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Reasonable or restrictive? Mindfulness as a moderator of reactance to environmental messages

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**Reasonable or restrictive? Mindfulness as a moderator of reactance to environmental
messages**

by

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A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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ABSTRACT

Environmental issues are gaining global traction, as evidenced by the 2015 United Nations Climate Change Conference. However, the changes needed to address these issues are viewed by some as threatening. Given that environmental initiatives often call for restricting behavior, they can elicit reactance—a motivational state that is thought to occur when a freedom is eliminated or threatened with elimination. In the following studies, I sought to better understand how to reduce reactance by curtailing its underlying processes. Study 1 tested the relationships among trait mindfulness, reactance, and environmentalism and revealed differences among various facets of mindfulness. Importantly, facets of trait mindfulness predicted less anger in response to environmental messages, greater intentions to behave in a pro-environmental way, and more environmental advocacy. Study 2 tested whether inducing a state of mindfulness would mitigate the formation of reactance to a pro-environmental message by increasing cognitive flexibility and decreasing emotional reactivity. While Study 2 failed to support these main hypotheses, it yielded some interesting results regarding cognitive flexibility and emotional reactivity. Specifically, inducing a state of mindfulness decreased emotional reactivity, but had no impact on cognitive flexibility. Cognitive flexibility, however, moderated the effect of the type of environmental message (threatening vs not) in predicting reactance; people with higher cognitive flexibility were not impacted by the threat manipulation. Taken together the results of these studies offer insight into the nature of mindfulness, reactance, and environmentalism.

Keywords: environment, reactance, mindfulness, cognitive flexibility, emotional reactivity, attitudes

CHAPTER 1. INTRODUCTION

Reasonable or Restrictive? Mindfulness as a Moderator of Reactance to Environmental Messages

Imagine that you have come across some information that you would like to print. Perhaps it's a journal article; perhaps it is just a shopping list. Regardless, you want a hard copy of it. Let's further suppose that you use a communal lab for printing, and that you arrive only to be confronted by a sign posted to the printer reading "Don't print unnecessarily. Most work can be handled online or on-screen" (a common message in corporate sustainability efforts). How do you react? Do you stop or do you continue with printing your item?

Chances are, your reaction depends on your existing attitudes toward environmental behaviors. If you hold a position that is generally favorable to conservation and sustainability, you will likely be more willing to forgo printing or at the very least consider the sign's message. On the other hand, if you are someone who does not abide by the tenants of environmental conservation, you will probably go about your business and print. Furthermore, a sign telling you not to print may be interpreted as an annoying affront to your personal freedom (albeit a relatively weak one).

In fact, the entire conservation movement could be construed as a threat to personal freedom, at least among those inclined to maintain their current habits. Unfortunately, the resource consumption that goes hand-in-hand with the American status quo has led us into the current environmental quagmire. Human behavior is contributing to environmental degradation and climate change. While climate does vary naturally over time, scientists are confident that human action is spurring major changes, primarily through the emission of greenhouse gases caused by the consumption of fossil fuels (a process involved in many

aspects of our day-to-day lives; see Environmental Protection Agency, 2015 for a review).

While a substantial group of people is actively facing this challenge, there remains a large subset of the population that is resistant to the changes necessary to address a myriad of environmental problems. The “green get greener,” but the rest fall by the wayside.

Environmental initiatives are often voluntary, mostly reaching those already motivated to act.

How do these initiatives come across to others, and what are the underlying mechanisms of their responses? Answering such questions will help environmental advocates reach those who are less likely to pursue personal change.

Overview

The key premise of the present studies is that many people may see pleas for “environmentally-friendly” behavior as a threat to their chosen way of life. Perceived threat may lead to reactance, which is “the motivational state that is hypothesized to occur when a freedom is eliminated or threatened with elimination” (Brehm & Brehm, 1981, p. 37). In the following studies, I sought to better understand reactance to environmental messages. Study 1 tested the relationships among trait mindfulness, reactance, and environmentalism, and revealed important differences among various facets of mindfulness. In Study 2 I tested a novel way of mitigating the underlying components of reactance. The purpose of these studies was three-fold: 1) To confirm that environmental attitudes predict reactance in response to conservation messages, 2) to test whether increased mindfulness decreases reactance, and 3) to test whether increased cognitive flexibility and lowered emotional reactivity would mediate the impact of induced mindfulness on reactance to conservation messages (i.e., mediated moderation in Study 2).

