

ASSESSMENT OF AFFECTIVE DISTRESS INTOLERANCE

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**Novel measurement of affective distress intolerance: behavioral paradigm
development and ecological momentary assessment in individuals with binge eating**

A Dissertation

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by

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ABSTRACT

Novel measurement of affective distress intolerance: behavioral paradigm development and ecological momentary assessment in individuals with binge eating

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Distress intolerance is defined as the inability and/or unwillingness to endure negative emotional or physical experiences, specifically by engaging in maladaptive behaviors to alleviate the experience. *Affective* distress intolerance (pertaining specifically to negative emotional experiences) is theorized to be a key dimension underlying a wide range of maladaptive behaviors, such as loss-of-control (LOC) eating. Those with poor affective distress tolerance engage in behaviors that achieve temporary relief from negative affect, despite the potential long-term negative consequences of such behaviors. As such, affective distress intolerance is a key theoretical target for change in the development and evaluation of promising new psychological treatments. However, nearly all examinations in the current literature have relied on retrospective self-report measurement of affective distress intolerance, which is laden with problematic biases that may halt treatment development and evaluation. As such, the current project aimed to (1) iteratively develop a novel behavioral paradigm that tapped specifically into affective distress intolerance and (2) use ecological momentary assessment (EMA) to examine the interaction between momentary distress tolerance and negative affect in predicting subsequent episodes of LOC eating. We recruited 69 individuals with (n=39) and without (n=30) LOC eating to test seven iterations of the behavioral paradigm developed in the current study. A subset of individuals with LOC eating (n=12; data collection ongoing)

completed an EMA protocol over the course of two weeks. While the iterations of the behavioral paradigm developed were largely successful in inducing dysphoric emotional experiences, qualitative and quantitative data suggested we were unable to successfully tap into behavioral affective distress intolerance with any iteration of the paradigm. EMA results provided preliminary support for the model that the relation between momentary changes negative affect and subsequent episodes of LOC is strongest for those with lower levels of affective distress tolerance. Ideas for future iterations of the behavioral paradigm, including methods for increasing distress induced by the task, alternative mood induction paradigms, and ways of assessing behavioral escape, are discussed.

CHAPTER 1: INTRODUCTION

1.1 Affective distress intolerance

Distress intolerance is defined as the inability and/or unwillingness to endure negative emotional or physical experiences, with a tendency to engage in maladaptive behaviors to alleviate the experience (Linehan, 1993). Distress intolerance that pertains specifically to dysphoric or aversive *emotional* experience (which we term *affective distress tolerance*) is theoretically posited to be a key functional dimension that underpins a wide swath of difficult-to-treat psychopathology and impulsive behaviors (Leyro, Zvolensky, & Bernstein, 2010) including anxiety disorders (Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010), cluster B personality disorders (Bornovalova et al., 2008; Linehan, 1993), self-injury behaviors (Anestis, Pennings, Lavender, Tull, & Gratz, 2013; Nock & Mendes, 2008), substance abuse (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Zvolensky et al., 2009), and eating disorders (EDs; Anestis, Selby, Fink, & Joiner, 2007; Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007). Those with low affective distress tolerance perceive their emotions as unbearable and are thus motivated to engage in behaviors (e.g., binge eating, self-injury) intended to reduce emotional distress in the immediate short-term, even when such actions eventually engender negative consequences (e.g., scars, weight gain). Although many definitions of distress tolerance focus on one's *perceived ability* to tolerate negative emotions, for the purposes of the current investigation we are deliberately using a behavioral operationalization, i.e., the ability to engage in adaptive behavior in the face of negative affect, and, conversely, refraining from the use of maladaptive behaviors to regulate affect (Leyro et al., 2010). Notably, affective distress tolerance is related to, and overlaps with, several constructs

such as emotion regulation, negative urgency, experiential avoidance, and anxiety sensitivity (See Table 1, below), all of which have similarly demonstrated robust evidence for their relevance in either the development or maintenance of a wide range of psychopathology.

Table 1. Constructs overlapping with affective distress tolerance

Construct	Definition	Relation to distress tolerance	Existing measures
<i>(Affective) Distress tolerance</i>	Inability and/or unwillingness to endure negative emotional experiences, specifically by engaging in maladaptive behaviors to alleviate the experience	--	<ul style="list-style-type: none"> Distress Tolerance Scale
<i>Emotion regulation</i> (Gratz & Roemer, 2004)	(1) Awareness and understanding of emotions; (2) acceptance of emotions; (3) ability to control impulsive behaviors and behave in accordance with desired goals when experiencing negative emotion; and (4) access to emotion regulation strategies perceived to be effective	<ul style="list-style-type: none"> Distress tolerance appears to be a more specific sub-construct (e.g., within acceptance of emotions and ability to control impulsive behaviors) within the broad area of emotion regulation in the Gratz and Roemer model 	<ul style="list-style-type: none"> Difficulties in Emotion Regulation Scale (DERS)
<i>Negative urgency</i> (Fischer, Smith, Spillane, & Cyders, 2005)	Personality trait defined as the tendency to act impulsively or rashly when experiencing negative emotion	<ul style="list-style-type: none"> Distress tolerance is generally conceived as broader than impulsive action under the context of negative emotion; when experiencing negative emotion, maladaptive behaviors may not necessarily be impulsive (Belin, Mar, Dalley, Robbins, & Everitt, 2008) 	<ul style="list-style-type: none"> UPPS Impulsivity scale (negative urgency subscale)
<i>Experiential avoidance</i> (Hayes, 2004)	Type of responding that alters the form or frequency of aversive internal experiences	<ul style="list-style-type: none"> Very similar construct, but definitions of experiential avoidance generally encompass a wider range of more subtle avoidance behaviors 	<ul style="list-style-type: none"> Acceptance and Action Questionnaire - II
<i>Anxiety sensitivity</i> (Reiss, Peterson, Gursky, & McNally, 1986)	Fear of anxiety and arousal-related sensations, and the tendency to interpret the experience of such sensations as catastrophic	<ul style="list-style-type: none"> Anxiety sensitivity centrally refers to the <i>anticipation</i> of negative consequences of physiological and emotional changes, while distress tolerance does not 	<ul style="list-style-type: none"> Anxiety Sensitivity Index Discomfort Intolerance Scale

1.2 Affective distress tolerance as a maintenance factor and treatment mechanism

A wide body of literature utilizing ecological momentary assessment (EMA; a repeated sampling method that takes place in a person's natural environment via smartphone) has established that negative affect is an immediate precipitant of a wide range of maladaptive behaviors such as binge eating (Haedt-Matt & Keel, 2011), self-injury (Bresin, Carter, & Gordon, 2013), smoking (Shiffman et al., 2007; Shiffman & Waters, 2004), substance use (Simons, Gaher, Oliver, Bush, & Palmer, 2005). Often, negative affect decreases (temporarily) during and immediately after engaging in the behavior (Berg et al., 2013; Bresin et al., 2013; Hedeker, Mermelstein, Berbaum, & Campbell, 2009). Such evidence lends support to the idea that the group of maladaptive behaviors described above are at least partially driven by an unwillingness or perceived inability to tolerate negative affect, and that engaging in such behaviors is motivated by a subsequent (even if temporary) relief from such affect.

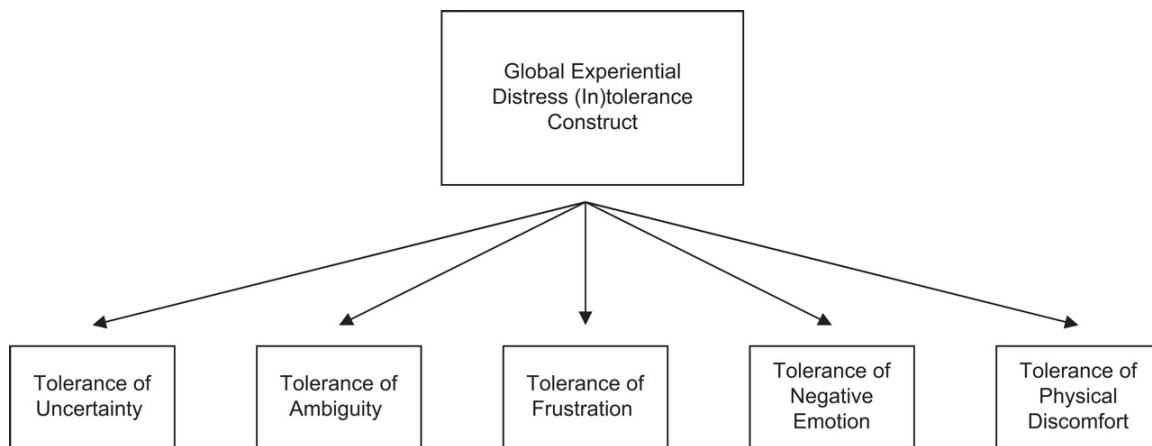
In fact, one of the recent successful innovations in behavioral treatments for psychopathology is the emphasis on providing skills for tolerating and/or regulating negative affect (Forman & Herbert, 2009; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Linehan, 1993; Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006). Interventions of this type (especially "Third Wave" therapies such as Acceptance and Commitment Therapy [ACT] and Dialectical Behavior Therapy [DBT]) have shown preliminary efficacy in the treatment of several of the disorders and maladaptive behaviors described above, such as anxiety disorders (Arch et al., 2012), EDs (Juarascio, Manasse, Schumacher, Espel, & Forman, 2017; Juarascio et al., 2013), borderline personality disorder (Linehan et al., 2006), and unhealthy behaviors, such as smoking (Gifford et al.,

2004) and overeating in the context of obesity (Forman et al., 2013; Forman et al., 2016). Several investigations have supported distress tolerance and/or related constructs as a key treatment mechanism of action (Forman, Herbert, Moitra, Yeomans, & Geller, 2007; Hayes et al., 2006; Neacsiu, Rizvi, & Linehan, 2010), but results are sparse and somewhat mixed.

1.3 Global distress tolerance versus domain-specific distress tolerance

Distress tolerance is sometimes presumed to be a unitary construct; however, more recent models and empirical evidence suggest that global distress tolerance is hierarchical in nature, and may be composed of lower-order domain-specific dimensions, including tolerance of uncertainty, frustration tolerance, tolerance of negative emotion, and tolerance of physical discomfort (see Figure 1).

Figure 1. Heuristic depiction of the global experiential distress intolerance construct and lower-order dimensions.



(Zvolensky et. al, 2010).

Such a framework and empirical evidence suggests that domain-specific constructs are indeed distinct from each other and predict different outcomes and facets

of psychopathology. For example, tolerance of frustration reflects the ability to persist in a cognitively difficult or frustrating task. Behaviorally-measured frustration tolerance (see *Section 1.3.2*) has been associated with problematic alcohol use, smoking cessation failure, and length of drug/alcohol abstinence attempts (Brown et al., 2005; Leyro et al., 2010). By contrast, tolerance of uncertainty (the way in which an individual perceives information in uncertain situations and responds with a set of cognitive, emotional, or behavioral reactions) is related to concurrent anxiety symptoms and the presence of generalized anxiety disorder (Holaway, Heimberg, & Coles, 2006). Tolerance of negative emotional states (typically measured via self-report) is related to substance abuse disorders, drug coping motives, bulimic symptoms, and post-traumatic stress symptoms (Buckner, Keough, & Schmidt, 2007; Howell, Leyro, Hogan, Buckner, & Zvolensky, 2010). Thus, although several lower-order distress tolerance domains appear to share variance in their associations with psychopathology (e.g., frustration tolerance and affective distress tolerance), such constructs also appear to reflect distinct facets of psychopathology. This notion is particularly relevant when considering the construct of frustration tolerance, which boasts several well-validated behavioral measures that appear to be associated with the presence of, and ability to abstain from, addictive behaviors. Although behavioral frustration tolerance tasks elicit specific dimensions negative affect, such affect is limited to frustration, which is distinct from other types of affect --such as sadness, guilt, and shame-- that have been shown to precede episodes of maladaptive behavior. Frustration tolerance may thus be especially related to *task persistence*, which holds relevance to clinical issues such as continuing to abstain from drug use after recovery, but less so for the ongoing maintenance of maladaptive behaviors such as binge

eating. Thus, findings from the body of research using frustration tolerance, while promising, leave room for further exploration of the measurement of affective distress tolerance.

1.3 Features and shortcomings of existing measures of distress tolerance

1.3.1 Self-report measurement of distress tolerance and related constructs

The most commonly-used measure of affective distress tolerance is the Distress Tolerance Scale (Simons & Gaher, 2005), which focuses on the extent to which an individual perceives his or her own feelings as unbearable and the tendency to engage in behaviors to alleviate aversive internal experiences. The DTS is well-validated in both clinical and non-clinical samples. Another common measure of distress intolerance is the Discomfort Intolerance Scale (Schmidt, Richey, & Fitzpatrick, 2006), which focuses on the ability to tolerate *physical* distress, and thus may be most applicable to anxiety-related disorders (e.g., panic) and less so to other disorders and behaviors discussed above. Similar items to those found in the DTS appear in self-report measures such as the Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004), the Acceptance and Action Questionnaire (Bond et al., 2011), which measures experiential avoidance, and the UPPS Impulsivity Scale (Whiteside, Lynam, Miller, & Reynolds, 2005), which includes the negative urgency subscale.

Reliance on self-report stems from its low-cost and easy administration in the context of treatment studies; in addition, “objective” measures for psychological constructs are difficult to develop. However, self-report measurement of affective distress intolerance likely produces highly biased and inaccurate data, because reporters are subject to recency, experimenter, confirmation and other biases (Gorin & Stone, 2001);

demand characteristics; unwillingness to report on maladaptive behavior; and/or poor recall (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Schwarz et al., 1994). For example, answers to many items on the DTS (e.g., “I can’t handle feeling distressed or upset,” “When I feel distressed or upset, I must do something about it immediately”) assume participants will answer honestly and are insightful enough to report on the level of their own distress tolerance. Reliance on such measures also assumes that participants can accurately report on their own relative strengths and weaknesses (Gramzow, Elliot, Asher, & McGregor, 2003). In fact, evidence suggests that self-report measurements of affective distress tolerance actually measure *perceived* ability to tolerate distress rather than true behavioral ability or willingness to do so (Leyro et al., 2010). These issues highlight the need to utilize multimodal methods such as behavioral measures to more comprehensively and accurately identify affect-related maintenance factors and mechanisms (NIMH, 2014). Continued utilization of self-report measures as the only form of measurement of affective distress intolerance limits the ability to identify psychopathology maintenance factors (i.e., target identification) and conduct effective and efficient treatment development and evaluation (NIMH, 2013).

1.3.2 Behavioral measures of distress tolerance

Although a range of behavioral measures (i.e., in which behavior is elicited and observed in a laboratory setting) exist for the assessment of sub-constructs under the broad umbrella of distress tolerance, no existing measures specifically tap into the construct of *affective* distress tolerance as broadly applicable to the maladaptive behaviors described above. Three of the most widely-used behavioral measures of distress tolerance are the Mirror Tracing Task (MTT) (Strong et al., 2003), Paced

Auditory Serial Anticipation Task (PASAT; Lejuez, Kahler, & Brown, 2003), and Cold Pressor Task (Neufeld & Thomas, 1977). As briefly described above, tasks such as the MTT and the PASAT measure the construct of *frustration* tolerance, which refers to the ability to *persist in a cognitively taxing behavior* despite its difficulty and cognitive strain. For example, the PASAT asks individuals to persist in a nearly-impossible arithmetic task, while the MTT asks individuals to engage in a nearly-impossible task of tracing a figure.

Affective distress intolerance, by contrast, involves engaging in a behavior to reduce a range of negative emotional experiences, such as sadness, guilt, and shame. The CPT (which involves keeping a hand in a pool of cold water) measures the ability to endure *physical pain*, which does not approximate the negative affect preceding maladaptive behaviors. A body of literature has consistently found that self-report measures of distress tolerance show high correlations amongst themselves and some behavioral measures show modest correlations with other behavioral measures of distress tolerance (Bernstein, Marshall, & Zvolensky, 2011). However, existing behavioral measures of distress tolerance show very low associations with self-report measures of affective distress tolerance (i.e., most Pearson's r correlations between range between .01-.12; (Bernstein et al., 2011; Marshall - Berenz, Vujanovic, Bonn - Miller, Bernstein, & Zvolensky, 2010; McHugh, Daughters, et al., 2011; Schloss & Haaga, 2011). This evidence suggests that distress tolerance is a multi-faceted construct (Bernstein, Zvolensky, Vujanovic, & Moos, 2009), and that current measures are not tapping into *affective* distress intolerance. To date, only two previous studies sought to create a paradigm that could be adapted to measure affective distress tolerance specifically

(McHugh, Hearon, Halperin, & Otto, 2011). However, in this paradigm, participants are asked to *retrospectively* report an amount of money they would be willing to pay to never experience distress similar to that just elicited. Thus, this method relies on self-report of a hypothetical behavior. As such, it is subject to many of the problems associated with conventional self-report measures described above. Although the study also included an “escape” option from a negative mood induction, the induction consisted of a film clip, which was likely engrossing in nature and was unlikely to induce the type of personally-relevant distress that normally precedes maladaptive behavior (Berg et al., 2013). It is therefore not surprising that no participants chose to escape the paradigm in this study.

Recently, researchers created the Emotional Intolerance Task (EIT), which sought to measure affective distress tolerance (Veilleux, Pollert, Zielinski, Shaver, & Hill, 2017). In the EIT, participants are shown a series of distressing images chosen from the International Affective Picture System (IAPS; a set of images that have been validated in the induction of certain emotions), and are asked to indicate with a key press when/if he or she becomes distressed. When/if the participant notes distress, the image remains on the screen for up to 30 additional seconds with the option to move on to the next image (i.e., to “escape”) with another key press. Outcome measures included time until distress is reported by the participant, and average length of time the image was tolerated (i.e., choosing not to move on) after distress key presses. Affective distress tolerance as measured by the EIT showed preliminary concurrent and criterion validity, although as with other distress tolerance tasks, it showed little association with self-report measures of distress tolerance. While the EIT shows promise in the measurement of affective distress tolerance, the authors note that the wide array of images used (e.g., those that

provoke disgust [body parts] and anger or sadness [images from 9/11]) in the task, it is difficult to surmise what specific types of affect are being induced in the task. In addition, tolerance was partially measured based on a dichotomous self-report of “distress,” which is likely subject to variable interpretations across participants. As above, the distress induced in the task was also not personally-relevant, decreasing the ecological validity of the measure.

In sum, while researchers have begun to attempt behavioral measurement of affective distress intolerance, innovations in task development are necessary.

