



Mindfulness as a moderator of neuroticism–outcome relations: A self-regulation perspective

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ABSTRACT

Neuroticism's prediction of negative emotional outcomes has been linked to negative reactivity tendencies. Dispositional mindfulness, defined in terms of being attentive and aware (versus not) of present-moment reality, appears to mitigate negative reactivity tendencies. The present two studies, involving 289 undergraduate participants, sought to integrate these two personality-processing perspectives. Neuroticism was an inverse predictor of mindfulness and both neuroticism and mindfulness independently predicted trait anger (Study 1) and depressive symptoms (Study 2). Of more importance, neuroticism–outcome relations were stronger (weaker) among individuals low (high) in mindfulness. The results document the role that dispositional mindfulness appears to play in moderating neuroticism's pernicious correlates. Results are discussed from personality, cognitive, emotional, social, and clinical perspectives.

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1. Introduction

Neuroticism is a robust predictor of negative emotional outcomes as diverse as depression (Clark, Watson, & Mineka, 1994), anger-motivated aggression (Wilkowski & Robinson, 2008), anxiety disorders (Hettema, Neale, Myers, Prescott, & Kendler, 2006), and somatic symptoms (Rosmalen, Neeleman, Gans, & de Jonge, 2007). In understanding relations of this type, McCrae and Costa (1991) contrasted two personality-processing views. The first *instrumental* view contends that relations of this type are likely due to the greater frequency of negative life events occurring among individuals high in neuroticism. The second *temperamental* view contends, instead, that neuroticism predicts higher levels of reactivity to negative events and that such reactivity processes are likely to be the more important factor in understanding neuroticism's outcome-related correlates.

Although McCrae and Costa (1991) did not assess relations between neuroticism and negative event frequency, they did suggest that temperament-related reactivity processes are likely to be more consequential in understanding the correlates of this trait. Other studies have provided support for this idea. Relations between neuroticism and stressor frequency have been shown to be insufficient for understanding neuroticism–outcome relationships (Headey & Wearing, 1989). For example, Bolger and Schilling

(1991) found that neuroticism predicted a greater frequency of stressors in a daily diary study, but found that neuroticism could be better modeled and understood as a predictor of *reactivity* to such stressors (also see Suls & Martin, 2005). Experimental studies have converged on the idea that neuroticism predicts greater reactivity to negative emotional inductions, with their nature and type held constant across individuals (Gross, Sutton, & Ketelaar, 1998; Rusting & Larsen, 1997). Neuroticism also predicts greater brain reactivity to negative stimuli and inductions (Canli, 2004).

Thus, a variety of sources of data link neuroticism to greater reactivity to negative events, consistent with a temperament-related view of this trait (McCrae & Costa, 1991). From a self-regulation perspective, though, there should be protective factors that mitigate such forms of negative emotional reactivity (Mischel & Ayduk, 2004; Rueda, Posner, & Rothbart, 2005). We suggest that individual differences in mindfulness are likely to have this protective function and we investigate this idea, novel to the personality literature, in two studies.

1.1. Dispositional mindfulness as a potential protective factor

Mindfulness originates from Buddhist practice, which has contrasted two modes of functioning. It is suggested that individuals often function in a “mindless” mode characterized by inattentiveness and the use of inflexible mental routines (Langer, 1989). Mindfulness, by contrast, involves paying attention to what is occurring (Epstein, 1995). More formally, mindful processing has been described as “focusing one's attention . . . on the experience occurring in the present moment” (Baer, Smith, & Allen, 2004, p.

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191). According to this definition, being attentive and aware are key to mindfulness, and this emphasis appears to be shared among multiple investigators in this emerging literature (Bishop et al., 2004; Brown & Ryan, 2004).

Based on this attention-related conception, Brown and Ryan (2003) created and validated a dispositional measure of mindfulness that holds great promise in understanding individual differences in present-focused attention, self-regulation, and well-being. Brown and Ryan found that individuals naturally differ in their tendencies toward mindful versus mindless states. As predicted, individuals scoring higher on this dispositional scale also reported higher states of mindfulness in their everyday lives. Furthermore, and of central importance here, Brown and Ryan reported several findings consistent with the idea that higher levels of mindfulness are associated with lower levels of distress, anger, and depression.

Although no prior studies have examined whether dispositional mindfulness moderates neuroticism–outcome relationships, there are theoretical and empirical precedents for this idea. Theoretically, attention and awareness are viewed as crucial components of effective self-regulation. Cybernetic theories of self-regulation, for example, view awareness of potentially problematic states of functioning as a somewhat necessary condition for controlling one's tendency toward problematic outcomes (Carver & Scheier, 1998; Powers, 2005). Specifically, to the extent that the individual is inattentive and unaware, discrepancies between current and desired states of functioning would be missed and therefore opportunities for rectifying problematic outcomes would be missed as well (Brown & Ryan, 2004).

