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# Looking Up: Mindfulness Increases Positive Judgments and Reduces Negativity Bias

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## Abstract

The present research examined the relation between mindfulness and negativity bias, or the tendency to weigh negative information more heavily than positive. A randomized experiment compared a brief mindfulness induction to an unfocused attention control condition. Negativity bias was assessed with a subjective measure of optimism and pessimism and an objective measure of negativity bias in attitude formation, BeanFest, which required associating novel stimuli with positive or negative outcomes. Participants in the mindfulness condition demonstrated less negativity bias in attitude formation. That is, they correctly classified positive and negative stimuli more equally than those in the control condition. Interestingly, the difference in negativity bias stemmed from better categorization of positives. Furthermore, those in the mindfulness condition reported higher levels of optimism compared to the control condition. Together, these results suggest that mindfulness increases positive judgments and reduces negativity bias.

## Keywords

attitudes, optimism, pessimism, social cognition, categorization, well-being

> When you observe things through the lens of mindfulness, whether it be through formal meditation practice or in daily living, you invariably begin to appreciate things in a new way because your very perceptions change.
>
> Kabat-Zinn (1990, p. 154)

Mindfulness is a sustained, receptive attention to and awareness of events and experiences as they occur (Brown & Ryan, 2003). That is, it involves a regulation of attention and awareness toward present-moment experiences. Furthermore, these observations are made in a nondiscriminatory fashion, that is, they are experienced simply as they occur rather than selectively avoiding some and dwelling in others. Such receptivity is necessary to truly orient attention toward whatever the present moment holds. This process entails a reduction in habitual mental elaboration on thoughts and feelings about experiences (Bishop et al., 2004), freeing conscious resources to process information that is immediate to the present moment (Martin, 1997).

Mindfulness has been associated with stress reduction and many mental health benefits, such as reduced symptoms of depression, anxiety, and other psychopathology, as well as increased subjective well-being (cf. Brown, Ryan, & Creswell, 2007). However, relatively little empirical work has focused on how mindfulness affects basic cognitive processes, which may shed light on the mechanisms by which mindfulness improves mental health. A rich theoretical literature suggests that the receptive nature of mindfulness reframes observations so that they are clearer and less biased (e.g., Brown et al., 2007; Shapiro, Carlson, Astin, & Freedman, 2006). For example, mindfulness "is thought to allow the person to 'acknowledge and accept the situation for what it is.' ... This seems to involve reliance less on preconceived ideas, beliefs, and biases and more on paying attention to all available information" (Bishop, 2002, p. 74). Thus, mindfulness may improve well-being by reducing biased attention and cognitions, particularly negatively biased processes.

Negativity biases, or the tendency to weight negative information, events, or emotions more than positive, have been documented extensively throughout psychology (for reviews, see Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001). Indeed, some have concluded that humans may have a general bias toward negativity. For example, greater attention tends to be given to negative than positive stimuli (e.g., Oehman, Lundqvist, & Esteves, 2001; Pratto & John, 1991), negative information is weighted more heavily than positive information (e.g., Gilovich, 1983; Peeters & Czapinski, 1990), and negative emotions tend to be more

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influential than positive emotions (e.g., Baumeister, Heatherton, & Tice, 1994; Esses & Zanna, 1995). Moreover, a number of psychological disorders have been associated with negativity biases in cognitive style (e.g., Abramson, Metalsky, & Alloy, 1989; Beck, 1987; Riskind, 1997).