In the pages that follow, I first explore barriers to environmentally friendly behaviors, including how these obstacles may produce a threat response. Second, I describe reactance, its components, and how it can be induced or expressed. Third, I describe mindfulness and illustrate how it could impact cognitive flexibility and emotional reactivity. Fourth, given that reactance is considered to have two main components—negative cognition and anger (Dillard & Shen, 2005)—I argue that increasing cognitive flexibility and decreasing emotional reactivity may decrease reactance to a prescriptive environmental message (i.e., a message that strongly prescribes behavior). Finally, I outline how each study tests these ideas.

CHAPTER 2. LITERATURE REVIEW

Barriers to Environmental Behaviors: Attitudes, Information Processing, and Anger

Being told to change your behavior can be hard to hear even when you recognize the value of the statement. It presents an even larger barrier when your existing attitudes conflict with the message. In this section I will describe individual-level barriers to enacting environmental initiatives. I begin with people who hold some degree of favorable attitude toward conservation through personal action. Next, I consider people for whom appeals to conservation are counter-attitudinal, exploring information processing and emotional responses that contribute to their reactions to environmental initiatives. These barriers provide a backdrop for the key construct of the current work: Reactance.

There is considerable evidence that the people likely to adhere to environmentally friendly initiatives are those who are already aware of and concerned about environmental issues (e.g., Guagnano, Stern, & Dietz, 1995; Loukopoulos, Jakobsson, Garling, Schneider, & Fujii, 2004). For example, pro-environmental attitudes and behavior have an average correlation of $r = .42$ (Bamberg & Möser, 2007). However, even individuals with favorable environmental attitudes often experience barriers to enacting ecologically sound behaviors. Typically, holding pro-environmental attitudes predicts low-cost actions and “good intentions,” but that predictive power declines as the behaviors in question become costlier or inconvenient. For example, personal norms pertaining to recycling behavior and reductions in car use are overridden by issues of expediency (Guagnano, Stern, & Dietz, 1995; Bamberg & Schmidt, 2003; see Lindenberg & Stern, 2007 for a review). When people are inclined to such expediency, they could see legitimate restrictions on their behavior as infringing on their personal freedom. Indeed, even restrictions perceived to be appropriate in a given

situation may be interpreted as a threat (i.e., elicit reactance, Sittenthaler, Steindl, & Jonas, 2015).

People who do not hold favorable attitudes of environmental initiatives face different barriers to ecologically sound behaviors. They may be apathetic or possibly may not hold any particular attitude on the subject. Given the large-scale coverage of environmental issues in the media, however, most people in the United States have likely been exposed to enough information to form an attitude (e.g., the 2015 United Nations Climate Change Conference, advertising geared toward ‘green’ products, etc.). Attitudes most strongly predict future behaviors when they are easy to recall (accessible) and are stable (Glasman, & Albarracín, 2006). People who do not value environmentally friendly behaviors may not devote much thought to such things on a day-to-day basis. However, when someone is confronted with a choice whether or not to behave in an environmentally friendly way, the relevant attitude will be activated (Bizer, & Krosnick, 2001). If the individual’s attitude is counter to the message being presented, the person has a greater likelihood of experiencing negative affect, such as anger (Na, 1999).

The research on anger and attitudes has produced mixed results, particularly in the domain of information processing. Anger falls under the umbrella term of “negative affect,” and some studies have shown that negative affect increases information processing. Other studies have shown an inverse relationship. If we assume elaboration is unconstrained (that is, that people are free to devote time and effort to thinking about a topic), emotion can serve as a cue whether or not to think carefully. According to Petty and Brinol’s (2015) *differential appraisals hypothesis*, assessments of valence may prompt people to focus on the unpleasantness of negative affect. That unpleasantness could bleed into how they view their

current opinions. Feeling negatively about their current views could lead people to elaborate more extensively on new information out of a desire to ameliorate those unpleasant feelings.