In neuroscience terms, also, attention and awareness appear crucial to effective self-regulation (van Veen & Carter, 2006). A structure in the medial prefrontal cortex, namely the anterior cingulate cortex (ACC), responds to processing conditions in which a problematic outcome has occurred or is likely to occur in the future (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Holroyd & Coles, 2002). Activation of this structure, in turn, is tightly coupled to the recruitment of regions of the prefrontal cortex (and particularly the dorsolateral prefrontal cortex) that does the work of self-regulating problematic outcomes (Kerns et al., 2004; Miller & Cohen, 2001). Dispositional mindfulness, linked to higher levels of attention and awareness (Brown & Ryan, 2004), should therefore facilitate more effective emotion-regulation (Ochsner & Gross, 2008) and self-regulation (Robinson, Schmeichel, & Inzlicht, submitted for publication) according to this somewhat consensual neural model of monitoring and correction.

The clinical intervention literature can be cited as further support for our moderation-related hypotheses. Kabat-Zinn (1990) has conducted mindfulness-based stress reduction therapy (MSBR) for several decades now and shown that it is effective in mitigating problematic outcomes among predisposed individuals (typically, those suffering from chronic and untreatable pain). Linehan's (1993) cognitive-behavior therapy for borderline personality disorder includes multiple elements derived from Zen Buddhism and there is treatment-related evidence for the effectiveness of this therapy in preventing suicidal behavior among predisposed individuals, relative to interventions not including such mindfulness-based elements (Linehan et al., 2006).

Perhaps of most relevance to our moderation-related hypotheses are results pertaining to the effectiveness of mindfulness-based cognitive therapy for depression (Segal, Williams, & Teasdale, 2002). These authors contend that depression relapse occurs because predisposed individuals do not recognize, early enough, that they are headed for another depressive episode in the near future. Accordingly, the authors developed a mindfulness-based psychotherapy, modeled after Kabat-Zinn's (1990), seeking to teach such individuals to recognize triggers of depressive relapse early enough

that such tendencies toward relapse could be prevented. Subsequent therapy outcome studies have shown that this psychotherapy is effective in preventing depressive relapse, but *only* among individuals who have experienced three or more previous depressive episodes (Ma & Teasdale, 2004; Segal, Teasdale, & Williams, 2004).

We suggest that the results of Ma and Teasdale (2004) make sense from a temperament-related perspective. Individuals high in neuroticism are prone to negative emotional outcomes (e.g., depressive symptoms) and thus higher levels of dispositional mindfulness may be especially beneficial among such individuals. On the other hand, as individuals low in neuroticism are not temperamentally predisposed to negative emotional outcomes (Clark & Watson, 1999; Watson & Clark, 1984), levels of dispositional mindfulness may be less consequential among such individuals. Of more importance, though, we emphasize moderation-related predictions: Neuroticism–outcome relations should be stronger at low levels of dispositional mindfulness and weaker at high levels of dispositional mindfulness.

1.2. Overview of present studies

Our goal was to understand neuroticism–outcome relations and their moderation, a goal of both theoretical and clinical significance. The focus was on dispositional variables rather than manipulated ones. Neuroticism is a multi-dimensional tendency toward negative emotional dysfunction and any purported manipulation of it (e.g., in terms of a negative mood state induction) would fail to capture its multi-dimensional nature in our opinion. Mindfulness was also assessed as a dispositional tendency rather than a manipulated one, as our interest was in personality processes and it is uncertain whether short-term manipulations of mindfulness fully capture the manner in which mindfulness functions as a dispositional variable (Brown, Ryan, & Creswell, 2007; Thompson & Waltz, 2007).

We focused on two different outcomes – trait anger and depressive symptoms – for the sake of convergent validity. Both outcomes have been linked to high levels of neuroticism (Clark et al., 1994; Martin, Watson, & Wan, 2000). Both have also been linked to reactivity processes. For example, trait anger (the Study 1 outcome variable) should be conceptualized primarily in terms of reactivity to provocation rather than tendencies toward anger and aggression in the absence of such provoking conditions (Defenbacher, 1992; Wilkowski & Robinson, in press). In addition, there is evidence for inverse relations between mindfulness and both of these outcomes in the dispositional mindfulness literature (Baer et al., 2004; Brown & Ryan, 2003; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007).

Unique to the present studies was the idea that mindfulness would moderate neuroticism–outcome relations. However, other relations among the individual difference measures were first examined. The negative emotional reactivity characteristic of high levels of neuroticism may be somewhat antithetical to the development of dispositional mindfulness (Brown & Ryan, 2004) and we therefore predicted inverse relations between neuroticism and mindfulness in both studies. In zero-order correlational terms, we also predicted inverse relations between mindfulness and both of the outcome measures, results that would confirm those reported in prior studies (Brown et al., 2007) and further the case for the benefits of mindfulness in relation to such negative emotional outcomes.

Neuroticism and mindfulness, conceptually at least, are very different individual difference variables (Brown & Ryan, 2003). In addition, we build on the clinical literature in suggesting that mindfulness may reduce problematic outcomes among individuals otherwise prone to such outcomes due to their negative

temperament (Borkovec & Sharpless, 2004; Robins, Schmidt, & Linehan, 2004). If so, neuroticism and mindfulness may *independently* predict trait anger and depressive symptoms when simultaneously controlled in multiple regressions. To the extent that this is true, results would highlight the incremental validity of dispositional mindfulness in understanding outcomes typically viewed in terms of neuroticism-related processes (Clark et al., 1994; Martin et al., 2000).