1.4 Binge eating

A particularly good example of a maladaptive behavior theorized to be driven by distress intolerance is binge eating, a key symptom of EDs such as bulimia nervosa (BN) and binge eating disorder (BED). Binge eating is defined as eating an objectively large amount of food within a discrete time period, characterized by a pervasive sense of loss of control (LOC) over eating. Binge eating and LOC eating are linked to serious psychological and physical consequences (Grilo, White, & Masheb, 2009; Grucza, Przybeck, & Cloninger, 2007; Latner, Hildebrandt, Rosewall, Chisholm, & Hayashi, 2007), including elevated depression and anxiety (Grilo et al., 2008; Grilo et al., 2009; Grucza et al., 2007; Latner et al., 2007), impaired social and occupational functioning (Mond et al., 2006; Rieger, Wilfley, Stein, Marino, & Crow, 2005), and health outcomes such as weight gain and diabetes (Crow, Kendall, Praus, & Thuras, 2001; Hanlan, Griffith, Patel, & Jaser, 2013). A recent investigation of ED treatments determined that half or more of patients are partially or fully symptomatic after a full course of treatment (Fairburn et al., 2009), signaling substantial room for improvement in treatment outcome.

One large potential limitation of existing treatments is the insufficient emphasis on provision of strategies for tolerating or coping with emotional distress (Wisniewski & Kelly, 2003).

A large body of evidence, including several studies utilizing EMA (Crosby et al., 2009; Haedt-Matt & Keel, 2011; Wonderlich et al., 2007), has demonstrated that individuals with binge eating experience a sharp increase in negative affect as an immediate antecedent to binge episodes. Additionally, negative affect appears to decrease temporarily during and/or after binge episodes, suggesting a negative reinforcement function of binge eating (Berg et al., 2013; Engel et al., 2013). Preliminary research suggests self-reported affective distress tolerance is an inverse predictor of bulimic symptomology (e.g., binge eating) above and beyond anxiety and depression symptoms, impulsivity, body dissatisfaction, and perfectionism (Anestis et al., 2007; Anestis, Smith, Fink, & Joiner, 2009; Corstorphine et al., 2007). In addition, negative urgency, a personality trait that is conceptually similar to distress intolerance, has a wide body of evidence supporting its role in the maintenance (Anestis et al., 2009), the prospective onset (Fischer, Peterson, & McCarthy, 2013) and outcome from treatment of binge eating pathology (Manasse et al., 2016). In addition, one recent study showed that individuals with binge eating pathology were three times more likely to quit the MTT compared to those without binge eating (Eichen, Chen, Boutelle, & McCloskey, 2017), and another study revealed trend-level associations between binge eating symptoms and distress intolerance on the MTT in a non-clinical sample (Veilleux et al., 2017). As such, poor affective distress tolerance has preliminary support for its role in the relation between negative affect and binge eating. Specifically, the relation between negative affect and

binge eating may depend on one's level of affective distress tolerance; however, this relation has yet to be empirically examined.

Yet, as described above, a valid method of assessing affective distress tolerance (other than self-report) does not exist at this time. It is thus possible that conclusions drawn from use of self-report measures of affective distress tolerance may be incorrect. Continued utilization of self-report measures as primary measurement may lead to the faulty assumption that a construct (e.g., distress tolerance) improved as a result of the treatment, or that a treatment component was ineffective, halting effective and efficient treatment development and evaluation. Creation of a behavioral measure of affective distress tolerance has the potential to provide converging support of affective distress tolerance as a maintenance factor of behaviors such as binge eating (i.e., target identification), and to provide a method other than self-report for evaluating mechanisms and moderators of new treatments (i.e., target engagement and validation).

1.5 The current study

The current study sought to develop and validate a behavioral task of affective distress tolerance. We also examined the moderating role of affective distress tolerance in the relation between negative affect and binge eating. We originally proposed to conduct the present study in two phases: Phase I of the study, which includes the initial pilot and finalizing of the behavioral paradigm, and Phase II, in which we proposed to validate the paradigm in a sample of undergraduate students (n=80) and individuals with LOC eating (n=20). However, as described below, challenges that arose regarding the development of the paradigm in Phase I precluded the completion of Phase II as proposed.

The initial framework for the paradigm developed for the current study was based on methods and procedures for existing behavioral paradigms for broadly-defined distress tolerance and related constructs. Most existing paradigms of distress tolerance include a continuous induction of a distressing state (e.g., a cognitively taxing/frustrating task, keeping a hand in cold water, breath-holding), an option to escape the distressing state (e.g., quitting the task), and typically, an incentive for persistence in the task or consequence for choosing to escape (e.g., monetary reward). Thus, the initial paradigm we sought to test in the current study included these critical components but adapted to apply specifically to affective distress intolerance (e.g., continuous induction of negative affect).

To achieve these aims, we originally proposed two study phases, as mentioned above. In Phase I, we iteratively adjusted the procedures of the paradigm based on examination of the data and interviews with participants regarding their experience with the task. We examined the following after every 1-3 participants went through the task: means and ranges of intensity of negative affect means and ranges of duration of negative affect (specifically, we looked for at least a 4 out of 5 rating on at least one index of negative affect measured throughout the paradigm), and mean, standard deviation and range of time until escape of negative affect induction. We also aimed for a maximum of 40% of participants reaching ceiling on the task, consistent with the rate of termination found in other distress tolerance tasks (Anestis, Gratz, Bagge, & Tull, 2012; Daughters et al., 2005). We also gathered qualitative data from participants regarding their motivations for terminating or not terminating the task (see Appendix C).

1.5.1 Changes from the originally-proposed study methods

Reaching the task the milestones we proposed for Phase I was met with significant challenges. Specifically, a very low number of participants chose to escape the task across all iterations (described in more detail in *Results*). Because Phase II consisted of a validation phase, we chose to not move to Phase II with a task that did not meet a priori specifications, and instead focused on iterating on the task. As such, current manuscript describes Phase I of the study, as Phase II has yet to be completed. However, we started EMA data collection, which was originally proposed as part of Phase II of the project (n=12 completed EMA, data collection ongoing, projected n=20 in September 2017), in order to examine the moderating role of momentary affective distress tolerance in the relation between momentary negative affect and subsequently-reported binge eating. Preliminary results of this portion of the study are described in *Results*.

1.6 Aims and hypotheses

The study aims described below reflect the changes to the proposed study described in *1.5.1*.

1.6.1 Primary Aims

1. To develop a behavioral measure of affective distress tolerance, i.e., a task that induces negative affect from which participants can choose an early escape (at a cost). In order to discriminate between individuals who are theoretically more likely to have lower distress tolerance from those who have higher distress tolerance, we will, in an exploratory manner, compare metrics of the task between those with and without LOC eating.
 - a. *Hypothesis 1*: The measure developed in the current study will result in adequate persistence of negative affect (i.e., a rating of at least 4 out of 5 on one type of

- negative affect on the PANAS for the entirety of the paradigm) and variability in latency to termination of the task (i.e., a maximum of 40% of participants reach ceiling of the task).
- b. *Hypothesis 2*: Individuals with LOC will show relatively greater increases in negative affect in response to the task, and higher levels of escape compared to those without LOC.
2. To preliminary test the model that affective distress tolerance moderates the relation between momentary negative affect and subsequent binge episodes.
 - a. *Hypothesis 3*: The relation between within-subjects changes (i.e., higher or lower levels relative to oneself) negative affect and subsequently-reported binge episodes will be moderated by affective distress tolerance such that the relation between negative affect and subsequent binge episodes will be strongest at lower levels of within-subjects (i.e., relative to oneself) affective distress tolerance.

CHAPTER 2: METHODS

2.2 Components of the initial paradigm

As described above, the initial framework for the paradigm developed for the current study was based on methods and procedures for existing behavioral paradigms for distress tolerance.

2.2.1 *Continuous negative affect induction*

We originally considered several different methods for the continuous induction of negative mood. Several well-validated methods exist for the induction of negative mood, such as autobiographical recall, use of film clips, and music; however, not all of these methods were well-suited to the current purposes. Several considerations were taken into account, such as the ability of the method to conjure a potent enough emotional experience to motivate escape from the paradigm, and the tendency of individuals to persist in a task for reasons other than high distress tolerance (e.g., a need for resolution or determination to succeed in a task). Autobiographical recall (e.g., asking participants to immerse themselves in a particularly distressing memory) was strongly considered; however, individuals may vary greatly in the type of memories they would be willing to select, and in fact, individuals may vary considerably in how distressing their most distressing memories are. Thus, it was determined that the standardization of an autobiographical induction procedure would prove difficult. Additionally, it is unknown how long distress conjured by autobiographical recall (even in conjunction with a music induction) could last and whether such an induction could truly be continuous in nature. As described earlier, film clips may yield limited escape rates due to the desire of individuals to see a resolution of the conflict presented in the film clip, and the self-

removed nature of any distress elicited. Musical induction of negative mood alone also would be unlikely to be potent enough for individuals to motivate an urge to escape the experience.

One method that we originally determined was well-suited to the current purposes was guided imagery, or the imagination of a standardized hypothetical distressing event via an induction script (Keltner, Ellsworth, & Edwards, 1993; Mayer, Allen, & Beauregard, 1995). One such script designed to induce sadness used in previous studies asked participants to imagine the death of their mother with a 5-part script (Keltner et al., 1993). Using a script such as this one allows for greater standardization of the amount of affect elicited by the induction. Although we considered retaining the storyline presented in the Keltner et al. script, we ultimately decided to design a scenario that evoked both sadness and guilt, given evidence that guilt is a temporal precedent of maladaptive behaviors potentially driven by distress intolerance (Berg et al., 2013). In addition, the script created by Keltner and colleagues may be differentially effective in inducing sadness depending on an individual's relationship with her mother (and of course, whether her mother is still living). Thus, we created a new script that aimed, to the degree possible, to induce affect that seemed likely to be similarly effective across individuals of differing ages and backgrounds (see Appendix A). The script describes a scenario in which the participant is asked to imagine a situation in which she is driving with her best friend in the car and takes her eyes off the road to check a text message on her phone. As a result, she gets into a car accident and her friend dies while the participant does not. The purpose of the paradigm is to elicit a constellation of dysphoric affect known to precede maladaptive behavior (e.g., binge eating), especially sadness, guilt, and shame. In

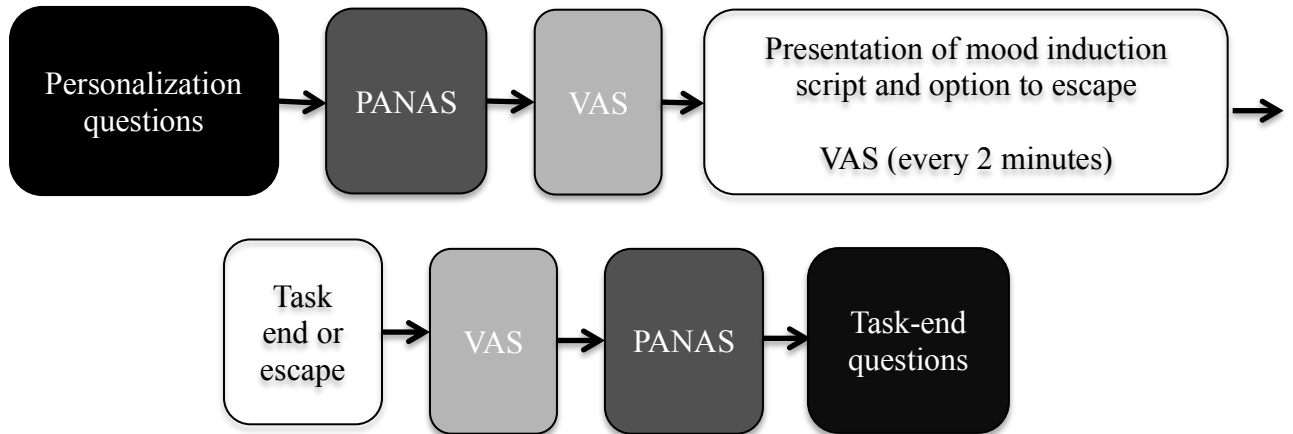
addition, we designed the scenario to be easily imaginable (e.g., most individuals have checked a text message while driving, or at least while engaged in another important task).

2.2.2 Initial task procedures

The task was programmed using Unity, a software used for video game development. When starting the task, participants were asked to enter the first name and gender of their closest friend, in addition to several other details (see Appendix A). The script then auto-filled with the name and gender of the friend provided by the participant (in addition to other details), in order to increase personalization of the script. At the beginning of the task, selected items from the PANAS (see *Measures*) were administered (Afraid, Lonely, Irritable, Ashamed, Disgusted, Nervous, Dissatisfied with self, Sad, Distressed, Angry with self, Guilty, Bored). The PANAS was also administered when the participant concluded the task. Every two minutes during the task, in addition to before each PANAS administration, we administered a visual analog scale (VAS) to assess for changes in mood. Specifically, participants rated how upset they felt in the current moment by clicking on a 100mm line (“not at all” to “extremely”). We considered administering the PANAS every two minutes, however, it was determined completing several mood ratings may detract from immersion in the task.

The script was then presented 1-3 sentences at a time in order to facilitate full immersion in the scenario (e.g., as opposed to running the risk of the participant skimming through large portions of the script). Music known to induce negative mood (*Adagio in G Minor*) commenced at half-speed (Kenealy, 1988). See Figure 2 for a schematic of the original task flow.

Figure 2. Flow of the original task



In the initial version of the task, the “resolution” or “spoiler” of the scenario (e.g., death of a close friend) was presented upfront to the individual so that curiosity to hear the resolution of the story was limited, and the script continuously presented the events leading up to the distressing scenario (e.g., seeing a car speeding towards the car you are driving), the distressing scenario itself, as well as the ramifications of the scenario (e.g., life without a close friend). We presented the script presented in groups of 1-3 sentences, which advanced automatically after a period of time sufficient to imagine and immerse oneself in each part of scenario, allowing for a continuous induction. Prior to task start, the experimenter orally read instructions, which originally were: *“After I start the task, you will be asked to answer a couple of questions. Then, sad music will start playing, and you will be asked to imagine the scenario presented in text on the screen. It’s very important that try as hard as you can to imagine the scenario as intensely and real as you can make it. At certain points during the task, you will be asked to rate your mood. The scenario will be presented gradually. You have the option to turn off the music and text at any time if you do not wish to continue. If you keep going with the task until the end, you will be entered into a lottery to win an extra gift card at the end of the study. However,*

if you choose to end the task early, you will not be entered into the lottery.” (See Distal consequence for terminating the paradigm).

2.2.2 Option to terminate the task

In order to maximize potential variability in latency to task termination, upon starting the task, a prompt appeared on the screen (in addition to the text of the script, with the music still playing): “Press the space bar to end the task.” Once the text appeared, it remained on the screen as a reminder to participants. If the participant pressed the space bar, the music ended and the participants were asked to rate their overall (VAS) and specific level of moods (PANAS). We planned to index affective distress tolerance as latency in seconds to task termination, consistent with other paradigms (Lejuez et al., 2003). Existing measures of distress tolerance have observed appropriate variability in latency to termination of the task in a 5-7 minute timeframe. We made the task length 12 minutes in order to allow for maximum variability in latency to task termination. However, in order to prevent participants from anticipating the end of the task in a manner that might aid their ability to tolerate it, they were not told how long the task would last. Other procedures for inducing negative mood (e.g., film clips) have lasted 12 minutes (Ray, 2007), and other behavioral distress tolerance tasks have successfully induced and maintained a state that produces variability in escape tendencies within 7 minutes (Lejuez et al., 2003; Strong et al., 2003). Thus, we expected the negative affect induced by the paradigm to be effectively induced and persist within the 12-minute timeframe. We also assessed affect levels at several points throughout the paradigm (see *Procedures*) as a manipulation check and to monitor levels of affect throughout the paradigm.

2.2.3 *Distal consequence for terminating the paradigm*

The methodology of using entry into a lottery to win a gift card as an incentive for engaging in the task was meant to approximate the sometimes distal-seeming, non-salient consequences for engaging in affect-reducing maladaptive behaviors *in the moment*. However, we believed the incentive would instill some motivation to tolerate the distress of the task. Similar methods of incentivizing continued participation in distressing behavioral tasks have been shown to be effective, and achieve a wide variability in length of persistence in the task (MacPherson et al., 2012).

2.2.4 *Positive mood induction*

A positive mood induction (using a written autobiographical recall method) took place after completion of the affective distress tolerance paradigm. Participants chose one of three positive scenarios to write about for five minutes: their most positive experience, their nicest experience with a loved one, or greatest personal achievement. The positive mood induction was associated with large decreases in distress, guilt, and shame ($t_s = 8.73-11.51, p_s < .01$).

2.3 Overview of modifications to the task

Throughout the study, we examined (1) manipulation checks to ensure negative affect was effectively being induced in the task (i.e., at least a 4 out of 5 on at least one index of negative affect on the PANAS throughout the paradigm); (2) whether the task yielded variability in latency to termination of the task (e.g., at least 60% of individuals terminate the task early); and (3) the trajectory of negative affect throughout the task to ensure habituation to the continuous mood induction did not occur. As described in more detail in *Results*, participants were generally reporting adequate increases in negative

affect throughout the task, but the rate of escape was far below 60%. As such, task modifications took the form of attempting to remove additional motivation for persisting in the task (i.e., removing the lottery incentive), increasing the affect induced by the task (by adding provocative images and sounds to the task), changing the frame of the task from an “escape” to “switch” paradigm (to address participant reports that they were “up for the challenge”), and attempting to induce more personally-relevant distress. These modifications are described in greater detail in *Results*.

2.4 Participants

To recruit a mixed clinical and non-clinical sample for piloting the task in Phase I, we included non-treatment seeking undergraduate females (n=19) and adults (ages 18-65) seeking treatment for emotional eating, binge eating disorder, or bulimia nervosa (n=50). All participants had the ability to speak and write English. Participants were excluded if they were (a) underweight (i.e., < BMI of 18); (b) endorsed suicidal ideation with any degree of intent; or (c) experiencing symptoms of psychosis.

Although we intended to limit the BE sample to women (given that most individuals with BE are women; Hudson, Hiripi, Pope Jr, & Kessler, 2007), we opted to include men in the BE sample in order facilitate recruitment and for purposes of piloting the task. To be included in the BED or BN treatment studies (for which the distress tolerance task was administered at baseline), participants were required to be regularly engaging in LOC eating (i.e., an average of one LOC episode per week for the past three months) and, for the BN studies, once-weekly compensatory (e.g., self-induced vomiting, laxative use) behaviors on average for the past three months. Given convincing evidence that LOC, rather than binge size or frequency, is the characteristic of BE most associated

with impaired quality of life and elevated psychopathology (Latner et al., 2007; Mond, Latner, Hay, Owen, & Rodgers, 2010), we decided to recruit a transdiagnostic sample of those who regularly engage in LOC eating, who are not required to meet the “objectively large” binge episodes requirement of BN/BED diagnoses. All participants had the ability to speak and write English. Participants for the BN/BED treatment studies were excluded if they (a) were currently receiving psychological treatment for an eating disorder (although participants completed the assessment prior to entry into treatment); (b) met criteria for anorexia nervosa; (c) currently endorsed any suicidal ideation; (d) had any other major psychiatric diagnosis that would interfere with the ability to engage with treatment (e.g., pervasive developmental disorder); and (e) had previously received a course of CBT or ACT for eating pathology.