Some evidence suggests that mindfulness may reduce negativity bias. Trait mindfulness has been associated with fewer cognitive errors (Herndon, 2008), fewer hostile attributions (Heppner et al., 2008), and less self-reported pessimism (e.g., Brown & Ryan, 2003). Mindfulness practices also have been found to affect attentional and cognitive processes, such as increasing attentional flexibility and control (Ortner, Kilner, & Zelazo, 2007), decreasing rumination (e.g., Jain et al., 2007; Ramel, Goldin, Carmona, & McQuaid, 2004), increasing the ability to let go of automatic negative thoughts (Frewen, Evans, Maraj, Dozois, & Partridge, 2008), and reducing habitual responding (Wenk-Sormaz, 2005). Of particular significance, Ramel and colleagues (2004) found that a mindfulness intervention, as compared to control conditions, resulted in fewer dysfunctional attitudes, or negatively biased cognitions associated with emotional disorders. Collectively, these studies suggest that mindfulness may be related to less negativity bias. However, none of the previous studies have focused specifically on testing the link between mindfulness and negativity bias.

The purpose of the present research was to directly examine whether mindfulness reduces negativity bias. The effect of a mindfulness induction was examined in relation to an objective, performance-based measure of negativity bias (BeanFest; Fazio, Eiser, & Shook, 2004) and a subjective, self-report measure of negativity bias (Future Events Scale; Anderson, 1990). Previous findings associating mindfulness with negativity bias have used subjective, self-report measures of bias. However, self-report measures have inherent problems, such as social desirability concerns, demand effects, and errors in question interpretation (e.g., Kendall & Flannery-Schroeder, 1998; Schwarz, 1999; Vasey & Lonigan, 2000). Thus, subjective measures may not provide accurate assessments of bias. Objective, performance-based measures eliminate these concerns and provide a clear standard of accuracy from which the degree of deviation quantifies the degree of bias.

Initially developed to examine basic attitude formation, BeanFest is a computer game in which participants must associate novel stimuli with positive or negative outcomes to succeed at the game. Specifically, participants are presented with stimuli (i.e., ‘‘beans’’) that vary systematically in appearance (shape and number of speckles) and valence (positive or negative point value). Examples of the beans are provided in Figure 1. On presentation of a single bean, participants are given the option to either select (approach) or not select (avoid) the bean. If selected, participants' game scores are adjusted according to the value of the bean. If the bean is not selected, participants' points remain the same, but they do not receive any information about the value of the bean. Thus, in the original version of the game, feedback was contingent on selecting the bean. To succeed at the game, participants must select

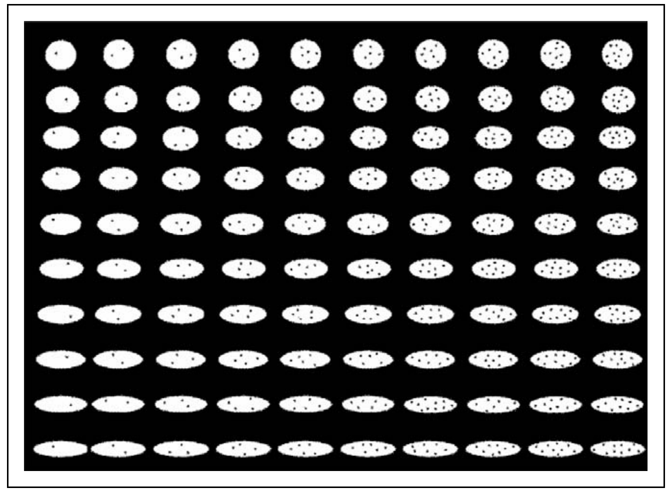

**Figure 1.** Bean matrix
Bean appearance varies by shape (circular to oblong) and by number of speckles (1-10).

positively valenced beans (approach good beans) and not select negatively valenced beans (avoid bad beans). Participants complete a game phase in which they are presented with each game bean three times (i.e., have three opportunities to learn whether a bean is positive or negative). After the game phase, participants complete a test phase in which they are simply presented with each game bean and asked to classify it as ‘‘helpful’’ (i.e., increased points during the game) or ‘‘harmful’’ (i.e., decreased points during the game). Classification of the beans serves as an assessment of attitude formation.