With neuroticism and mindfulness controlled, we then hypothesized an interaction among these dispositional variables such that neuroticism–outcome relations would be weaker (and perhaps non-significant) among individuals high in mindfulness. Finally, to support the discriminant validity of our interactive predictions, we examined alternative potential interactions among the variables (e.g., in Study 1, whether there would be a mindfulness \times trait anger interaction in predicting levels of neuroticism). We did not expect such interactions to occur and therefore expected the results to converge on a mindfulness-as-moderator framework.

2. Study 1

Neuroticism is a robust predictor of trait anger (Martin et al., 2000) and negative emotional reactivity processes are central to understanding individual differences in anger (Wilkowski & Robinson, 2008). Because mindfulness has been linked to processes facilitating non-reactivity (Baer, 2007) and better emotion-regulation (Feldman et al., 2007), we hypothesized that higher levels of mindfulness would attenuate the neuroticism–anger relationship and that the highest levels of anger would be observed among individuals both (a) high in neuroticism and (b) low in mindfulness.

2.1. Method

2.1.1. Participants

The sample consisted of a group of 195 (115 female) undergraduate volunteers from North Dakota State University seeking extra credit. We did not collect age and ethnicity information, but such demographics are easy to characterize in general terms. The vast majority of our participant pool is of traditional college student age (i.e., 18–21) and over 90% are Caucasian in race. Of note, participant sex did not moderate the findings reported below, $F < 1$, and we therefore collapsed across this variable.

2.1.2. Measures and procedure

Neuroticism was assessed by Goldberg's (1999) 10-item scale, with many of the items referring to greater emotional reactivity (e.g., "Get stressed out easily"; 1 = very inaccurate; 5 = very accurate). This measure is reliable and correlates highly with other measures of neuroticism (Goldberg, 1999; here, α was .85). It has been validated in a number of studies (e.g., Robinson, Goetz, Wilkowski, & Hoffman, 2006; Tamir & Robinson, 2004).

Mindfulness was assessed by Brown and Ryan's (2003) 15-item dispositional measure, which was extensively validated in their original set of studies and results in a unifactorial structure (here, α was .88). The scale (1 = almost never; 6 = almost always) taps core aspects of attention and awareness to present-moment cognitions (e.g., "I forget a person's name almost as soon as I've been told it for the first time."), experiences (e.g., "I could be experiencing some emotion and not be conscious of it until some later time."), and behaviors (e.g., "I do jobs or tasks automatically, without being aware of what I'm doing."). Higher levels of attention and awareness, in turn, are thought to facilitate the beneficial consequences of a mindful mode of processing, such as non-reactivity to thoughts and experiences (Brown & Ryan, 2004).

Trait anger was assessed with Spielberger's (1988) well-validated 10-item measure (e.g., "When I get frustrated, I feel like hitting someone"; 1 = almost never; 4 = almost always; here, α was .84). The scale has extensive evidence for its validity, as it is a strong predictor of state anger following provocation (Deffenbacher, 1992), as well as other anger-linked outcomes such as aggressive driving (Deffenbacher, Huff, Lynch, Oetting, & Salvatore, 2000) and workplace anger and aggression (Hershcovis et al., 2007). Participants completed all scales on computer, using E-prime software, in one of the lab's six private computer rooms.

2.2. Results

2.2.1. Correlations among measures

As expected, neuroticism was positively correlated with trait anger, $r = .48$, $p < .01$, and negatively correlated with mindfulness, $r = -.49$, $p < .01$. We also found an inverse relationship between mindfulness and trait anger, $r = -.37$, $p < .01$. The mindfulness correlations are particularly interesting because this scale includes no items directly suggestive of negative affect. Thus, results confirm the value of viewing individual differences in negative affect from a (low) mindfulness-based perspective (Brown & Ryan, 2003).

2.2.2. Primary analyses

Neuroticism and mindfulness were significantly correlated, but we hypothesized that each would independently predict variance in trait anger. We also hypothesized that mindfulness would moderate neuroticism–anger relations. To examine both hypotheses, we performed a stepwise regression. In accord with the recommendations of Aiken and West (1991) for examining interactions among continuous variables, neuroticism and mindfulness were both centered and a neuroticism \times mindfulness interaction term was then computed. In all of the analyses reported in the paper, we refer to "predictors" as those variables that predict significant variance in the outcome measure rather than necessarily implying causal mechanisms.

In Step 1 of the regression, neuroticism was entered as the sole predictor of trait anger. Neuroticism was a significant predictor, $t = 7.66$, $p < .01$, $\beta = .50$, R^2 change = .23. In Step 2, individual differences in mindfulness were entered. With levels of neuroticism controlled, mindfulness was a significant predictor, $t = -2.52$, $p < .05$, $\beta = -.18$, R^2 change = .09. Thus, higher levels of mindfulness were associated with lower levels of anger even with the trait of neuroticism statistically controlled. In Step 3, the neuroticism \times mindfulness interaction term was then entered. As hypothesized, mindfulness moderated the predictive value of neuroticism, resulting in a significant interaction, $t = -2.29$, $p < .05$, $\beta = -.14$, R^2 change = .02.