In order to widen the sample piloting the task, we also included a group of individuals who were seeking treatment for emotional eating, i.e., those who reported eating regularly eat in response to negative emotions. While we did not originally propose to recruit individuals with emotional eating in Phase I, we decided to include these participants given that, theoretically, emotional eating may also be driven by affective distress intolerance. In addition, inclusion of these participants allowed for more rapid testing and iterations with a sample that was likely to have high affective distress intolerance. To be included in the emotional eating treatment study, participants must have reported at least five instances of eating in response to negative emotions (anxiety, sadness, loneliness, tiredness, anger) in the past month. Emotional eating participants had the additional exclusion criteria of having previously received ACT or DBT, as the treatment trial was testing treatment components that incorporated principles from each

of these treatments.

The task was administered during the baseline assessment of the treatment studies, except as noted in *Results*.

2.5 Recruitment procedures

Recruitment of undergraduate students occurred via undergraduate classes at Drexel University. Flyers were posted across campus, and study representatives visited undergraduate psychology classes to recruit students. Psychology students (recruited from both Drexel) were offered extra credit, which were be applied to their psychology courses. Recruitment for participants with LOC eating and emotional eating occurred simultaneously. The task was also administered as part of the baseline assessment for ongoing treatment studies for BN and BED. Recruitment for those with LOC eating and emotional eating thus featured the treatment studies being advertised, and included radio ads, flyers placed in the community, targeted emails, social media campaigns, visits to college counseling centers, recruitment messages on ED websites and listservs and emails sent to local university employees and students. In addition, the Drexel Eating and Weight Loss Treatment and Assessment Clinic referred eligible new patients to the treatment studies. Ongoing weight loss studies in our laboratory served as a recruitment source for binge eating participants; in particular, those excluded from weight loss trials due to binge eating were referred to ongoing binge eating treatment trials. Patients were also recruited through organizations and clinics in the Philadelphia area treating eating pathology.

2.6 Screening procedures

2.6.1 Undergraduate student participants.

We had originally sought to select individuals who meet the criteria for “high” and “low” distress intolerance in order to distinguish those who would be more likely to escape the task from those who were less likely. We had proposed to use cutoffs for “high” and “low” derived by a college student validation study as measured by a cutoff of ≥ 4.19 on the DTS for “high distress intolerance,” representing greater than or equal to one standard deviation above the college sample mean in affective distress intolerance. “Low” distress intolerance consist of scores ≤ 2.67 on the DTS, representing at least one standard deviation below the college sample mean in affective distress tolerance. However, based on the very low associations between self-report and behavioral measures of distress intolerance (Glassman et al., 2016; Leyro et al., 2010), and in order to facilitate recruitment, we did not screen out participants based on DTS score, and all undergraduate female participants who did not meet exclusion criteria described above were included in the current study.

2.6.2 Emotional eating study

For emotional eating participants, interested participants were screened over the phone by a trained assessor who determined eligibility (i.e., frequency of emotional eating episodes \geq five in the past month). Those who met initial criteria for the treatment study were scheduled for a baseline assessment, during which the task was administered.

2.6.3 Binge eating participants.

For individuals with BN and BED, interested participants were screened over the phone by a trained assessor who assessed preliminary eligibility (e.g., frequency of binge

eating). Those who met initial criteria for the treatment studies (either for BED or BN) were scheduled for an assessment visit. Final eligibility was assessed using the Eating Disorders Examination (Cooper & Fairburn, 1987). EDEs, conducted by graduate students and research coordinators, were audio-recorded. Assessors were trained until they reached 100% agreement on diagnosis and acceptable reliability ($> .80$) on scoring.

2.7 Assessment procedures

In the Phase I study visit, participants completed the affective distress intolerance paradigm, self-report measures, and an interview with the assessor regarding their experience of the paradigm. Assessors interviewed them regarding their motivations to continue or discontinue the task (See Appendix C). In addition, participants answered several multiple choice questions regarding their motivations to escape or persist in the task (See Appendix D). Participants also completed the binge eating module of the EDE (although, as described above, participants with BN/BED completed the full EDE) in addition to self-report measures (See *Measures*).

2.8 EMA Protocol

A subset of BED participants ($n=12$; data collection ongoing) recruited through Project BITE (a treatment study for BED) also underwent an EMA training and a two-week EMA protocol. Participants received payment of up to \$140 for completion of the baseline visit and EMA (with \$1 deductions for each missed EMA prompt).

This subset of BED participants completed a 2-week EMA protocol using PACO (Google, 2017), a customizable EMA smartphone application (app) downloadable from the Apple and Google Play app stores. At the assessment visit, participants were assisted in downloading PACO and logging in with a study-generated e-mail address. EMA

methodology is ideally suited to this project given the importance of assessing the temporal relations between affect and binge eating. EMA has ecological validity because data are collected in the natural environment; there is reduced retrospective recall biases since data is collected in the moment, and clear temporal ordering of hypothesized causal factors and outcomes (Shiffman, Stone, & Hufford, 2008). Research has indicated that reactivity is a minimal concern with EMA (Hufford, Shields, Shiffman, Paty, & Balabanis, 2002), that participant burden is not excessive (Hufford, 2007), and that collecting EMA data is feasible in individuals with EDs (Smyth et al., 2001).

The EMA assessment protocol implemented three types of daily self-report methods: (1) signal-contingent recording, (2) interval-contingent recording, and (3) event-contingent recording. Participants were signaled by PACO to complete EMA assessment ratings at six semi-random times throughout the day (signal-contingent recording). These signals occurred semi-randomly, but were within ± 45 min of each of six “anchor” times distributed evenly throughout the day: 8:30 a.m., 11:10 a.m., 1:50 p.m., 4:30 p.m., 7:10 p.m., and 9:50 p.m. The interval-contingent recording consisted of completing EMA assessment ratings at the end of each day. Finally, participants were instructed to fill out an EMA survey immediately following the occurrence of a binge or LOC episode (event-contingent recording). During each survey, participants reported whether they had an eating episode since the last survey, completed the PANAS, a rating of stress, a report on eating episodes since the last survey, and several questions used in previous EMA studies meant to assess the degree to which they experienced loss of control over eating, if an eating episode was reported (Goldschmidt et al., 2014; Goldschmidt et al., 2012). In addition, we modified questions from the DTS in order to

assess momentary levels of distress tolerance (See *Measures*). To facilitate compliance, \$1.00 was deducted from the \$100 total for every missed prompt.

2.8.1 EMA technical issues

For the first eight participants to undergo the EMA protocol, the continuous LOC questions were administered as part of conditional logic programmed into the PACO app. Specifically, participants were asked when they last ate, and whether or not they had already answered questions regarding their last eating episode. If they had not already answered questions about their last eating episode, they were asked the set of LOC questions regarding their most recent eating episode. For a subset of participants (n=3), the conditional logic failed and were never asked the LOC questions, regardless of whether they responded “yes” or “no” to whether they had already answered questions about their last eating episode. As such, these participants were unable to record any LOC episodes, and were thus excluded from analyses. To ensure a similar error did not continue to occur, after this error was discovered, all questions were made required. If participants noted that they had already answered questions about their previous eating episode, their LOC responses for that survey were excluded.

2.9 EMA compliance

At the assessment, a trained assessor explained the rationale for EMA, logistics of completing surveys and troubleshooting solutions, and definitions of LOC and binge eating (which included both subjectively and objectively large binge episodes).

Participants were contacted by a research assistant at least 2x/week via email to address any problems. A recent EMA study conducted in our lab achieved 80% compliance with

EMA prompts using similar methods (Forman et al., 2017), and another study achieved 86% compliance using these methods with a BN sample (Smyth et al., 2007).

2.10 Measures

In-person and behavioral assessments

All participants underwent the affective distress tolerance task and a clinician-administered screening for binge eating pathology. The binge eating samples additionally underwent the full Eating Disorders Examination (EDE). We had originally proposed a larger battery of self-report measures, but many of these measures were proposed for the purpose of establishing validity of the task in Phase II, which was not conducted. As such, only those measures administered in Phase I are described below.

Binge eating and eating disorder symptomology

Eating Disorders Examination (EDE) Version 16D (Cooper & Fairburn, 1987)

BED module. The EDE a standardized semi-structured interview, measuring the severity and frequency of the characteristic psychopathology and key behaviors of eating disorders during the past 4 weeks or, for diagnostic items, the previous 3 months. Interrater reliability between trained interviewers and test-retest reliability is high (Rizvi, Peterson, Crow, & Agras, 2000) and the measure has good internal consistency among eating disorder samples (Cooper, Cooper, & Fairburn, 1989). The BED module of the EDE is considered the most reliable method for screening for objective and subjective binge eating episodes (Grilo, Masheb, Lozano-Blanco, & Barry, 2004; Wilfley, Schwartz, Spurrell, & Fairburn, 1997). The full EDE was administered to binge eating participants,

while only the BED module was administered to undergraduate and emotional eating participants.

Weight and Height

A calibrated scale was used to take participants' weight. A stadiometer was used to measure participants' height (used to calculate BMI).

Self report measures

Negative affect

The *PANAS* (Watson, Clark, & Tellegen, 1988), which measures two dimensions of affect (i.e., positive and negative), was administered. The negative affect subscale from the *PANAS* was utilized to assess levels of negative affect before and after administration of the distress tolerance behavioral paradigm. Several items from the *PANAS* (chosen based on the highest factor loadings and theoretical relevance for this project, consistent with other studies (Smyth et al., 2007), including both positive and negative affect scales, were administered as part of the self-report battery and in the EMA protocol. The *PANAS* is widely used and well-validated (Crawford & Henry, 2004).

A Visual Analogue Scale (VAS) was additionally used to track overall levels of affect throughout the paradigm. Participants were asked to click on a line on the screen to represent how "upset" they felt at this current moment from "not at all" to "extremely."

Depressive symptoms

Beck Depression Inventory-II (Beck, Steer, & Brown, 1996): The BDI is a self-report measure of depression symptomatology in the previous two weeks. The BDI-II has adequate test-retest reliability and high internal consistency, and convergent validity has been established (Dozois, Dobson, & Ahnberg, 1998; Steer, Ball, Ranieri, & Beck, 1997).

Affective distress tolerance

The *DTS* (Simons & Gaher, 2005) is a 15-item self-report measure which examines the degree to which individuals experience negative emotions as intolerable. Items utilize a Likert Scale of 1 (Strongly agree) to 5 (Strongly disagree), with lower scores reflecting a tendency to experience psychological distress as unacceptable. The *DTS* has strong psychometric properties, including good test-retest reliability and criterion validity.

Emotion Regulation

The 36-item *DEERS* (Gratz & Roemer, 2004) was used to assess emotion dysregulation. The measure contains six subscales: non-acceptance (non-acceptance of emotional states), strategies (limited access to adaptive emotion regulation skills), goals (difficulty with goal-directed behavior in the context of emotional distress), impulse (difficulty controlling behaviors when upset), clarity (lack of emotional clarity) and awareness (lack of emotional awareness). Items are rated on a 5-point Likert-type scale and are summed such that higher scores indicate greater emotion dysregulation. The measure has demonstrated good reliability and validity (Gratz & Roemer, 2004).

Negative Urgency

The Negative Urgency Subscale of the UPPS Impulsive Behavior Scale (Whiteside et al., 2005) examines the extent to which an individual acts rashly or impulsively in the context of negative affect and positive affect, respectively. The Urgency subscale consists of 12 items measuring the degree to which individuals act rashly in the face of negative affect (e.g., “I often make matters worse because I act without thinking when I am upset.”). The UPPS has adequate reliability and validity (Claes, Vandereycken, & Vertommen, 2005).

EMA Measurement

See Appendix G for the full battery of EMA measures.

LOC EMA Assessment

In the EMA protocol, we utilized a dimensional (rather than categorical) measure of LOC used in previous EMA studies (Berg et al., 2014). For every eating episode, participants were asked: the following four questions on a Likert scale from 1 (“not at all”) to 5 (“extremely”): (a) “While you were eating, to what extent did you feel a sense of loss of control?” (b) “While you were eating, to what extent did you feel that you could not resist eating?” (c) “While you were eating, to what extent did you feel that you could not stop eating once you had started?” and (d) “While you were eating, to what extent did you feel driven or compelled to eat?” As in previous studies, an episode was classified as an episode of LOC if the participant rated at least one of the four LOC items at ≥ 4 (i.e., at least “very much”).

Momentary distress tolerance

We adapted items from the DTS to include in the EMA protocol. Consistent with previous methods (Lavender, Tull, DiLillo, Messman-Moore, & Gratz, 2015), we modified three items (one from each subscale of the DTS) to be phrased in a momentary fashion. These questions (See Appendix G) were asked at every EMA prompt. For the purposes of examining momentary distress tolerance as a moderator within the EMA analyses, we took the mean responses for the three questions and used this DTS summary score as the momentary measure of distress tolerance. The three momentary DTS items were highly correlated with each other ($r_s = .77-.88$), suggesting the items were tapping into a similar construct.

2.12 Data analysis plan

Descriptive statistics and exploratory graphing such as frequencies, means, standard deviations, histograms and scatter plots were used to assess the normality of all data in terms of the presence of skew and/or outliers on all measures. Continuous measures were normalized if necessary by using an appropriate transformation.

Hypothesis 1: Adequate persistence was measured by examining distributions of affect throughout the paradigm for each participant in Phase I. Adequate persistence was conceptualized as least a 4 out of 5 on at least one index of negative affect on the PANAS throughout the paradigm). Adequate variability in latency to termination of the task was examined by calculating the percentage of individuals who do not reach ceiling of the task.

Hypothesis 2: The sample was divided into those with and without LOC, and we compared (in an exploratory manner) the same metrics in *Hypothesis 1* between the two samples.

Hypothesis 3. Generalized estimated equations, with AR(1) working correlation matrix structure and logit function (for dichotomous outcome) were used to examine the relation between levels of momentary negative affect and momentary distress tolerance (measured by EMA) at one time point (time 1) and LOC eating (dichotomous) at the subsequent time point (time 2) controlling for LOC eating at time 1. Interactions were examined for both within and between-subjects effects (Curran & Bauer, 2011). Between and within-subjects distress tolerance at time 1 were entered into the model as main effect predictors and moderators using a between-subjects negative affect-by-distress tolerance interaction and a within-subjects negative-affect-by-distress tolerance interaction. Between-subjects terms (including interaction terms) were grand-mean centered while within-subjects variables were person-mean centered. These models have momentary observations (Level 1) nested within subjects (Level 2). Variables were be centered appropriately for both within (person-mean) and between-subjects (grand-mean) interaction effects.

2.11.1 Power analysis.

Hypothesis 1. This aim solely required descriptive statistics and thus we did not conduct a power analysis for this hypothesis.

Hypothesis 2: Because of the low sample size, we examined means and effect size, but not statistical significance, and thus we did not conduct a power analysis.

Hypothesis 2. Power analyses for this hypothesis was based upon multi-level Monte Carlo simulations using Mplus 7.11, assuming a total sample size for EMA of 20 participants, a two-week EMA assessment period, an 80% EMA compliance rate, an ICC of .40, and a two-tailed alpha of .05. The magnitude of the effect was then varied until a power of .80 was obtained (i.e., the null hypothesis of no association was rejected on 80% of the replications). The proposed sample size (n=20) provided adequate statistical power (.80) to detect a clinically meaningful odds ratio of 1.89 between time 1 negative affect and time 2 LOC eating.

CHAPTER 3: INDIVIDUAL TASK ITERATION RESULTS AND DISCUSSION

3.1 Participant Characteristics

3.1.1. Overall sample

Of all participants ($n=69$), the majority (88.4%) were female, white (50.4%, Asian: 20.9%, African-American: 17.9%, Hispanic: 4.3%, Mixed/Other: 6.5%), and tended to be of overweight BMI ($M=29.13$, $SD = 7.25$). Most participants (72.4%, $n=50$) were recruited via a treatment study (for BED, BN, or emotional eating), while the remainder (30.2%, $n=19$) were non treatment-seeking undergraduates recruited via the Drexel Psychology Department. A substantial proportion of the sample (37.3%, $n=25$) met DSM-5 criteria for binge eating disorder or bulimia nervosa, while 20.9% ($n=14$) endorsed LOC eating in the past three months but did not meet criteria for full-threshold BED or BN, and 43.4% ($n=30$) endorsed no eating disorder behaviors over the past three months.

3.1.2 Individuals with and without LOC eating

About half of the sample (56.5%, $n=39$) endorsed at least one episode of LOC eating in the past three months. For simplicity, we present the sample descriptive statistics divided into those with (≥ 1 LOC episodes) and without LOC (Table 2). Consistent with previous literature, individuals with LOC eating were of higher BMIs and reported higher levels of depressive symptoms, emotion dysregulation, negative urgency. Self-reported distress tolerance did not statistically differ between the two groups.

Table 2. Sample descriptive statistics – individuals with and without LOC

	LOC (n=39)	No LOC (n=30)	<i>t</i>	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
Age	39.95 (15.72)	27.18 (11.85)	-3.76	<.001
BMI	31.67 (6.63)	25.60 (6.66)	-3.69	.001
BDI-II	20.87 (10.08)	13.33 (9.37)	-2.93	.005
% meet criteria for DSM-5 ED	64.1%	--	--	--
DTS Score ^a	12.32 (3.28)	11.29 (3.72)	-1.13	.26
UPPS Urgency ^b	2.68 (.35)	2.45 (.32)	-2.58	.012

BDI-II = Beck Depression Inventory-II; DTS = Distress Tolerance Scale, UPPS Urgency = Negative Urgency Subscale of the UPPPS

^ahigher scores indicate poorer distress tolerance

^bhigher scores indicate higher levels of negative urgency

3.2. Overall summary of task iterations and participant feedback

Below, the rationale for each task iteration, and qualitative and quantitative data from participants' administration of the task are provided. Table 3 provides an overview of modifications to the task.

Table 3. Description of task modifications

Rationale for modification	Modification description	Participants	Escape/switch/skip results	Summary of qualitative feedback from participants post-task
--	[original task]	n=2 with LOC	0/2 escapes	Task could be made more intense with addition of other stimuli
Likely too much motivation to persist in the task	Removed reward	n=3 with LOC n= 1 without LOC	0/4 escapes	Reported elevated negative affect, but could be made more intense with the addition of pictures and other sounds
Insufficient affect induced by the task	Added provocative background photos and sounds (e.g., firetruck, hospital sounds)	n=7 with LOC n=3 without LOC	1/10 escapes	Reported elevated negative affect, but participants were “up for the challenge” and “wanted to be able to finish”
Participants viewed persisting in the task as a “challenge”	Modified assessor presentation of the task; allowed for more of an out	n=3 with LOC n=2 without LOC	0/5 escapes	Reported elevated negative affect, with similar feedback to above (up for the challenge, wanted to be able to finish)
Participants wanted to put “best food forward” and/or provide experimenters with full data	Changed paradigm to a be a “switch” paradigm – participants were told they could switch to a less distressing version of the task (rather than escape the task completely)	n=16 with LOC, n=24 without LOC	4/40 escapes	Most participants reported being “up for the challenge” or that they would be able to tolerate the task no matter how distressing; three of four participants who escaped were undergrads without LOC
Desire to enter study may have been impacting motivations to persist in task	For BED participants, administer the task a few sessions into treatment rather than at baseline	n=3 with LOC	0/3 switches	No new feedback; same as above
Potentially the distress was not personal enough or real-life enough; persistence was passive	Change task to elicit binge-eating specific distress; autobiographical recall paradigm; several chances for skipping questions	n=5 with LOC	4/6 with at least one “skip”	Participants endorsed skipping questions for reasons other than distressing nature of the task

3.3. Task Version 1: Original paradigm

3.3.1 Version 1 Methods

The paradigm was administered as described in *Methods*. The first two participants run were recruited through the emotional eating study; both endorsed LOC eating, and one of the two participants met criteria for BED.