From the initial studies, an intriguing phenomenon emerged, which was termed the ‘‘learning asymmetry’’ (Fazio et al., 2004). Overall, participants exhibited a negativity bias in attitude formation. That is, participants correctly classified more negative beans than positive beans in the test phase. Subsequent studies demonstrated that the negativity bias in the original version of BeanFest stemmed largely from sampling behavior during the game phase. Individuals who selected, or approached, more of the beans during the game received more information about the bean world (i.e., received feedback on more game trials) and consequently showed less negativity bias. When the game was manipulated such that participants received full feedback (i.e., feedback was not contingent on approach behavior), the overall negativity bias was reduced.

Although full feedback reduced the negativity bias in attitude formation overall, there was still considerable variability at an individual level. That is, independent of behavioral decisions during the game and given equal information about the valence of the game beans, participants varied in their tendency to classify beans as positive or negative during the test phase. As such, the full-feedback version of BeanFest paradigm has been used as a performance-based measure of negativity bias. For example, Shook, Fazio, and Vasey (2007) examined whether individual differences in the negativity bias observed in BeanFest related to measures of cognitive susceptibility to emotional disorders. They found that individuals who reported a more negatively biased cognitive style and were more predisposed to emotional disorders exhibited greater negativity bias in BeanFest. Furthermore, this finding was the result of participants' classification of positive beans. Individuals who were predisposed to emotional disorders were worse at correctly classifying positive beans, as opposed to performing better at correctly classifying negative beans. That is, it appeared that these individuals showed an "underappreciation" of positive stimuli. In a follow-up study (Conklin, Strunk, & Fazio, 2009), a sample of students meeting the criteria for major depressive disorder (MDD) according to the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994) were compared to students who scored in the lowest 30% for MDD. Students who met criteria for MDD exhibited a significant negativity bias in the BeanFest paradigm, whereas the nondepressed group did not. Moreover, the difference between the groups was the result of the depressed group correctly classifying fewer positive beans than the nondepressed group. Thus, reducing negativity bias and predisposition to emotional disorders may involve increasing positive responses rather than decreasing negative responses.

Relatedly, preliminary evidence indicates that mindfulness may increase perception of positive qualities. Two studies found that inducing a mindfulness-like state versus a control condition increased perceived positivity of eating a raisin (Kiken & Brown, 2008) and increased enjoyment of chocolate tastings (LeBel & Dubé, 2001). Thus, mindfulness may increase positive judgments, which in turn may reduce negativity bias and help to explain why mindfulness is associated with less emotional distress (Brown et al., 2007). Therefore, the present research sought to examine not only if mindfulness reduces negativity bias but also if it increases positive judgments.[1]

## Experiment

We used a between-groups experiment to test for a causal relationship between mindfulness and negativity bias. Specifically, a laboratory induction of mindfulness was compared to an unfocused attention induction to test for reduced bias on objective and subjective measures. It was predicted that the mindfulness induction condition would demonstrate less negativity bias and more positive judgments (i.e., better classification of positive stimuli and more optimism) than the control condition.

## Method

### Participants

For course credit, 175 undergraduate psychology students participated (47% male, 40% White). Average age was 19.6 years ($SD = 2.4$).

### Measures

*Mindfulness manipulation.* Participants in the experimental condition received instructions to induce an approximation of a mindful state through mindful breathing (adapted from Arch & Craske, 2006; Kabat-Zinn, 1990). The instructions informed participants that they were going to practice a process to help them perceive things in a way that is deeply aware of the present moment. Participants were guided in anchoring their attention on the qualities of each breath as it occurred, without trying to control the breath but simply experiencing it as it was in that moment with a sense of curiosity. Additional instructions guided participants to register and accept any thoughts or feelings as they occurred—acknowledging them gently without dwelling on them—to reconnect to the present moment. Reminders and variations of these instructions were repeated periodically throughout the 15-min instructional period.