However, a more fine-grained look into negative affect and information processing shows important nuances. While sadness tends to increase information processing, anger leads to a reliance on simple cues (e.g., stereotypes, Bodenhausen, Sheppard, & Kramer, 1994). When people feel angry, they report that the situation is unpleasant, not of their own doing, and that they are certain about those things (Tiedens & Linton, 2001). The role of anger in response to a counter-attitudinal message plays a vital role in the current proposal, as is elucidated through the concept of reactance.

Reactance

Environmental messages prescribe behavior, and as such they may spur psychological reactance (Wicklund, 1974). Reactance is “the motivational state that is hypothesized to occur when a freedom is eliminated or threatened with elimination” (Brehm & Brehm, 1981, p. 37). Because environmental messages generally state what action a person *should* take, they could be construed as an affront to personal choice (e.g., “you shouldn’t buy anything non-recyclable”). When a choice is threatened, freedom of behavior is threatened. Reactance theory states that when this occurs, people will be motivated to restore their freedom (Dillard & Shen, 2005). This could be via direct restoration, which would mean doing the prohibited behavior anyway. Freedom can also be restored indirectly by attitude change, making a different choice, derogating the source of the threat, or denying the existence of the threat—all reflecting a re-assertion of one’s autonomy and control.

For quite some time, reactance proved difficult to study. The original researchers stated that it could not be measured directly and instead focused on its conceptual definition

and the predictions it could make (Brehm & Brehm, 1981). However, this changed with advances in studying cognition and affect. Dillard and Shen (2005) were able to operationalize reactance as a combination of negative cognition and anger (i.e., the *Intertwined Process Model*). In their research, the model with the best fit to the reactance data was one where negative cognition and anger were intermingled. This model improved upon others with a strictly cognitive view in which reactance was conceived as counter-arguing. Likewise, the new model provided a better fit than previous notions that reactance could be operationalized simply as an emotion. There remains some debate as to whether anger and negative cognition should be considered as one component or two (i.e., an intertwined model or a dual model; *intertwined*: Dillard & Shen, 2005; Rains, 2013; *dual*: Sittenthaler et al., 2015; Steindl, Jonas, Sittenthaler, Traut-Mattausch, & Greenberg, 2015; Sittenthaler, Jonas, & Traut-Mattausch, 2016). The intertwined process model seems to best capture an impulsive reactance response, while the dual process model is most appropriate in instances where reactance may be delayed (e.g., vicarious reactance, reactance to a legitimate restriction). Critically, both models agree that reactance can be construed as anger and negative cognition—only the method of analysis differs.

Until recently, the study of reactance has focused on behavioral restrictions that are believed to be inappropriate or illegitimate by those being studied. Sittenthaler et al. (2015) broadened reactance theory by examining responses to restrictions perceived to be legitimate. Given that reactance is expected to occur under any threat to personal freedom, it should arise even when a behavioral constraint is viewed as appropriate. Not only did Sittenthaler and colleagues find support for reactance after legitimate restrictions, they noted interesting differences in responses to legitimate versus illegitimate behavioral constraints. Illegitimate

restrictions produced a rapid and primarily emotional response (e.g., anger). Legitimate restrictions produced a slower, more cognitive response that also ultimately aroused anger. While both types of restrictions lead to similar self-reports of reactance (legitimate $M = 3.78$, $SD = .50$; illegitimate $M = 3.84$, $SD = .58$), there appeared to be important differences in arriving at that end.

In sum, reactance should play a main role in how people process and respond to environmental initiatives. This is likely to hold true for people with and without environmentally friendly attitudes to different degrees. Addressing the underlying processes of reactance may be an important way to increase the efficacy of pleas for conservation. In short, features of the person (i.e., existing attitudes) and features of the situation (i.e., exposure to an environmental message) yield an internal state of reactance characterized by negative cognition and anger. A relatively recent focus within psychology—mindfulness—provides the means to study reactance by potentially altering its underlying processes (i.e., via increasing cognitive flexibility and decreasing emotional reactivity).

