hypothesis 13.5

Ambulatory depression significantly predicted the log odds of choosing rumination ($\beta = 0.051, p < .001$). The odds ratio was 1.052.
Hypothesis 13.6

Ambulatory depression significantly predicted the log odds of choosing suppression ($\beta = 0.043, p < .001$). The odds ratio was 1.044.

Hypothesis 14.1

Ambulatory anxiety did not significantly predict the log odds of choosing acceptance ($\beta = 0.002, p = .605$).

Hypothesis 14.2

Ambulatory anxiety significantly predicted the log odds of choosing avoidance ($\beta = 0.026, p < .001$). The odds ratio was 1.027.

Hypothesis 14.3

Ambulatory anxiety significantly predicted the log odds of choosing problem solving ($\beta = 0.017, p < .001$). The odds ratio was 1.017.

Hypothesis 14.4

Ambulatory anxiety significantly predicted the log odds of choosing reappraisal ($\beta = 0.019, p < .001$). The odds ratio was 1.019.
Hypothesis 14.5

Ambulatory anxiety significantly predicted the log odds of choosing rumination ($\beta = 0.039, p < .001$). The odds ratio was 1.040.

Hypothesis 14.6

Ambulatory anxiety significantly predicted the log odds of choosing suppression ($\beta = 0.039, p < .001$). The odds ratio was 1.040.

Hypothesis 15.1

Ambulatory stress significantly predicted the log odds of choosing acceptance ($\beta = 0.019, p < .001$). The odds ratio was 1.019.

Hypothesis 15.2

Ambulatory stress significantly predicted the log odds of choosing avoidance ($\beta = 0.027, p < .001$). The odds ratio was 1.027.

Hypothesis 15.3

Ambulatory stress significantly predicted the log odds of choosing problem solving ($\beta = 0.020, p < .001$). The odds ratio was 1.020.
Hypothesis 15.4

Ambulatory stress significantly predicted the log odds of choosing reappraisal ($\beta = 0.020, p < .001$). The odds ratio was 1.020.

Hypothesis 15.5

Ambulatory stress significantly predicted the log odds of choosing rumination ($\beta = 0.041, p < .001$). The odds ratio was 1.042.

Hypothesis 15.6

Ambulatory stress significantly predicted the log odds of choosing suppression ($\beta = 0.027, p < .001$). The odds ratio was 1.028.

Exploratory Hypothesis 16

To determine if there was between-subjects variance in the number of emotion regulation strategies chosen when coping with ambulatory distress (depression, anxiety, stress), the number of strategies were entered as the outcome variables in a multilevel model. If the data supported the hypothesis, the model term of interest was significantly different from zero.

Hypothesis 16.1

Individuals significantly varied in the number of emotion regulation strategies chosen when coping with ambulatory depression ($Var(\pi_{0i}) = 4.03, p < .001$).
Hypothesis 16.2

Individuals significantly varied in the number of emotion regulation strategies chosen when coping with ambulatory anxiety \((Var(\pi_{oi}) = 2.33, p < .001)\).

Hypothesis 16.3

Individuals significantly varied in the number of emotion regulation strategies chosen when coping with ambulatory stress \((Var(\pi_{oi}) = 1.57, p < .001)\).

Exploratory Hypothesis 17

To determine if severity of ambulatory distress (depression, anxiety, stress) predicted the number of emotion regulation strategies chosen, the number of endorsed strategies was entered as the outcome variable in a multilevel model. The ambulatory distress measures were entered as Level 1 predictors. If ambulatory distress predicted the number of strategies used, the model term of interest was significantly different from zero, and the coefficient indicated if this relationship was positive or negative. In addition, these models were compared to the null models in Hypothesis 16, and \(R^2\) was computed to determine the percent of variance explained by ambulatory distress.

Hypothesis 17.1

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 1 predictor was not independent of the Level 1 residuals, and the Level 2 residuals were not normally distributed. Ambulatory depression did
not significantly predict the number of strategies used ($\beta = 0.010, p = .019$). When compared to the corresponding null model, ambulatory depression predicted 15.46% of the variance in the number of strategies used.

**Hypothesis 17.2**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 1 predictor was not independent of the Level 1 residuals, and the Level 2 residuals were not normally distributed. Ambulatory anxiety significantly predicted the number of strategies used ($\beta = 0.011, p = .004$). When compared to the corresponding null model, ambulatory anxiety predicted 22.31% of the variance in the number of strategies used.

**Hypothesis 17.3**

Robust standard errors were used when testing this hypothesis because the Level 1 residuals were not normally distributed, the Level 1 predictor was not independent of the Level 1 residuals, and the level 2 residuals were not normally distributed. Ambulatory stress significantly predicted the number of strategies used ($\beta = 0.012, p < .001$). When compared to the corresponding null model, ambulatory stress predicted 29.08% of the variance in the number of strategies used.

**Exploratory Hypotheses 18-23**

To determine if self-esteem predicted the log odds that individuals chose each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination,
suppression) when regulating ambulatory distress (depression, anxiety, stress), the emotion regulation strategies were entered as the outcome variables in generalized multilevel models. The total self-esteem score was entered as the Level 2 predictor. If self-esteem was a significant predictor, the model term of interest was significantly different from zero, and the coefficient indicated if this relationship was positive or negative. Table 3 summarizes the findings of these hypotheses and of Hypotheses 7-12.

**Hypothesis 18.1**

Baseline self-esteem did not significantly predict the log odds that individuals chose acceptance when regulating ambulatory depression ($\beta = -0.123, p = .092$).

**Hypothesis 18.2**

Baseline self-esteem did not significantly predict the log odds that individuals chose acceptance when regulating ambulatory anxiety ($\beta = -0.038, p = .535$).

**Hypothesis 18.3**

Baseline self-esteem did not significantly predict the log odds that individuals chose acceptance when regulating ambulatory stress ($\beta = -0.063, p = .325$).

**Hypothesis 19.1**

Baseline self-esteem significantly predicted the log odds that individuals chose avoidance when regulating ambulatory depression ($\beta = -0.192, p = .007$). The odds ratio was 0.825.
Table 3
Summary of Hypotheses 7-12 and 18-2

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Self-Compassion $\beta$</th>
<th>Self-Esteem $\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
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<td>ns</td>
</tr>
<tr>
<td>Avoidance</td>
<td>ns</td>
<td>-0.192</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Rumination</td>
<td>ns</td>
<td>-0.185</td>
</tr>
<tr>
<td>Suppression</td>
<td>ns</td>
<td>-0.141</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptance</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>Avoidance</td>
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</tr>
<tr>
<td>Problem Solving</td>
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</tr>
<tr>
<td>Reappraisal</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
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<tr>
<td>Suppression</td>
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<td>ns</td>
</tr>
<tr>
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<td></td>
</tr>
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</tr>
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<td>Avoidance</td>
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</tr>
<tr>
<td>Suppression</td>
<td>ns</td>
<td>Ns</td>
</tr>
</tbody>
</table>

Note: $N = 1099$. ns = nonsignificant. For all reported $\beta$, $p \leq .01$. 
Hypothesis 19.2

Baseline self-esteem did not significantly predict the log odds that individuals chose avoidance when regulating ambulatory anxiety ($\beta = -0.094, p = .104$).

Hypothesis 19.3

Baseline self-esteem did not significantly predict the log odds that individuals chose avoidance when regulating ambulatory stress ($\beta = -0.084, p = .103$).

