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Abstract

Objectives: Mindfulness has been linked to better emotion regulation and more adaptive responses to stress across a number of studies, but the mechanisms underlying these links remain to be fully understood. The present study examines links between trait mindfulness (Five Facets of Mindfulness Questionnaire; FFMQ) and participants' responses to common emotional challenges, focusing specifically on the roles of reduced avoidance and more self-distanced engagement as key potential mechanisms driving the adaptive benefits of trait mindfulness.

Methods: Adults ($n = 305$, age range: 40-72) from the Second Generation Study of the Harvard Study of Adult Development completed two laboratory-based challenges – public speaking combined with difficult math tasks (the Trier Social Stress Test) and writing about a memory of a difficult moment. State anxiety and sadness were assessed immediately before and after the two stressors. To capture different ways of engaging, measures of self-distancing, avoidance, and persistent worry were collected during the lab session.

Results: As predicted, individuals who scored higher on the FFMQ experienced less anxiety and persistent worry in response to the social stressors. The FFMQ was also linked to less anxiety and sadness when writing about a difficult moment. The links between mindfulness and negative emotions after the writing task were independently mediated by self-distanced engagement and lower avoidance.

Conclusions: Affective benefits of trait mindfulness under stress are associated with both the degree and the nature of emotional engagement. Specifically, reduced avoidance and self-distanced engagement may facilitate reflection on negative experiences that is less affectively aversive.

Keywords: mindfulness, emotional engagement, self-distancing, avoidance, stress

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Everyday life is filled with emotional challenges. Some of them, like thinking about a

recent event that did not go well, occur largely in private; others, like performing a challenging

task in front of others, are more social. Being able to navigate these kinds of everyday emotional

challenges is fundamental to both physical and mental wellbeing (e.g., Penley et al., 2002).

Understanding why people vary in their ability to manage negative emotions in challenging

contexts is a critical research goal. Trait mindfulness, or the tendency to attend to present

experiences without judgment (Kabat-Zinn et al., 1985), has been linked with less negative

emotional reactivity, more effective emotion regulation, and quicker recovery from stress

(Brown & Ryan, 2003; Chambers et al., 2009). However, much remains to be understood about

the mechanisms underlying the adaptive benefits of trait mindfulness and approaches to

measuring this multifaceted construct. Much of the empirical inquiry into the benefits of

mindfulness has focused on mindfulness as a set of skills cultivated through formal training, or

as a strategy enacted on demand in a laboratory setting. Less, however, is known about how

individual differences in trait mindfulness may shape individuals' affective responses to stressors

commonly encountered in everyday life.

There is evidence that mindfulness promotes a particular way of engaging with

emotionally challenging experiences, which may account for some of the positive effects of trait

mindfulness on individuals' responses to stress (Arch & Craske, 2006). The adaptive benefits of

engaging with one's emotions, memories, and thoughts have been emphasized by social

scientists from a wide range of theoretical perspectives (e.g., Foa & Kozak, 1986; Hayes et al.,

2004). However, it has also been noted that attempts to engage with and analyze discomforting

experiences can give rise to profound emotional distress (e.g., Kross & Ayduk, 2011). Feeling

crushed under the weight of one's own emotions, individuals often seek to "push away" their

negative feelings and thoughts (Kashdan et al., 2006). Such avoidance may in turn lead to

ruminative patterns of negative thinking and difficulty moving on from discomforting

experiences, further exacerbating negative feelings instead of alleviating them (Kashdan et al.,

2006). Consistent with these observations, avoidance has been shown to be a risk factor for a

wide range of maladaptive outcomes (e.g., Kashdan et al., 2006; Waldinger & Schulz, 2015), and

identifying effective ways of reducing avoidance has become the focus of much empirical and

clinical research (Hayes et al., 2004). Avoidance is often driven by discomfort with negative

emotions (Kashdan et al., 2006), which is why it is especially important to identify the factors

that may promote engagement with negative experiences without becoming overwhelmed.

The use of mindfulness practices has been linked to reductions in avoidance-related

regulatory strategies (e.g., Miller et al., 1995; Weinstein et al., 2009). Questionnaire-based

studies have also established links between trait mindfulness and reflective styles characterized

by less rumination (Brown & Ryan, 2003). One challenge for researchers has been agreeing on

exactly what the key features of trait mindfulness are and how they can be measured. There have

been fruitful efforts to identify commonalities across different instruments that assess the trait-

like properties of mindfulness (Baer et al., 2006; Park et al., 2013). The Five Facets of

Mindfulness Questionnaire (FFMQ; Baer et al., 2006) was developed out of these efforts, and

research suggests that the five facets may relate differentially to emotional and mental health

outcomes (for a meta-analysis, see Mattes, 2019). Examining the associations between

mindfulness and regulatory strategies at both the composite scale level and the facet level can

shed valuable light on the links between avoidance-related regulatory strategies and trait

mindfulness. One possibility is that skills or behaviors that are part of trait mindfulness – such as acceptance and non-reactivity – allow individuals to engage with negative experiences without becoming overly focused on self-relevant aspects of the experiences (Shepherd et al., 2016). One such form of engagement is known as self-distanced engagement (Kross et al., 2009), and it may protect individuals from getting caught in cycles of recurrent negative thinking and worry.

Self-distancing is conceptually related to decentering, which involves shifting one's perspective on experiences from close and personal to observing and non-judgmental (Fresco et al., 2007). Decentering is often conceptualized as a general metacognitive ability that allows more mindful individuals to view their thoughts as transient mental events, and it underlies some of the emotional benefits of mindfulness, such as reductions in emotional distress and depressive symptoms (see Bernstein et al., 2015 for a review). Self-distancing is more narrowly defined as a strategy that may be especially advantageous when used to reflect on negative past experiences (Ayduk & Kross, 2017). There is emerging evidence showing that the ability to maintain a distanced perspective on one's experiences might be an important component of decentering (Gecht et el., 2014). Limited evidence also points to links between self-distancing and mindfulness (Hussain et al., 2020; Shepherd et al., 2016). Less, however, is known about spontaneous self-distancing as a potential mechanism driving the adaptive benefits of trait mindfulness under stress. Part of the reason for this may be due to the fact that the research on the links between mindfulness and responses to stress has focused largely on individuals' responses to social stressors (e.g., TSST, Kirschbaum et al., 1993). In contrast, the study of self-distancing and other forms of emotional engagement has typically focused on engagement in the context of more private emotional challenges that require sustained attention to discomforting experiences (e.g., reflecting on a negative event, Kross & Ayduk, 2008). Bridging the gap

between the two literatures is a critical step for gaining a more comprehensive understanding of the adaptive benefits of trait mindfulness across stressors.