Mindfulness

Mindfulness—often defined by variations of “paying attention to the present moment”—is a growing area of interest across the subfields of psychology, for good reason. Research points to numerous benefits of mindfulness training, ranging from treating depression to physiological changes indicating lower stress and even cellular viability (Teasdale, Segal, Williams, Ridgeway, Soulsby, & Lau, 2000; Jacobs, et al., 2013; Jacobs, et al., 2011). This promising area of research has grown out of two similar but distinct lines of inquiry: creative mindfulness and meditative mindfulness (terminology suggested by Hart,

Ivtzan, & Hart, 2013). I will briefly describe both; however, I will focus on meditative mindfulness as the majority of relevant research stems from this area.

Creative and Meditative Mindfulness: Similarities and Differences

These two veins of research have been operating in parallel for over three decades (Hart et al., 2013). Ellen Langer's research concentrates on creative thought and drawing novel distinctions, the states resulting from those processes have been referred to as creative mindfulness (also called 'mindset-oriented mindfulness,' Kang, Gruber, & Gray, 2014). To Langer, a state of mindfulness is characterized by the process of noticing or creating novelty, which in turn allows the person to recognize his/her uncertainty about a target stimulus (e.g., an image or a concept). By recognizing that there are aspects of which the person was previously unaware, he/she naturally attends to the nuances of the target.

Central features of both creative and meditative mindfulness involve paying attention and being open to incoming information without judgment. Along with these components there is an emphasis on an air of curiosity and awareness. Creative mindfulness yields a willingness to weigh new perspectives, while meditative mindfulness arrives at a similar end through accepting the present moment (including the present moment's informative stimuli) without criticism yet with careful observation (Kang, Gruber, & Gray, 2014). There are notable differences in these two types, however. Creative mindfulness is generally induced by goal-oriented tasks (e.g., a problem solving task requiring the production of new uses for common objects). In contrast, meditative mindfulness avoids a set goal beyond focusing on the meditative process itself (Kabat-Zinn, 2003). Furthermore, creative mindfulness builds new categories by assessing stimuli in a fresh way (Langer, 1992), while meditative mindfulness breaks down existing categories (Kang et al., 2014). Despite some differences in

approach, both versions of mindfulness may impact automaticity—the tendency to unconsciously engage in behaviors (Langer, 1992; Moore & Malinowski, 2009). In the interest of specificity and clarity, I have limited the scope of this paper to meditative mindfulness, which I describe more thoroughly in the following section.

Meditative Mindfulness

Drawing from Buddhist traditions, Kabat-Zinn’s line of therapeutically-minded research aims to reduce distress (suffering). This is accomplished by promoting a metacognitive awareness which in turn enhances cognitive regulatory processes (Hart, Ivztan, & Hart, 2013). Would-be adherents of meditative mindfulness generally begin by directing their attention to an arousal-neutral object, typically the sensations associated with breathing (i.e., focused awareness meditation). Once practiced in this shifting of attention, adherents are able to produce a relatively calm, yet attentive, mental state as needed. This is appealing from a therapeutic standpoint, as it would allow for redirection away from on-going and often critical inner monologues that can carry unpleasant affect (Carmondy, 2014). While this inner monologue may spring up from time to time, Kabat-Zinn’s view of mindfulness emphasizes non-judgment of the present moment. That is, adherents need not condemn themselves for having negative thoughts—the thoughts themselves may carry some judgment, but the meditator is not self-critical of that aspect. Rather, they acknowledge the thoughts and the affect that may accompany them, recognizing both as transient. By allowing those thoughts to pass by, rather than ruminating on them, adherents are able to reduce their level of distress. This forms the core of mindfulness-based stress reduction and mindfulness-based cognitive therapy (MBSR and MBCT; Hart, Ivztan, & Hart, 2013); although there are several different methods of pursuing mindful meditation.