The control condition received instructions on unfocused attention, or mind wandering (adapted from Arch & Craske, 2006). These control instructions have previously been established as an acceptable baseline for mindfulness-based experiments with valenced stimuli (Arch & Craske, 2006) and cognitive tasks (McHugh, Simpson, & Reed, 2010). That is, mind wandering is a neutral state opposite to mindfulness in that it encourages participants not to direct conscious attention toward present-moment experiences (Arch & Craske, 2006). Specifically, the instructions informed participants that they were going to practice a process to perceive things in a way that let their mind wander freely. They were told to think about whatever came to mind and to let their mind wander freely without trying to focus on anything in particular. Close variants of these instructions were repeated throughout the 15-min instructional period at the same time intervals used in the mindfulness induction instructions.

The instructions were pilot tested with a state version of the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) administered afterward as a manipulation check. The state MAAS includes five items from the larger trait MAAS measure (described below), slightly rephrased to assess state mindfulness. Participants in the mindfulness induction condition scored higher ($M = 3.50$) than those in the control condition ($M = 2.50$), $t(18) = 3.31$, $p < .01$, on the state MAAS, indicating that the mindfulness instructions were effective.

*BeanFest.* As an objective measure of negativity bias, the BeanFest paradigm (Fazio et al., 2004) was used. BeanFest is a computer game set in an imaginary world of beans. Half of the beans are "helpful" (i.e., increase player's points when selected), whereas the other half are "harmful" (i.e., decrease player's points when selected). To succeed at the game, players must associate beans with their positive or negative outcomes. The beans are distinguishable by their appearance, which varies by shape (circular to oval to oblong) and number of speckles (1-10). From 100 possible shape-speckle combinations (see Figure 1), 36 beans from six regions of the bean matrix are presented during the game (see Fazio et al., 2004, for details). These beans were carefully selected such that participants must associate each bean with the outcome it produces rather than learning a simple rule that would explain the valence of multiple beans (e.g., circular beans are positive).

On a given trial, participants are presented with a single bean and must decide whether to select the bean or not. If selected, the participant's point value is adjusted according to the value of the bean (i.e., +10 or –10). If not selected, the participant's point value remains the same. Participants begin the game with 50 points. Reaching 100 represents winning the game, and reaching zero represents losing. In either case, the game restarts at 50 points. Although the number of games played depends on the individual's success, participants complete the same number of trials (108). For the current study, a full-feedback version of BeanFest was used. Regardless of their decision, participants were informed of the bean's value at the end of the trial. A full-feedback version was implemented to get a cleaner assessment of negativity bias, independent of game behavior. Thus, all participants received equal information about the valence of positive and negative beans.

After playing the game, a critical test phase assessed participants' accuracy in classifying the beans. Participants were presented with the game beans in a random order and asked to classify each bean as "helpful" or "harmful." During the test phase, there was no point value and participants did not receive feedback.

*Future Events Scale (FES).* As a subjective measure of negativity bias, the FES (Anderson, 1990) was used. The FES is composed of 26 items divided between two subscales measuring optimism and pessimism. Participants rate the likelihood of specific positive (e.g., "To live the lifestyle I have always dreamed of") and negative (e.g., "To be responsible for someone's physical or emotional suffering") events happening to them at some point in the future on a scale from –5 (*extremely unlikely*) to +5 (*extremely likely*). Ratings were averaged for each subscale ($\alpha =$. 90 for optimism, $\alpha = .77$ for pessimism).

*MAAS.* The MAAS (Brown & Ryan, 2003) is a self-report measure of trait mindfulness and was included to ensure that trait mindfulness did not account for between-group differences. Participants indicate the extent to which they experience 15 statements (e.g., "I find it difficult to stay focused on what's happening in the present") from 1 (*almost always*) to 6 (*almost never*). Item scores are averaged; higher mean scores reflect higher mindfulness ($\alpha = .84$).