Hypothesis 20.1

Baseline self-esteem did not significantly predict the log odds that individuals chose problem solving when regulating ambulatory depression ($\beta = -0.043, p = .595$).

Hypothesis 20.2

Baseline self-esteem did not significantly predict the log odds that individuals chose problem solving when regulating ambulatory anxiety ($\beta = -0.022, p = .691$).

Hypothesis 20.3

Baseline self-esteem did not significantly predict the log odds that individuals chose problem solving when regulating ambulatory stress ($\beta = -0.067, p = .221$).
Hypothesis 21.1

Baseline self-esteem did not significantly predict the log odds that individuals chose reappraisal when regulating ambulatory depression ($\beta = -0.057, p = .467$).

Hypothesis 21.2

Baseline self-esteem did not significantly predict the log odds that individuals chose reappraisal when regulating ambulatory anxiety ($\beta = -0.062, p = .315$).

Hypothesis 21.3

Baseline self-esteem did not significantly predict the log odds that individuals chose reappraisal when regulating ambulatory stress ($\beta = -0.062, p = .255$).

Hypothesis 22.1

Baseline self-esteem significantly predicted the log odds that individuals chose rumination when regulating ambulatory depression ($\beta = -0.185, p = .003$). The odds ratio was 0.831.

Hypothesis 22.2

Baseline self-esteem significantly predicted the log odds that individuals chose rumination when regulating ambulatory anxiety ($\beta = -0.164, p = .002$). The odds ratio was 0.849.
Hypothesis 22.3

Baseline self-esteem significantly predicted the log odds that individuals chose rumination when regulating ambulatory stress ($\beta = -0.140, p = .007$). The odds ratio was 0.869.

Hypothesis 23.1

Baseline self-esteem significantly predicted the log odds that individuals chose suppression when regulating ambulatory depression ($\beta = -0.141, p = .010$). The odds ratio was 0.868.

Hypothesis 23.2

Baseline self-esteem did not significantly predict the log odds that individuals chose suppression when regulating ambulatory anxiety ($\beta = -0.105, p = .046$).

Hypothesis 23.3

Baseline self-esteem did not significantly predict the log odds that individuals chose suppression when regulating ambulatory stress ($\beta = -0.101, p = .023$).
CHAPTER 4

DISCUSSION

The purpose of the present study was to use ambulatory assessment methodology to examine how differences in self-compassion were associated with the use of emotion regulation strategies in daily life. It was designed to extend previous methodology, which examined self-compassion and stress, to also assess emotion regulation choice, depression, and anxiety (Krieger et al., 2015).

Hypothesis 0 anticipated that baseline measures of distress (depression, anxiety, and stress) and emotion regulation strategies (acceptance, avoidance, problem solving, reappraisal, rumination, and suppression) would predict ambulatory measures of distress and emotion regulation choice. Overall, the results of this hypothesis were mixed. Although baseline measures of depression and anxiety predicted ambulatory ratings depression and anxiety, baseline stress did not significantly predict ambulatory stress. Corresponding baseline measures did not predict ambulatory acceptance, reappraisal, rumination, or suppression of depression, anxiety, or stress. Baseline problem solving significantly predicted problem solving of depression but not of anxiety or stress. Finally, baseline avoidance significantly predicted ambulatory avoidance of depression, anxiety, and stress.

Hypothesis 1 sought to replicate previous findings, specifically that self-compassion would predict distress (depression, anxiety, and stress) at baseline. This hypothesis was partially
supported. Although self-compassion did not significantly predict depression, it did predict anxiety and stress.

Hypothesis 2 anticipated that participants would vary in their total average ambulatory levels of distress (depression, anxiety, and stress), which the data supported. This was a necessary precondition for later hypotheses. Hypothesis 3 sought to extend previous findings, specifically that baseline self-compassion would predict ambulatory distress (depression, anxiety, and stress). However, the model terms of interest were not significantly different from zero.

Hypotheses 4, 5, and 6 anticipated that participants would vary in the log odds that they chose to employ each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal, rumination, and suppression) to cope with ambulatory distress (depression, anxiety, and stress). The data supported these hypotheses for each combination of emotion regulation strategy and distress type. This was a necessary precondition for later hypotheses. Hypotheses 7, 8, 9, 10, 11, and 12 focused on the relationship between baseline self-compassion and ambulatory emotion regulation choice (acceptance, avoidance, problem solving, reappraisal, rumination, and suppression) of distress (depression, anxiety, and stress). Some specific predictions were made regarding significance and directionality. For acceptance, the model term of interest was expected to be significantly different from zero and positive. For avoidance and rumination, the model terms of interest were expected to be significantly different from zero and negative. However, self-compassion did not significantly predict the log odds that individuals chose any emotion regulation strategy to regulate ambulatory depression, anxiety, or stress.

Hypotheses 13, 14, and 15 explored whether the severity of ambulatory distress (depression, anxiety, and stress) predicted the log odds of choosing each emotion regulation
strategy (acceptance, avoidance, problem solving, reappraisal, rumination, and suppression). No predictions were made regarding significance or directionality. Many of the model terms of interest were significant. Intensity of depression significantly and positively predicted the log odds that individuals selected acceptance, avoidance, rumination, and suppression to cope. Intensity of anxiety significantly and positively predicted the log odds of using avoidance, problem solving, reappraisal, rumination, and suppression to cope. Lastly intensity of stress significantly and positively predicted the log odds that individuals selected acceptance, avoidance, problem solving, reappraisal, rumination, and suppression.

Hypothesis 16 examined whether individuals varied in the number of emotion regulation strategies chosen to cope with ambulatory distress (depression, anxiety, and stress). The variance was significant for all three model terms of interest. This was a necessary precondition for later hypotheses. Hypothesis 17 explored whether the severity of ambulatory distress (depression, anxiety, and stress) predicted the number of emotion regulation strategies individuals used. No predictions were made regarding significance or directionality. Although intensity of depression did not predict the number of strategies used, intensity of anxiety and stress significantly and positively predicted the number of strategies used.

Finally, Hypotheses 18, 19, 20, 21, 22, and 23 explored whether baseline self-esteem predicted ambulatory emotion regulation choice (acceptance, avoidance, problem solving, reappraisal, rumination, and suppression) of distress (depression, anxiety, and stress). No predictions were made regarding significance or directionality. Most of the model terms of interest were nonsignificant. However, self-esteem significantly and negatively predicted avoidance of depression, rumination of all three types of distress, and suppression of depression.
Various potential factors may have contributed to the null results. As Cronbach and Meehl (1955) suggest, the nonsignificant findings could indicate problems with measurement, theory, and/or experimental design. Each of these potential causes will be explored.