3.3.2 Version 1 Results

Both of these participants reported a 4 out of 5 on the sadness and guilt items on the PANAS at post-task, and reported subjectively high distress in the post-task interview, but chose not to escape the paradigm. When asked why they chose to persist in the task rather than escape, one participant reported that she “likes to finish things” and the other participant reported being “curious” about the end of the story. Both provided suggestions for making the script more distressing, specifically, a suggestion to include pictures and more sounds, and a suggestion to include a confrontation with the friend’s family in the script.

3.3.3 Version 1 Discussion

Although participants reported high levels of negative affect induced by the task, it appeared that there were several factors precluding ideal functioning of the task (e.g., room for even more affect to be generated from the task, extra motivation to persist because of the gift card reward). We had originally proposed to run three participants before making any task changes. However, given concerns that two LOC participants did not escape the task, we determined it was necessary to amend the task to reduce the motivation to persist in the task.

3.4 Task Version 2: Removal of the lottery gift card incentive

3.4.1 Version 2 Methods

To address the first participants' high level of motivation, we removed the lottery gift card incentive (originally presented verbally by the assessor). We tested this version of the task with four participants, all from the emotional eating study (n=3 with LOC eating, n=1 without LOC).

3.4.2 Version 2 Results

No participants chose to escape the task. As with Version 1, the participants generally reported that the task induced guilt and remorse, although one participant noted that it did not "feel real" because she does not hold a driver's license. Notably, all participants reached at least a 4 out of 5 on either the guilt or sadness items of the PANAS, and two LOC participants rated a "5" on sadness post-task. Two participants noted that the task could be more potent with a family member as the victim rather than a friend. On the post-task multiple choice question asking what most led to their decision to persist in the task, all four responded, "I was up for the challenge."

In addition, several participants to this point had noted in the interview that they were "curious" to see how the story told in the script ended, and that they were motivated to stay in the task to gain a sense of closure from the scenario.

3.4.3 Version 2 Discussion

The removal of the lottery gift card incentive did not appear to significantly change individuals' motives to persist in the task. We thus determined that increasing the negative affect yielded by the mood induction needed to be intensified using provocative

photos and sounds, as suggested by several participants. In order to minimize the impact of curiosity driving the motivation to persist in the task (rather than pure distress tolerance), we also deemed it necessary to make clear to the participant that there was no resolution or satisfaction to be derived from persisting to the end of the task.

3.5 Version 3: Addition of provocative images and sounds to the task

3.5.1 Version 3 Methods

In order to increase negative affect incurred by the mood induction, we included a full background image in each “section” of the task (i.e., His/Her Death, The hospital, The funeral, Your new reality). To facilitate participants’ ability to visualize the scenario (which we hypothesized would increase the affect yielded from the task), we chose images that were from a first-person perspective (e.g., from the perspective of a driver on a highway, or a person lying in a hospital bed) to serve as the background while the text appeared on the screen (See Digital Appendix). We considered choosing images that were even more provocative in nature (e.g., blood, an open casket), but we were also concerned about striking a balance of allowing the participant’s imagination to be facilitated, but not impeded, by the images. We also added sound effects to the script, including a sound of a car crash, a siren (to correspond with an ambulance coming to the scene of the accident) and background noise (e.g., beeping) that occurs in a hospital. Additionally, in order to address participants’ feedback that they were “curious” to hear the end of the story, we added language in the instructions that explicitly stated there was no “resolution” to the story, specifically: “In the scenario, you cause the death of a close friend. As a result, people around you distance themselves from you, leaving you forever, sad, guilty and lonely for the rest of your life. This story has no resolution.”

Ten participants, all recruited through the emotional eating treatment study (n=7 with LOC eating, 6 of whom met full criteria for BED, and n=3 with emotional eating but no LOC) completed this version of the task.

3.5.2 Version 3 Results

Like previous versions, participants largely reported increases in negative affect from beginning to end of task (See Table 4). Notably, the sadness guilt, shame, distress, lonely, and nervous PANAS items, in addition to the VAS rating, evidenced large increases from pre- to post-task.

Table 4. Task descriptive statistics, third iteration

	Pre-task M (SD)	Post-task M (SD)	<i>d</i> (within- subjects)
Sadness	2.60 (1.71)	4.60 (.70)	1.49
Guilt	2.10 (1.52)	4.40 (1.10)	1.67
Shame	2.40 (1.65)	4.30 (1.10)	1.28
Dissatisfied with Self	3.00 (1.94)	4.10 (1.20)	0.76
Distressed	2.20 (1.55)	3.90 (1.20)	1.41
Lonely	2.40 (1.64)	4.00 (1.25)	1.32
Bored	2.40 (1.27)	2.20 (1.40)	0.24
Nervous	2.50 (1.27)	3.50 (1.35)	1.10
VAS rating	.29 (.29)	.95 (.10)	2.71

One participant, a participant without LOC eating, chose to escape the task. This participant described escaping due to “extreme” emotional distress in response to the task. In an examination of this participant’s data, she reported no history of LOC eating, and was in the category of “high” distress tolerance according to published norms for college students. No other participants escaped this version of the task. Four of ten participants noted that they did not escape because they were “up for the challenge” and two were still “curious to hear the end of the story.”

3.5.3 Version 3 Discussion

Although one participant escaped the task, the fact that a large portion of participants were still endorsing that they were “up for the challenge” of the task led us to believe that it was possible that language used by the assessor may have implicitly implied that persisting in the task was the more desirable outcome. For example, it is possible the participant may have thought that the experimenter would have perceived her favorably if she persisted in the task, or that she were providing more valuable data by doing so. As such, we determined it would be important to modify assessor language to convey “permission” to escape the task.

3.6 Version 4: Modification of assessor frame of the task

3.6.1 Version 4 Methods

To address the above-described concerns, we modified the language of the assessor to more explicitly “excuse” a participant’s decision to escape. Specifically, the change to the assessor script included the addition of “Some people find this particular story too distressing, and would like to stop the task.” This language was intended to

increase participants' permission to escape the task if they were having difficulty tolerating their distress. Of the participants ($n=5$, all through the emotional eating study) included in this iteration, three had LOC eating.

3.6.2 Version 4 Results

Notably, effect sizes for negative affect yielded from the task were somewhat lower than in the previous iteration (although overall were large; see Table 5).

Table 5. Task descriptive statistics, fourth iteration

	Pre-task M (SD)	Post-task M (SD)	<i>d</i> (within- subjects)
Sadness	2.00 (1.23)	3.40 (1.52)	0.98
Guilt	1.80 (1.10)	3.00 (1.23)	0.92
Shame	1.20 (0.45)	3.00 (1.58)	1.77
Dissatisfied with Self	2.00 (1.00)	2.80 (1.10)	0.97
Distressed	2.00 (1.23)	3.20 (1.30)	0.92
Lonely	2.20 (1.09)	3.40 (1.52)	1.63
Bored	2.20 (0.45)	1.20 (0.45)	-1.41
Nervous	2.00 (1.23)	2.60 (0.55)	0.60
VAS rating	.09 (.15)	.71 (.21)	6.76

Of the five participants to complete this version of the task, no participants chose to escape. As in previous versions, the most highly cited reasons for not escaping the task were that they were “up for the challenge” and “I always do my best.” Notably, four of the five participants noted that they would be able to tolerate the task “no matter what”

whereas only one participant noted that she would be likely to escape if the task were “more emotionally intense.”

3.6.3 Version 4 Discussion

Based on the results of Version 4, we concluded that the change to the assessor frame of the task was not strong enough to overcome participants’ desire to perform “well” on the task. Given that participants were still approaching the task as a “challenge,” we determined that a more major shift in the paradigm structure was warranted in the next iteration of the paradigm. Based on participant feedback, we hypothesized that participants may have felt as if they were letting down the experimenter or the study by not staying in the task as long as possible (e.g., that the study would have less data if they cut their time short). While this sort of motivation to continue a task may reflect a type of distress tolerance, the social influence of the experimenter may artificially increase distress tolerance such that the ability to persist through the task may not approximate tolerating emotions in every day life. For example, there may be less social motivation to refrain from escaping negative affect (e.g., via binge eating) on a day-to-day basis versus a single lab visit. In addition, it was potentially problematic that in all versions of the task to this point, persisting in the task was the default option, rather than an active choice, i.e., the participant could “sit back” without actively deciding to persist in the task. As such, we determined that a greater change to the frame of the task, particularly one that lessened the desire to complete a “challenge” and made the choice to persist more active, was necessary.

It should also be noted that the effect sizes for negative affect generated by the task were comparatively lower than the previous versions of the task. While it is

theoretically possible that changing the frame of the task led to less affect being generated, it is more likely that this subset of participants was generally less emotionally reactive than the previous five participants. However, given that the mean post-task PANAS scores for all versions of the task thus far were not reaching at least a “4,” we decided that increasing the negative affect generated by the task was also warranted.

3.7 Version 5: Change to a “switch” rather than an “escape” paradigm

3.7.1 Version 5 Methods

Based on the above-described concerns with the previous version of the task, we made several changes in this version of the task, including presenting the participant with a “switch” rather than “escape” paradigm, presenting opportunities for the participant to actively choose to continue in the task (rather than the default being to continue), adding one component aimed to increase distress induced by the task, and including additional outcome measures, such as urges to switch tasks and level of difficulty the participant experienced in continuing the task. These changes are described below.

To address participants perceiving the task as a “challenge,” we made a more major change to the frame of the paradigm in that participants were told that if the task became “too much” for them, they could switch to a less distressing version of the task. Thus, the language presented on the screen presenting the option to switch tasks was changed to “After a minute or two, you will have the option to switch to a less intense version of the task (press space),” and assessors told participants before the start of the task, “you have the option to stop the task (by pressing the space bar at any time), and we can switch you to a less emotionally intense version. This version will still measure encoding of personal memories, but it will be less upsetting. If you choose to switch

tasks, press the space bar, answer the final questions presented to you, and just sit quietly and wait for the experimenter to re-enter the room.”

In actuality, if participants chose to “switch tasks,” the task ended, and participants were debriefed regarding the lack of a less emotionally intense version of the task, both via a message on the screen and by the assessor. We sought to ensure that participants did not detect the deception on the part of the experimenter before the task started (and thus become more motivated to persist in the task). Thus, if participants chose to “switch” tasks, they were asked (via an open ended question and text box at the end of the task) what they thought would be different about the less distressing version of the task (i.e., providing them the opportunity to write that they did not believe there was another version) before being debriefed.

We also sought to make persisting in the task a more active choice. As such, immediately after participants completed the VAS ratings of mood during the task, we presented participants with a message (“REMINDER: If this task has become too emotionally intense, you can switch to a less intense version”) and two options to choose from (Continue or Switch). This choice to stay in the task provided participants several opportunities to make an *active decision* to continue persisting in the task. Lastly, in order to better understand whether participants found persisting in the task to be difficult, we included several questions at the end of the task (See Appendix E) assessing individuals’ degree of desire to switch tasks. These data were collected as both a secondary outcome measure, and also to assess whether we were inducing distress strong or personal enough to incur a desire to escape, or whether it was necessary to re-think the construction of the paradigm in order to achieve the benchmarks we had originally set.

Lastly, given the strength of individuals' desires to rise to the "challenge" of the task, we sought to increase the distress incurred by the paradigm. The method with which we chose to increase distress was to include a final image of a woman kneeling by a grave, accompanied by audio of a woman crying. Viewing and hearing the distress caused by the participant in the scenario could be more visceral in nature, and thus may increase the distress incurred by the task, leading to greater rates of escape.

Given the number of variables we changed in this version of the task, we sought to pilot the paradigm with a larger number of participants (n=40 total, n=16 with LOC, n=24 without LOC).

3.7.2 Version 5 Results

See Table 6 for descriptive statistics of the fifth iteration of the task.

Table 6. Task descriptive statistics, fifth iteration

	Pre-task	Post-task	<i>d</i> (within- subjects)
	M (SD)	M (SD)	
Sadness	1.63 (0.90)	3.83 (1.11)	1.75
Guilt	1.38 (0.81)	3.78 (1.19)	1.88
Shame	1.45 (0.90)	3.18 (1.32)	1.26
Dissatisfied with Self	2.40 (1.30)	3.40 (1.34)	0.67
Distressed	1.73 (1.04)	3.20 (1.16)	1.21
Lonely	1.60 (0.96)	2.90 (1.37)	1.03
Bored	1.70 (0.82)	1.45 (0.71)	0.28
Nervous	1.85 (1.00)	2.93 (1.25)	0.84

VAS rating	.13 (.16)	.80 (.22)	2.41
Urge to switch ^a	--	1.97 (1.67)	--
Thought about switching ^a	--	1.79 (1.27)	--
Difficulty of not switching ^a	--	3.00 (1.60)	--

^a These items were only administered to individuals who did not switch; rated on a 1-7

Likert scale

Of these 40 participants, one participant with LOC (and a diagnosis of BED) chose to “switch,” as did three undergraduate participants without LOC. It should be noted that that BED participant who escaped reported that she had “accidentally” escaped and did not intend to do. Two of the four (both were undergraduates without LOC) participants who escaped fell in the top quartile of normed DTS scores (i.e., lower distress tolerance). Two of the three undergraduates reported that they escaped in order to “prevent” the distress they anticipated they would experience if they continued and one reported that she escaped in order to stop the distress of the scenario. Additionally, the most commonly reported reason (n=13) for not escaping the task was “I always try to do my best,” and the second most common reported reason (n= 10) was “I was up for the challenge.” It should also be noted that a portion of participants (n=7) reported that the story “did not affect me that much emotionally” and cited this reason for not escaping.

3.7.3 Version 5 Discussion

Although few individuals overall escaped the task, undergraduates were slightly more likely than LOC participants to escape the task, leading us to speculate that entering a treatment study could serve as a motivating factor to persist in the task (see 3.8).

Notably, of those who did not escape the task, mean levels of urges to escape, perceived difficulty of persisting in the task, and thinking about switching were much lower than expected (i.e., between 1-3 on a 7-point scale). Thus, participants self-reported large changes in affect from pre- to post-task (although, on average, not reaching the threshold of 4 on PANAS items), which appears to be a mismatch with the lack of escape behavior on the task. As a next step, we sought to test whether the concern that the desire to enter a treatment study may be affecting individuals' decision to persist in the task.

3.8 Version 6: Administration of the task after baseline for binge eating participants

3.8.1 Version 6 Methods

To this point, all binge eating participants had been administered the task at baseline before entry into a treatment study. Although we conceptualized the task with the intent of eventually using it to assess a moderating and/or mediating role of affective distress intolerance in treatment, we thought it was possible that administration of the task at baseline of a treatment study was problematic in two related ways: (1) Although participants were told that their performance on behavioral tasks did not affect eligibility for the treatment, participants were still under the assumption that they had to “prove” eligibility as they were not told their final eligibility until the end of the visit; (2) Because it was participants' first visit to the lab, they were especially motivated to provide “good,” or what they perceived as “complete” data. Especially given that undergraduate participants were more likely to escape the task than those without LOC in the previous iteration of the task (although we must interpret all results with caution given small samples), we speculated that the desire to enter the study could have been playing a role in participants' decision-making. Thus, although it is an ultimate goal to administer the

task at a baseline assessment of an intervention, and the possibility that treatment affects the ability to tolerate emotional distress, we sought to examine (in an exploratory manner) whether “switch” rates of the task appeared to change with the variable of baseline assessment removed.

As such, we administered the task to individuals (n=3) who had already begun a course of either guided self-help CBT for BED or Integrative Cognitive-Affective Therapy (ICAT) for BED. The task was administered after a therapy session, and session numbers at which the task was administered ranged from 3-12.

3.8.2 Version 6 Results

None of the participants switched tasks, and changes in affect/reasons for not switching tasks remained similar to previous trials of the task.

3.8.3 Version 6 Discussion

Although we only ran three participants in this iteration, we determined it was unlikely that the time of administration was the only factor leading to low rates of escape from the task. While it is possible that participating in a research study (regardless of the time point at which the task was administered) was playing a role in a decision to persist in the task, it is necessary for a task such as this to function within the context of a research study. As such, rather than continuing to examine whether the point of assessment was the primary reason for low escape rates, we sought to focus efforts on identifying ways to modify the task such that it could be administered at baseline.

Given the difficulty to this point in achieving the milestones we set *a priori*, we evaluated several of the reasons that the paradigm may not be functioning as hypothesized. We generated several hypotheses: (1) Given that a large number of

participants were “up for the challenge” and/or reported that they could tolerate the task “no matter what,” the affect induced may have been neither strong enough nor personal enough to yield escape; (2) Perhaps a single “escape” or “switch” option felt too high stakes for the participants to choose (e.g., escaping meant that the task was completely over); (3) Although participants were asked to immerse themselves in the scenario as intensely as they could, overall, the mood induction process in the task was more *passive* than *active*, which could allow participants to distance themselves from what was occurring on the screen in front of them (which could be especially problematic if the distress also did not feel personal enough to participants). As such, we opted to try to design another paradigm to test whether if we (1) invoked real-life distress (e.g., binge eating-specific distress for those with binge eating) and (2) included several escape opportunities, we could better tap into behavioral escape tendencies from dysphoric negative affect.

3.9 Version 7: Creation of a paradigm centered around binge eating–specific distress

3.9.1 Version 7 Methods

As described above, we sought to implement a more major change to the paradigm during this iteration. First, we decided to change the mood induction technique. One of the most effective extant mood induction paradigms, autobiographical recall, was considered for the original paradigm, but we had opted with guided imagery because of the difficulty of standardizing what participants would choose to write with an open-ended prompt (e.g., write about the saddest experience of your life.). However, autobiographical recall confers many advantages, including allowing any distress that is

induced to be highly personalized, and that the participant is actively engaged with (rather than passively consuming) the task – both of which were potentially problematic with previous versions of the task. One option for harnessing the advantages of autobiographical recall, while not allowing for a wide range of variability in participant responses, is to make the autobiographical prompts highly focused. Although centering the prompts around binge eating-specific distress limits who the task can be administered to, we opted to create a task utilizing autobiographical recall-style prompts that were specific to binge eating and weight/shape-related distress. Given that another concern with autobiographical recall was that it didn't allow as well for an "escape" option, we decided that the structure of the task should include multiple autobiographical prompts, with the option to skip questions or prompts that participants do not want to answer.