To determine the nature and pattern of the neuroticism \times mindfulness interaction, we estimated trait anger means for those low (-1 SD) and high ($+1$ SD) in each of the components of the interaction term (Aiken & West, 1991). These estimated means are displayed in Fig. 1. The figure indicates that the highest levels of anger were found among individuals high in neuroticism and low in mindfulness, as hypothesized.

Simple slopes analyses (Aiken & West, 1991) were then performed to assess relations between neuroticism and trait anger at low (-1 SD) versus high ($+1$ SD) levels of mindfulness. Although neuroticism predicted anger at both high, $t = 3.16$, $p < .01$, $\beta = .28$, and low, $t = 5.70$, $p < .01$, $\beta = .54$, levels of mindfulness, the magnitude of the neuroticism–anger relationship was clearly more pronounced at low levels of mindfulness. This interpretation of the simple slopes was confirmed by a simple slopes comparison (Cohen, Cohen, West, & Aiken, 2003), as 95% confidence intervals for the two simple slope estimates were non-overlapping.

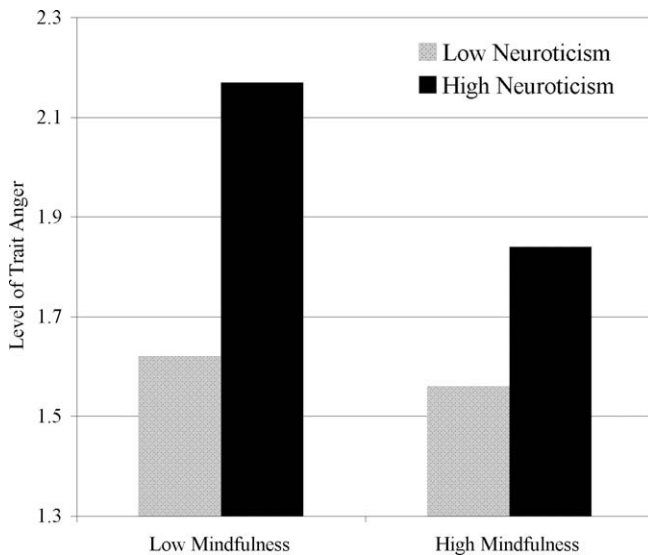


Fig. 1. Interactive effects of neuroticism and mindfulness in predicting anger, Study 1.

2.2.3. Alternative interactive models

We hypothesized that mindfulness would moderate neuroticism–anger relations, a theory-driven hypothesis that was confirmed. On the other hand, alternative moderation effects are at least statistically possible. For example, it could be that trait anger interacts with mindfulness to predict individual differences in neuroticism. Although it is difficult to envision a theoretical rationale for such a prediction, we sought to support the discriminant validity of the findings reported above by examining alternative moderation models of this type. In doing so, we used the regression-based procedures recommended by Aiken and West (1991), omitting a stepwise analysis for the sake of parsimony.

In a first multiple regression, we entered trait anger, mindfulness, and their interaction as predictors of neuroticism. The interaction term was non-significant, $t = 0.15$, $p > .85$. In a second multiple regression, we entered neuroticism, trait anger, and their interaction as predictors of mindfulness. The interaction term was similarly non-significant, $t = 0.31$, $p > .75$. Thus, mindfulness moderated the neuroticism–anger relationship, but no alternative moderation-related results characterized relations among the variables. The discriminant nature of the interactive findings thus further confirms a mindfulness-as-moderator perspective.

2.3. Discussion

Brown and Ryan (2003) made the case that mindfulness is an individual difference variable that is both novel and consequential to the personality literature. We concur with this view. For example, both neuroticism and mindfulness predicted dispositional tendencies toward anger when simultaneously controlled. Other aspects of the findings deserve note as well.

First, neuroticism was inversely predictive of mindfulness, suggesting that individuals high in neuroticism are less attentive to the moment-to-moment features of their lives. This is a fascinating finding that deserves more systematic treatment as it provides a perspective on neuroticism and how it functions that is quite different from other theories of this trait. Section 4 develops this theme further.

Second, mindfulness was inversely associated with trait anger, and this effect was independent of neuroticism. To understand this inverse relation, we point out that anger appears to be a particularly irruptive emotion that is somewhat automatically triggered

by aversive events (Berkowitz, 1993). Mindfulness may be especially beneficial in short-circuiting anger because it creates a “mental distance” between stimulus and reaction (Kabat-Zinn, 1990; Robins et al., 2004) that should be highly conducive to anger control (Wilkowski & Robinson, 2008).