The potentially adaptive role of taking a step back, or distancing oneself, when faced with distressing emotions has been highlighted for decades in cognitive therapies for depression (e.g., Beck et al., 1979). According to Beck, "one of the central advantages of these [cognitive] techniques is that the patient learns to 'distance' himself from his thoughts; that is, he begins to view his thoughts as psychological events" (Beck et al., 1979, p. 157). Psychological distancing in the context of private reflections on past negative experiences or potential future stressors has received renewed attention from the research community in recent years. Ayduk and Kross (2008) contrasted two approaches to engaging with these private emotional challenges. The first is a self-distanced approach, in which individuals view themselves, their experiences, and their feelings from a removed, third-person perspective, while focusing on more objective components of the situation (Ayduk & Kross, 2010; Kross & Ayduk, 2008). The second is a self-immersed approach, in which individuals view their experiences as close and personal and focus predominantly on self-relevant aspects of the experiences.

Experimental studies have shown that adopting a self-distanced rather than a self-immersed approach to reflecting on negative experiences results in lower affective and cardiovascular reactivity (Ayduk & Kross, 2008; Kross & Ayduk, 2008). Self-distancing is conceptualized as being different than other forms of perspective-shifting, such as meta-awareness and cognitive defusion (Berstein et al., 2015; Travers-Hill et al., 2017) and pathological processes that involve more extreme versions of distancing from one's experience, such as dissociation and depersonalization (Kross & Ayduk, 2009). Some have wondered whether self-distancing may be a form of avoidance (e.g., Berntsen et al., 2003), but initial

evidence suggests it is distinct from avoidance, and that it is the emotionally-engaging qualities of self-distancing that explain its positive effects on responses to stress (Ayduk & Kross, 2010). Specifically, it has been shown that individuals who report spontaneously self-distancing while reflecting on a negative autobiographical memory tend to report less use of avoidance-related regulatory strategies (Ayduk & Kross, 2010). It has also been demonstrated that self-distancing, but not avoidance, reduces the experience of depressed affect and rumination after reflecting on a negative experience (Kross & Ayduk, 2008).

Most of the evidence for the adaptive benefits of self-distancing comes from experimental studies in which participants are instructed to self-distance or self-immerse by adopting a "fly on the wall" perspective (self-distancing) or trying to relive the experience (self-immersion; e.g., Kross & Ayduk, 2008). Other strategies encourage participants to imagine spatial distance between them and the event (Williams & Bargh, 2008) or ask them to imagine themselves in near or distant future (temporal distance; e.g., Liberman et al., 2002). There is evidence that spontaneous (i.e., naturally occurring variations across people in) self-distancing has adaptive benefits as well (e.g., Ayduk & Kross, 2010; Grossman & Kross, 2010) but these individual differences have received less study. Little is known about what shapes individual differences in the tendency to self-distance when reflecting on challenging experiences.

Individuals in the present study were asked to respond to two common but distinct emotional challenges – (1) being judged while talking about oneself and completing a challenging mental arithmetic task, and (2) reflecting on a memory of a difficult moment in one's life. Building on the existing literature, we hypothesized that individuals with higher levels of trait mindfulness (as assessed by the FFMQ) would report lower levels of anxiety and less persistent worry following the social stress task. In the context of being asked to privately reflect

on a challenging moment, we tested a mediation model that posits that spontaneous self-distancing and reduced avoidance are two mechanisms driving the potentially adaptive affective benefits of trait mindfulness. We also conducted a series of exploratory analyses. Recognizing that the construct of trait mindfulness is complex and multifaceted, we conducted a set of analyses in which we tested all main hypotheses using each of the five facets independently. We also examined linguistic markers of emotional engagement in the writing task. Summaries of all exploratory analyses are available in the online supplement.

Method

Sample

The sample consisted of 305 participants (47.4% male, 52.6% female), aged between 40 and 72 years (M=59.78, SD=6.40), drawn from the Second Generation Study of the Harvard Study of Adult Development (Morrill et al., 2019). Reflecting their status as children of poor inner-city Boston residents and Harvard University students from the 1930s and 1940s, almost all (98.4%) were Caucasian. Participants in the present study came from 216 families, with an average of 1.41 (SD=.91) siblings per family. At the time of assessment, a total of 186 participants (60.98%) reported being married or in a marriage-like relationship, and 22 additional participants reported living with someone but not in a marriage-like relationship. The participants reported a median income of between $50,000 and $85,000 per year. Participants who took part in the lab visit that is the source of data for this study were demographically representative of the larger Second Generation Study sample. Lab participants did not differ from the larger sample in their age, gender, race, annual income, or trait mindfulness. Some individuals ($n = 26$) participated in the lab session but did not complete the Trier Social Stress Test (TSST; Kirschbaum et al., 1993). Five participants refused to participate in the TSST, two

were screened out due to worries about exacerbating psychiatric conditions, and 19 were

screened out after initial testing revealed high baseline blood pressure (systolic >165 mmHg or

diastolic >100 mmHg) that raised health concerns about stressing these participants. There were

no statistically significant differences on any of the key study variables between the lab

participants who completed the TSST and those who did not. Four participants did not complete

the writing task. There was a small amount of additional missing data (fewer than 8 participants

at any time point) on some study variables (anxiety, sadness, self-distancing, avoidance, and

mindfulness). Full-information maximum likelihood procedures were used to account for these

missing data in all correlational and regression analyses.