With the above considerations, we created an 11-question autobiographical binge eating-specific distress tolerance task (See Appendix F), administered via Qualtrics. Participants were given instructions to answer questions about their binge eating and beliefs about themselves, and were told ahead of time that they could choose to skip any questions if they did not want to answer them. In order to lessen demand effects, we did not explicitly tell participants that the task would be distressing. In the task, participants were presented with one question at a time, and presented with three options: (1) "I would like to start answering this question," (2) "I would like to skip this question," and (3) "I'd like to stop answering these questions all together." If participants selected (1), they were provided with a text box, and one minute to write a response (although participants were not explicitly told how long they would have to answer the question) before the screen auto-advanced to the next question. We originally imposed a one-

minute time limit in order to attempt to strike a balance between allowing enough time to become distressed by engaging with the prompt, but not letting the participant finish (and perhaps distance themselves from the prompt) or allowing the writing to take therapeutic effect. After two participants, we increased the time limit to 90 seconds given the limited amount of text participants were able to write in the time period.

This version of the task was to individuals with LOC eating (n=6; n=4 at baseline of a treatment study, n=2 during the course of treatment within a research study).

3.9.2 Version 7 Results

See Table 7 for pre to post changes in affect during Version 7 of the task. Unexpectedly, the effect sizes for pre to post changes in PANAS and VAS scores appear to be smaller than in Versions 1-6 (although it should be noted that only six participants completed this version of the task). Notably, four participants out of the six skipped at least one question. However, upon interview, all participants who skipped questions denied skipping due to the distressing nature of the questions. Although all participants stated that the task was distressing, the reasons for skipping questions provided by participants included feeling short on time to complete the assessment (e.g., the participant had another appointment to attend after the assessment), not feeling as if the question applied to him/her, or not knowing how to answer the question.

Table 7. Task descriptive statistics, seventh iteration

	Pre-task	Post-task	<i>d</i> (within- subjects)
	M (SD)	M (SD)	
Sadness	1.67 (0.82)	2.33 (0.82)	0.64
Guilt	2.17 (1.17)	3.17 (1.47)	1.17
Shame	2.33 (1.22)	3.33 (0.82)	1.21
Dissatisfied with Self	2.83 (1.67)	3.83 (1.17)	0.58
Distressed	2.00 (1.27)	2.50 (1.38)	0.36
Lonely	1.50 (0.55)	2.00 (0.89)	1.16
Bored	2.33 (1.03)	1.83 (0.41)	-.054
Nervous	1.00 (.00)	2.00 (0.89)	1.87
VAS rating	.11 (.13)	.37 (.24)	1.20

Three of the four participants who skipped questions only skipped one question, while one participant skipped two questions. Two of the questions (“When is your eating most out of control? What is it like when you’ve realized you’ve lost control of your eating” and “What does your binge eating say about you as a person?”) were skipped by two participants, and two others were skipped once.

3.9.3 Version 7 Discussion

We created the current version of the paradigm in an attempt to address some of the potential problems with the overall structure of the paradigm in Versions 1-6. Version 7 appeared to induce “escape” more often than previous versions, however, participants reported that other factors unrelated to distress tolerance contributed to decisions to skip

questions. While it is possible that participant report may not be reflective of more *unconscious* tendencies to avoid negative affect, participants are often able to consciously report negative affect as a trigger of LOC eating, and all participants denied negative affect as a potential reason for switching. Although participants reported reasons other than negative affect for skipping questions, it appeared that the current paradigm provided participants with higher levels of permission to “escape.” Participants likely felt more permission to skip because there were many questions, compared to a single escape paradigm in which an escape or switch feels higher stakes.

In addition, the amount of affect induced by the task appeared to be reduced compared to previous versions. However, this version of the task was potentially less susceptible to demand effects than previous versions (e.g., they were not warned ahead of time that the task would be distressing, and it may not have been as clearly apparent that the task and questions were primarily designed to induce distress). Participants, in post-task interview, generally reported that the task became increasingly distressing as they answered additional questions, perhaps suggesting that a longer version of the task could be effective in generating enough distress to induce behavioral escape tendencies. It may be that fully activating personally-relevant, intense distress in a laboratory setting takes time to achieve.

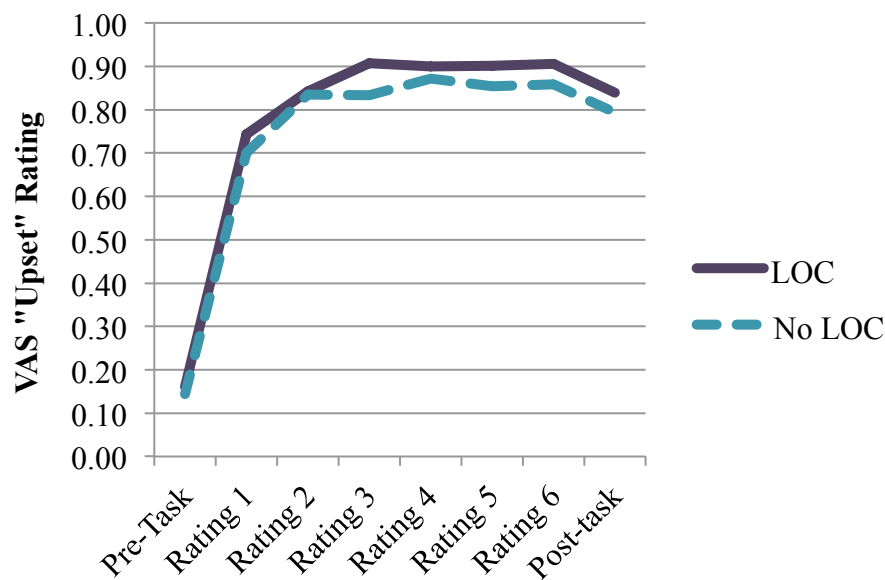
See Chapter 4 for further discussion of Version 7 of the task compared to previous versions, and future directions for future development of both paradigms.

3.10. Overall task characteristics and associations

3.10.1 Overall affect trajectory in Versions 1-6 of the task

As described above, participants who completed Versions 1-6 of the task experienced overall large increases in self-reported negative affect as measured by the PANAS and VAS scale from pre to post-task. In order to better understand the trajectory of affect throughout the task (and ensure that habituation to the task was not contributing to lack of escape tendencies), we examined the mean VAS score across over the course of the task (see Figure 3). We collapsed iterations 1-6 given similar results across iterations.

Figure 3. VAS ratings throughout the task



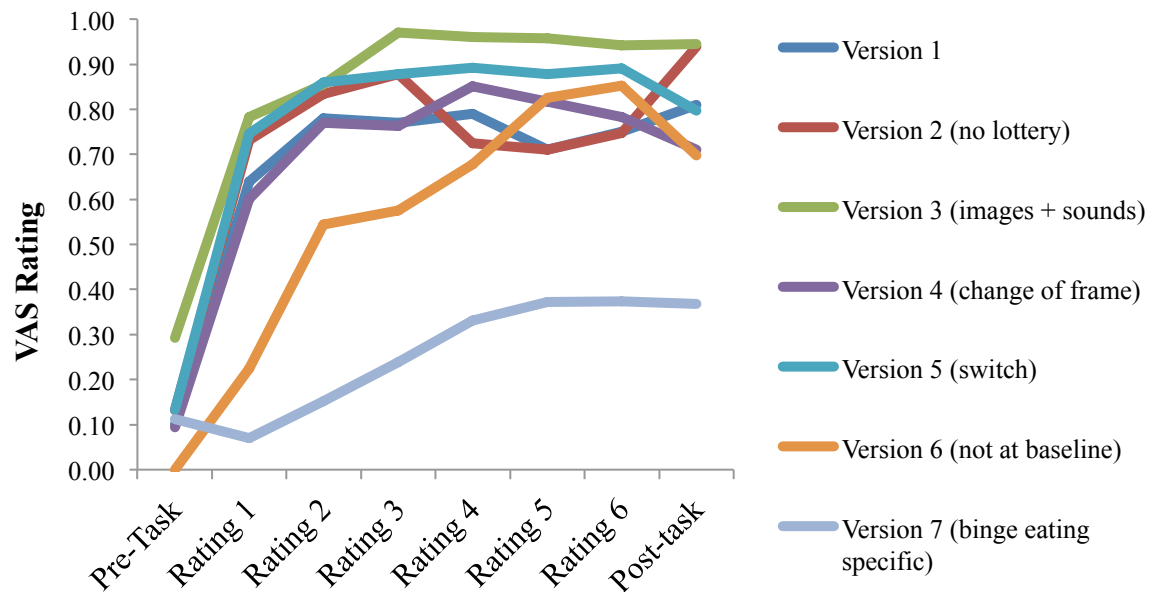
The LOC group had slightly higher ratings across the task starting at Rating 3 ($d_s = .11-.48$), but the differences did not reach statistical significance ($t_s = -1.8 - -0.16$, $p_s = .09-.74$). It should be noted that there is a drop-off in the VAS score at post-task, which may be explained by the task ending (i.e., the affect induced by the task may subside almost immediately upon task end). Based on visual inspection of the graph, it appears

that participants generally maintained a high level of self-reported negative affect throughout the task.

3.10.2 Affect trajectories by task version

In order to explore whether different versions of the task differed in trajectories of negative affect throughout the task, mean VAS scores for all versions of the task are graphed in Figure 4. Versions 1-6 of the paradigm appeared to yield greater overall levels of negative affect throughout the paradigm compared to Version 7.

Figure 4. VAS ratings by task version

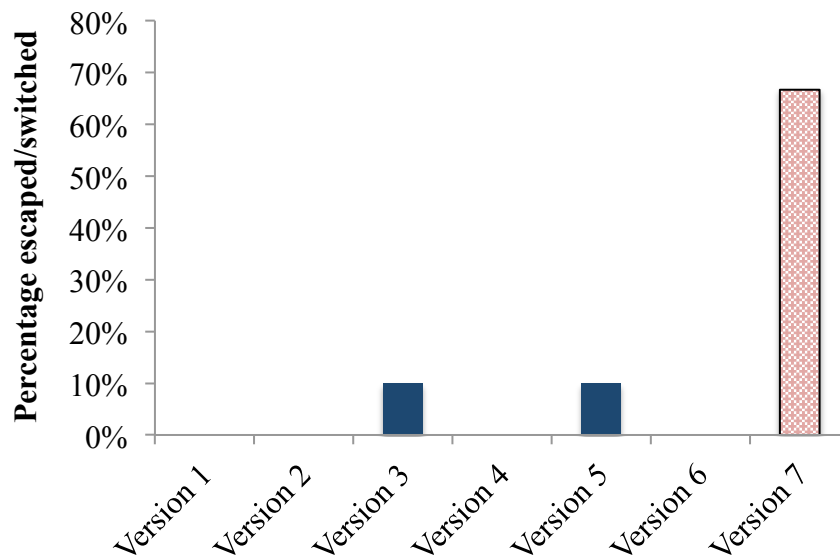


3.10.3 Escape by task version

See Figure 5 for the percentage of participants who engaged in an escape behavior, by task version. As can be seen in the graph, few participants across any

iterations escaped the task, and Version 7 yielded the greatest percentage (4/6; 66.7%) of individuals engaging in escape behavior.

Figure 5. Percentage of participants who escaped/switched or had at least one “skip”



Note: Because “escape” held a different meaning in Version 7 of the task, it is graphed in a lighter color above.

3.11 Exploratory examination of distress tolerance as a moderator between negative affect and binge eating using EMA

3.11.1 EMA Descriptive statistics and compliance

As described in the *Methods*, although 12 participants completed the EMA protocol, three participants were excluded due to a technical malfunction in the conditional logic being used to deploy the surveys. This malfunction led to the omission of LOC questions from all surveys for three participants, and one participant was excluded due to poor compliance (described below). Of the eight participants included in

the current analyses, seven were female, and seven were white (n=1 was Asian). All of these participants met binge eating frequency criteria for full threshold BED.

A total of 546 surveys were completed by the eight participants. Of these surveys, 26.4% (n=144) were classified as an episode of LOC (i.e., rated 4 or above on any question asking about LOC in the participant's most recent eating episode, see *Measures*). With regards to compliance, one participant's compliance with prompted surveys was below 50%, and thus this participant was excluded from analysis, as per previous studies (Forman et al., 2017). Of participants included in the current analyses (n=8), compliance (i.e., percentage of prompted surveys completed) was 86.6%, comparable with previous EMA studies in eating disorders (Smyth et al., 2007).

3.11.2 Main and interaction effects of momentary affect and distress tolerance on LOC

See Table 8 for a summary of GEE models. Given the exploratory and preliminary nature of these analyses, we did not correct for multiple comparisons. Main effects of within-subjects (i.e., an individual's current level of negative affect relative to one's average level) and between-subjects (i.e., each individual's average level of negative affect, relative to other participants) negative affect were generally not significantly associated with risk for episodes of LOC eating. One facet of momentary negative affect (*sadness*) was unexpectedly negatively associated ($b=-.25, p=.047$) with subsequent episodes of LOC. While momentary levels (i.e., within-subjects) of distress tolerance did not significantly predict subsequent episodes of LOC in any of the models ($bs = .01-.147, ps = .35-.91$), average level (i.e., between-subjects) of distress tolerance across the EMA period was positively associated with odds of LOC ($bs = .55-.76, ps =$

<.001-.02) except for when the GEE model included *anxious* ($b=.076, p=.88$) or *bored* ($b=.233, p=.55$).

Table 8. Unstandardized regression weights (b) and standard errors of main and interaction effects on LOC

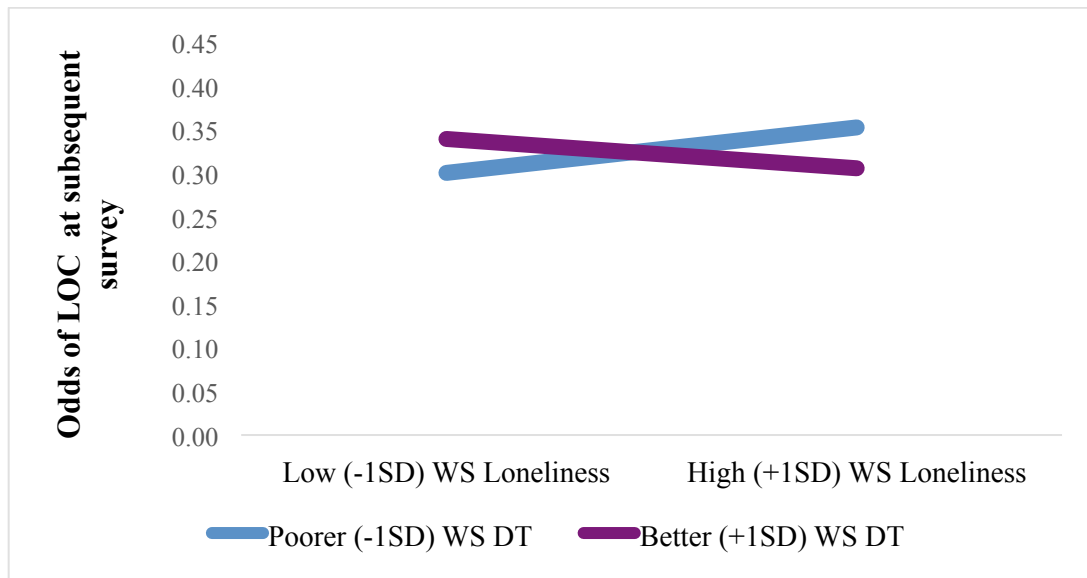
	WS Main effect	BS Main effect	BS-NA x BS-DT	WS-NA x WS-DT
Lonely	.02 [.06]	-.21 [.30]	.31 [.52]	.15 [.07]*
Shame	-.07 [.11]	-.36 [.36]	.63 [.66]	.18 [.09]*
Disgust	-.08 [.11]	-.35 [.32]	.49 [.53]	.14 [.08] [†]
Nervous	.03 [.09]	.43 [.22] [†]	-.78 [.65]	-.07 [.25]
Distress	-.17 [.18]	-.29 [.27]	.82 [.53]	.20 [.06]*
Angry	-.02 [.17]	-.25 [.22]	.75 [.49]	.13 [.19]
Bored	.16 [.16]	.34 [.37]	-.53 [.52]	-.17 [.12]
Sad	-.25 [.12]*	-.33 [.29]	.25 [.41]	.33 [.15]*
Guilty	-.18 [.13]	-.29 [.30]	.83 [.67]	.22 [.23]
Anxious	-.18 [.10]	.31 [.20]	-.39 [.67]	.27 [.33]

WS = within-subjects; BS = between-subjects; NA = negative affect; DTS = distress tolerance (measured by EMA); [†] $p = .05-.10$; * $p < .05$

Consistent with hypotheses, several relationships between momentary levels of negative affect and subsequent episodes of LOC were qualified by momentary levels of distress tolerance. In particular, momentary distress tolerance moderated the relationship between shame, loneliness, distress, and sadness, and subsequent episodes of LOC (see Figures 6 and 7, below, as exemplars). As expected, at lower levels of distress tolerance (compared to one's own average level), risk for LOC at the subsequent survey increased

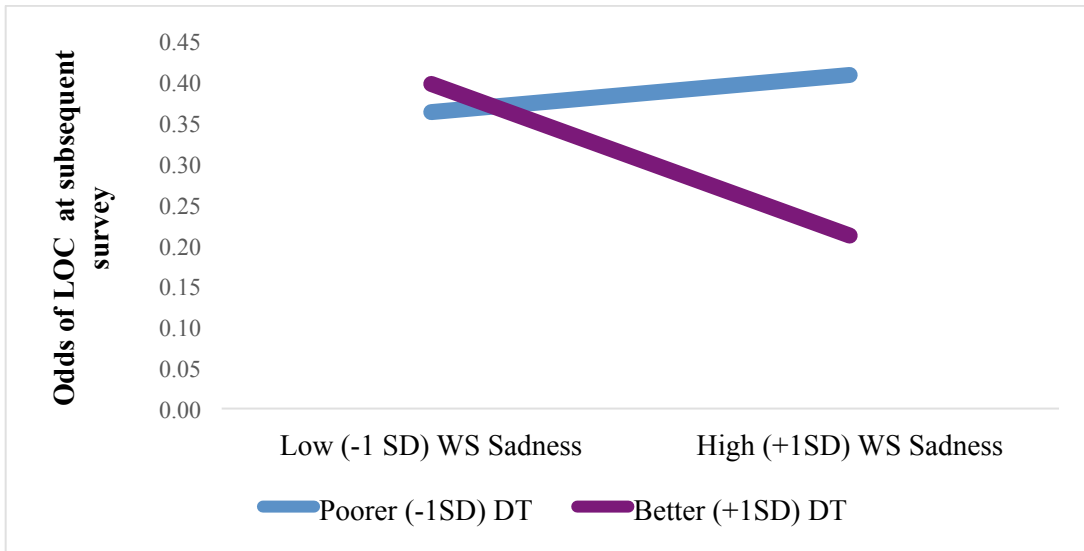
with increasing levels of negative affect. However, counter-intuitively, at higher levels of distress tolerance (relative to one's one self), risk for LOC was highest at lower levels of negative affect.