Third, precisely because mindfulness should facilitate non-reactivity and non-impulsive responding (Brown et al., 2007; Feldman et al., 2007), we found that higher levels of mindfulness were beneficial at higher levels of neuroticism. Specifically, the neuroticism–anger relationship was reduced, though not eliminated, at higher levels of mindfulness. Alternative moderation-related models resulted in no significant interactions among the variables. Before making more general conclusions, we sought to conceptually replicate the results of Study 1 in a second study in which a different negative emotional outcome was assessed, which would in turn support the generality of the mindfulness-as-moderator perspective advocated.

3. Study 2

The purpose of Study 2 was to conceptually replicate Study 1. Accordingly, the same neuroticism and mindfulness measures were assessed. However, we sought to examine a different emotional outcome variable in Study 2. Anger, the focus of Study 1, is seen as an approach-related emotion (Harmon-Jones, 2003), whereas depression has been linked to low levels of approach motivation (Henriques & Davidson, 1991). In addition, anger was measured in trait-related terms in Study 1, whereas a more state-like measure of depressive symptoms was assessed in Study 2. Thus, replication across the studies would be of utility in supporting more general conclusions concerning our moderation-related hypotheses.

Moreover, Study 2’s focus on depressive symptoms establishes stronger potential ties to the clinical literature on mindfulness-based treatments. Mindfulness-based cognitive therapy has proven efficacious in the treatment of depression, both in terms of relapse rates (Ma & Teasdale, 2004) and in terms of depressive symptoms among current depression sufferers (Kenny & Williams, 2007). Yet, it is also true that such treatments were designed to help chronic depression sufferers and in fact have been shown to be more efficacious to the extent that there is a more extensive prior history of depression (Ma & Teasdale, 2004; Teasdale et al., 2000).

Such considerations can be translated to our trait-related context. Individuals high in neuroticism are temperamentally prone to depression, whereas this is not the case among individuals low in neuroticism (Widiger, Verheul, & van den Brink, 1999). Because we hypothesize that mindfulness should be especially beneficial among distress-prone individuals, we can predict that relations between mindfulness and depressive symptoms should be stronger, if not somewhat exclusive to, individuals high in neuroticism. In other words, we predicted that neuroticism and mindfulness would interact in a manner parallel to Study 1.

3.1. Method

3.1.1. Participants

The Study 2 sample consisted of 94 (49 female) undergraduate volunteers from North Dakota State University seeking extra credit. Age and ethnicity information were not collected. Participant sex did not moderate the findings reported below, $p > .05$, and we therefore collapsed responses for men and women in our analyses.

3.1.2. Measures and procedure

Neuroticism ($\alpha = .88$) and mindfulness ($\alpha = .88$) were assessed by the same scales used in Study 1. To assess recent symptoms

characteristic of depression, we administered the 22-item BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). This assessment instrument asked individuals to characterize the extent to which they had experienced relevant symptoms (e.g., 0 = “I don’t have any thoughts of killing myself”; 3 = “I would kill myself if I had the chance”) during the last two weeks ($\alpha = .93$).

The negative emotion outcome measure of Study 2 can be viewed in terms of recent experiences of dysphoria. Depressive symptoms, as assessed by the scale, though, have been shown to be of considerable utility in initial screening for major depression (Steer, Cavalieri, Leonard, & Beck, 1999). In addition, higher scores on the BDI have been linked to a number of pathological outcomes such as likelihood of suicide (Westefeld & Liddell, 1994), drug use (McCusker, Goldstein, Bigelow, & Zorn, 1995), and decreased immune function (Herbert & Cohen, 1993). Data collection procedures were identical to Study 1.

3.2. Results

3.2.1. Correlations among measures

Neuroticism was positively correlated with depressive symptoms, $r = .42$, $p < .01$, and inversely correlated with mindfulness, $r = -.48$, $p < .01$. Additionally, mindfulness and depressive symptoms were inversely correlated, $r = -.47$, $p < .01$. We regard the mindfulness correlations as especially noteworthy because the mindfulness scale makes no mention of tendencies toward negative emotional states or reactivity (Brown & Ryan, 2003). For this reason, such mindfulness-related correlations cannot be viewed in terms of item-overlap issues that can occur when a trait measure of negative affect is used to predict a more state-related measure of negative affect (for a discussion, see Gross et al. (1998)).

3.2.2. Primary analyses

Neuroticism and mindfulness were centered and a neuroticism \times mindfulness interaction term was then computed (Aiken & West, 1991). Subsequently, we performed a stepwise multiple regression to examine whether neuroticism and mindfulness predict independent variance in depressive symptoms and, also, whether they interact in doing so. In Step 1 of the regression, neuroticism was entered as the sole predictor of depressive symptom and did indeed predict such symptoms, $t = 4.39$, $p < .01$, $\beta = .45$, R^2 change = .17.

Of more importance, in Step 2 of the regression, mindfulness was a significant predictor of depressive symptoms with levels of neuroticism controlled, $t = -3.40$, $p < .01$, $\beta = -.36$, R^2 change = .09. Thus, mindfulness is protective against depressive symptoms in a manner independent of trait levels of neuroticism. In Step 3 of the regression, we then entered the interaction term, which was significant, $t = -2.12$, $p < .05$, $\beta = -.19$, R^2 change = .03. As in Study 1, then, mindfulness was a significant moderator of neuroticism–outcome relationships.