Problems with Measurement

One possible explanation for the null findings is problems with measurement, specifically that the assessment methods did not accurately measure the constructs of interest (Cronbach & Meehl, 1955). All of the retrospective measures used were well established in the assessment of their respective constructs. However, the laboratory measures did not always significantly predict the corresponding ambulatory measures, as would be expected if each set of measures were assessing the same construct. Because the retrospective measures have demonstrated their validity and relationships with each other repeatedly, it is more likely that the problems lie with the ambulatory assessment items. The laboratory measures each consist of multiple items that are used collectively to calculate a total score; the ambulatory measures each consist of individual items that stand alone. For example, the DASS-21’s depression subscale consists of seven items (Henry & Crawford, 2005), whereas the ambulatory assessment of depression involves one item. It is possible that the participants’ understanding of each construct (e.g., depression) was not equivalent to the field’s diagnostic criteria (e.g., symptoms of depression included in the DASS-21). For example, participants may have focused exclusively on feelings of sadness while rating their ambulatory depression without considering other symptoms of depression that were measured in the laboratory (e.g., having nothing to look forward to). Thus, the ambulatory measures may not be evaluating the same constructs as were assessed in the laboratory.
Another potential measurement issue is the use of the AAQ-II to assess avoidance. This scale has been criticized for measuring negative affect and general distress rather than avoidance (Ong, Pierce, Woods, Twohig, & Levin, 2019; Rochefort, Baldwin, & Chmielewski, 2018; Tyndall et al., 2019; Wolgast, 2014). Factor analyses have found that the items of the AAQ-II were more strongly related to items measuring negative affect and general distress than to items measuring avoidance (Rochefort et al., 2018; Tyndall et al., 2019; Wolgast, 2014). One study using item response theory framework found that none of the AAQ-II’s items perform well when assessing avoidance (Ong et al., 2019). Given these criticisms regarding the AAQ-II’s poor discriminant validity, a different measure of avoidance, such as the Brief Experiential Avoidance Questionnaire (Gámez et al., 2014), may have been a better predictor of ambulatory avoidance.

Problems with Theory

Another potential explanation for the nonsignificant results is problems with theory, specifically that the theoretical foundation of the hypotheses is flawed (Cronbach & Meehl, 1955). All the hypotheses assumed equivalency between retrospective reporting and ambulatory assessment. Given the null findings of Hypothesis 0, this assumption appears to be flawed. It has been established that memory is subject to recall and other biases (e.g., Shiffman, Stone, & Hufford, 2008; Stone et al., 1998), and previous research has noted differences between retrospective and ambulatory measures (e.g., Stone et al., 1995). However, there is insufficient research to determine which constructs tend be less subjective to recall and other biases. Furthermore, almost all the a priori research focused on replicating previous, well-established findings using ambulatory assessment methodology under the aforementioned assumption. This flawed expectation of equivalency may explain why most hypotheses were nonsignificant.
The potential impact of the data collection methodology on the constructs of interest should be considered as well. Research has shown that self-monitoring impacts behavior and could be considered an intervention. For example, among individuals who smoke, monitoring their smoking behavior led to changes in the number of cigarettes smoked and the amount of time spent smoking each cigarette (McFall, 1970). A more recent study found that teachers who monitored when they praised their students increased the frequency of praise (Kalis, Vannest, & Parker, 2007). More relevant to the present study, nonclinical university students who monitored their anxiety demonstrated decreases in anxiety over the course of a week (Hiebert & Fox, 1981). Researchers have hypothesized that these changes, also termed “reactivity,” may be due to self-evaluation, importance of evaluated behavior, or other consequences of increased awareness of one’s behavior (Korotitsch & Nelson-Gray, 1999; Nelson & Hayes, 1981). Thus, it is possible that merely reporting on their distress and emotion regulation choice led to decreases (or other changes) in these variables of interest.

Another potential theoretical flaw is that in the present study self-compassion was neither classified as an emotion regulation strategy nor treated as such. However, previous researchers have conceptualized self-compassion as a regulatory strategy (Diedrich et al., 2014). In their study, self-compassion was more effective at decreasing induced depressed mood than waiting, and it was equally as effective as reappraisal and acceptance. Another study found that, while adaptive emotion regulation mediated the relationship between self-compassion and depressive symptoms, a reverse mediation was nonsignificant (Diedrich et al., 2017). Furthermore, self-compassion is not confined to a single step in Gross’s process model (Gross, 1998), but instead it could influence regulation at any point. Thus, it was argued in the introduction that self-compassion influences emotion regulation choice but is not itself a strategy. This framework
informed the hypotheses that self-compassion would predict which strategies individuals used to cope with their distress. However, it is possible that self-compassion did not predict any regulatory strategies because individuals with high self-compassion were responding to their distress with self-compassion rather than by using one of the identified strategies. For example, highly self-compassionate individuals may respond to feelings of anxiety with self-kindness, awareness of their distress, and acknowledgement that suffering is universal. While it could be argued that doing so corresponds to specific regulatory strategies (as was asserted in the introduction), participants may instead view this response as part of their general attitude or outlook on life. It is possible that self-compassion is a distinct method of coping with distress using attitudes described in the SCS. However, no measure of self-compassion was included in the app, so the present data cannot examine this possibility.

Problems with Experimental Design

A third possible explanation for the null findings is problems with experimental design, specifically that the chosen methodology did not adequately test the hypotheses (Cronbach & Meehl, 1955). First, given the large number of hypotheses, a more stringent threshold for significance was used when interpreting the results. This meant that some results that would have been considered significant at the typical threshold ($p = .05$) were interpreted as nonsignificant. A potential solution would have been to collect additional data to increase power. The ambulatory assessment portion of the study lasted less than six days and included up to six prompts per day. While this decision was made in an effort to maximize careful responding and prevent dropout, additional data in the form of more frequent prompts or additional days would have increased the statistical power. However, it is possible that
participants would not have complied or that reactivity to self-monitoring may have further influenced the variables of interest.

Recall that the laboratory measures did not significantly predict the corresponding ambulatory measures, which may have been due to participants’ inaccurate understanding of the constructs of interest. Although the methodology was designed to combat this by providing psychoeducation about each construct measured using the app, it may not have been effective. Participants’ comprehension of the information was not assessed, and participants were not provided with definitions of each construct to take with them or within the app itself. Either of these additions to the methodology could have decreased concerns that participants did not adequately understand all the items.

It is also possible that the participants were not consistently careful in their responding. Although catch questions were included in the laboratory measures, no efforts were made to ensure that participants completed the ambulatory measures with equal care. The laboratory measures were also conducted under more controlled circumstances; participants were in a room with few distractions and aware that their attention to the items was being evaluated. However, the ambulatory measures were completed wherever the participant happened to be at the time of the notifications, with all the inherent distractions. Participants were provided with no external motivation for careful responding, which may have impacted the quality of the ambulatory data.

Limitations

Although potential flaws in the experimental design have already been discussed, it is important to acknowledge other limitations of the present study. There are limitations inherent in the sample used. Participants were nonclinical undergraduate students, so the results of the
The present study may not generalize to individuals with clinical diagnoses or nonstudents. The mean scores of the depression, anxiety, and stress subscales of the DASS-21 were in the mild, moderate, and normal-to-mild ranges, respectively (Henry & Crawford, 2005; Osman et al., 2012). Although these scores are higher than those reported in some studies (Henry & Crawford, 2005; Osman et al., 2012), they are similar to means reported in other nonclinical samples (Bayram & Bilgel, 2008; Sinclair et al., 2012). Furthermore, participants also reported low levels of distress and little endorsement of emotion regulation strategies on average. Mean distress scores ranged from 12.70 to 20.29 on a 0 – 100 scale. Participants also used few strategies to cope with distress ($M = 0.87 – 1.30$), suggesting that there was little variability in emotion regulation choice to predict.