Procedures

As part of the Second Generation Study, participants were invited for an in-person

laboratory visit collecting data on physical health (e.g., blood pressure, body mass index),

functional health measures (e.g., mobility), and reactions to emotional challenges (e.g., Trier

Social Stress Test). Prior to the laboratory visit all participants completed questionnaires, which

included the Five Facets of Mindfulness Questionnaire. Remuneration was $75 for the laboratory

visit portion of the study.

Following an informed consent procedure, physical health assessments, and collection of

functional health measures, participants were guided through the Trier Social Stress Test (TSST)

in which they were asked to prepare (for 3 minutes) and present (5 minutes) a speech about

themselves, and to complete a series of mental arithmetic tasks (5 minutes). The TSST protocol

was slightly modified in this study to accommodate limited space in the lab. Instead of several

judges being present in the same room as the participant, a video call was set up between the

participant who was alone in the room and a trained judge in a different room. After the 3 minute

preparation period, the participant filled out the pre-TSST mood questionnaire. The computer

screen was then turned on and the judge on the screen instructed the participant to start the

speech and to continue talking until told to stop. Mental arithmetic tasks were initiated

immediately after the speech and terminated after 5 minutes. The participant completed the mood

questionnaire at the end of the mental arithmetic portion of the TSST, and an experimenter then

returned to take blood pressure readings. At the end of the 10-minute recovery period, the

participant completed the persistent worry questionnaire, after which the experimenter debriefed

the participant on the purpose of the TSST. Participants were told that the tasks were meant to

induce a temporary feeling of stress and informed that most people find the TSST quite

challenging, and that they did well. After that, participants were offered an optional break.

In the Expressive Writing Task, participants were asked to write for 10 minutes about a

time that stands out as a low point in their lives (adapted from The Life Story Interview,

McAdams, 2008). Mood Ratings (anxiety and sadness) were collected immediately before and

after the writing task. Right after completing the expressive writing task, participants completed

items describing how they engaged in the task. These items asked participants to report how

much they self-distanced and avoided while writing about the low moment. In contrast, anxiety

and sadness questions administered before and after the writing task asked participants to report

how anxious and/or sad they felt in that moment.

Measures

Mindfulness. Trait mindfulness was assessed using the short version of the Five Facets

of Mindfulness Questionnaire (FFMQ-SF, Bohlmeijer et al., 2011). The FFMQ-SF, like the

larger FFMQ (Baer et al., 2006) measures five facets of mindfulness: Observing (e.g., *I pay

attention to sensations, such as the wind in my hair or sun on my face, α=.77*), Describing (e.g.,

I'm good at finding words to describe my feelings, α=.85), Acting with Awareness (e.g., *I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted* (R), α=.81), Non-Judging (e.g., *I tell myself I shouldn't be feeling the way I'm feeling* (R), α=.81), and Non-Reactivity (e.g., *When I have distressing thoughts or images I am able just to notice them without reacting, α=.73;* Bohlmeijer et al., 2011). Each facet is captured by 5 items, except for Observing, which is measured with 4 items, with a response scale ranging from 1 = *never or very rarely true* to 5 = *very often or always true.* Total mindfulness scores ranging from 24 to 120 were derived by summing scores on all 24 items after reverse-scoring as needed. Higher scores represent higher levels of trait mindfulness. Previous studies provide evidence for internal consistency, convergent validity, and discriminant validity (Baer et al., 2006; Bohlmeijer et al., 2011). In the present study, the FFMQ-SF had a high level of internal reliability, α=.87.

Mood Ratings (Anxiety and Sadness pre- and post-lab stressors). A self-report measure developed by Tamir et al (2007) was used to assess anxious and sad states before and after the two types of stressors. Participants were presented with two separate triplets of emotion descriptors and asked to indicate the extent to which they felt each triplet at the time. The anxious triplet included "anxious/worried/fearful" and the sad triplet included "sad/depressed/down." Each item was rated on a scale of 1 = *not at all* to 7 = *very much.*

Persistent Worry following the TSST. To assess the degree to which participants continued to experience negative thoughts and worry about their performance after the speaking and math tasks, a measure of Persistent Worry was introduced. Persistent worry was measured after the 10-minute recovery period following the TSST and consisted of two items rated on a scale of 1 = *not at all* to 5 = *a lot* each: (1) "During this period of sitting quietly, how much did you find yourself having negative thoughts about the speech you gave or the math problems?"

and (2) "During this period of sitting quietly, how much did you find yourself having worries or experiencing stress about the speech you gave or the math problems?" An overall persistent worry score was derived by calculating the average of the two items ($r = .75$).

Avoidance during the Writing Task. Avoidance of memories associated with the low moments was measured by one self-report item (adapted from White et al., 2015) administered immediately after the writing task: "When I was first asked to remember this event, I tried not to think about it," with the scale ranging from 1 = *completely agree* to 7 = *completely disagree*. The scale was reversed prior to data analysis so that higher scores corresponded to higher avoidance.

Self-Distancing during the writing task. Self-distancing was measured by four items adapted from White et al (2015): (1) "When you thought about the event a few moments ago, how much did you feel like you were seeing it through your own eyes versus watching the event happen from a distance?", (2) "How far away from the event did you feel?", (3) "How much did it feel real or imagined?", and (4) "When you thought about the event a few moments ago, how long ago did it feel like the event happened?" Each item was rated on a scale of 1 to 7. The reliability of the 4 items was low ($\alpha = .58$). Removing items 1 and 3 (that measure how *real* the event felt) resulted in an improved reliability of $\alpha = .70$. As a result, items 2 and 4 (that measure how *far away* the event felt, thus focusing on psychological distance more directly) were averaged together to create the combined self-distancing score.

Data Analyses

Participants in the present study consist of siblings nested in 216 families. Such nesting can create dependencies in the data that may bias the estimates of standard errors and statistical significance. Preliminary analyses revealed that there was little family-level variation on most of the key study variables (see the intraclass correlation coefficients (ICCs) in Table 1) except for

avoidance, in which 37.4% of the total variation was due to variation at the family level (or being siblings). Moreover, calculation of the square root of the design effect (Muthén & Satorra, 1995), which is a function of the ICC and the average cluster (or family) size, for each variable in the present sample shows that estimates of standard errors for analyses involving avoidance could be biased by as much as 7.3%.