To determine the nature and pattern of the neuroticism \times mindfulness interaction, estimated means were calculated for those low (-1 SD) and high ($+1$ SD) in each of the components of the interaction term. These estimated means are graphed in Fig. 2. As shown in the figure, the highest levels of depressive symptoms were evident among individuals high in neuroticism and low in dispositional mindfulness, conceptually replicating Study 1, which found a similar interactive pattern.

As in Study 1, we conducted follow-up simple slopes analyses (Aiken & West, 1991). Neuroticism was a significant predictor of depressive symptoms at low (-1 SD) levels of mindfulness, $t = 3.25$, $p < .01$, $\beta = .44$. On the other hand, neuroticism did not predict depressive symptoms among individuals high ($+1$ SD) in mindfulness, $t = 0.78$, $p > .40$, $\beta = .10$. These simple slopes were significantly different from each other, as 95% confidence intervals

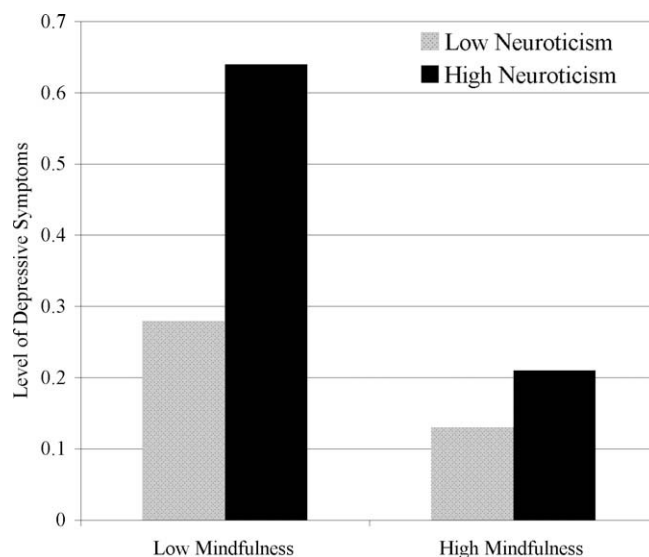


Fig. 2. Interactive effects of neuroticism and mindfulness in predicting depressive symptoms, Study 2.

for them were non-overlapping in nature (Cohen et al., 2003). To an even greater extent than in Study 1, then, the results are consistent with the idea that neuroticism predicts negative emotional outcomes particularly among individuals low in dispositional mindfulness.

3.2.3. Alternative interactive models

We sought to support the discriminant validity of our interactive findings by examining other potential moderating effects among the individual difference variables. In a first multiple regression, depressive symptoms, mindfulness, and their interaction term were entered as predictors of neuroticism and the interaction term was not significant, $t = 1.58$, $p > .10$. In a second multiple regression, potential interactive effects of neuroticism and depressive symptoms in predicting levels of mindfulness were examined. The interaction was again not significant, $t = 1.42$, $p > .15$. Thus, results highlight the particular interaction of neuroticism and mindfulness in predicting depressive symptoms relative to other potential interactions among the variables.

3.3. Discussion

Study 2 replicated Study 1 in several key respects. In both studies, neuroticism was an inverse predictor of mindfulness and a substantial one. Thus, higher levels of neuroticism appear somewhat detrimental to mindful processing concerning one’s moment-to-moment transactions with the environment. Regardless, with this overlap of neuroticism and mindfulness controlled, mindfulness was a significant and inverse predictor of depressive symptoms. Such results highlight the apparent benefits of mindfulness among otherwise distress-prone and reactive individuals, and are thus consistent with clinical perspectives on the mindfulness construct (Borkovec & Sharpless, 2004; Robins et al., 2004; Segal et al., 2004).

Indeed, Study 2 also found that neuroticism was an inconsequential predictor of depressive symptoms at high levels of mindfulness. This was an important finding because it reinforces suggestions that neuroticism is not an invariable predictor of distress or depressive symptoms in everyday life (Widiger et al., 1999). Rather, the pernicious correlates of high levels of neuroticism appear to be significantly mitigated to the extent that the individual can maintain greater attention and awareness concerning their momentary experiences.

4. General discussion

4.1. Background and findings

Mindfulness has a long intellectual history that can be traced to Buddhist meditation practices responsible for bringing attention and awareness into the present moment (Baer, 2003; Bishop et al., 2004). This mode of consciousness, in turn, is thought to render the individual less susceptible to automatic habits of mind, many of which may be problematic or self-defeating (Clark & Rhy- no, 2005; Hayes, 2004). It is thus intuitive that mindfulness-based interventions would have benefits in teaching individuals skills to overcome their problematic tendencies toward emotional distress, a hypothesis that has gained increasing support in clinical treat- ment studies in recent years (Grossman, Niemann, Schmidt, & Walach, 2004; Segal et al., 2004).