*Positive and Negative Affect Schedule (PANAS).* The PANAS (Watson, Clark, & Tellegen, 1988) assessed state affect after the induction to ensure that any differences between the conditions on the dependent variables were not the result of differences in mood. This commonly used self-report measure is composed of two subscales: positive and negative affect. Scores for each subscale are totaled, with higher scores indicating more positive ($\alpha = .87$) or negative affect ($\alpha = .86$).

*Compliance.* Because of the importance of instructional compliance with the audio recordings and the BeanFest game, two questions assessed the extent to which the participants complied with the BeanFest and manipulation instructions. These were, "To what extent did you follow the instructions during the BeanFest game?" and "To what extent did you follow the instructions during the audio recording at the beginning of this study?" Participants indicated their responses on a scale from 1 (*not at all*) to 5 (*completely*).

### Procedure

Sessions were run in groups of at most six participants who were seated in individual cubicles. Participants were randomly assigned to either the mindfulness manipulation or the control condition. All participants in one session were assigned to the same condition to maintain a consistent environment and avoid potential distractions. All participants listened through individual headphones to an audio recording that served as the manipulation. Next, participants completed the PANAS. Then, they played BeanFest and completed the FES. Finally, participants completed the trait MAAS and compliance questions. Participants were then debriefed, thanked, and dismissed.

## Results

### Manipulation and Compliance Checks

No significant differences between conditions for trait mindfulness, positive affect, or negative affect were revealed on $t$ tests ($t$s $< 1$), indicating that these variables did not account for differences between conditions on the dependent variables.

The conditions did differ in compliance with the manipulation instructions, $t(173) = 2.40$, $p < .05$, such that the mindfulness condition reported lower compliance ($M = 3.95$) than the control condition ($M = 4.27$). This may have been because the mindfulness instructions (i.e., observing one's breath) were less familiar and more challenging to participants than the control instructions (i.e., letting one's mind wander). Manipulation compliance also correlated significantly with FES scores, for optimism, $r(171) = .32$, and for pessimism, $r(173) = -.25$, $p$s $< .001$, so it was controlled for in subsequent analyses of FES scores. Manipulation compliance did not correlate significantly with any of the BeanFest indices ($r$s $= -.06$ to $.05$).

With regard to BeanFest, the conditions did not differ in compliance ($t < 1$). However, BeanFest compliance was associated positively with various BeanFest indices, including overall accuracy, $r(173) = .28$, $p < .01$, the proportion of positive beans correctly classified, $r(173) = .16$, $p < .05$, and the proportion of negative beans correctly classified, $r(173) = .28$, $p < .01$. Therefore, subsequent analyses of BeanFest data controlled for BeanFest compliance.

### BeanFest Performance

First, accuracy during the test phase was examined. Phi coefficients were computed assessing the relation between bean valence (positive or negative point value) and a participant's classification of that bean during the test phase (helpful or harmful). The mean phi coefficient was .23, which was significantly different from zero, $t(174) = 10.42$, $p < .001$, indicating that participants were able to accurately classify game beans

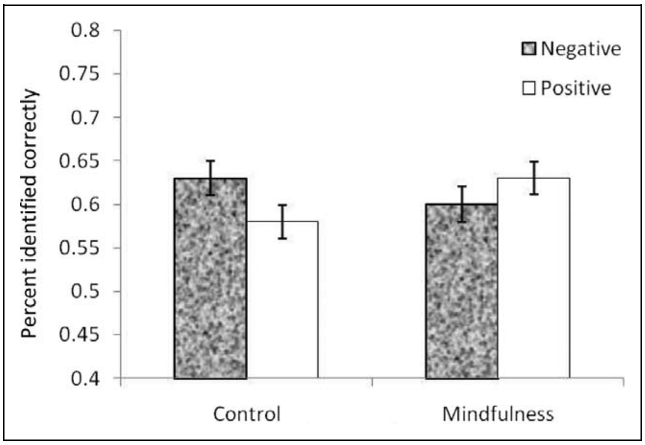


**Figure 2.** Interaction between condition (mindfulness vs. control) and bean valence (positive vs. negative) on BeanFest learning
Error bars represent ±1 *SE*.