To address the potential biasing effect of the nested nature of the sample, we examined all hypotheses using two different analytic techniques that account for this potential bias: (1) multilevel analyses that explicitly model and account for variation due to the clustered nature of the data and (2) standard error corrections to traditional correlational or regression approaches that account for non-independence of observations. All analyses were carried out in Mplus (Version 8, Muthén & Muthén, 1998-2017). Two-level models were fitted as random-intercepts fixed slopes models. In the second set of analyses, the ANALYSIS: TYPE=COMPLEX command in Mplus was used to adjust the standard errors. Findings are presented with the coefficients derived from both approaches. The subscript ML is used to denote estimates from multilevel analyses, and subscript SE is used to indicate estimates with standard error corrections.

Analyses showed that a minimum sample size of 244 is needed to detect small effect sizes with a .80 power. The design effect for the variable with the largest between-family variance component in this study (i.e., avoidance; DEFT=1.151) was used as a correction factor to adjust this power estimate for clustering effects, resulting in the minimum required sample size of 281. Our sample of 305 provides strong power (.94) for detection of small effects.

Results

Means, standard deviations, and bivariate correlations for key study variables are listed in

Tables 1 and 2. To examine whether the Trier Social Stress Test and the expressive writing task were successful in inducing the expected affective responses, we performed a series of paired-samples t-tests. As anticipated, the TSST induced large increases in reports of anxiety, Wald's W^2 (df) = 42.00(1), p < .001, d (within person) = .87. Similarly, there were meaningful increases in reports of both sadness, W^2 (df) = 122.60(1), p < .001, d = 1.20 and anxiety, W^2 (df) = 34.66(1), p < .001, d = 56 following the expressive writing task. Following the TSST, 96.8% of participants recovered to their baseline level of self-reported anxiety and 98.4% recovered to their baseline level of self-reported sadness. The length and content of the written responses in the low moment task suggest that participants took the task seriously and wrote about emotionally salient events. The length of participants' written responses ranged from 39 words to 771 words (M = 264.86, SD = 120.36). Common topics included major losses, illness, significant financial problems, betrayals, and personal setbacks. Age and gender were not associated with any variables of interest and so were not included as covariates in the main analyses.

Links between trait mindfulness and responses to the laboratory stressors

To test the hypothesis that higher trait mindfulness is associated with less negative emotion and fewer recurrent negative thoughts and worries following the laboratory stressors, we computed a series of correlations. Controlling for baseline anxiety, participants' total scores on the FFMQ were negatively correlated with anxiety reported after the TSST,, r_{ML}(303)=-.18, p<.01; r_{SE}(303)=-.18, p<.01 (standardized CI = [-.32, -.05] $_{ML}$; [-.30, -.05] $_{SE}$) and anxiety after the writing task, r_{ML}(305)=-.14, p = .021; r_{SE}(305)=-.14, p<.05 (CI = [-.26, -.02] $_{ML}$; [-.26, -.03] $_{SE}$). Controlling for baseline sadness, the FFMQ was also linked to post-writing task sadness, r_{ML}(305)=-.23, p<.001; r_{SE}(305)=-.22, p<.001 (CI = [-.35, -.11] $_{ML}$; [-.33, -.10] $_{SE}$).

Higher scores on the FFMQ were also associated with reports of fewer worries and

recurrent negative thoughts, $r_{ML}(303)$=-.25, p=.001; $r_{SE}(303)$=-.24, p=.001 (CI = [-.38, -.12]$_{ML}$; [-.36, -.12]$_{SE}$) following exposure to the social-evaluative stressor. Participants who reported feeling more anxious after the speech and math tasks also reported more persistent worries about their performance, $r_{ML}(303)$=.40, p<.001; $r_{SE}(303)$=.39, p<.001 (CI = [.22, .51]$_{ML}$; [.29, .48]$_{SE}$). We ran one additional analysis to examine if the negative link between the FFMQ and persistent worry was simply an artifact of a negative relationship between mindfulness and anxiety. In this analysis, we controlled for the effects of post-TSST anxiety by including it as a second predictor of persistent worry in a multiple regression model. The negative link between mindfulness and worry remained significant even after controlling for the intensity of self-reported anxiety, β_{ML}=-.149, p=.03; β_{SE}=-.141, p=.03 (CI = [-.26, -.03]$_{ML}$; [-.25, -.04]$_{SE}$). Additional analyses (see supplementary materials) show that the link between FFMQ and worry was driven largely by the Describing and Non-reacting FFMQ facets.

Links between trait mindfulness and emotional engagement with negative memories

Consistent with the notion that mindfulness is associated with greater acceptance and openness to experience, we found that individuals with higher FFMQ scores were less likely to report efforts to avoid negative memories during the writing task, $r_{ML}(305)$=-.25, p<.001; $r_{SE}(305)$=-.22, p<.001 (CI = [-.37, -.13]$_{ML}$; [-.33; -.12]$_{SE}$). All FFMQ facets except Observing were negatively correlated with avoidance when tested independently (Pearson's r range: -.15 to -.24; for more details see supplementary materials). As hypothesized, individuals who were more avoidant during the task reported more anxiety, r_{ML}=.38, p<.001; r_{SE}=.28, p<.001 (CI = [.26, .50]$_{ML}$; [.18, .39]$_{SE}$) and sadness, r_{ML}=.41, p<.001; r_{SE}=.32, p<.001 (CI = [.31, .51]$_{ML}$; [.22, .41]$_{SE}$).

Consistent with our expectations, we found that scores on the FFMQ were positively

correlated with self-distancing, $r_{ML}(305)=.27$, $p<.001$; $r_{SE}(305)=.26$, $p<.001$ (CI = [.17, .37] $_{ML}$; [.17; .36] $_{SE}$). All FFMQ facets were correlated with self-distancing when tested independently (Pearson's r range: .13 to .22; for more details see supplementary materials). Additional analyses indicated that the longer ago the event occurred, the more participants reported self-distancing when writing about the event, $r_{ML}=.31$, $p<.001$, CI=[.20, .42]. Given this association, we examined the links between self-distancing and the experience of anxiety and sadness while controlling for time since the event. Self-distancing was negatively correlated with reports of anxiety, $r_{ML}(301)=-.32$, $p<.001$; $r_{SE}(301)=-.34$, $p<.001$ (CI = [-.40, -.24] $_{ML}$; [-.42, -.27] $_{SE}$), and sadness, $r_{ML}(301)=-.38$, $p<.001$; $r_{SE}(301)=-.40$, $p<.001$ (CI = [-.46, -.30] $_{ML}$; [-.48, -.32] $_{SE}$), after expressive writing.