The present results extend such clinical perspectives to the per- sonality trait and personality-processing literatures. Neuroticism can be viewed in terms of negative emotional reactivity processes (Gross et al., 1998), but mindfulness has been posited to mitigate such forms of reactivity (Brown & Ryan, 2004). On the basis of such considerations, neuroticism should be a more consequential pre- dictor of negative emotional outcomes to the extent that mindful- ness is low because, in this context, the problematic consequences of high levels of neuroticism would remain largely unchecked. Sup- port for this interactive hypothesis was obtained across two differ- ent – and consequential – outcomes. Section 4 considers the wider implications of the findings and does so in relation to multiple literatures.

4.2. Understanding neuroticism from a mindfulness perspective

The fact that neuroticism predicts negative emotional outcomes is well documented (Watson, 2000). It is less certain why this rela- tionship exists and a number of explanatory models have been offer- ed. Eysenck and Eysenck (1985) suggested that neuroticism reflects limbic system activation in response to emotional events, whereas Gray and McNaughton (1996) suggested that relevant re- sults could be viewed in terms of a hypothetical “behavioral inhi- bition system” potentially centered in the hippocampus. These neural frameworks have resulted in an inconsistent pattern of find- ings (Matthews & Gilliland, 1999) and other authors have enter- tained the possibility that neuroticism is systematically related to cognitive processes favoring negative affect in attention, inter- pretation, and memory (e.g., Rusting, 1998). However, these cog- nitive-mediational frameworks have also been associated with inconsistent results in previous studies (Robinson, 2007; Rusting, 1998). At the very least, then, the processing basis of neuroticism would seem to benefit from other potential perspectives.

In fact, the models mentioned above do not appear to be suffi- cient in understanding inverse relations between neuroticism and mindfulness, which were substantial in the present studies. Why so? We suggest that the key culprit may be worry, conceptualized in terms of a negative internal dialogue concerning relatively ab- stract threats to the ego (Borkovec & Sharpless, 2004). Neuroticism and worry are closely linked (Watson & Clark, 1984). Further, that worry draws attention away from the present has been demon- strated in the test anxiety (Sarason & Sarason 1990), rumination (Siegle, Steinhauer, Carter, Ramel, & Thase, 2003), and generalized anxiety disorder (Borkovec, Ray, & Stöber, 1998) literatures. Worry may lead to greater reactivity because negative events are inter- preted as more ego-relevant and therefore problematic (Watson & Clark, 1984). Of more direct relevance here, because worry draws attention away from the present, the person becomes less flexible

and less capable of adjusting the self when problems occur (Borko- vec & Sharpless, 2004).

Indeed, the clinical literature has suggested that the most effec- tive treatments for worry may well involve techniques that render individuals more attentive to the psychological present rather than the past or future (Robins et al., 2004; Segal et al., 2004). Doing so facilitates the recognition that negative events come and go and also allows the individual to bring more flexible self-regulation strategies to daily living, precisely because problems are recog- nized as they occur (Germer, 2005). For such reasons, mindfulness may well be an antidote to worry or at least to its pernicious effects on well-being (Borkovec & Sharpless, 2004). To the extent that mindfulness can be increased, then, it is likely to be especially use- ful in averting some of the negative emotional consequences char- acteristic of high levels of neuroticism.

Given that neuroticism and mindfulness were inversely corre- lated, it is useful to consider directionality among these variables. Precursors to neuroticism appear very early in life (Rothbart, Aha- di, & Evans, 2000), even before more than rudimentary capacities for self-regulation develop (Rueda et al., 2005). Abilities related to mental control, including attention control, emerge later in life (Rothbart, Ellis, & Posner, 2004). It is also the case that neuroticism is highly stable across the adult life span (McCrae & Costa, 1994) and that effective psychotherapies targeting neuroticism-related outcomes (e.g., depressive symptoms) mitigate such outcomes to a far greater extent than they alter trait levels of neuroticism (Clark et al., 1994; Widiger et al., 1999). On the basis of such consid- erations, neuroticism is likely to undermine dispositional mindful- ness to a greater extent than mindfulness is likely to reduce trait levels of neuroticism.

4.3. Understanding mindfulness from a self-regulation perspective

According to the influential theory of Carver and Scheier (1981), effective self-regulation is seen to require higher levels of self-con- sciousness. Although this theory has performed well in under- standing situational variations in behavior (particularly those involving the presence versus absence of a mirror in the room), it has not performed well when considering dispositional measures of self-consciousness (Trapnell & Campbell, 1999). For example, higher levels of dispositional self-consciousness appear to intensify, rather than mitigate, a wide variety of psychologically disor- dered symptoms (Ingram, 1990; Mor & Winquist, 2002). Thus, there are reasons for thinking that higher levels of mindfulness should not be viewed in terms of higher levels of self-conscious- ness, narrowly considered.

In fact, Brown and Ryan (2003) found that their dispositional measure of mindfulness, the one used in the present studies as well, did not reliably correlate with either private self-conscious- ness or public self-consciousness across samples. Such null rela- tions can be viewed from three perspectives. First, the moderating role of mindfulness observed in the present studies should not be ascribed to higher levels of dispositional self-con- sciousness. Second, it appears that mindfulness is a broader con- struct than self-consciousness. Third, mindfulness may involve a different mode of awareness, one that is not self-conscious in nature, but rather characterized in terms of a “pre-reflexive” mode of processing that is perceptual rather than conceptual in nature and non-reactive for this reason (Brown & Ryan, p. 823).