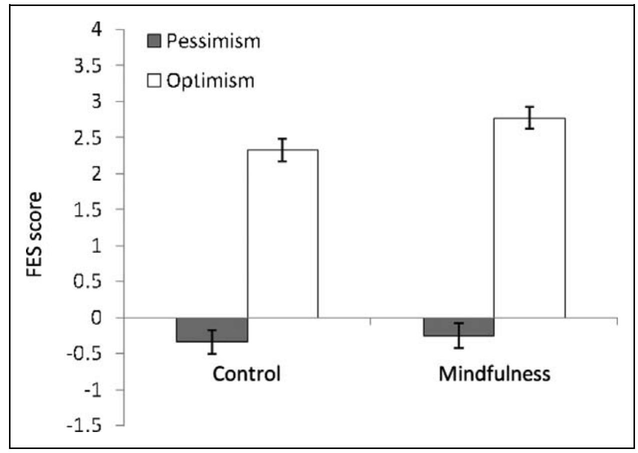


**Figure 3.** Effect of condition (mindfulness vs. control) on Future Events Scale subscales
Error bars represent ±1 *SE*.

beyond chance levels. Likewise, the proportion classified correctly was above chance for both positive beans ($M = 0.60$), $t(174) = 7.58$, $p < .001$, and negative beans ($M = 0.61$), $t(174) = 7.79$, $p < .001$. Thus, participants were engaged during the BeanFest game and were not randomly responding during the test phase.

### *Did Mindfulness Reduce Negativity Bias?*

A 2 (condition) × 2 (bean valence) ANCOVA with bean valence entered as a repeated measure was conducted to determine if mindfulness affected the relative proportions of positive and negative beans correctly classified during the test phase. BeanFest compliance was entered as a covariate given the associations with the BeanFest performance indices. A significant interaction was found between condition and bean valence, $F(1, 172) = 4.08$, $p < .05$, partial $\eta^2 = .023$ (see Figure 2). Participants in the mindfulness condition did not exhibit a negativity bias that differed from zero, $t < 1$, whereas participants in the control condition showed a marginally significant negativity bias, $t(87) = 1.76$, $p < .09$. Furthermore, the difference between the two conditions was more the result of accurate classification of positive beans by participants in the mindfulness condition, $t(173) = 2.12$, $p < .05$. The conditions did not differ in classification of the negative beans, $t < 1$. These results suggest a negativity bias in the control condition but no bias in the mindfulness condition, with more accurate classification of positives in the mindfulness condition.

Next, FES scores were examined. Overall, participants reported more optimism ($M = 2.55$) than pessimism ($M = -0.30$), $t(172) = 14.53$, $p < .001$. To determine whether the mindfulness induction affected optimism or pessimism, hierarchical regression analyses were used with manipulation compliance as a covariate. Regression analyses were used because manipulation compliance differed by condition as well as correlated with FES scores. Manipulation compliance was entered in the first step, condition was entered in the second step, and their interaction term was entered in the third step. For optimism, condition was a significant predictor above and beyond manipulation compliance, ($\beta = .15$, $t = 2.00$, $p < .05$), with the mindfulness condition reporting more optimism than the control condition. For pessimism, however, condition was not a significant predictor ($\beta = .03$, $t < 1$), indicating no difference between conditions. The interaction was not significant in either analysis. These results, depicted in Figure 3, suggest that mindfulness increased positive responses on the subjective measure but did not influence negative judgments.

## Discussion

The theoretical literature suggests that mindfulness may reduce bias (e.g., Bishop, 2002; Brown et al., 2007). We examined the link between mindfulness and negativity bias. A mindfulness induction, as compared to a control condition, resulted in less negativity bias and more accurate classification of positive stimuli on an objective, performance-based measure. Participants in the mindfulness induction condition also reported more optimism than those in the control condition. Together, these findings suggest that mindfulness can reduce negativity bias and increase positive judgments.