Focused-attention meditation. Focused-attention meditation revolves around concentrating on a particular stimulus, such as the breath or a candle flame. When undertaking this type of meditation, people generally sit in an upright position—the term ‘dignified’ is often used to invoke the meditators’ correction of their posture. Once a comfortable yet erect position has been achieved, the meditators are asked to focus on the stimulus to the exclusion of all other sensations and thoughts. Other sensations and thoughts do occur; however, when their appearance is noted, meditators redirect their attention to the stimulus object. This is typically the approach novice meditators use to begin their training (van Vugt & Slagter, 2014; Lippelt, Hommel, & Colzato, 2014).

Open awareness meditation. Open awareness meditation does not require tight focus on one stimulus. Rather, in this form of mindful meditation, people are encouraged to notice whatever stimuli enter into their awareness. That is, meditators monitor awareness itself. As with the focused attention, these meditators are encouraged to move beyond the thought stream (i.e., not get caught up in a line of thought); rather, attention is directed to the wide variety of external and internal stimuli that make up any given moment (van Vugt & Slagter, 2014; Lippelt, Hommel, & Colzato, 2014).

Summary of types of mindful meditation. There are other forms of mindful meditation beyond the scope of the present review (e.g., loving-kindness meditation). I concentrate on focused attention and open awareness meditation, as they are those most commonly practiced by beginners (Lippelt, Hommel, & Colzato, 2014). While the focus of attention varies between the two, they share an emphasis on non-judgment. Meditators do not criticize themselves for failing to fully adhere to the process. They acknowledge when their mind does wander; then they refocus on either their meditative stimulus (e.g., breath) or on

their meta-awareness. I suggest that it is through this focus and awareness that meditative mindfulness diffuses anger and negative cognition, which characterize reactance. In the next section I explore the evidence that mindfulness could potentially impact the latter by increasing cognitive flexibility. It is important to note that the nature of meditative mindfulness changes with experience. The impact mindfulness on a novice differs from that of someone with years of experience, which differs from that of someone with decades of experience. In the studies presented on the following pages, the level of meditative experience is noted.

Meditative Mindfulness Increases Cognitive Flexibility

Mindful meditators are trained to view their thoughts as an outside observer would; that is, they learn how to decenter (Siegel, 2014; Carmody, Baer, Lykins, & Olendzki, 2009; Hayes-Skelton & Graham, 2013). Decentering can be thought of as the ability to take a step back from one's thoughts and feelings and observe them as fleeting events. Importantly, this includes recognizing that thoughts and feelings do not necessarily reflect truth or reality and do not require any particular response (Sauer & Baer, 2010; Fresco, et al., 2007). Given this feature of mindfulness, I propose that mindfulness training will increase cognitive flexibility (i.e., the ability to process information and think in novel ways) and therefore decrease reactance to an environmental message. As this is a burgeoning area of inquiry, there is only limited evidence directly connecting mindfulness training to cognitive flexibility. Therefore, I begin by showcasing how mindfulness training is linked to increases in attentional control, a necessary prerequisite for cognitive flexibility. I then focus on one study that linked mindfulness and cognitive flexibility. Later on, I draw on this connection to bolster the

hypothesis that meditative mindfulness will decrease reactance to environmental messages, in part through cognitive flexibility.

Meditative Mindfulness Increases Attention

One component of cognitive flexibility is the ability to reappraise information—to acknowledge that one’s initial interpretation of incoming stimuli may need to be revisited. This can be an iterative process resulting in a different interpretation than the one derived initially. Without sufficient attentional resources, however, reappraisal is not possible. Importantly, an increased ability to focus attention is a main outcome of the initial stages of meditation. There are three distinct components to attention, 1) *Alerting*, the ability to recognize important targets of attention that were previously outside of one’s focus, 2) *Orienting*, the ability to bring attention to a particular object, and 3) *Conflict monitoring*, the ability to sort among various stimuli to prioritize and attend to the most relevant (van Vugt, 2015). Mindfulness meditation enhances these components in a variety of ways.