Self-distancing is conceptualized as a form of engagement that involves a degree of separation between individuals and their experience. In order to confirm that self-distancing is in fact a type of engagement rather than a form of avoidance, an additional correlational analysis was completed. As with mindfulness, reports of self-distancing were negatively correlated with reports of avoidance, $r_{ML}(301)=-.36$, $p<.001$; $r_{SE}(301)=-.30$, $p<.001$ (CI = [-.46, -.26] $_{ML}$; [-.39, -.21] $_{SE}$), indicating that those who reported a more self-distanced perspective on their memories were less likely to report trying to avoid thinking about the upsetting event.

Mechanisms underlying the link between trait mindfulness and responses to stress

Finally, we tested whether the links found between the FFMQ and anxiety or sadness after the writing task were mediated by both self-distancing and avoidance. We tested the full double mediation model for both sadness and anxiety (see Figures 2 and 3) using regression analyses and Monte Carlo methods (MCMAM using 20,000 repetitions: Preacher & Selig, 2012; Selig & Preacher, 2008) to estimate the significance of the total indirect effect. The relevant

emotion prior to the writing task and time since the occurrence of the low moment were controlled for in all mediation analyses. Consistent with the proposed mediation models, analyses indicated that both self-distancing and avoidance accounted for part of the link between participants' scores on the FFMQ and emotional outcomes. Each indirect effect (via self-distancing and via avoidance) independently predicted anxiety (95% CI [-.013, -.001]$_{\text{avoidance}}$; [-.011, -.002]$_{\text{self-distancing}}$) and sadness (95% CI [-.017, -.003]$_{\text{avoidance}}$; [-.019, -.004]$_{\text{self-distancing}}$). The combination of the two indirect effect accounted for 62.67% of the total effect of mindfulness on anxiety and 55.26% of the total effect of mindfulness on sadness. The indirect effects of each of the FFMQ facets on anxiety and sadness via self-distancing and avoidance were similar to and consistent with the results for the full FFMQ scale (see supplementary materials).

Discussion

The present study sought to identify correlates and active ingredients of mindfulness that may explain why trait mindfulness is linked to less negative emotional reactions under stress. We examined individuals' responses to two distinct emotional challenges: social stress evoked by public speaking and a cognitive challenge, and a private emotional encounter involving reflecting on a memory of a difficult moment in one's life. As expected, in both challenging contexts, mindfulness is linked with less emotional distress. In the context of the social stressor, mindfulness is also linked with less persistent worry following the task. In the context of the reflection about a low moment, our findings supported our hypothesized mediation model with indirect pathways through avoidance and spontaneous self-distancing accounting for a large part of the link between trait mindfulness and reduced distress.

Trait mindfulness and responses to emotional challenges

As hypothesized, individuals with higher levels of trait mindfulness as measured by the

FFMQ reported experiencing less negative emotion in response to the two challenges. These findings are consistent with past research documenting links between mindfulness and people's ability to manage negative emotions under stress (e.g., Brown & Ryan, 2003; Chambers et al., 2009). These analyses controlled for baseline emotions, suggesting that the associations observed are driven by more mindful individuals' ability to cope with acute stress rather than more general links between mindfulness and emotional wellbeing. Much of the previous work in this area focuses on the deliberate or instructed practice of mindfulness techniques. The present study adds to this literature by providing evidence that naturally occurring variations in mindfulness are systematically connected to experiencing less emotional distress following common stressors. These findings are consistent with an emerging body of research linking trait mindfulness to lower affective, cardiovascular, and neuroendocrine reactivity to acute stress and better emotion regulation (e.g., Brown et al., 2012; Martelli et al., 2018).

In addition to experiencing less emotional distress, more mindful individuals in our study showed fewer signs of performance worries and difficulty moving on from negative thoughts stimulated by the social stress task. Of note, the link between persistent worry and the FFMQ in the present study was driven largely by two facets: Describing and Non-Reacting. Unlike anxiety, which is an affective experience, worrying refers to uncontrollable chains of negative thoughts and images (Borkovec et al., 1983). Consistent with the idea that a continued focus on negative feelings and thoughts evoked by a stressor after it has terminated may stimulate additional negative affect and become part of a cycle of rumination (Ayduk & Kross, 2010; Nolen-Hoeksema et al., 2008), we found that those who had more persistent worries following the social stress task also reported more anxiety. As in other studies, both anxiety and persistent negative thinking in the present study were negatively associated with trait mindfulness (e.g.,

Brown et al., 2012). It is noteworthy that the negative link between the FFMQ and worry remained significant after accounting for the intensity of post-TSST anxiety. The fact that worrying is related to lower trait mindfulness independently of anxiety points to the importance of investigating skills and behaviors that could explain why mindful individuals are less prone to getting caught up in both negative thoughts and feelings.

What do mindful individuals do when faced with a stressor?

We found support for a mediation model in which less avoidance and greater self-distancing account for a substantial proportion of the link between higher FFMQ scores and less negative emotion after the writing task. The two indirect pathways and their roles in driving the adaptive benefits of mindful engagement are discussed in turn in the following sections.

Avoidance. As hypothesized, and consistent with previous research (e.g., Weinstein et al., 2009), we found that more mindful individuals reported less avoidance when writing about a low moment in their lives. This linkage may be reflective of higher distress tolerance and openness to experience – qualities that are core elements of mindfulness and that allow individuals to engage with discomforting memories and thoughts without getting overwhelmed by them (Bishop et al., 2004). Consistent with this idea, our findings show that participants who engaged more deeply with the memory of a low moment as compared to those who tried not to think about it (i.e., avoid) also reported less anxiety and sadness.

