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Mindfulness and rumination as predictors of persistence with a distress tolerance task

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ABSTRACT

Distress tolerance (DT) is a proposed transdiagnostic factor in psychopathology, yet sources of individual differences in DT are largely unknown. The present study examined mindfulness and rumination facets as predictors of persistence on a standardized DT task (mirror tracing). Acting with awareness (a facet of mindfulness) and reflection (a potentially adaptive form of rumination) predicted increased DT. Increased task-induced skin conductance reactivity predicted decreased DT. These results held after controlling for task skill and subjective and heart rate reactivity. Together, these results suggest that teaching skills to promote mindful awareness and reflection hold promise as interventions to enhance DT.

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1. Introduction

Distress tolerance (DT), or the ability to withstand unpleasant internal states elicited by a stressor, has been linked to several forms of psychopathology (Leyro, Zvolensky, & Bernstein, 2010). DT is operationalized behaviorally as persistence with challenging, unpleasant laboratory tasks. Lower persistence is demonstrated by individuals with major depression (Ellis, Vanderlind, & Beevers, 2013), adolescent self-injurers (Nock & Mendes, 2008), and individuals with borderline personality disorder (Bornovalova et al., 2008). Furthermore, the clinical utility of these tasks has been demonstrated in studies showing that lower persistence is associated with substance use relapse (Brown, Lejuez, Kahler, & Strong, 2002) and premature attrition from substance use disorder treatment (Daughters et al., 2005; MacPherson, Stipelman, Duplinsky, Brown, & Lejuez, 2008). Despite the promise of DT as a clinically useful construct, there remains a need for more research to clarify the nomological net of constructs that relate to DT (Leyro et al., 2010). The primary goal of the present study is to examine facets of mindfulness and rumination as two individual differences that may impact DT, as indexed by persistence with the Mirror Tracing Persistence Task Computerized Version (MTPT-C; Strong et al., 2003).

Mindfulness involves attending to one's present internal and external experience in a non-judgmental and accepting manner (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Rumination is a response to distress characterized by repetitive focus on symptoms, causes, and consequences of one's distress (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). A recent laboratory study of individuals diagnosed with borderline personality disorder found that those who were randomly assigned to a brief mindfulness exercise following a negative mood induction demonstrated greater DT than those assigned to a rumination procedure (Sauer & Baer, 2012). This study is noteworthy as few published studies have demonstrated that an experimental manipulation impacts DT persistence (Leyro et al., 2010); however, one question raised by this study is the degree to which results were due to salutatory effects of mindfulness, deleterious effect of rumination, or both. As such, an informative complementary approach to experimentally manipulating mindfulness and rumination is to examine individual differences in these constructs as predictors of distress and DT. However, direct comparisons of individual differences in mindfulness and rumination as predictors of behavioral DT have yet to be reported.

Both mindfulness and rumination are multi-dimensional constructs. An initial mindfulness questionnaire—the Mindful Attention and Awareness Scale (MAAS: Brown & Ryan, 2003)—captures a single dimension: present-focused attention and awareness in daily activities. A subsequent factor-analysis derived measure, the Five Facet Mindfulness Questionnaire (FFMQ: Baer et al., 2006), captures this construct in the "acting with awareness" subscale, and also includes subscales to assess nonjudgmental acceptance of experiences and non-reactivity to internal experiences. Similarly, a factor analysis study revealed two factors in the widely-used self-report measure of rumination, the Response

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Styles Questionnaire (RSQ, Nolen-Hoeksema & Morrow, 1991); one factor called brooding emphasizes passively focusing on symptoms of distress, whereas reflection emphasizes active efforts to gain insights into one's problems (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Both factors of rumination are typically correlated with depression in cross-sectional analyses with brooding showing stronger associations (Nolen-Hoeksema et al., 2008). Brooding is also associated with increased depression prospectively, whereas reflection predicts decreased depression over time (Treynor et al., 2003). Thus, reflection may be a more adaptive form of rumination. Through the use of multi-dimensional measures of mindfulness and rumination, the present study allows for greater specificity in understanding which elements of each constructs are most relevant for DT, which in turn may help guide more targeted clinical interventions.

Individual differences in mindfulness have been associated with persistence with difficult laboratory tasks. In a laboratory study with both clinically-anxious and non-anxious participants (Arch & Craske, 2010), persistence with a CO_2 challenge task was predicted by higher mindful attention and awareness, as measured by the MAAS. In a college student sample (Evans, Baer, & Segerstrom, 2009), persistence with a difficult anagrams task was predicted by two facets of FFMQ, non-judgment and non-reactivity to internal experiences. Acting with awareness showed a small, marginally significant association with persistence ($r = .15$) similar in magnitude to non-judgment ($r = .17$, $p < .05$) and non-reactivity ($r = .21$, $p < .05$). We did not examine or observe and describe FFMQ scales in the present study as Evans et al. (2009) found they were virtually uncorrelated with persistence.