**Implications and Future Directions**

The results of the present study suggest areas for future research and examination. First, depression, anxiety, avoidance (depression, anxiety, and stress), and problem solving (depression only) were the only constructs that demonstrated consistency across the laboratory assessment and ambulatory assessments. Researchers should continue to employ ambulatory assessment methodology. Most research on emotion regulation relies on retrospective reporting. Additional research is needed to understand the extent to which recall and other memory biases influence each of these constructs. Such methodology is subject to various biases that could impede research in this area. Researchers should also explore concerns inherent with this methodology, such as the use of single-item constructs and the extent to which they are predicted by corresponding multi-item scales, ensuring careful responding when participants are outside of the laboratory, and other unique aspects of ambulatory assessment methodology.
A second area for future exploration is ambulatory emotion regulation choice. Because all three types of distress predicted the selection of most or all of the emotion regulation strategies, it is possible that regulatory strategies are nonspecific (i.e., used for all types of distress) and generalize to other negative emotions, such as anger. In addition, it is unclear whether self-compassion influences emotion regulation choice, if it is an emotion regulation strategy, or if it plays both roles. Future research should examine these possibilities.

Third, an overlooked construct in this project was regulatory flexibility. It is possible that regulatory flexibility is employed indiscriminately based on type of distress. This could explain why intensity of distress predicted most or all of the regulatory strategies. Furthermore, number of strategies chosen may be a proxy for regulatory flexibility. Those with greater flexibility might employ more strategies than those with less flexibility because they may select additional strategies when the initial ones prove ineffective. For example, an individual with greater flexibility may find that suppression is ineffective at regulating stress and may try additional strategies (e.g., avoidance, rumination, problem solving) until he or she has effectively regulated the distress. It is possible that only high levels of distress are flexibly regulated (thus depression, which was lower on average, was not a significant predictor) or that individuals only flexibly regulate their emotions when they experience specific types of distress. Future research should examine the role of regulatory flexibility in the selection of strategies and the number of strategies used, which may vary by type and intensity of distress. This construct may provide some clarity in why individuals choose specific strategies or the number of strategies chosen. In other words, regulatory flexibility may lead to a better understanding of some of the exploratory hypotheses included in this study.
Given the similarities and distinctions between self-compassion and self-esteem, more research should be conducted to understand how the two constructs influence emotion regulation, thus exploring the questions raised by the final set of exploratory hypotheses. This set of hypotheses (18-23) was included to compare the predictive power of self-compassion (Hypotheses 7-12) and self-esteem. Self-compassion was anticipated to be the better predictor. It is an alternative to self-esteem (Neff, 2003a, 2003b) and a protective factor against low self-esteem (Marshall et al., 2015). Furthermore, self-compassion is a stable construct (Raes, 2011), whereas self-esteem fluctuates to varying degrees (Kernis, 2005). It is interesting that self-esteem negatively predicted the log odds of choosing some emotion regulation strategies (avoidance and suppression of depression, rumination of all types of distress) while self-compassion was a nonsignificant predictor. Unlike self-compassion, self-esteem is dependent upon comparison, and high self-esteem requires favorable comparisons in order to be maintained (Neff, 2003b, 2009, 2011). This distinction may explain why some of the results of these hypotheses were significant. Three of the emotion regulation strategies of depression were significant, which could suggest that there is something unique about the relationship between self-esteem and depression. The types of distress assessed in this study may be less threatening to those with high self-esteem, particularly depression. Individuals with low self-esteem could be avoiding and suppressing feelings of depression to protect their self-esteem. Rumination may reflect further comparisons. For example, if an individual feels depressed about being rejected, he or she may ruminate on the situation in an effort to discover comparisons that reflect favorably on the self rather than the rejector.

The present study sought to examine how differences in self-compassion were associated with the use of emotion regulation strategies in daily life over six days using ambulatory
assessment methodology. Although the findings were largely nonsignificant, the project generated a number of considerations for future research which could have important implications, such as the lack of equivalency between baseline and ambulatory measures and the possibility of gathering ambulatory ratings of self-compassion.
REFERENCES


The variables in the following equations stand for SCS = self-compassion, RSE = self-esteem, DEP = ambulatory depression, ANX = ambulatory anxiety, STR = stress, DEP_I, = initial depression, ANX_I = initial anxiety, STR_I = initial stress, ACC = initial acceptance, AVD = initial avoidance, PRS = initial problem solving, RAP = initial reappraisal, RUM = initial rumination, SUP = initial suppression, ACC_D = ambulatory acceptance for depression (dummy coded), AVD_D = ambulatory avoidance for depression (dummy coded), PRS_D = ambulatory problem solving for depression (dummy coded), RAP_D = ambulatory reappraisal for depression (dummy coded), RUM_D = ambulatory rumination for depression (dummy coded), SUP_D = ambulatory suppression for depression (dummy coded), ACC_A = ambulatory acceptance for anxiety (dummy coded), AVD_A = ambulatory avoidance for anxiety (dummy coded), PRS_A = ambulatory problem solving for anxiety (dummy coded), RAP_A = ambulatory reappraisal for anxiety (dummy coded), RUM_A = ambulatory rumination for anxiety (dummy coded), SUP_A = ambulatory suppression for anxiety (dummy coded), ACC_S = ambulatory acceptance for stress (dummy coded), AVD_S = ambulatory avoidance for stress (dummy coded), PRS_S = ambulatory problem solving for stress (dummy coded), RAP_S = ambulatory reappraisal for stress (dummy coded), RUM_S = ambulatory rumination for stress (dummy coded), SUP_S = ambulatory suppression for stress (dummy coded), NER_D = number of ambulatory emotion regulation strategies used for depression, NER_A = number of ambulatory emotion regulation strategies used for anxiety, and NER_S = number of ambulatory emotion regulation strategies used for stress.

**Hypothesis 0.** Initial ratings of distress will predict average ambulatory levels of distress. Specifically, depression will predict average ambulatory levels of depression (Hypothesis 0.1), initial ratings of anxiety will predict average ambulatory levels of anxiety
(Hypothesis 0.2), and initial ratings of stress will predict average ambulatory levels of stress
(Hypothesis 0.3). Initial ratings of baseline emotion regulation (acceptance, avoidance, problem
solving, reappraisal, rumination, suppression) will predict average ambulatory log odds of
choosing each emotion regulation strategy (acceptance, avoidance, problem solving, reappraisal,
rumination, suppression) for each type of distress (depression, anxiety, stress; Hypotheses 0.4-
0.21). In other words, \( \beta_{01} \) should be significantly different from zero and positive for all
hypotheses. In addition, each of these models will be compared to their corresponding null
model, and \( R^2 \) will be computed to determine the percent of variance explained by ambulatory
distress and ambulatory emotion regulation choice.

Note that emotion regulation strategies are binomial outcome variable in these
hypotheses. As such, when the variable is indicated as the outcome, it is actually a link function
\( (\eta_{ij} = \log \left( \frac{\varphi_{ij}}{1 - \varphi_{ij}} \right) \) referring to the log odds of using that strategy, although it is not specified as
such in each hypothesis. This is also true for all hypotheses with a binomial outcome variable.