Interestingly, there was a difference in terms of bias across measures. In the BeanFest paradigm, the mindfulness induction condition displayed no bias toward negativity or positivity. Yet on the FES, participants generally reported positive events as more likely than negative events, or a positivity bias. These differences between the BeanFest game and the FES may be indicative of the difference between an objective, performance-based measure versus a subjective, self-report measure. Regardless, across both measures, mindfulness was related to greater positivity (i.e., more accurate classification of positive stimuli and more optimism). Whether this increased positivity led to reduced negativity bias (BeanFest) or increased positivity bias (FES) depended on the baseline. As a metaphor, if one is looking down, lifting one's gaze will make one look straight. But if one is looking up already, lifting one's gaze will make one look up even higher.

The mechanism by which mindfulness might increase positive judgments was not tested in the present research. However, we speculate that because mindfulness involves less habitual mental elaboration, as suggested in theoretical descriptions (e.g., Bishop et al., 2004, Brown et al., 2007) and supported by studies of mindfulness and rumination (e.g., Jain et al., 2007; Ramel et al., 2004), it frees conscious resources (cf. Martin, 1997) to notice information that usually might be noticed less or not at all. Given general tendencies to focus more on negative information than positive information (e.g., Baumeister et al., 2001; Rozin & Royzman, 2001), mindfulness may free resources, allowing for greater attention to and awareness of positive information. Future research could examine this potential mechanism.

The present results have important implications for well-being. First, negativity bias in BeanFest because of less accurate categorization of positive stimuli has been associated with other measures of negatively biased cognition and tendencies toward depression and anxiety (e.g., Shook et al., 2007). Therefore, more negativity bias with poorer performance associated with classification of positives may indicate greater vulnerability to emotional disorders. Given that mindfulness was associated with better classification of positives and reduced negativity bias, the results suggest a mechanism through which mindfulness may confer protective benefits against emotional distress. Furthermore, mindfulness increased optimism, which is associated with greater well-being (Carver, Scheier, & Segerstrom, 2010). Finally, some domains of psychology have documented positivity biases, although much rarer than negativity biases, which may serve beneficial functions socially (cf. Rozin & Royzman, 2001). The present findings suggest that mindfulness may be related to such positivity biases. In sum, the present findings potentially provide new insights into why mindfulness has been linked repeatedly to less distress and greater well-being (cf. Brown et al., 2007).

Of course, these findings are preliminary and warrant more research on mindfulness and both negativity and positivity biases, perhaps using other measures to test the robustness of these findings. Different operationalizations of mindfulness also could be considered. The MAAS is one of many existing measures of mindfulness. Other measures, such as multidimensional scales, may provide additional perspectives on how mindfulness relates to negativity bias. In addition, research with extended mindfulness training may provide a truer manipulation of mindfulness compared to a single, brief mindfulness induction with inexperienced participants. Still, the induction increased state mindfulness in pilot tests, and this method provided greater experimental control than common multiweek mindfulness trainings. In fact, it was particularly impressive that a brief mindfulness induction with novices led to less negativity bias, indeed no bias, in the BeanFest paradigm.

In conclusion, the present research suggests that mindfulness may affect basic cognitive processes related to weighting what is "good" and "bad," with less negativity bias and more positive judgments. These cognitive processes are important not only for emotional distress and well-being (Beck, 1987; Shook et al., 2007) but also for navigating our social environments (Fazio & Petty, 2008). Therefore, the current work provides a new perspective on how mindfulness may relate to well-being and may have broader implications for social perception and interaction.

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## Note

1. Our hypotheses were informed by previous research and by a serendipitous finding. A BeanFest study was conducted with participants who had completed a trait mindfulness scale. We found a correlation between correct classification of positive beans and mindfulness, $r(180) = .16$, $p < .05$.

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