Figure 6. The interaction of within-subjects loneliness and within-subjects distress tolerance in predicting odds of LOC at the subsequent survey



WS = within-subjects
DT = distress tolerance

Figure 7. The interaction of within-subjects sadness and within-subjects distress tolerance in predicting odds of LOC at the subsequent survey



WS = within-subjects
DT = distress tolerance

CHAPTER 4: GENERAL DISCUSSION

The primary aims of the current study were to (1) develop a behavioral task of affective distress tolerance and (2) to use EMA to test the theory that the relation between momentary negative affect and subsequent episodes of binge eating depends on affective distress tolerance. Specifically, we aimed to develop the first behavioral distress tolerance task to induce dysphoric affect such as guilt and sadness, which has been shown to be associated with episodes of LOC eating. While the paradigm was successful in some respects (e.g., inducing self-reported guilt and sadness), developing a paradigm that met our *a priori* benchmarks for moving on to a measure validation stage (especially a 60% escape rate) was met with significant challenges. With seven iterations of the paradigm, we were unable to develop a behavioral paradigm that measured affective distress intolerance. With regards to the second aim of the study, we conducted the first ever examination of distress tolerance as a moderator of the relation between momentary negative affect and subsequent episodes of binge eating. While we originally aimed to use the behavioral task as the moderating variable, we were unable to trust its validity, and as such, utilized a momentary self-report measure of distress tolerance. We obtained preliminary partial support for the theory that the relationship between momentary negative affect and subsequent episodes of binge eating is dependent on levels of distress tolerance.

4.1 Inducing negative affect

One of the main successes of the paradigm (particularly Versions 1-6) was the ability to reliably increase and sustain self-reported (via a VAS and PANAS scale) negative affect. In particular, as we intended, effect sizes for pre to post-task change in

negative affect were consistently large for sadness, guilt and shame. In addition, increases in loneliness from pre to post-task were especially large. The increase in loneliness was initially unexpected as we specifically aimed to increase guilt and shame; however, given the content of the paradigm (especially Versions 1-6 in which a close friend of the participant is killed), it is unsurprising that loneliness increased at high levels as well. As discussed in more detail below, it is possible that this increase in loneliness was in fact a result of demand effects (see *4.4.3 Challenges with interpreting self-report measures of negative affect*). When comparing PANAS changes from the current study to PANAS changes in other mood induction paradigms utilized with eating disorder samples, changes in our study appear to exceed changes in negative affect in other studies (Manasse, Everett, Moskow, Wonderlich, & Forman, in prep). In fact, few studies in eating disorders samples have aimed to increase specific facets of negative affect, and most report only about 1-1.5 point changes in negative affect from pre to post task (Manasse et al., in prep). A potential implication of the findings from the current study is that it is indeed possible to induce larger changes in guilt and shame, which could be done in future studies examining the impact of mood on eating behavior. We should note, however, that despite large increases in negative affect during the paradigm, means at post-task rarely exceeded a 4 out of 5 on the PANAS, calling into question the clinical significance of these “large” changes in negative affect.

While Versions 1-6 of the paradigm enjoyed large changes in negative affect as measured by the VAS and PANAS, changes in both of these indices for Version 7 appeared much lower (see Figure 4), although such inferences should be made cautiously given the small sample size (n=6) that completed Version 7. However, should this result

be reliable, there are several viable explanations. First, the fact that participants were either treatment-seeking or in treatment could have lessened the impact of an autobiographical recall paradigm on negative affect levels. For example, treatment-seeking participants may have expected that they would have to face difficult issues regarding their binge eating and weight and thus did not experience sharp increases in negative affect when asked to confront these issues in writing. However, it is more likely is that participants in Version 1-6 were more susceptible to demand effects because they were explicitly told in advance that the task would be highly distressing. In fact, those who received Versions 4-6 were told that it was excusable to switch to a “less distressing” version of the task if the first version was too distressing. This type of prompt by the experimenter stands in stark contrast to the much more neutral introduction given to participants completing Version 7, in which they were told they could answer some optional questions, and skip any that they did not want to answer. If demand effects were at play, it is possible that participants in Versions 1-6 were overrating their negative affect in response to the task. Likewise, given the neutral prompt by experimenters, it is possible that those who completed Version 7 were *underrating* their affect if they perceived emotional reactivity to questions about their binge eating or weight to be not acceptable (especially by the experimenter). These unknowns about the “true” negative affect experienced by participants during the task highlight the limitations of self-reported negative affect (further discussed in *Limitations and Implications and Future Directions*). However, as measured by the best-established self-report measurement of affect (the PANAS), all versions of the paradigm were successful in inducing relatively large changes in guilt, sadness, and loneliness.

4.2 Lack of escape behavior

Despite the ability of the paradigm to increase self-reported sadness, guilt, shame, and loneliness, we were largely unable to elicit escape behavior on the task from participants who were likely in everyday life engaging in behaviors (e.g., LOC eating) that serve the function of escaping negative affect. There are several potential reasons for this mismatch between reported affect and behavioral escape tendencies. First, the lab environment may have incurred demand effects that were difficult to overcome with the type of paradigm we were testing. Especially as most participants were being assessed at baseline of a treatment study, there was likely implicit pressure on the participant to do their “best” on the task, and a perception that escaping or switching would provide less good data for the experimenter (even when participants were told otherwise). As described in *Results*, the majority of participants endorsed being up for the challenge or wanting to do their best as the reason for persisting in the task. It is possible that with that type of orientation towards the task, even individuals with the lowest levels of distress tolerance would be able to persist in a distressing task that induces sadness, guilt, and loneliness. In fact, a large percentage of participants reported that they would have been able to tolerate the task “no matter what,” indicating that this momentary snapshot of behavior may not approximate typical participant experiences.

Another likely explanation for the lack of escape behavior is that the affect generated by the task is not similar enough to the affect experienced in everyday life by participants. There are many domains of possibility for how the affect induced by the task is different from “real” life, including the type, intensity, and length of affect. While increases in guilt, shame, and sadness are prospectively associated with LOC eating (Berg et

al., 2013), the experience of these emotions in everyday life is almost certainly very different from the experience of these emotions in the lab. In the case of Versions 1-6, guilt induced from imagining a fake scenario likely feels much different from the real-life experience of rejection or accidentally hurting a friend. Additionally, as mentioned above, while VAS ratings were generally high, post-task PANAS ratings rarely exceeded a mean of 4 out of 5, suggesting there is room for increasing the intensity of emotion evoked from the task, and also points to the possibility that the intensity of negative affect for some participants may be much more intense in real life than experienced in the lab. Importantly, the task also artificially increased negative affect within a 15-20 minute period, which may not approximate how negative affect contributes to binge eating in everyday life. There are two main ways that the time period of the task may not approximate real life: (1) negative affect grows more and more intense throughout the day until it becomes intolerable to the participant (intensity) or (2) It is in fact not the *intensity* of the affect that becomes intolerable, but rather the *duration*. In fact, EMA research suggests that binge eating is most likely on days where high levels of negative affect are sustained, or there is a trajectory of rising negative affect throughout the day (Crosby et al., 2009). Another model of behavioral dysregulation posits that maladaptive behaviors emerge after emotional cascades, or cycles of intense rumination and negative affect (Selby, Anestis, & Joiner, 2008). If any of these instances, any of the distress tolerance paradigms tested in the current study would have trouble, in a reasonable time frame, capturing the type of distress intolerance contributing to binge eating pathology.

Version 7 of the task yielded greater rates of “escape” compared to Versions 1-6, but as described in *Results*, all participants who skipped questions cited reasons other

than unwillingness/inability to tolerate negative affect for skipping questions. This result points to the need to fine-tune the question framing and wording to ensure that participants only skip questions when too distressed to answer or continue answering (although this need must be balanced with not incurring excessive demand effects). However, there is also the possibility that participants may have been unwilling (due to embarrassment) or unable (due to lack of insight) to report on when distress intolerance contributed to skipping a question. In the latter case, it would be difficult to know when the “right” type of escape is occurring.

4.3 Using EMA to test the distress tolerance model

While we were unable to examine behavioral distress tolerance as a moderator between momentary affect and subsequent episodes of LOC, we were able to, in a preliminary and exploratory fashion (i.e., in a small sample) examine interactions between momentary (within-subjects; i.e., changes in distress tolerance relative to one’s general level) distress tolerance and momentary levels of negative affect in predicting subsequent episodes of LOC. Preliminary results lent partial support for the idea that the relationship between negative affect and LOC depends on one’s ability to tolerate emotional distress (especially in specific moments). In particular, consistent with hypotheses, higher momentary (i.e., relative to one’s self) level of sadness, loneliness, and shame was associated with increased risk for subsequent LOC when one’s level (relative to him or herself) of distress tolerance was low. However, unexpectedly, when one’s level of distress tolerance was *high* (relative to one’s typical level), risk for subsequent LOC *decreased* as one’s level of sadness, loneliness, and shame increased. While results await replication, there are a number of interpretations that could be made.

For instance, it is possible that one's level of distress tolerance is only relevant when certain emotions are at play. If an individual's binge eating is driven by loneliness, for example, perhaps distress tolerance is more relevant when this person is lonely than when she is anxious. However, should results hold, the fact that higher levels of distress tolerance are connected with increased risk for LOC at *lower* levels of negative affect is counterintuitive. It is possible that the combination of high distress tolerance and low negative affect is connected with dietary restriction, which in turn makes subsequent LOC more likely. These results could suggest that one's overall or average level of distress tolerance may be less relevant than distress tolerance in specific moments or in response to specific emotions.

Given the current analyses only included eight individuals (i.e., a large number of observations spread over a small sample size), results must be interpreted with caution. Once the final sample is collected, it will be important to examine the fluid nature of distress tolerance (i.e., within-person variability). In addition, future research should aim understand differential relationships of affective and distress tolerance variables with urges, instead of LOC eating itself, as an outcome. While EMA is still reliant on self-report, its methodology will allow for a more dynamic understanding of distress tolerance's role in binge eating pathology, and perhaps will also lend ideas for behavioral paradigm development. Valid momentary measurement of distress intolerance could lead to ecological momentary interventions in which participants would receive in-the-moment strategies for increasing distress intolerance. One consideration to take into account is whether repeated prompting regarding one's level of distress tolerance (as

opposed to negative affect itself) in and of itself has reactivity effects (e.g., asking repeatedly about distress tolerance could cue stronger distress tolerance).

4.4 Implications and future directions

4.4.1 Increasing affective intensity of the paradigm

Although we were unable to create a paradigm that we determined was reliably assessing affective distress intolerance, the current study has several implications for future research, especially in the realms of measurement and theoretical conceptualization of affective distress tolerance. First, addressing barriers to tapping into affective distress intolerance in a laboratory setting is an important priority. Given the limitations of a lab setting (e.g., artificiality, demand effects, limited time, a need for standardization across participants), how do we induce and sustain personally-relevant negative affect that is akin to affect experienced in everyday life? With regards to Versions 1-6 of the paradigm, likely a more immersive experience in the scenario is necessary to invoke affect intense enough to match everyday life. Technologies such as virtual reality could allow for more immersion in the scenario, and importantly, a more life-like experience that could elicit behavioral escape tendencies in distress intolerant individuals. It is also possible that the scenario presented in Versions 1-6 of the paradigm did not feel real-life enough due to a mismatch between logistics of the participant's life (e.g., the participant does not have a car or a driver's license) and the content of the paradigm. As such, tailoring the scenarios presented in a guided imagery script could facilitate increased affect generated from the paradigm. For example, developing several versions of the paradigm (with different scenarios) and asking participants (without their knowing why they were being asked such questions) which of the several scenarios (e.g.,

a death of a friend, a romantic breakup, failing out of school) would be most distressing and *possible* (and likely in the context of their lives) could be a way to increase the affect yielded from the paradigm. With regards to Version 7 of the paradigm, it is possible that increasing the emotional provocativeness of the questions and length of the task could yield distress-intolerance-driven escape.

In addition to simply making a guided imagery or autobiographical recall mood induction paradigm more intense, there are several other venues through which to induce negative affect that could be considered for future iterations of the paradigm. For example, social stress tests (Kirschbaum, Pirke, & Hellhammer, 1993) or paradigms where the participant is made to feel as if he or she did something wrong or failed (e.g., tell a participant that their score on an IQ test was way below average) could be made to induce “real” feelings of guilt and sadness. As described in the *Introduction*, developing an “escape” outcome measure from these paradigms may be challenging, but likely not impossible. For example, in one study examining emotion regulation differences between those with and without borderline personality disorder, experimenters (Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006) modified the PASAT such that participants received a message at the end of the task letting them know (regardless of actual performance) that they performed in the bottom 10% of all participants. Following this message, participants were told to complete an anagram completion task, with the opportunity to quit the task at any point. Only 24% of individuals with BPD chose to stop the anagram completion task, but this number was statistically greater than individuals without BPD. Perhaps a future version of the current paradigm (either Version 6 or 7) could be administered following a stressor such as the PASAT and negative evaluation of the

participant. Theoretically, this type of paradigm would allow for examination of willingness to tolerate dysphoric emotions following a stressor. In addition, the administration of a task in which the participant is made to feel as if he/she is inadequate may increase the affective intensity of either of the paradigms developed in the current study. One implication of the current study is that it is perhaps less important that a distress tolerance paradigm induce highly specific facets of negative affect, and more important that the affect approximates a real-life experience.

4.4.2 Measuring more subtle forms of escape behavior

In addition to considering other forms of mood induction, it may be equally as important to develop methods of measuring more subtle forms of escape behavior. For example, it is possible that during the guided imagery paradigms, distress intolerant individuals were using subtle avoidance behaviors (e.g., avoiding eye contact with the screen, distracting oneself with thinking about something else) to not fully engage with the scenario. As such, methods to detect such subtle avoidance behaviors, such as eye-tracking, could complement paradigms such as those developed in the current study.

4.4.3 Challenges with interpreting self-report measures of negative affect

Another critical consideration of the current study is the difficulty with interpreting self-reported changes in negative affect within mood induction paradigms. While PANAS and VAS ratings are widely-used and widely-validated, such ratings are highly susceptible to demand effects, especially when participants believe they are expected to react a certain way to a stimulus. Integration of other methods to measure changes negative affect, such as psychophysiological measures, would be an important addition to the development of a future distress tolerance paradigm. While

psychophysiological measures (e.g., galvanic skin response, heart rate variability, respiratory sinus arrhythmia) have mixed evidence for detecting changes in dysphoric affect (Cavazzi & Becerra, 2014), they partially address the problems (e.g., demand) inherent with self-report measurement and at the very least, could be used in conjunction with self-report to gauge the intensity of affect invoked by the paradigm.

4.4.4 Affective distress tolerance may not be the operative variable

The model of maladaptive behavior we proposed in the current project is based on a negative reinforcement model, i.e., that individuals engage in maladaptive behavior in order to escape the experience of dysphoric emotions. However, an additional (or potentially, alternative) model supported by research (Muehlenkamp et al., 2009; Pearson, Chester, Powell, Wonderlich, & Smith, 2016) is that individuals engage in maladaptive behavior because they anticipate and/or receive reward or experience positive affect from the behavior itself (i.e., a positive reinforcement model). For example, a body of research suggests that individuals with binge eating are likely to show altered reward circuitry activation in anticipation of (Bohon & Stice, 2011; Schienle, Schäfer, Hermann, & Vaitl, 2009), and during (Bohon, Stice, & Spoor, 2009) eating behavior, and that a propensity towards immediate versus delayed reward is associated with engagement with maladaptive behaviors (Alessi & Petry, 2003; Field, Christiansen, Cole, & Goudie, 2007; Manasse et al., 2015). Potentially, both reinforcement pathways (positive and negative) are at play in engagement in maladaptive behaviors such as binge eating (versus disorders characterized by maladaptive *absence* of behavior, such as social anxiety or depression), in which case, a task isolating only one pathway may not be powerful enough to yield the escape tendencies observed in everyday behavior. As such,

it is possible that a paradigm where individuals can exchange tolerating negative affect for a reward may better approximate how individuals who engage in maladaptive behaviors approach decision-making. For example, participants could be told ahead of time that if the paradigm became too distressing, they could stop at anytime and would also receive a reward (e.g., a candy bar). Such a paradigm would be a theoretical mix of distress tolerance and delay discounting (i.e., tendency to overvalue short term over long term), but it could be that both constructs are at play for the subset of individuals who engage in maladaptive behaviors in response to negative affect. If such is the case, “mixing” theoretical constructs may be warranted.

Another possibility is that affect *reactivity*, rather than *tolerance*, is the construct of interest. Recent research has suggested that affect reactivity to a distress tolerance paradigm (the PASAT), rather than escape behavior on the task, is associated with the development and increases in eating pathology across adolescence (Juarascio et al., 2016). It may be that individuals with LOC eating (and others who engage in maladaptive behaviors) simply reach higher levels of affect that would be intolerable for anyone, i.e., that it is less that affective distress *tolerance* that varies, but rather, the level and length of persistence of the affective distress itself (Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2010). Logically, it should follow that if reactivity is the construct that truly varies, that the behavioral manifestation of intolerance of that increased affect should also vary. However, Juarascio et al. 2016, mentioned above, showed that affective reactivity, rather than escape tendencies, was predictive of eating pathology, suggesting that overt behavioral escape from a task (rather than more subtle forms of escape, as described above) may not capture escape tendencies in individuals with LOC eating. It also may be

that affective reactivity and affective distress intolerance, in LOC samples, are highly intertwined and difficult to separate from each other, but that escape tendencies are more difficult to measure in the laboratory. If such is the case, we should aim to measure the simpler construct (which, in this case, is presumably affect reactivity). Data from the current project could be used to examine relationships between affect reactivity to the paradigms and their cross-sectional relation to LOC, and, could be compared to overall reactivity/variability in affect as measured by EMA. Future research should aim to parse out these two constructs and their roles in the etiology, maintenance, and treatment outcome for LOC and other disorders.

4.6 Strengths

Although the current study did not meet its original goals of developing and validating a task measuring affective distress intolerance, the project had several strengths. First, we aimed to improve on self-report measurement of distress intolerance, which is highly biased in several ways. We also innovated on existing mood induction paradigms, which have largely stayed the same for the past 30-40 years, despite mixed evidence of their effectiveness (Westermann, Stahl, & Hesse, 1996). We did so by enhancing the guided imagery paradigm with a detailed and personalized scenario, which, to our knowledge has never been done. In addition, we employed an iterative design that allowed for systematic, yet constant, updating and modification of the paradigm. Lastly, this was the first study to our knowledge to utilize EMA assessment of affective distress intolerance, which, while still self-report, has higher ecological validity than retrospective report. This methodology will also allow us to be the first to examine self-reported distress tolerance as a fluid, momentary construct, rather than a stable one.