The connection between avoidance and the experience of anxiety is a common finding across diverse research literatures. For example, it has been shown that avoidance can exacerbate feelings of anxiety and be a risk factor for different forms of psychopathology (Kashdan et al., 2006). The fact that avoidance of negative experience in this study was associated with both higher anxiety and sadness is also consistent with transdiagnostic models of psychopathology

that highlight avoidance as a mechanism involved in a range of maladaptive behaviors (e.g.,

Waldinger & Schulz, 2015). Over the past few decades, efforts to reduce the use of avoidance

and encourage greater engagement have become central to many treatment approaches, including

cognitive behavioral therapy, acceptance and commitment therapy, and many psychodynamic

treatments (Hayes et al., 2004). A better understanding of the role that mindfulness plays in

facilitating reductions in avoidance is a critical goal for both researchers and clinicians to pursue.

Self-distancing. Findings from this study also point to important links between trait

mindfulness and spontaneous self-distancing. Parallels have been drawn before between self-

distancing and properties associated with mindfulness such as decentering and non-judgmental

attention (e.g., Ayduk & Kross, 2008; Kross & Ayduk, 2017). However, the links between

mindfulness and self-distancing have not been explored empirically. In the present study, we

found that more mindful individuals were more likely to report using a self-distanced rather than

self-immersed approach to writing about a low moment in their life. This finding suggests that

instead of focusing narrowly on self-relevant aspects of an emotionally-challenging experience –

a style which has been linked to rumination and higher levels of negative affect – more mindful

individuals are able to step back and ponder the bigger picture.

Consistent with previous studies of self-distancing and adaptive self-reflection (e.g.,

Ayduk & Kross, 2010; Kross & Ayduk, 2008), we also found that self-distanced engagement

with memories of a difficult moment was linked to the experience of less anxiety and sadness. In

addition to pointing to potentially adaptive mechanisms that flow from trait mindfulness, this

finding provides additional evidence for the emotion-regulatory benefits of spontaneous – as

opposed to experimentally induced – self-distancing. Questions about the sources of individual

differences in people's tendency to spontaneously self-distance or self-immerse have been raised

in previous studies (e.g., Grossmann & Kross, 2010; Kross & Ayduk, 2011). The tendency of

more mindful individuals in our study to spontaneously self-distance when faced with a stressor

sheds new light on these important questions.

The findings in the present study show that, despite sharing close to 13% of their

variance, both spontaneous self-distancing and (less) avoidance explain unique variance in

distress following the writing task. This pattern of findings – as well as the fact that the links

between mindfulness and self-distancing/avoidance were not driven by any one facet of the

FFMQ – is consistent with the view that the positive effects of mindfulness on stress reactivity

may stem, in part, from a particular way of engaging with emotionally challenging experiences.

Engagement characterized by increased psychological distance or a "bird's eye" view of

discomforting experiences, memories, and thoughts may help individuals reflect on and analyze

their experiences without becoming overwhelmed and turning to avoidance-related regulatory

strategies as a result. Self-distancing and avoidance together explained a large proportion of the

variance in negative emotions, which suggests that mindfulness-based interventions may be

useful in helping individuals improve their overall ability to navigate emotional challenges.

The possibility that spontaneous self-distancing and less avoidance are primary

characteristics of mindful engagement does not exclude the possibility that these processes are

also shaped in part by emotional experiences in a challenging encounter. In this study,

participants were asked to report how much they self-distanced or avoided during the writing

task and how much anxiety and sadness they felt after the task. Despite this difference in

temporal focus, these questions were posed at the same time in the lab visit, raising concerns that

part of the link between emotions and styles of engagement could be driven by current emotional

states. Kross and Ayduk (2008) suggested that the intensity of negative emotional experiences

may influence people's ability to self-distance. The degree to which individuals seek to avoid engaging with their memories and thoughts might also be driven by the intensity of negative emotions that these memories and thoughts elicit. Just like anxiety and persistent worry, it is likely that self-distancing, avoidance, and emotional responses have complex reciprocal influences, and it is important that this possibility be addressed in future research with more temporally sensitive designs. The existence of such bi-directional links would have important implications for clinical practice. In particular, it would suggest that reducing anxiety and increasing self-distancing might both be worthwhile goals to pursue when helping clients engage more adaptively with negative events.

Consistent with previous work in this area, avoidance in the present study is negatively correlated with emotional distress (e.g., Kashdan et al., 2006; Waldinger & Schulz, 2015). It is important to note, however, there is also evidence suggesting that the short-term use of avoidant strategies, such as suppression and denial, can in certain situations have adaptive advantages over more approach-oriented techniques (e.g., Dempsey et al., 2000; Ginzburg et al., 2002). This growing literature on the contextual nature of coping and adaptation has led some to speculate that self-distancing might be a form of avoidance (e.g., Berntsen et al., 2003; Coles et al., 2001). Several studies, however, have demonstrated that reports of spontaneous self-distancing are negatively correlated with reports of avoidance (e.g., Ayduk & Kross, 2010), suggesting that the two strategies are distinct. Additional evidence that self-distancing is not a form of avoidance comes from findings in the present study that self-distancing is negatively associated with avoidance, and that the mediating role of avoidance in explaining the link between mindfulness and distress is independent of the indirect pathway involving self-distancing.

Taken together, our findings highlight the idea that both the degree and the nature of

emotional engagement are linked to how much distress individuals experience in stressful situations, which makes a simplistic emphasis on "avoiding" avoidance problematic. Our findings join those of other studies in suggesting that engagement characterized by self-focus may be particularly likely to lead to avoidance and cycles of rumination than others. Like self-immersed engagement, rumination is characterized by increased self-focus and reduced ability to recognize the objective aspects of the situation. In contrast, mentally taking a step back (i.e., self-distancing) from discomforting feelings and thoughts may facilitate a deeper level of understanding and effective problem-solving (Ayduk & Kross, 2010). Forming a more complete understanding of the interplay among types of emotional engagement, rumination, and other affective and cognitive sequelae of emotional stress is a critical goal for future research.