Hypothesis 0.1:

Level 1: \( DEP_{ti} = \pi_{0i} + e_{ti} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(DEP_{I}) + r_{0i} \)

Hypothesis 0.2:

Level 1: \( ANX_{ti} = \pi_{0i} + e_{ti} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(ANX_{I}) + r_{0i} \)

Hypothesis 0.3:

Level 1: \( STR_{ti} = \pi_{0i} + e_{ti} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(STR_{I}) + r_{0i} \)

Hypothesis 0.4:
Level 1: $ACC_{D_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(ACC) + r_{0i}$

Hypothesis 0.5:

Level 1: $ACC_{A_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(ACC) + r_{0i}$

Hypothesis 0.6:

Level 1: $ACC_{S_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(ACC) + r_{0i}$

Hypothesis 0.7:

Level 1: $AVD_{D_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(AVD) + r_{0i}$

Hypothesis 0.8:

Level 1: $AVD_{A_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(AVD) + r_{0i}$

Hypothesis 0.9:

Level 1: $AVD_{S_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(AVD) + r_{0i}$

Hypothesis 0.10:

Level 1: $PRS_{D_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(PRS) + r_{0i}$

Hypothesis 0.11:

Level 1: $PRS_{A_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(PRS) + r_{0i}$
Hypothesis 0.12:

Level 1: \( PRS_{S_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(PRS) + r_{0i} \)

Hypothesis 0.13:

Level 1: \( RAP_{D_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RAP) + r_{0i} \)

Hypothesis 0.14:

Level 1: \( RAP_{A_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RAP) + r_{0i} \)

Hypothesis 0.15:

Level 1: \( RAP_{S_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RAP) + r_{0i} \)

Hypothesis 0.16:

Level 1: \( RUM_{D_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RUM) + r_{0i} \)

Hypothesis 0.17:

Level 1: \( RUM_{A_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RUM) + r_{0i} \)

Hypothesis 0.18:

Level 1: \( RUM_{S_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RUM) + r_{0i} \)

Hypothesis 0.19:

Level 1: \( SUP_{D_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(SUP) + r_{0i} \)

Hypothesis 0.20:

Level 1: \( SUP_{A_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(SUP) + r_{0i} \)

Hypothesis 0.21:

Level 1: \( SUP_{S_{ti}} = \pi_{0i} \)

Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(SUP) + r_{0i} \)

**Hypothesis 1.** In replication of previous findings, self-compassion at baseline will be significantly negatively related to initial depression (Hypothesis 1.1), anxiety (Hypothesis 1.2), and stress (Hypothesis 1.3). In other words, \( \beta_1 \) should be significantly different from zero and negative for all hypotheses.

Hypothesis 1.1:

\[ DEP_i = \beta_0 + \beta_1 SCS + e_i \]

Hypothesis 1.2:

\[ ANX_i = \beta_0 + \beta_1 SCS + e_i \]

Hypothesis 1.3:

\[ STR_i = \beta_0 + \beta_1 SCS + e_i \]

**Hypothesis 2.** Individuals will vary (between subjects variation) significantly in their average levels of distress, namely depression (Hypothesis 2.1), anxiety (Hypothesis 2.2), and stress (Hypothesis 2.3). In other words, \( Var(r_{0i}) = \hat{\tau}_{00} \) should be significantly different from zero for depression, anxiety, and stress.

Hypothesis 2.1:

Level 1: \( DEP_{ti} = \pi_{0i} + e_{ti} \)
Level 2: \( \pi_{oi} = \beta_{00} + r_{oi} \)

Hypothesis 2.2:

Level 1: \( ANX_{ti} = \pi_{oi} + e_{ti} \)

Level 2: \( \pi_{oi} = \beta_{00} + r_{oi} \)

Hypothesis 2.3:

Level 1: \( STR_{ti} = \pi_{oi} + e_{ti} \)

Level 2: \( \pi_{oi} = \beta_{00} + r_{oi} \)

**Hypothesis 3.** In replication of previous findings, self-compassion will predict average levels of ambulatory distress, namely depression (Hypothesis 3.1), anxiety (Hypothesis 3.2), and stress (Hypothesis 3.3). In other words, \( \beta_{01} \) should be significantly different from zero for depression, anxiety, and stress. In addition, each of these models will be compared to their corresponding null model, and \( R^2 \) will be computed to determine the percent of variance explained by self-compassion.

Hypothesis 3.1:

Level 1: \( DEP_{ti} = \pi_{oi} + e_{ti} \)

Level 2: \( \pi_{oi} = \beta_{00} + \beta_{01}(SCS) + r_{oi} \)

Hypothesis 3.2:

Level 1: \( ANX_{ti} = \pi_{oi} + e_{ti} \)

Level 2: \( \pi_{oi} = \beta_{00} + \beta_{01}(SCS) + r_{oi} \)

Hypothesis 3.3:

Level 1: \( STR_{ti} = \pi_{oi} + e_{ti} \)

Level 2: \( \pi_{oi} = \beta_{00} + \beta_{01}(SCS) + r_{oi} \)
Hypotheses 4-6. Individuals will vary in the log odds that they select each emotion regulation strategy when regulating ambulatory distress, namely depression (Hypothesis 4), anxiety (Hypothesis 5), and stress (Hypothesis 6). Specifically, the log odds that they select acceptance (Hypothesis 4.1), avoidance (Hypothesis 4.2), problem solving (Hypothesis 4.3), reappraisal (Hypothesis 4.4), rumination (Hypothesis 4.5), and suppression (Hypothesis 4.6) will vary when regulating depression. Similar variation will be found in the log odds of selecting acceptance (Hypothesis 5.1), avoidance (Hypothesis 5.2), problem solving (Hypothesis 5.3), reappraisal (Hypothesis 5.4), rumination (Hypothesis 5.5), and suppression (Hypothesis 5.6) when regulating anxiety. Individuals will also vary in the log odds that they select acceptance (Hypothesis 6.1), avoidance (Hypothesis 6.2), problem solving (Hypothesis 6.3), reappraisal (Hypothesis 6.4), rumination (Hypothesis 6.5), and suppression (Hypothesis 6.6) when regulating stress. In other words, $Var(\pi_{0i}) = \tau_{00}$ should be significantly different from zero for all hypotheses. In addition, the ICC and DEFF will be computed to assess the importance of the clustering.

Hypothesis 4.1:

Level 1: $ACC_{Dt_i} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 4.2:

Level 1: $AVD_{Dt_i} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 4.3:

Level 1: $PRS_{Dt_i} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$
Hypothesis 4.4:

Level 1: \( RAP_{D_{tl}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 4.5:

Level 1: \( RUM_{D_{tl}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 4.6:

Level 1: \( SUP_{D_{tl}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 5.1:

Level 1: \( ACC_{A_{tl}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 5.2:

Level 1: \( AVD_{A_{tl}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 5.3:

Level 1: \( PRS_{A_{tl}} = \pi_{0l} + e_{tl} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 5.4:

Level 1: \( RAP_{A_{tl}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 5.5:

Level 1: \( RUM_{A_{tl}} = \pi_{0l} \)
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 5.6:

Level 1: $SUP_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 6.1:

Level 1: $ACC_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 6.2:

Level 1: $AVD_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 6.3:

Level 1: $PRS_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 6.4:

Level 1: $RAP_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 6.5:

Level 1: $RUM_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

Hypothesis 6.6:

Level 1: $SUP_{S_{ti}} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$
**Hypothesis 7-12.** Self-compassion is expected to positively predict the log odds of acceptance when regulating depression (Hypothesis 7.1), anxiety (Hypothesis 7.2), and stress (Hypothesis 7.3). Self-compassion is expected to negatively predict the log odds of avoidance in when regulating depression (Hypothesis 8.1), anxiety (Hypothesis 8.2), and stress (Hypothesis 8.3). No directionality is predicted in the relationship between self-compassion and the log odds of problem solving (Hypothesis 9) or reappraisal (Hypothesis 10) when regulating depression (Hypothesis 9.1, Hypothesis 10.1), anxiety (Hypothesis 9.2, Hypothesis 10.2), and stress (Hypothesis 9.3, Hypothesis 10.3). Self-compassion is expected to negatively predict the log odds of rumination when regulating depression (Hypothesis 11.1), anxiety (Hypothesis 11.2), and stress (Hypothesis 11.3). No directionality is predicted in the relationship between self-compassion and the log odds of suppression (Hypothesis 12) when regulating depression (Hypothesis 12.1), anxiety (Hypothesis 12.2), and stress (Hypothesis 12.3). In other words, $\beta_{01}$ should be significantly different from zero for acceptance, avoidance, and rumination, and the coefficient should be positive for acceptance and negative for avoidance and rumination.