4.7 Limitations

Several limitations of the current study must also be acknowledged. First, several iterations of the paradigm were only tested with a small number of participants. It is possible that in some instances, due to limitations in time and resources, we made decisions to change or iterate upon the paradigm too early in the process, and as such, may have moved past ideas or concepts that may have led to a better-functioning paradigm or that were not consistent with the original distress tolerance theory. For example, we chose to remove the lottery gift incentive after only two participants although the lottery gift incentive represented an important component of the theory for why individuals could be willing to tolerate distress. Compounding this problem is the uncertainty with which we can say that the participants completing the paradigm were truly distress intolerant. We assumed that at least a subset of individuals with BED or BN had elevated enough levels of distress intolerance such that if the paradigm were functioning correctly, a detectable subset would show behavioral escape. Especially considering that nearly all participants with binge eating were treatment-seeking (e.g., were theoretically willing to face difficult issues in treatment), it is possible that very few were *truly* distress intolerant. Informal interviews completed with a subset participants completing the paradigm, suggest that many of the LOC participants who underwent the paradigm engaged in LOC eating in order to escape or avoid negative affect. However, these self-reports can only reflect participants' post-hoc and subjective explanations of their behavior. At this time, there is no ideal "gold-standard" distress tolerance measure to which to cross-validate a behavioral affective distress intolerance measure.

Without such a measure, we may need to rely on clinical interviews or predictive validity

to compare against a developed paradigm. Lastly, although we aimed to develop a behavioral paradigm that overcame some of the limitations of self-report, the current project was still highly reliant on self-report measurement overall (e.g., changes in negative affect on the PANAS), subjecting its results to similar skepticism inherent in research that draws inferences based on self-report.

4.8 Conclusion

The current project's original aim to develop and validate a measure of affective distress intolerance was met with significant challenges. Although we were unable to create a paradigm that met our own benchmarks for moving on to the measurement validation stage, this endeavor raised several interesting theoretical and measurement questions that will lend direction to continued development of an affective distress tolerance paradigm. In addition, we were able to be one of the first to utilize momentary distress tolerance measurement, and we obtained partial and preliminary support for the theory that the relationship between negative affect and binge eating is dependent on affective distress tolerance. Future research that continues to refine measurement of affective constructs and in particular, addresses problems inherent in self-report, is of utmost importance to the field.

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APPENDIX A: ORIGINAL (VERSION 1) PARADIGM SCRIPT AND SCENARIO**Instructions**

Imagine the scenario printed on the screen as intensely as you can.

As you read the text, imagine the scenario is *truly happening to you in the moment*.

After a minute or two, you will have the option to escape the task at any time if you do not wish to continue.

Your best friend, PERSON1, died a week ago because of a mistake that you made.

You were driving, and she was in the passenger seat.

You let yourself get distracted by a text message, causing a deadly accident

It was your fault.

HER/HIS Death

It is a gorgeous, sunny day, around 1pm on the day that PERSON1 dies.

You drive over to HER/HIM place to pick HER/HIM up. While you drive, you and PERSON1 are catching up.

[Press the space bar at any time to escape the task]

HER/HIS Death

You are on the highway when your phone vibrates with a text message.

You look down at your phone and see the message is from another friend, PERSON2.

[Press the space bar at any time to escape the task]

HER/HIS Death

You carefully pick up your phone, while still keeping your eye on the road.

It's a picture. You start to open the message to take a closer look at the photo.

[Press the space bar at any time to escape the task]

HER/HIS Death

You glance back up to see that your car isn't following a bend in the road.

It is hurtling at a high speed towards the guard rail. PERSON1 screams.

[Press the space bar at any time to escape the task]

HER/HIS Death

You slam on the brakes and try to steer back into the lane, but it is too late.

Your car careens out of control, crosses the median and smashes into a car coming towards you.

[Press the space bar at any time to escape the task]

HER/HIS Death

The next few seconds are a blur of car screeching, screaming, and panic.

You feel the car flip over several times.

[Press the space bar at any time to escape the task]

HER/HIS Death

You open your eyes after what may have been several minutes and you have difficulty making out what is around you.

You feel suffocating pressure on top of you. You call HER/HIS name.

[Press the space bar at any time to escape the task]

HER/HIS Death

No answer, but you hear sirens approaching.

You begin to panic. You call HER/HIS name again.

[Press the space bar at any time to escape the task]

HER/HIS Death

You attempt to shift under the weight on top of you and, in the corner of your eye, you see
HER/HIM.

HER/HIS body is in a growing pool of blood.

[Press the space bar at any time to escape the task]

HER/HIS Death

HE/SHE's at arm's length, so you reach over and touch HER/HIM, but HE/SHE doesn't
move or respond.

HE/SHE doesn't appear to be breathing.

[Press the space bar at any time to escape the task]

HER/HIS Death

You then shift your gaze to HER/HIS face.

Your heart drops.

[Press the space bar at any time to escape the task]

HER/HIS Death

HER/HIS eyes are open but HER/HIS face is blank and unmoving.

You scream HER/HIS name again. No response.

[Press the space bar at any time to escape the task]

HER/HIS Death

You realize what you have just done.

PERSON1 is dead.

[Press the space bar at any time to escape the task]

The hospital

You are overcome by unbearable emotional pain as you lay trapped in your hospital bed.

[Press the space bar at any time to escape the task]

The hospital

Doctors and police repeatedly ask you questions.

You are continually forced to repeat the accident story over and over again.

[Press the space bar at any time to escape the task]

The hospital

Police officers are visibly shocked and disapproving when you tell the story.

“It was my fault,” you say. “I made the worst mistake of my life.”

[Press the space bar at any time to escape the task]

The hospital

As you repeat the story, it's becoming more real. *HE/SHEE's really gone.*

The pit in your stomach is unrelenting.

[Press the space bar at any time to escape the task]

The hospital

You hear PERSON1's family members outside your hospital room, but none of them come in to talk to you.

You are being shunned. You are alone.

[Press the space bar at any time to escape the task]

The hospital

The pit in your stomach is unrelenting.

Breathing feels difficult because of the lump in your throat.

Your mind is consumed without thoughts of PERSON1.

[Press the space bar at any time to escape the task]

The hospital

For several hours, the tears are unrelenting. You are overcome with guilt, regret, and emotional pain.

You killed PERSON1 with such a stupid mistake.

[Press the space bar at any time to escape the task]

The hospital

You will never forgive yourself for what has happened.

You've lost your best friend.

HE/SHE's gone forever.

[Press the space bar at any time to escape the task]

The hospital

Why did you have to take your eyes off the road?

Then everything would be okay, and she would still be here.

[Press the space bar at any time to escape the task]

The hospital

You think of HER/HIS family; they have lost someone so important.

You hear that her FAMILYMEMBER, FAMILYMEMBERNAME, cannot bear to face you, PARTICIPANT, the person who is at fault for PERSON1's death.

[Press the space bar at any time to escape the task]

The hospital

Soon, you get more bad news.

The driver of the other car in the accident will never walk again.

How could this be happening?

[Press the space bar at any time to escape the task]

The hospital

But it can't be taken back.

The deep pit in your gut will never leave.

[Press the space bar at any time to escape the task]

The Funeral

Everyone is crying, and the air is heavy.

Many people avoid eye contact with you, and stay away.

[Press the space bar at any time to escape the task]

The Funeral

All of the papers, websites, and social media are buzzing with what happened.

One dead, another paralyzed; the driver at fault for the accident survives with minor injuries.

[Press the space bar at any time to escape the task]

The Funeral

No one seems like they'll ever forgive you.

You will never forgive yourself, either.

[Press the space bar at any time to escape the task]

The Funeral

At the viewing, you are overcome with grief seeing PERSON1 in a casket.

Your legs feel as if they are going give out beneath you as you gaze at HER/HIM.

[Press the space bar at any time to escape the task]

The Funeral

Her parents keep are sobbing throughout the funeral.

Your other mutual friends each give speeches about her.

She had the most radiant smile. The most contagious laugh. A selfless, generous, kind soul who inspired those around her. Too young to die. She lived life to the fullest.

[Press the space bar at any time to escape the task]

The Funeral

The next thing you see is her mother collapsing to the ground with grief.

You are the cause of her pain and suffering, which she'll endure for the rest of her life.

[Press the space bar at any time to escape the task]

The Funeral

Between speeches, your mind flashes to your future.

She won't be there for any of that.

She won't be around for anyone else's future, either.

[Press the space bar at any time to escape the task]

The Funeral

The guilt is overwhelming.

*My thoughtless, stupid act is solely responsible for cutting short PERSON1's life.
I am the cause of her death. I am the cause of so many people's pain.*

[Press the space bar at any time to escape the task]

The Aftermath

Everything changes after the accident.

Your life is ruined.

The pit in your stomach never really disappears, and it's your own fault.

[Press the space bar at any time to escape the task]

The Aftermath

You are isolated from friends and family.

You call, but they keep themselves distant.

It becomes clear that they don't want you around because of what you did.

[Press the space bar at any time to escape the task]

The Aftermath

Every single day for the rest of your life, you wish you could just take back that one moment in time.

[Press the space bar at any time to escape the task]

APPENDIX B: VERSION 6 PARADIGM SCRIPT AND SCENARIO

Instructions

You're about to experience a scenario presented on the screen.

In the scenario, you cause the death of a close friend. As a result, people around you distance themselves from you, leaving you forever, sad, guilty and lonely for the rest of your life.

This story has no resolution.

As you read the text, imagine the scenario is *truly happening to you in the moment*. It is important that you imagine the scenario as intensely as you can.

After a minute or two, you will have the option to switch to a less intense version of the task (press space).

HER/HIS Death

It is a gorgeous, sunny day, around 1pm on the day that PERSON1 dies.

You drive over to HER/HIM place to pick HER/HIM up. While you drive, you and PERSON1 are catching up.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

You are on the highway when your phone vibrates with a text message.

You carefully pick up your phone, while still keeping your eye on the road.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

It's a picture. You start to open the message to take a closer look at the photo.

You glance back up to see that your car isn't following a bend in the road.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

It is hurtling at a high speed towards the guard rail. PERSON1 screams.

You slam on the brakes and try to steer back into the lane, but it is too late.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

The next few seconds are a blur of car screeching, screaming, and panic.

You feel the car flip over several times.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

You open your eyes after what may have been several minutes and you have difficulty making out what is around you.

You feel suffocating pressure on top of you. You call HER/HIS name.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

You attempt to shift under the weight on top of you and, in the corner of your eye, you see HER/HIM.

HER/HIS body is in a growing pool of blood.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

HE/SHE isn't breathing.

You then shift your gaze to HER/HIS face. Your heart drops

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

HER/HIS eyes are open but HER/HIS face is blank and unmoving.

You scream HER/HIS name again. No response.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

HER/HIS Death

You realize what you have just done.

PERSON1 is dead.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

You are overcome by unbearable emotional pain as you lay trapped in your hospital bed.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

Doctors and police repeatedly ask you questions.

You are continually forced to repeat the accident story over and over again.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

Police officers are visibly shocked and disapproving when you tell the story.

“It was my fault,” you say. “I made the worst mistake of my life.”

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

As you repeat the story, it’s becoming more real. *HE/SHE’s really gone.*

The pit in your stomach is unrelenting.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

You hear PERSON1’s family members outside your hospital room.

FAMILYMEMBERNAME comes in.

“YOU KILLED PERSON1! You made the mistake! Why couldn’t you be the one who died?” FAMILYMEMBERNAME screams.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

All you can do is cry and apologize to FAMILYMEMBERNAME over and over again.

However, FAMILYMEMBERNAME says “I hate you for what you did, and I’ll never forgive you” and walks out.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

PERSON1’s family and friends continue to come into your room to express their rage at you.

Their words are like physical blows.

“How dare you take away the person most important to me.”

“You’ve ruined my life. I hope you suffer for the evil you’ve done.”

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

The pit in your stomach is unrelenting.

Breathing feels difficult because of the lump in your throat.

Your mind is consumed without thoughts of PERSON1.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

For several hours, the tears are unrelenting. You are overcome with guilt, regret, and emotional pain.

You killed PERSON1 with such a stupid mistake.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

You will never forgive yourself for what has happened.

You've lost your best friend.

HE/SHE's gone forever.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

Why did you have to take your eyes off the road?

Then everything would be okay, and HE/SHE would still be here.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

Soon, you get more bad news.

The driver of the other car in the accident will never walk again.

How could this be happening?

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The hospital

But it can't be taken back.

The deep pit in your gut will never leave.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

Everyone is crying, and the air is heavy.

Many people avoid eye contact with you, and stay away.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

Others, however, confront you. “How dare you even show up here?” They ask.

No one seems to remember that you cared about PERSON1. They just see you as HIS/HER killer.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

All of the papers, websites, and social media are buzzing with what happened.

One dead, another paralyzed; the driver at fault for the accident survives with minor injuries.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

FAMILYMEMBERNAME confronts you again.

“I hope we never see you again,” FAMILYMEMBERNAME says. “No one wants to see you again, ever.”

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

No one seems like they'll ever forgive you.

You will never forgive yourself, either.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

At the viewing, you are overcome with grief seeing PERSON1 in a casket.

Your legs feel as if they are going give out beneath you as you gaze at HER/HIM.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

Everyone is sobbing throughout the funeral.

Your other mutual friends each give speeches about HER/HIM.

HE/SHE had the most radiant smile. The most contagious laugh. A selfless, generous, kind soul who inspired those around HER/HIM. Too young to die. HE/SHE lived life to the fullest.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

You see HER/HIS relatives collapsing to the ground with grief.

You are the cause of their pain and suffering, which they'll endure for the rest of their lives.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

Between speeches, your mind flashes to your future.

HE/SHE won't be there for any of that.

HE/SHE won't be around for anyone else's future, either.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

The Funeral

The guilt is overwhelming.

*My thoughtless, stupid act is solely responsible for cutting short PERSON1's life.
I am the cause of HIS/HER death. I am the cause of so many people's pain.*

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

One person remains, kneeling by the grave, sobbing uncontrollably.

Watching her, you feel devastatingly sad and guilty.

[REMINDER: If this task has become too emotionally intense, press the space bar to switch]

APPENDIX C: POST-TASK ASSESSOR INTERVIEW

ID: _____

Post-task interview:

The following questions should be asked of the participant after completion of the task. Please ask these questions verbatim, and ask participants to elaborate or provide further details as necessary.

Did you quit the task or did it end on its own?

Circle one: PARTICIPANT QUIT PARTICIPANT DID NOT QUIT

ALL PARTICIPANTS:

What was it like to go through the task, i.e., to read the story?

- Follow-up questions: How did you feel? Did you notice the music? What impact did that have? Did you want the story to stop?

What did you think about the reward (i.e., chance at winning a gift card)?

- Follow-up question: Did the reward play a part in when you exited from the task?

If terminated early: what was the strongest motivation for quitting the task early?

- After the participant answers the question above, probe whether any of the following played a role in terminating the task early: wanting escape a certain emotion, wanting to prevent a certain emotion, boredom, not knowing when the task would end, vagueness of the reward
- What would the reward have to be to motivate you to stay in the task longer?

If not terminated early: what motivated you to stay in the task?

- What do you think would make you more likely to quit the task early?
- After the participant answers the question above, probe whether any of the following played a role in terminating the task early: the task wasn't that distressing so it was easy to keep going, wanting a chance at the reward, wanted to see how the story played out, wanting to

put your best foot forward on the task. Ask the participant to elaborate on any factors that played a significant role in her decision to escape the task.

- If the story were even more emotionally intense, do you think you would have quit? Ask the participant to elaborate on her response.

ALL PARTICIPANTS:

Would this task have been less, equally, or more effective in making you feel negative emotion if you had been able to choose a different person other than your “best friend?” For example, what if we had asked you to imagine the same scenario (accidentally killing the person) with a parent or other family member? Is there anyone else you could have chosen that would have been even more effective than a best friend or family member?

Sometimes people approach these types of task very seriously. They really concentration on doing everything exactly as asked, and putting themselves into it 100%. Other times, people don’t really see the point and are just trying to get finished as easily and quickly as possible. Where were you between these two extremes? Can you explain?

What do you think would make this task more difficult to tolerate?

Assessor: Make any notes (e.g., clinical judgment, whether this participant is a “typical” participant, observations) below regarding your interview of the participant, if needed/applicable:

APPENDIX D: POST-TASK PARTICIPANT MULTIPLE CHOICE QUESTIONS**If participant quit the task:**

Please answer the following questions:

What most contributed to you quitting this task?

Please type your response here: _____

Of the following options, what most contributed to you quitting this task?

- a. It made me feel bad
- b. Wanting to prevent feeling bad
- c. I got bored
- d. It was taking too long
- e. I didn't care about the reward
- f. Other (specify): _____

Which of the following would have made you most likely to stay in the task longer?

- a) If the task were less emotionally intense
- b) If it were less boring
- c) If it were shorter or if I knew when it would end
- d) If the reward were bigger
- e) Other (specify): _____

If the participant did not quit early; i.e., persisted to the end of the task:

1. You had the option of quitting early, but you didn't. What most contributed to you NOT quitting this task?
 - a. It didn't affect me that much emotionally
 - b. I was curious to hear the end of the story
 - c. The reward for staying in the task
 - d. I was up for the challenge
 - e. I always try to do my best
 - f. Other (specify): _____

2. If the story in the task were even more emotionally intense, do you think you would have quit?

- a. Yes
 - b. No, I would have been able to tolerate it no matter what
 - c. No, I was determined to have chance to get the reward.
-

APPENDIX E: QUESTIONS REGARDING URGES AND DESIRE TO SWITCH**TASKS****If the participant chose to “switch tasks”:**

Before deciding to switch, how much did you think about switching?

1	2	3	4	5	6	7
Not at all		Several times				Constantly

During the most intense parts of the task, how hard was it to keep going?

1	2	3	4	5	6	7
Not at all		Moderately			Very difficult/I could barely stand it	

In the moments before requesting to switch, how strong was your urge to switch to a less intense task?

1	2	3	4	5	6	7
Not at all		Moderate				Intense

If the participant chose not to “switch tasks”:

How much did you think about switching?

1	2	3	4	5	6	7
Not at all		Several times				Constantly

During the most intense parts of the task, how hard was it to keep going?

1	2	3	4	5	6	7
Not at all		Moderately			Very difficult/I could barely stand it	

How strong was your urge to switch to a less intense task?

1	2	3	4	5	6	7
Not at all		Moderate				Intense

APPENDIX F: VERSION 7 TASK QUESTIONS

After rating your moods on the next two screens, you will be asked a series of questions about your binge eating and beliefs about yourself. These questions are optional, and you are free to skip any questions you do not want to answer.

As a reminder, any responses you give are completely private and confidential.

If you chose to answer a question, a text box will appear. You will have a limited amount of time to answer each question. After an amount of time, the screen will auto-advance and give you the option of answering the next question. For any question you chose to answer, write as much as you can with as much detail possible. Do not be concerned if the program advances you to the next question before you have finished. At any time, you can choose to stop answering the current question, or the rest of the questions altogether.

When do you feel your most content? Please describe in detail. Choose an option below.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

Why do you think it has been so difficult for you to stop binge eating? Please describe in detail.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

What do your difficulties with binge eating say about you as a person?