Limitations and future directions

This study has limitations that need to be considered. One important limitation is that measures of emotional engagement (i.e., avoidance and self-distancing) were collected only for the expressive writing task. As a result, it remains unclear to what extent the mechanisms driving reductions in emotional distress following the writing task might generalize to other types of challenging contexts. In addition, measures of anxiety and sadness relied entirely on self-reports. Self-reports of emotion are subject to biases, including those related to individual differences in people's ability and willingness to recognize and label emotional states (Schulz & Lazarus, 2012). Incorporating additional indicators of in-vivo engagement and emotional reactivity (such as emotion expression, physiology, and linguistic markers) during the TSST would provide useful supplements to self-reports. Another limitation is the lack of a clear temporal separation between the collection of measures of emotional engagement and emotion reports after the writing task, which limits our understanding of the direction of influence in the mediation model.

Furthermore, being told that the TSST was meant to induce feelings of stress after the recovery period may have rekindled participants' negative emotions, which could influence their emotions in the writing task. This limitation is partially mitigated by the fact that emotions were included as control variables in the mediation analyses, and that the vast majority of participants indicated that their subjective feelings of anxiety and sadness returned back to baseline levels before the writing task. However, this does not preclude the possibility that the TSST may have shaped the contents of participants' narratives in the writing task (e.g., by making anxious memories more accessible). Finally, the participants in this study were almost entirely Caucasian, and all resided in the United States. This raises important questions about the extent to which the results from the present study would generalize to more diverse populations. It is important that future studies continue to investigate the links between different facets of mindfulness and emotional outcomes. Sequelae of emotional challenges other than the experience of negative emotion and worry should also be considered in future research. Ruminative processes, in particular, merit further attention, as do longer-term physical and mental health outcomes.

Ethical standards

Author contributions

All authors were involved in the conception and execution of this study. KP, MSS, and

KJP conducted primary analyses. KP drafted the manuscript with assistance from MSS. All

authors provided critical feedback and contributed to the final manuscript.

Data availability

Covariance matrices and other statistics sufficient to replicate the main findings are

available at https://osf.io/vj43f/

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Table 1

Descriptive Statistics and Intraclass Correlations

	N	M	SD	ICC	Cluster Size	Design Effect
Mindfulness	297	89.47	12.00	0.075	1.414	1.030
Anxiety (TSST)	279	2.39	1.60	0.108	1.354	1.040
Persistent Worry	277	1.97	1.06	0.164	1.351	1.057
Anxiety (EW)	301	2.00	1.43	0.016	1.408	1.006
Sadness (EW)	301	2.70	1.89	0.106	1.407	1.042
Self-Distancing	301	3.71	1.81	0.105	1.405	1.042
Avoidance	301	2.59	2.05	0.374	1.407	1.151

Note. TSST = Assessed after the Trier Social Stress Test; EW = Assessed after the expressive writing task.

Table 2

Zero-order Correlations of Key Study Variables Derived from Two Different Analytical Techniques

Variable	1	2	3	4	5	6	7
1. Mindfulness	—	-.27***	-.25**	-.28***	-.30***	.27***	-.25***
2. Anxiety (TSST)	-.26***	—	.40***	.41***	.32***	-.21**	.50*
3. Persistent Worry	-.24**	.39***	—	.22**	.21**	-.20**	.17*
4. Anxiety (EW)	-.28***	.40***	.22**	—	.55***	-.36***	.38***
5. Sadness (EW)	-.29***	.31***	.19**	.52***	—	-.42***	.41***
6. Self-Distancing	.26***	-.19**	-.17**	-.35***	-.41***	—	-.36***
7. Avoidance	-.22***	.17*	.17*	.28***	.32***	-.30***	—