Whether the latter pre-reflexive processes can be adequately captured by self-report scales is an issue of continued controversy to the mindfulness literature (Bishop et al., 2004; Germer, 2005). In any case, the present findings *cannot* be viewed in terms of higher levels of self-consciousness. Rather, we suggest that the cybernetic monitoring processes highlighted by Carver and Scheier (1981, 1998) are likely better captured by individual differences in

mindfulness than by individual differences in self-consciousness. This is an important suggestion as it argues for revisiting the role of dispositional monitoring processes, and their importance to self-regulation, highlighted by Carver and Scheier's (1981, 1998) model. We suggest that it is now possible to do so from a mindfulness-as-monitoring perspective.

4.4. Additional considerations and future directions

The general view advocated here is that mindfulness is an important, if not necessary, precursor to controlling automatic habits (such as negative emotional reactivity processes among individuals high in neuroticism) that are problematic or prone to error. If so, mindfulness and self-control should be systematically linked. Indeed, we have found quite strong correlations between Brown and Ryan's (2003) dispositional mindfulness scale and Tangney, Baumeister, and Boone's (2004) dispositional self-control scale, $r_s > .5$. Such correlations are particularly impressive given that there appears to be a low level of item overlap involved.

Nevertheless, there are precious few studies directly linking mindfulness to cognitive control. Jha, Krompinger, and Baime (2007) found that mindfulness training was associated with some benefits to the cognitive control of attention, but not all findings were supportive of this view. In the trait domain, higher levels of mindfulness have been theoretically linked to higher levels of attention and awareness (Brown & Ryan, 2004), but there are very few studies of a cognitive type supporting such predictions (Shapiro, Carlson, Astin, & Freedman, 2006). Therefore, as the literature on mindfulness develops, it will be important to link this variable more directly to the cognitive-affective processes thought to underlie it (Wallace & Shapiro, 2006).

Neuroticism is a risk factor for a wide variety of negative outcomes (Widiger et al., 1999). We suggest that many of these neuroticism-linked outcomes may be specific to neurotic individuals who are low in dispositional mindfulness. In support of this point, lower levels of attention and awareness are viewed as important in exacerbating many of the tendencies driven by negative affect, including bulimic symptoms (Heatherton & Baumeister, 1991) and pathological drinking (Baumeister, Heatherton, & Tice, 1994). Thus, we suggest that mindfulness may be generally beneficial among individuals high in neuroticism and encourage systematic research examining outcome variables aside from those examined in our two studies.

In addition, the moderating effects of mindfulness should be examined in relation to other trait–outcome relations as well. For example, individuals higher in trait anger are clearly more reactive to situational provocations (Wilkowski & Robinson, 2008). Also, impulsive individuals are vulnerable to many self-regulation failures including poor academic performance, involvement in crime, and abuse of drugs (Eysenck & Eysenck, 1985). According to the present analysis, such trait-linked outcomes, too, should be somewhat particular to individuals low in dispositional mindfulness. In short, we believe that dispositional mindfulness may play a broad role in moderating temperament-linked vulnerabilities, but more work of this type is needed.

Finally, understanding relations of the present type might well benefit from experimental studies. There are increasing suggestions that mindfulness can be effectively trained (Brown et al., 2007), perhaps even in terms of manipulations lasting approximately 10 min (Zabelina, Robinson, Ostafin, & Council, submitted for publication). Our data suggest that increased levels of mindfulness should facilitate better self-regulation, a prediction that may be useful to examine in laboratory tasks of self-regulation of the type often used by Baumeister and colleagues (e.g., Muraven, Tice, & Baumeister, 1998; Vohs et al., 2008). Our data further suggest, though, that such manipulations may be particularly effective, at

least in terms of levels of emotional reactivity, among individuals high in neuroticism. We therefore encourage experimental research of this type, which is capable of making more definitive causal conclusions.

4.5. Conclusions

The findings reinforce the idea that mindfulness is particularly beneficial among distress-prone individuals. By contrast, to the extent that one is not prone to distress (i.e., at low levels of neuroticism), mindfulness appears to be less consequential. We encourage conceptual replication efforts, a focus on the cognitive-affective mechanisms posited to underlie individual differences in mindfulness, and extensions of our interactive model to other traits (e.g., impulsivity) thought to be associated with maladaptive habits. If we are correct, mindfulness may play a broad role in moderating trait-linked vulnerabilities of multiple types.

In any case, the results reinforce the important idea that neuroticism is a vulnerability factor for negative emotional outcomes, but not an invariant one. To the extent that such individuals possess tendencies and/or skills that can facilitate the self-regulation of negative emotional reactivity, high levels of neuroticism are less consequential (Robinson, 2007). Our results highlight dispositional mindfulness as one such protective factor and therefore converge with the clinical intervention literature, which has increasingly shown mindfulness-based interventions to be effective among otherwise distress-prone individuals (Baer, 2007).

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