Research to date has yet to directly examine the association of trait rumination and DT; however, experimentally-induced rumination produces impaired goal-directed behavior and problem-solving generally (Nolen-Hoeksema et al., 2008). Brooding and reflection may have divergent effects on persistence in the face of stress. Specifically, reflection is positively associated with self-reported active coping styles; whereas brooding is correlated with coping through goal disengagement (Burwell & Shirk, 2007; Marroquín, Fontes, Scilletta, & Miranda, 2010). The present study tested whether these rumination facets predicted persistence with a laboratory stressor in a manner consistent with findings on self-reported coping styles in daily life.

As an exploratory aim, we also examined whether stress-induced physiological arousal influences DT persistence. DT tasks produce increases in skin conductance levels (SCL) (Ellis et al., 2013; Lejuez, Kahler, & Brown, 2003; Nock & Mendes, 2008). Prior studies typically report such increases as a validity check (i.e., to show that the task is arousing) or a dependent variable. For instance, adolescents who self-injure show greater SCL reactivity during a DT task (Nock & Mendes, 2008); whereas, individuals with major depression show a blunted SCL response (Ellis et al., 2013). However, the association between sympathetic arousal and task persistence has received little attention to date. Furthermore, heart rate (HR) response to DT tasks is less clear. HR has been shown to have a less robust increase than SCL to DT tasks (Lejuez et al., 2003) and may actually decrease when performing the MTPT-C (Ellis et al., 2013).

We hypothesized that higher levels of the mindfulness facets of acting with awareness, non-judgment, and non-reactivity would predict greater DT persistence (Arch & Craske, 2010; Evans et al., 2009). We also predicted that brooding would negatively correlate with persistence whereas reflection would correlate positively with persistence (Burwell & Shirk, 2007; Marroquín et al., 2010). In addition, we performed follow-up analyses controlling for two potentially confounding factors that may also impact task persistence: task skill and task-induced stress reactivity assessed with subjective and objective (SCL and HR) measures.

2. Methods

2.1. Sample

One-hundred female undergraduates attending a woman's college participated in a single laboratory session in exchange for course credit. Due to technical problems, psychophysiological data were not recorded for three participants and task skill data were not recorded for one. Analyses were performed on the remaining sample [$N = 96$, Age $M = 20.50$ (4.14); 76.0% White, 11.5% Asian/Pacific Islander, 4.2% Black/African-American, 7.3% circled multiple ethnicities or "Other"; 92.7% non-Hispanic, 6.3% Hispanic, 1.0% left this item blank].

2.2. Measures

Three facets of mindfulness were assessed with the FFMQ (Baer et al., 2006): (1) acting with awareness (8 items, $\alpha = .87$) measures the tendency to act in a conscious, deliberate, non-automatic manner and to concentrate on present moment experiences, (2) non-judging (8 items $\alpha = .92$) measures the tendency to accept one's thoughts/feelings without judging them as good or bad, and (3) non-reactivity (7 items, $\alpha = .76$) assesses the tendency to allow thoughts/feelings to enter and pass through awareness without reacting to or becoming absorbed by them. Items are rated on a scale of 1 ("never or very rarely true") to 5 ("very often or always true"). All three scales uniquely predict psychopathology symptoms (Baer et al., 2006).

Two facets of rumination were measured with the RSQ (Nolen-Hoeksema & Morrow, 1991; Treynor et al., 2003). Brooding (5 items, $\alpha = .74$) taps passive rumination on negative mood and personal shortcomings whereas reflection (5 items, $\alpha = .71$) describes active efforts to understand one's negative feelings. Items are rated on a scale of 1 ("almost never") to 4 ("almost always").

Distress tolerance (DT) was assessed with the Mirror Tracing Persistence Task Computerized Version (MTPT-C; Strong et al., 2003). The task requires participants to move a red dot with a computer mouse along the lines of three different geometric shapes presented on a computer monitor. The dot moves in the opposite direction of physical movement, simulating tracing the image in a mirror. All participants used their left hand to avoid interference in psychophysiological recordings taken from the right hand and arm. Each error—moving the red dot off the shape or a hesitation in movement of 2 s or more—was accompanied by a loud buzzer sound and resulted in having to return to the beginning of the shape. Participants first completed two relatively simple shapes (a line, L-shape) with a 60 s time limit. Next, a 30 s latency period occurred during which participants viewed a message on the screen indicating the final shape will be difficult. Participants then were asked to trace a difficult star shape. Participants were told that they could discontinue the task by pressing any key on the keyboard. They were instructed to use their maximum effort to attain the highest score they could and discontinuing early would affect this overall score. Consistent with prior studies assessing the association of task persistence with psychopathology (Ellis, Fischer, & Beevers, 2010; Nock & Mendes, 2008) and mindfulness (Arch & Craske, 2010; Evans et al., 2009), no monetary incentive for persistence was provided. All participants who did not terminate after 5 min were stopped by the experimenter and told that they could continue to the next portion of the study. DT was assessed by persistence, defined as the time (s) spent until discontinuing the third shape. Skill was assessed by two behavioral measures: (a) total time spent on shapes 1 and 2 and (b) number of errors on shape 3 divided by number of seconds spent on this shape (cf. Bornovalova et al., 2008). A log10 transformation was ap-

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