Note. Intercorrelations derived from two-level random-intercepts models are presented above the diagonal, and intercorrelations derived from single-level models with standard error corrections are presented below the diagonal. TSST = Trier Social Stress Test; EW = Expressive Writing.
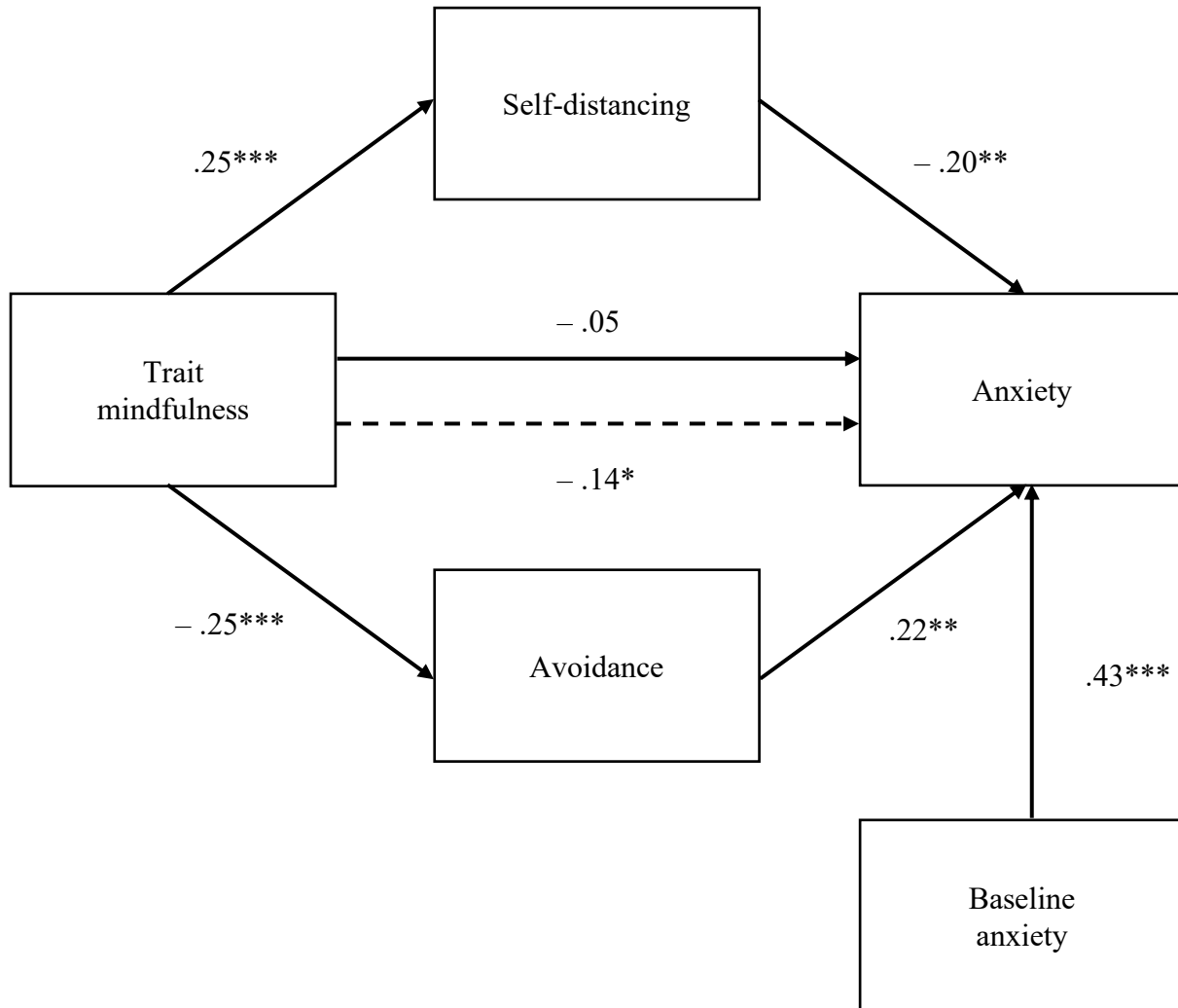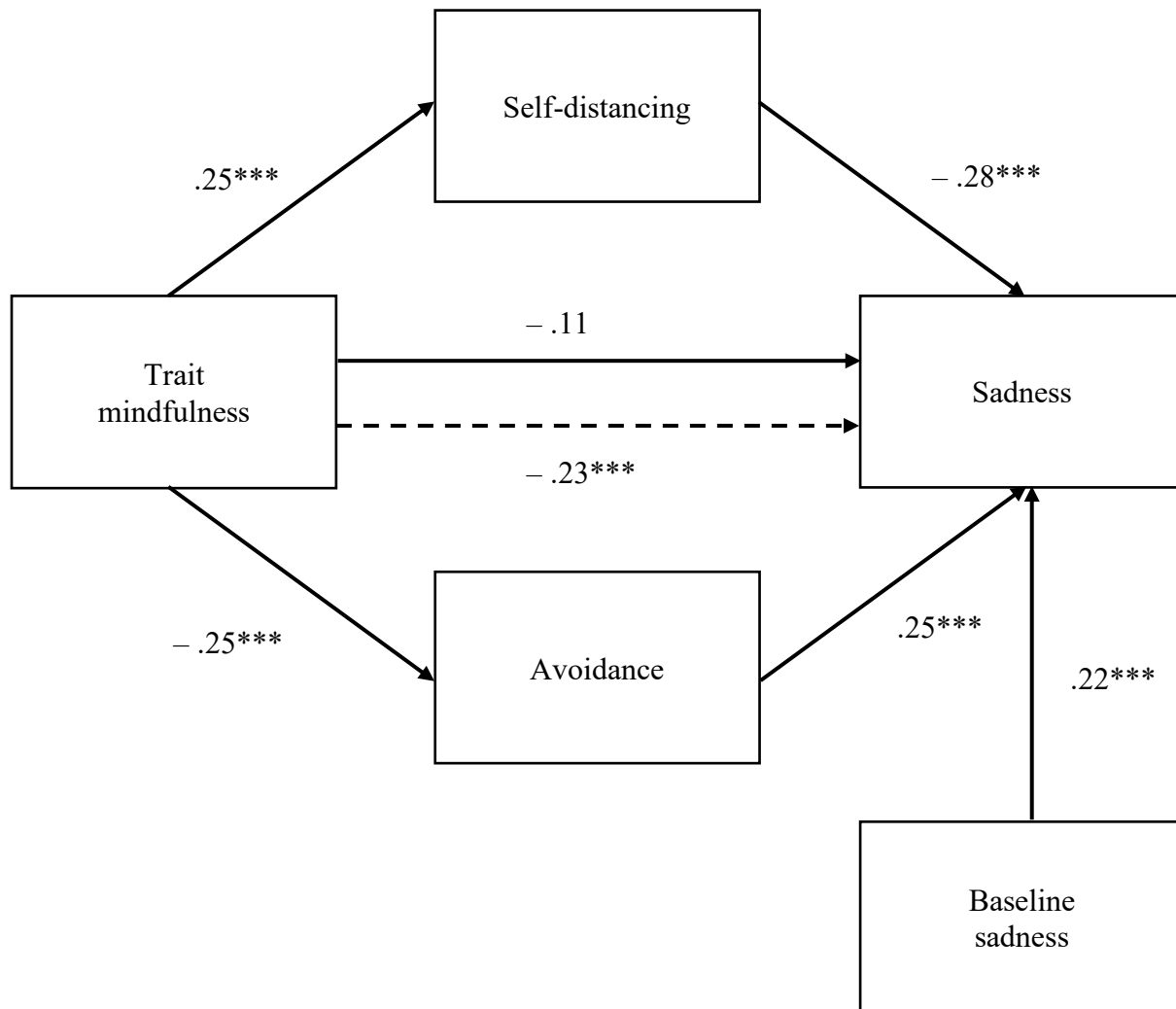
*, p<.05; **, p<.01; ***, p<.001.

Figure 1. The link between trait mindfulness and self-reported anxiety is mediated by self-distancing and avoidance, $R^2 = 30.5\%$. The hyphenated line represents the unmediated link between trait mindfulness and anxiety (controlling for baseline anxiety). Figure presents standardized coefficients derived from multilevel analyses. * $p < .05$; ** $p < .01$; *** $p < .001$.

Figure 2. The link between trait mindfulness and self-reported sadness is mediated by self-distancing and avoidance, $R^2 = 28.2\%$. The hyphenated line represents the unmediated link between mindfulness and sadness (controlling for baseline sadness). Figure presents standardized coefficients derived from multilevel analyses. * $p< .05$; ** $p< .01$; *** p<.001.