Hypothesis 7.1:

Level 1: $ACC_{D_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 7.2:

Level 1: $ACC_{A_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 7.3:

Level 1: $ACC_{S_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$
Hypothesis 8.1:
Level 1: $AVD_{D_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 8.2:
Level 1: $AVD_{A_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 8.3:
Level 1: $AVD_{S_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 9.1:
Level 1: $PRS_{D_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 9.2:
Level 1: $PRS_{A_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 9.3:
Level 1: $PRS_{S_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 10.1:
Level 1: $RAP_{D_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 10.2:
Level 1: $RAP_{A_t} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 10.3:

Level 1: $RAP_{Sti} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 11.1:

Level 1: $RUM_{Dt} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 11.2:

Level 1: $RUM_{At} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 11.3:

Level 1: $RUM_{St} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 12.1:

Level 1: $SUP_{Dt} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 12.2:

Level 1: $SUP_{At} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$

Hypothesis 12.3:

Level 1: $SUP_{St} = \pi_{0i}$
Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(SCS) + r_{0i}$
**Hypotheses 13-15.** Intensity of ambulatory distress, specifically depression (Hypothesis 13), anxiety (Hypothesis 14), and stress (Hypothesis 15), may predict the log odds of choosing to use acceptance (Hypothesis 13.1, Hypothesis 14.1, Hypothesis 15.1), avoidance (Hypothesis 13.2, Hypothesis 14.2, Hypothesis 15.2), problem solving (Hypothesis 13.3, Hypothesis 14.3, Hypothesis 15.3), reappraisal (Hypothesis 13.4, Hypothesis 14.4, Hypothesis 15.4), rumination (Hypothesis 13.5, Hypothesis 14.5, Hypothesis 15.5), and suppression (Hypothesis 13.6, Hypothesis 14.6, Hypothesis 15.6). No predictions are made regarding directionality or significance. In other words, $\beta_{1i}$ will be significantly different from zero if intensity of distress predicts the proportion with which individuals choose an emotion regulation strategy, and the coefficient will indicate if this relationship is positive or negative.

**Hypothesis 13.1:**

Level 1: $ACC_D = \pi_{0i} + \pi_{1i}(DEP)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

**Hypothesis 13.2:**

Level 1: $AVD_D = \pi_{0i} + \pi_{1i}(DEP)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

**Hypothesis 13.3:**

Level 1: $PRS_D = \pi_{0i} + \pi_{1i}(DEP)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

**Hypothesis 13.4:**
Level 1: $RAP_D = \pi_{0l} + \pi_{1l}(DEP)$

Level 2: $\pi_{0l} = \beta_{00} + r_{0i}$

$\pi_{1l} = \beta_{10}$

Hypothesis 13.5:

Level 1: $RUM_D = \pi_{0l} + \pi_{1l}(DEP)$

Level 2: $\pi_{0l} = \beta_{00} + r_{0i}$

$\pi_{1l} = \beta_{10}$

Hypothesis 13.6:

Level 1: $SUP_D = \pi_{0l} + \pi_{1l}(DEP)$

Level 2: $\pi_{0l} = \beta_{00} + r_{0i}$

$\pi_{1l} = \beta_{10}$

Hypothesis 14.1:

Level 1: $ACC_A = \pi_{0l} + \pi_{1l}(ANX)$

Level 2: $\pi_{0l} = \beta_{00} + r_{0i}$

$\pi_{1l} = \beta_{10}$

Hypothesis 14.2:

Level 1: $AVD_A = \pi_{0l} + \pi_{1l}(ANX)$

Level 2: $\pi_{0l} = \beta_{00} + r_{0i}$

$\pi_{1l} = \beta_{10}$

Hypothesis 14.3:

Level 1: $PRS_A = \pi_{0l} + \pi_{1l}(ANX)$

Level 2: $\pi_{0l} = \beta_{00} + r_{0i}$

$\pi_{1l} = \beta_{10}$
Hypothesis 14.4:

Level 1: $R A P\_A = \pi_{0i} + \pi_{1i}(ANX)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 14.5:

Level 1: $R U M\_A = \pi_{0i} + \pi_{1i}(ANX)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 14.6:

Level 1: $S U P\_A = \pi_{0i} + \pi_{1i}(ANX)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 15.1:

Level 1: $A C C\_S = \pi_{0i} + \pi_{1i}(STR)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 15.2:

Level 1: $A V D\_S = \pi_{0i} + \pi_{1i}(STR)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 15.3:

Level 1: $P R S\_S = \pi_{0i} + \pi_{1i}(STR)$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$
\[ \pi_{1i} = \beta_{10} \]

Hypothesis 15.4:

Level 1: \( RAP_S = \pi_{0l} + \pi_{1l}(STR) \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

\[ \pi_{1i} = \beta_{10} \]

Hypothesis 15.5:

Level 1: \( RUM_S = \pi_{0l} + \pi_{1l}(STR) \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

\[ \pi_{1i} = \beta_{10} \]

Hypothesis 15.6:

Level 1: \( SUP_S = \pi_{0l} + \pi_{1l}(STR) \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

\[ \pi_{1i} = \beta_{10} \]

**Hypothesis 16.** There may be between subject variance in the number of emotion regulation strategies chosen when coping with ambulatory distress, specifically depression (Hypothesis 16.1), anxiety (Hypothesis 16.2), and stress (Hypothesis 16.3). If the data support the hypothesis, \( Var(\pi_{0l}) = \hat{\tau}_{00} \) will be significantly different from zero.

Hypothesis 16.1:

Level 1: \( NER_{D_{ti}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)

Hypothesis 16.2:

Level 1: \( NER_{A_{ti}} = \pi_{0l} \)

Level 2: \( \pi_{0l} = \beta_{00} + r_{0l} \)
Hypothesis 16.3:

Level 1: $NER_{S_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

**Hypothesis 17.** Ambulatory distress severity, specifically depression (Hypothesis 17.1), anxiety (Hypothesis 17.2), and stress (Hypothesis 17.3), may predict the number of emotion regulation strategies chosen. No predictions are made regarding directionality or significance. In other words, $\beta_{10}$ will be significantly different from zero if intensity of distress predicts the proportion with which individuals choose an emotion regulation strategy, and the coefficient will indicate if this relationship is positive or negative. In addition, these models will be compared to the null models in Hypothesis 16, and $R^2$ will be computed to determine the percent of variance explained by ambulatory distress.