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

What are you afraid might happen to you if your binge eating continues? How would you feel if that happened and why? Describe in detail.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

Think about the people in your life who don't know the extent of your binge eating. What would they think if they knew the extent of your binge eating?

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

Say you gained a large amount of weight. How would you feel about yourself and why? Please describe in detail.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

What aspects of your binge eating are you most ashamed of and why? Please describe in detail.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

Describe what you don't like about your body. Be very specific and detailed.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

Who do you find yourself comparing your body to? How is your body different from his/hers, and how do you feel when you compare yourself to this person? Please describe in detail.

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

When does your eating feel most out of control? What is it like when you've realized you've lost control of your eating?

- I'd like to start answering this question
- I'd like to skip this question
- I'd like to stop answering these questions altogether

[if yes to start, display text box for 90 seconds]

APPENDIX G: EMA MEASURES**EMA measures:****PANAS items**

Please rate your current mood:

1 = Very slightly or not at all

2 = A little

3 = Moderately

4 = Quite a bit

5 = Extremely

Afraid: _____

Lonely: _____

Irritable: _____

Ashamed: _____

Disgusted: _____

Nervous: _____

Confident: _____

Dissatisfied with self: _____

Concentrating: _____

Sad: _____

Distressed: _____

Angry with self: _____

Strong: _____

Determined: _____

Bored: _____

Guilty: _____

Stress rating

Please rate your current level of stress

1 (not at all) 2 3 4 5 (Extremely)

Since your last rating, please indicate which of the following has been stressful for you (choose all that apply):

- Family Concerns

- Personal Relationships
- Financial Problems
- Work-related problems
- School-related problems
- Other
- I have not experienced any stressful events

Are you anticipating any stressful events in the next hour?

- Yes
- No

Eating episodes:

How long has it been since you last finished eating something?

[Drop-down list]

- < 15 minutes
- 15-30 minutes
- 30-60 minutes
- 1 – 1.5 hours
- 1.5 – 2 hours
- > 2 hours

What type of meal/snack was it?

- Breakfast
- Morning Snack
- Lunch
- Afternoon Snack
- Dinner
- Evening Snack
- Binge
- Other

Did you remember to enter your eating episode after you ate? [for signal-contingent recording]

- Yes
- No, I forgot

If no above, or for entering an eating episode:

1 = Very slightly or not at all

2 = A little

3 = Moderately

4 = Quite a bit

5 = Extremely

- To what extent do you feel that you overate?
- While you were eating, to what extent did you feel a sense of loss of control?
- While you were eating, to what extent did you feel that you could not stop eating once you started?
- To what extent did you feel like you overate?
- To what extent did you believe that this was a binge episode?
- While you were eating, to what extent did you feel you could not resist eating?
- While you were eating, to what extent did you feel driven or compelled to eat?

Check any that apply since the last survey:

- I made myself vomit
- I took laxatives
- I tried to limit the amount that I ate

Since the last survey, to what extent have you experienced an urge to binge?

1 = Not at all

2 = Slightly

3 = Moderately

4 = Quite a bit

5 = Extremely

Please indicate how much each statement applies to you right now:

Scale 1-5 (1: Not at all, 5: Completely)

- I can't handle my current emotions
- My emotions are so intense that they are completely taking over
- I'll do anything to stop feeling how I feel
- I am having difficulty controlling my behaviors
- My emotions feel out of control
- I feel out of control
- My emotions feel overwhelming
- I am having difficulty doing the things I need to do right now
- I am having difficulty understanding my current emotions

APPENDIX H: SELF-REPORT MEASURES

Beck Depression Inventory –II

Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during the **past 2 weeks, including today**. Mark the number next to the statement you have picked. If several statements in the groups seem to apply equally well, simply choose the statement which has the **largest number**.

(1) Sadness

- 0 ___ I do not feel sad.
 1 ___ I feel sad.
 2 ___ I am sad all the time.
 3 ___ I am so sad or unhappy that I can't stand it.

(2) Pessimism

- 0 ___ I am not discouraged about my future.
 1 ___ I feel more discouraged about my future than I used to be.
 2 ___ I do not expect things to work out for me
 3 ___ I feel that the future is hopeless and that things cannot improve.

(3) Past Failure

- 0 ___ I do not feel like a failure.
 1 ___ I have failed more than I should.
 2 ___ As I look back, I see a lot of failures.
 3 ___ I feel I am a total failure as a person.

(4) Loss of Pleasure

- 0 ___ I get as much pleasure as I ever did from the thing I used to enjoy.
 1 ___ I don't enjoy things the way I used to.
 2 ___ I get very little pleasure from the things I used to enjoy.
 3 ___ I can't get any pleasure from the things I used to enjoy.

(5) Guilty Feelings

- 0 ___ I don't feel particularly guilty.
 1 ___ I feel guilty over many things I have done or should have done.
 2 ___ I feel quite guilty most of the time.
 3 ___ I feel guilty all of the time.

(6) Punishment Feelings

- 0 ___ I don't feel I am being punished.
 1 ___ I feel I may be punished.
 2 ___ I expect to be punished.
 3 ___ I feel I am being punished.

(7) Self Dislike

- 0 ___ I feel the same about myself as ever.
 1 ___ I have lost confidence in myself.
 2 ___ I am disappointed in myself.
 3 ___ I dislike myself.

(8) Self Criticism

- 0 ___ I don't criticize or blame myself any more than usual.
 1 ___ I am more critical of myself than I used to be.
 2 ___ I criticize myself for all my faults.
 3 ___ I blame myself for everything bad that happens.

(9) Suicidal Thoughts or Wishes

- 0 ___ I don't have any thoughts of killing myself.
 1 ___ I have thoughts of killing myself, but I would not carry them out.
 2 ___ I would like to kill myself.
 3 ___ I would kill myself if I had the chance.

(10) Crying

- 0 ___ I don't cry any more than I used to.
 1 ___ I cry more now than I used to.
 2 ___ I cry over every little thing.
 3 ___ I feel like crying, but I can't.

(11) Agitation

- 0 ___ I am no more restless or wound up than usual.
 1 ___ I feel more restless or wound up than usual.
 2 ___ I am so restless or agitated that it's hard to stay still.
 3 ___ I am so restless or agitated I have to keep moving or doing something.

(12) Loss of Interest

- 0 ___ I don't feel I am being punished.
 1 ___ I feel I may be punished.
 2 ___ I expect to be punished.
 3 ___ I feel I am being punished.

(13) Indecisiveness

- 0 ___ I make decisions about as well as I ever did.
 1 ___ I find it more difficult to make decisions than usual.
 2 ___ I have much greater difficulty in making decisions than usual.
 3 ___ I have trouble making any decisions.

(14) Worthlessness

- 0 ___ I do not feel I am worthless.
 1 ___ I don't consider myself as worthwhile or useful as I used to.
 2 ___ I feel more worthless compared to other people.
 3 ___ I feel utterly worthless.

(15) Loss of Energy

- 0 ___ I have as much energy as ever.
 1 ___ I have less energy than I used to have.
 2 ___ I don't have enough energy to do very much.
 3 ___ I don't have enough energy to do anything.

(16) Change in Sleeping Pattern

- 0 ___ I have not experienced any change in my sleeping pattern.

- 1a ___ I sleep somewhat more than usual.
 1b ___ I sleep somewhat less than usual.

- 2a ___ I sleep a lot more than usual.
 2b ___ I sleep a lot less than usual.

- 3a ___ I sleep most of the day.
 3b ___ I wake up 1-2 hours early and can't get back to sleep.

(17) Irritability

- 0 ___ I am no more irritable than usual.
 1 ___ I am more irritable than usual.
 2 ___ I am much more irritable than usual.
 3 ___ I am irritable all the time.

(18) Changes in Appetite

- 0 ___ I have not experienced any changes in my appetite.

- 1a ___ My appetite is somewhat less than usual.
 1b ___ My appetite is somewhat greater than usual.

- 2a ___ My appetite is much less than before.
 2b ___ My appetite is much greater than usual.

- 3a ___ I have no appetite at all.
 3b ___ I crave food all the time.

(19) Concentration Difficulty

- 0 ___ I can concentrate as well as ever.
 1 ___ I can't concentrate as well as usual.
 2 ___ It's hard to keep my mind on anything for very long.
 3 ___ I find I can't concentrate on anything.

(20) Tiredness or Fatigue

- 0 ___ I don't get more tired than usual.
 1 ___ I get tired or fatigue more easily than usual.
 2 ___ I am too tired or fatigued to do a lot of the things I used to do.
 3 ___ I am too tired or fatigued to do most of the things I used to do.

(21) Loss of Interest in Sex

- 0 ___ I have not noticed any recent change in my interest in sex.
 1 ___ I am less interested in sex than I used to be.
 2 ___ I am much less interested in sex now.
 3 ___ I have lost interest in sex

PANAS

Thinking about yourself and how you feel right now, that is, at this present moment, to what extent do you feel:

1 = Very slightly or not at all

2 = A little

3 = Moderately

4 = Quite a bit

5 = Extremely

Afraid: _____

Happy: _____

Lonely: _____

Alert: _____

Irritable: _____

Proud: _____

Ashamed: _____

Cheerful: _____

Disgusted: _____

Enthusiastic: _____

Nervous: _____

Confident: _____

Dissatisfied with self: _____

Concentrating: _____

Jittery: _____

Energetic: _____

Sad: _____

Distressed: _____

Calm: _____

Angry with self: _____

Strong: _____

Determined: _____

Attentive: _____

Relaxed: _____

Bored: _____

Guilty: _____

UPPS-P

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you **Agree Strongly** circle **1**, if you **Agree Somewhat** circle **2**, if you **Disagree somewhat** circle **3**, and if you **Disagree Strongly** circle **4**. Be sure to indicate your agreement or disagreement for every statement below. Also, there are questions on the following pages.

	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
1. I have a reserved and cautious attitude toward life.	1	2	3	4
2. I have trouble controlling my impulses.	1	2	3	4
3. I generally seek new and exciting experiences and sensations.	1	2	3	4
4. I generally like to see things through to the end.	1	2	3	4
5. When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.	1	2	3	4
6. My thinking is usually careful and purposeful.	1	2	3	4
7. I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4
8. I'll try anything once.	1	2	3	4
9. I tend to give up easily.	1	2	3	4
10. When I am in great mood, I tend to get into situations that could cause me problems.	1	2	3	4
11. I am not one of those people who blurt out things without thinking.	1	2	3	4
12. I often get involved in things I later wish I could get out of.	1	2	3	4
13. I like sports and games in which you have to choose your next move very quickly.	1	2	3	4
14. Unfinished tasks really bother me.	1	2	3	4
15. When I am very happy, I tend to do things that may cause problems in my life.	1	2	3	4
16. I like to stop and think things over before I do them.	1	2	3	4
17. When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
18. I would enjoy water skiing.	1	2	3	4
19. Once I get going on something I hate to stop.	1	2	3	4
20. I tend to lose control when I am in a great mood.	1	2	3	4
21. I don't like to start a project until I know exactly how to proceed.	1	2	3	4

Please go to the next page

	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
22. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
23. I quite enjoy taking risks.	1	2	3	4
24. I concentrate easily.	1	2	3	4
25. When I am really ecstatic, I tend to get out of control.	1	2	3	4
26. I would enjoy parachute jumping.	1	2	3	4
27. I finish what I start.	1	2	3	4
28. I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
29. When I am upset I often act without thinking.	1	2	3	4
30. Others would say I make bad choices when I am extremely happy about something.	1	2	3	4
31. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
32. I am able to pace myself so as to get things done on time.	1	2	3	4
33. I usually make up my mind through careful reasoning.	1	2	3	4
34. When I feel rejected, I will often say things that I later regret.	1	2	3	4
35. Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4
36. I would like to learn to fly an airplane.	1	2	3	4
37. I am a person who always gets the job done.	1	2	3	4
38. I am a cautious person.	1	2	3	4
39. It is hard for me to resist acting on my feelings.	1	2	3	4
40. When I get really happy about something, I tend to do things that can have bad consequences.	1	2	3	4
41. I sometimes like doing things that are a bit frightening.	1	2	3	4
42. I almost always finish projects that I start.	1	2	3	4
43. Before I get into a new situation I like to find out what to expect from it.	1	2	3	4
44. I often make matters worse because I act without thinking when I am upset.	1	2	3	4
45. When overjoyed, I feel like I can't stop myself from going overboard.	1	2	3	4

Please go to the next page

	Agree Strongly	Agree Some	Disagree Some	Disagree Strongly
46. I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
47. Sometimes there are so many little things to be done that I just ignore them all.	1	2	3	4
48. I usually think carefully before doing anything.	1	2	3	4
49. Before making up my mind, I consider all the advantages and disadvantages.	1	2	3	4
50. When I am really excited, I tend not to think of the consequences of my actions.	1	2	3	4
51. In the heat of an argument, I will often say things that I later regret.	1	2	3	4
52. I would like to go scuba diving.	1	2	3	4
53. I tend to act without thinking when I am really excited.	1	2	3	4
54. I always keep my feelings under control.	1	2	3	4
55. When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.	1	2	3	4
56. I would enjoy fast driving.	1	2	3	4
57. When I am very happy, I feel like it is ok to give in to cravings or overindulge.	1	2	3	4
58. Sometimes I do impulsive things that I later regret.	1	2	3	4
59. I am surprised at the things I do while in a great mood.	1	2	3	4

DERS

INSTRUCTIONS: Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

1-----	2-----	3-----	4-----	5-----
almost never (0-10%)	sometimes (11-35%)	about half the time (36-65%)	most of the time (66-90%)	almost always (91-100%)

- _____ 1) I am clear about my feelings.
- _____ 2) I pay attention to how I feel.
- _____ 3) I experience my emotions as overwhelming and out of control.
- _____ 4) I have no idea how I am feeling.
- _____ 5) I have difficulty making sense out of my feelings.
- _____ 6) I am attentive to my feelings.
- _____ 7) I know exactly how I am feeling.
- _____ 8) I care about what I am feeling.
- _____ 9) I am confused about how I feel.
- _____ 10) When I'm upset, I acknowledge my emotions.
- _____ 11) When I'm upset, I become angry with myself for feeling that way.
- _____ 12) When I'm upset, I become embarrassed for feeling that way.
- _____ 13) When I'm upset, I have difficulty getting work done.
- _____ 14) When I'm upset, I become out of control.
- _____ 15) When I'm upset, I believe that I will remain that way for a long time.
- _____ 16) When I'm upset, I believe that I'll end up feeling very depressed.
- _____ 17) When I'm upset, I believe that my feelings are valid and important.
- _____ 18) When I'm upset, I have difficulty focusing on other things.
- _____ 19) When I'm upset, I feel out of control.
- _____ 20) When I'm upset, I can still get things done.
- _____ 21) When I'm upset, I feel ashamed with myself for feeling that way.

1-----	2-----	3-----	4-----	5
almost never (0-10%)	sometimes (11-35%)	about half the time (36-65%)	most of the time (66-90%)	almost always (91-100%)

- _____ 22) When I'm upset, I know that I can find a way to eventually feel better.
- _____ 23) When I'm upset, I feel like I am weak.
- _____ 24) When I'm upset, I feel like I can remain in control of my behaviors.
- _____ 25) When I'm upset, I feel guilty for feeling that way.
- _____ 26) When I'm upset, I have difficulty concentrating.
- _____ 27) When I'm upset, I have difficulty controlling my behaviors.
- _____ 28) When I'm upset, I believe that there is nothing I can do to make myself feel better.
- _____ 29) When I'm upset, I become irritated with myself for feeling that way.
- _____ 30) When I'm upset, I start to feel very bad about myself.
- _____ 31) When I'm upset, I believe that wallowing in it is all I can do.
- _____ 32) When I'm upset, I lose control over my behaviors.
- _____ 33) When I'm upset, I have difficulty thinking about anything else.
- _____ 34) When I'm upset, I take time to figure out what I'm really feeling.
- _____ 35) When I'm upset, it takes me a long time to feel better.
- _____ 36) When I'm upset, my emotions feel overwhelming.

Distress Tolerance Scale

Directions: Think of times that you feel distressed or upset. Select the item from the menu that best describes your beliefs about feeling distressed or upset.

1. Strongly agree
2. Mildly agree
3. Agree and disagree equally
4. Mildly disagree
5. Strongly disagree

1. Feeling distressed or upset is unbearable to me. (Tolerance)
2. When I feel distressed or upset, all I can think about is how bad I feel. (Absorption)
3. I can't handle feeling distressed or upset. (Tolerance)
4. My feelings of distress are so intense that they completely take over. (Absorption)
5. There's nothing worse than feeling distressed or upset. (Tolerance)
6. I can tolerate being distressed or upset as well as most people. (Appraisal)
7. My feelings of distress or being upset are not acceptable. (Appraisal)
8. I'll do anything to avoid feeling distressed or upset. (Regulation)
9. Other people seem to be able to tolerate feeling distressed or upset better than I can. (Appraisal)
10. Being distressed or upset is always a major ordeal for me. (Appraisal)
11. I am ashamed of myself when I feel distressed or upset. (Appraisal)
12. My feelings of distress or being upset scare me. (Appraisal)
13. I'll do anything to stop feeling distressed or upset. (Regulation)
14. When I feel distressed or upset, I must do something about it immediately. (Regulation)
15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels. (Absorption)

Stephanie Manasse, M.S.

EDUCATION

<p>Drexel University Ph.D., Clinical Psychology Advisor: Evan Forman, Ph.D.</p>	<p>2012 - 2017 Philadelphia, PA</p>
<p>University of California, Berkeley Bachelor of Arts, Psychology</p>	<p>2004 - 2008 Berkeley, CA</p>

RESEARCH SUPPORT

2015-2017	Ruth L. Kirschstein National Research Service Award (F31), National Institute of Mental Health, Direct costs: \$86,340 <i>Novel Assessment of Affective Distress Intolerance in Binge Eating</i>
2016	Academy of Eating Disorders Student Research Grant, \$1000
2013	Graduate Student Research Grant, Psi Chi, \$1500
2013	Junior Scientist Fellowship, American Psychological Association of Graduate Students (APAGS)/Psi Chi, \$1000

HONORS AND AWARDS

2017	Exceptional Student Award, Department of Psychology, Drexel University
2017	Honorable Mention, University-Wide Outstanding Promise Award, Drexel University
2017	Outstanding Promise Award, Drexel University College of Arts and Sciences
2015	International Travel Award, Drexel Office of International Programs, \$750
2015	Graduate Student Research Excellence Award, Drexel University, \$500
2014	Early Career Investigator Award, The Obesity Society, \$1000
2014	Graduate Student Researcher Award, Association for Behavioral and Cognitive Therapies
2014	Adelaide M. Delluva Student Travel Award, Association for Women in Science – Philadelphia Chapter, \$500
2014	Meritorious Abstract, Society for Behavioral Medicine Annual Meeting
2013	Conference Travel Fellowship, Psi Chi, \$1000
2012-2014	Provost Fellowship, Drexel University, \$10,000

OTHER ACCOMPLISHMENTS

- 27 total publications, 25 peer-reviewed, 2 book chapters
- Seven first-author publications
- 69 conference oral and poster presentations