Hypothesis 17.1:

Level 1: $NER_{D} = \pi_{0i} + \pi_{1i}(DEP) + e_{ti}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 17.2:

Level 1: $NER_{A} = \pi_{0i} + \pi_{1i}(ANX) + e_{ti}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$

Hypothesis 17.3:

Level 1: $NER_{S} = \pi_{0i} + \pi_{1i}(STR) + e_{ti}$

Level 2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10}$
**Hypothesis 18-23.** Self-esteem may predict the log odds that individuals choose each emotion regulation strategy, specifically acceptance (Hypothesis 18), avoidance (Hypothesis 19), problem solving (Hypothesis 20), reappraisal (Hypothesis 21), rumination (Hypothesis 22), and suppression (Hypothesis 23). No predictions are made regarding directionality or significance. In other words, $\beta_{01}$ will be significantly different from zero if self-esteem predicts use of the emotion regulation strategy.

Hypothesis 18.1:

Level 1: $ACC\_D_{tl} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 18.2:

Level 1: $ACC\_A_{tl} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 18.3:

Level 1: $ACC\_S_{ti} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 19.1:

Level 1: $AVD\_D_{tl} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 19.2:

Level 1: $AVD\_A_{ti} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 19.3:

Level 1: $AVD\_S_{tl} = \pi_{0i}$
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 20.1:

Level 1: \( PRS_{D_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 20.2:

Level 1: \( PRS_{A_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 20.3:

Level 1: \( PRS_{S_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 21.1:

Level 1: \( RAP_{D_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 21.2:

Level 1: \( RAP_{A_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 21.3:

Level 1: \( RAP_{S_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 22.1:

Level 1: \( RUM_{D_{ti}} = \pi_{0i} \)
Level 2: \( \pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i} \)

Hypothesis 22.2:
Level 1: $RUM_{A_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 22.3:

Level 1: $RUM_{S_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 23.1:

Level 1: $SUP_{D_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 23.2:

Level 1: $SUP_{A_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$

Hypothesis 23.3:

Level 1: $SUP_{S_{ti}} = \pi_{0i}$

Level 2: $\pi_{0i} = \beta_{00} + \beta_{01}(RSE) + r_{0i}$
APPENDIX B

DEMOGRAPHICS QUESTIONNAIRE
Please answer the following:

1. In what year were you born (please enter 4 digits – 19XX)? (YYYY)

2. In what month were you born?
   a. January
   b. February
   c. March
   d. April
   e. May
   f. June
   g. July
   h. August
   i. September
   j. October
   k. November
   l. December

3. On what date were you born (please enter a number between 1 and 31 – for example, if you were born on March 30th, enter 30)? ___

4. What is your gender?
   a. Male
b. Female

c. Prefer not to respond

5. What is your race?
   a. American Indian/Alaskan Native
   b. Asian or South-Asian
   c. Black or African American
   d. Native Hawaiian/Pacific Islander
   e. White or Caucasian
   f. Not listed: ____________________
   g. Prefer not to respond

6. Do you identify as Latino/a, Hispanic, or being of Spanish origin?
   a. Yes
   b. No
   c. Prefer not to respond
APPENDIX C

SELF-COMPASSION SCALE (NEFF, 2003B)
HOW I TYPICALLY ACT TOWARDS MYSELF IN DIFFICULT TIMES

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

1 Almost never

2

3

4

5 Almost always

_____ 1. I’m disapproving and judgmental about my own flaws and inadequacies.

_____ 2. When I’m feeling down I tend to obsess and fixate on everything that’s wrong.

_____ 3. When things are going badly for me, I see the difficulties as part of life that everyone goes through.

_____ 4. When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.

_____ 5. I try to be loving towards myself when I’m feeling emotional pain.

_____ 6. When I fail at something important to me I become consumed by feelings of inadequacy.

_____ 7. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.

_____ 8. When times are really difficult, I tend to be tough on myself.

_____ 9. When something upsets me I try to keep my emotions in balance.

_____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
11. I’m intolerant and impatient towards those aspects of my personality I don’t like.

12. When I’m going through a very hard time, I give myself the caring and tenderness I need.

13. When I’m feeling down, I tend to feel like most other people are probably happier than I am.

14. When something painful happens I try to take a balanced view of the situation.

15. I try to see my failings as part of the human condition.

16. When I see aspects of myself that I don’t like, I get down on myself.

17. When I fail at something important to me I try to keep things in perspective.

18. When I’m really struggling, I tend to feel like other people must be having an easier time of it.

19. I’m kind to myself when I’m experiencing suffering.

20. When something upsets me I get carried away with my feelings.

21. I can be a bit cold-hearted towards myself when I’m experiencing suffering.

22. When I’m feeling down I try to approach my feelings with curiosity and openness.

23. I’m tolerant of my own flaws and inadequacies.

24. When something painful happens I tend to blow the incident out of proportion.

25. When I fail at something that’s important to me, I tend to feel alone in my failure.

26. I try to be understanding and patient towards those aspects of my personality I don’t like.
APPENDIX D

ROSENBERG SELF-ESTEEM SCALE (ROSENBERG, 1965)
Below is a list of statements dealing with your feelings about yourself. Please indicate how strongly you agree or disagree with each statement.

1  Strongly Agree

2  Agree

3  Disagree

4  Strongly Disagree

_____ 1. On the whole, I am satisfied with myself.

_____ 2. At times I think I am no good at all.

_____ 3. I feel that I have a number of good qualities

_____ 4. I am able to do things as well as most other people.

_____ 5. I feel I do not have much to be proud of.

_____ 6. I certainly feel useless at times.

_____ 7. I feel that I’m a person of worth, at least on an equal plan with others.

_____ 8. I wish I could have more respect for myself.

_____ 9. All in all, I am inclined to feel that I am a failure.

_____ 10. I take a positive attitude toward myself.
APPENDIX E

DEPRESSION, ANXIETY, AND STRESS SCALES 21 (HENRY & CRAWFORD, 2005)
Please read each statement and write the number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

0  Did not apply to me at all  
1  Applied to me to some degree, or some of the time  
2  Applied to me to a considerable degree, or a good part of time  
3  Applied to me very much, or most of the time  

_____ 1. I found it hard to wind down  
_____ 2. I was aware of dryness of my mouth  
_____ 3. I couldn’t seem to experience any positive feeling at all  
_____ 4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)  
_____ 5. I found it difficult to work up the initiative to do things  
_____ 6. I tended to over-react to situations  
_____ 7. I experienced trembling (e.g., in the hands)  
_____ 8. I felt that I was using a lot of nervous energy  
_____ 9. I was worried about situations in which I might panic and make a fool of myself  
_____ 10. I felt that I had nothing to look forward to  
_____ 11. I found myself getting agitated  
_____ 12. I found it difficult to relax  
_____ 13. I felt down-hearted and blue  
_____ 14. I was intolerant of anything that kept me from getting on with what I was doing
15. I felt I was close to panic
16. I was unable to become enthusiastic about anything
17. I felt I wasn't worth much as a person
18. I felt that I was rather touchy
19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)
20. I felt scared without any good reason
21. I felt that life was meaningless
APPENDIX F

FIVE FACET MINDFULNESS QUESTIONNAIRE, NONJUDGMENTAL ACCEPTANCE SUBSCALE (BAER ET AL., 2006)
Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1 never or very rarely true
2 rarely true
3 sometimes true
4 often true
5 very often or always true

_____ 1. I criticize myself for having irrational or inappropriate emotions.
_____ 2. I tell myself I shouldn’t be feeling the way I’m feeling.
_____ 3. I believe some of my thoughts are abnormal or bad and I shouldn’t think that way.
_____ 4. I make judgements about whether my thoughts are good or bad.
_____ 5. I tell myself that I shouldn’t be thinking the way I’m thinking.
_____ 6. I think some of my emotions are bad or inappropriate and I shouldn’t feel them.
_____ 7. When I have distressing thoughts or images, I judge myself as good or bad, depending on what the thought/image is about.
_____ 8. I disapprove of myself when I have irrational ideas.
APPENDIX G

ACCEPTANCE AND ACTION QUESTIONNAIRE-II (BOND ET AL., 2011)
Below you will find a list of statements. Please rate how true each statement is for you by using the scale below to fill in your choice.

1 never true
2 very seldom true
3 seldom true
4 sometimes true
5 frequently true
6 almost always true
7 always true

_____ 1. My painful experiences and memories make it difficult for me to live a life that I would value.

_____ 2. I’m afraid of my feelings.

_____ 3. I worry about not being able to control my worries and feelings.

_____ 4. My painful memories prevent me from having a fulfilling life.

_____ 5. Emotions cause problems in my life.

_____ 6. It seems like most people are handling their lives better than I am.

_____ 7. Worries get in the way of my success.
APPENDIX H

COPING STRATEGIES INVENTORY, PROBLEM SOLVING SCALE (TOBIN ET AL., 2001)
The purpose of this questionnaire is to find out how people deal with situations that trouble people in their day-to-day lives. Please read each item and determine the extent to which you used it in handling troubling events in general.

0 Not at all
1 A little
2 Somewhat
3 Much
4 Very much

_____ 1. I just concentrated on what I had to do next; the next step.
_____ 2. I changed something so that things would turn out all right.
_____ 3. I stood my ground and fought for what I wanted.
_____ 4. I made a plan of action and followed it.
_____ 5. I tackled the problem head-on.
_____ 6. I knew what had to be done, so I doubled my efforts and tried harder to make things work.
_____ 7. It was a tricky problem, so I had to work around the edges to make things come out OK.
_____ 8. I worked on solving problems in the situation.
_____ 9. I struggled to resolve the problem.
APPENDIX I

EMOTION REGULATION QUESTIONNAIRE (GROSS & JOHN, 2003)
We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1 strongly disagree
2
3
4 neutral
5
6
7 strongly agree

_____ 1. When I want to feel more positive emotion (such as joy or amusement), I change what I’m thinking about.

_____ 2. I keep my emotions to myself.

_____ 3. When I want to feel less negative emotion (such as sadness or anger), I change what I’m thinking about.

_____ 4. When I am feeling positive emotions, I am careful not to express them.

_____ 5. When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm.

_____ 6. I control my emotions by not expressing them.
7. When I want to feel more positive emotion, I change the way I’m thinking about the situation.

8. I control my emotions by changing the way I think about the situation I’m in.

9. When I am feeling negative emotions, I make sure not to express them.

10. When I want to feel less negative emotion, I change the way I’m thinking about the situation.
APPENDIX J

RUMINATION-REFLECTION QUESTIONNAIRE, RUMINATION FACTOR (TRAPNELL & CAMPBELL, 1999)
For each of the statements located below, please indicate your level of agreement or disagreement by indicating the appropriate response choice. Use the scale as shown below:

1 Strongly Disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly Agree

_____ 1. My attention is often focused on aspects of myself I wish I’d stop thinking about.
_____ 2. I always seem to be “re-hashing” in my mind recent things I’ve said or done.
_____ 3. Sometimes it is hard for me to shut off thoughts about myself.
_____ 4. Long after an argument or disagreement is over with, my thoughts keep going back to what happened.
_____ 5. I tend to “ruminate” or dwell over things that happen to me for a really long time afterward.
_____ 6. I don’t waste time re-thinking things that are over and done with.
_____ 7. Often I’m playing back over in my mind how I acted in a past situation.
_____ 8. I often find myself re-evaluating something I’ve done.
_____ 9. I never ruminate or dwell on myself for very long.
_____ 10. It is easy for me to put unwanted thoughts out of my mind.
_____ 11. I often reflect on episodes in my life that I should no longer concern myself with.
_____ 12. I spend a great deal of time thinking back over my embarrassing or disappointing moments.
APPENDIX K

AMBULATORY ASSESSMENT SIGNAL
How depressed did you feel since the last assessment?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Which strategies did you use to cope with feeling depressed?

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem solving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reappraisal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppression</td>
<td></td>
<td></td>
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</tbody>
</table>

How anxious did you feel since the last assessment?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Which strategies did you use to cope with feeling anxious? Select as many as you want.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
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<tr>
<td>Problem solving</td>
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<tr>
<td>Reappraisal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumination</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How stressed did you feel since the last assessment?

<table>
<thead>
<tr>
<th>not at all</th>
<th>completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

Which strategies did you use to cope with feeling stressed? Select as many as you want.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
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<tr>
<td>Problem solving</td>
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<td>Reappraisal</td>
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<td>Rumination</td>
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<td>Suppression</td>
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APPENDIX L

PSYCHOEDUCATION SCRIPT
Because people may use different words to describe the same thing, we want to make sure that everyone is using the same definitions for what the app will ask. The three feelings that you will be asked to rate are depression, anxiety, and stress. Here, “depression” means feeling blue, not seeming to experience any positive feeling at all, or feeling that you have nothing to look forward to. “Anxiety” means feeling close to panic or experiencing breathing difficulty or noticing the action of your heart in the absence of physical exertion. These feelings might be excessively rapid breathing, breathlessness, like your heart rate increased, or like your heart missed a beat. “Stress” means finding it difficult to relax, finding it hard to wind down, or feeling like you’re using a lot of nervous energy. Those are the feelings the app will ask you about. Do you have any questions about these feelings?

The app will also ask you about how you handled those feelings. Six ways you might handle these feelings are acceptance, avoidance, problem solving, reappraisal, rumination, or suppression. Here, “acceptance” means being okay with how your feeling without labeling it as “good” or “bad.” When you’re accepting your emotions, you might tell yourself, “I feel worried, and that’s okay.” “Avoidance” means trying to escape or get away from the situation that caused the feeling or the feeling itself. When you’re avoiding your emotions, you might try to distract yourself or leave. “Problem solving” means changing the situation so that you get a better outcome. When you’re problem solving, you might brainstorm ways to fix something. “Reappraisal” means thinking differently about a situation so that you feel better about it. When you’re reappraising, you might tell yourself, “It’s not that bad—maybe I made a wrong assumption.” “Rumination” means focusing over and over again on negative emotions. When you’re ruminating, you might keep thinking about how stressed you are. And keep thinking about it. And keep thinking about it. “Suppression” means trying not to think about something
or trying not to feel a certain way. When you’re suppressing your emotions, you might try really hard not to think about that test you’re really worried about. These are the different ways of handling feelings that the app will ask you about. You’ll be able to choose as many or as few as you used for each feeling. Do you have any questions about these different ways of handing feelings?