Different forms of meditation may work more strongly on different aspects of attention, but generally there is evidence that meditation—as a whole—increases attentiveness (van Vugt, 2015). This is apparent in work addressing what cognitive researchers call the *attentional blink*, where participants miss a secondary cue due to overinvestment of attentional resources in a primary cue (Shapiro, Arnell, & Raymond, 1997). The attentional blink is observed when two masked targets are presented within 500 ms of each other and participants are not instructed to ignore the first cue. Conversely, participants can report the second cue if instructed to ignore the first. However, experienced meditators show an increased ability to report both cues. They also exhibit corresponding changes in the brain’s electrical activity as measured via EEG (Slagter, Lutz, Greischar,

Nieuwenhuis, & Davidson, 2009). The authors of that study reason that meditators are able to devote fewer resources to the first stimulus, creating greater opportunity to detect the second. Slagter and colleagues were able to bolster behavioral evidence (i.e., the ability—or inability—to report cues) with changes in brain activity (i.e., lowered variability in theta activity between the primary and secondary stimuli presentations). This study illustrates what is possible with the mental training one accumulates in meditative practices. While this research focuses on highly experienced meditators, it stands to reason that early stage meditators may experience similar benefits on a smaller scale.

Other Cognitive Benefits of Meditative Mindfulness

Cognitive benefits are apparent after even a relatively brief mindfulness training lasting four days (Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). In one study, groups of three to five participants were led through four 20-minute sessions of breath awareness by a facilitator with 10 years of experience. The control condition meetings were the same length, but the participants listened to JRR Tolkien's *The Hobbit*. After the training period, the researchers found that the meditation group showed an enhanced ability to sustain attention. Mindfulness training increased participants' visuo-spatial processing and verbal fluency, which the researchers took as evidence of greater efficiency in both working and long term memory retrieval (as compared to the control group). While the researchers did not test for improvement in cognitive flexibility, the overall improvement in sustained attention as well as the increase they found in executive control (i.e., ability to direct cognition; not being swept up in irrelevant information) suggest that brief mindfulness training could increase cognitive flexibility (Zeidan et al., 2010).

Cognitive Flexibility

There is some evidence of improvements in cognitive flexibility associated with mindful meditation. Experienced meditators were recruited from a local Buddhist center and were compared with a meditation-naïve control group. At minimum, the meditators had completed a six week training course, and most were enrolled in an intermediate class at the time of the study. The researchers also recruited a community sample of matched controls. A traditional Stroop task was used to assess the participants' degree of response automatization/deautomization. In a typical Stroop tasks, participants need to occasionally inhibit their automatic response to a stimulus (i.e., reading a word vs stating the color of the ink in which it is printed). There are both congruent (e.g., the word 'red' printed in red ink) and incongruent (e.g., the word 'red' printed in yellow ink) trials. The speed and number of errors committed are taken as an indication of the ability to inhibit (deautomize) a response. Participants also completed the *d2-concentration and endurance test*, which is a measure of selective attention. The d2 consists of 14 lines, each with 47 characters, yielding a total of 658 characters that participants must evaluate. The characters are visually similar (i.e., *ds* and *ps*). Participants proceed row by row with 20 seconds allotted to each and are asked to cross out all *ds*. There are two outcome measures of this test, errors of commission (i.e., crossing out a *p* instead of a *d*) and errors of omission (i.e., missing a *d*). Errors of omission are common and relate to attentional control. Errors of commission are less common and are indicative of inhibitory control, accuracy of visual scanning, and cognitive flexibility. Moore and Malinowski (2009) found that meditators committed significantly fewer errors of all types in both the Stroop task and d2 test. Furthermore, self-reported mindfulness was significantly correlated with better performance on both tasks. While self-reported

mindfulness was higher in meditators, the link between mindfulness and performance held across the entire sample of individuals. This study suggests that both practice with mindful meditation and dispositional mindfulness are related to greater attentional control, ability to deautomize, and cognitive flexibility (Moore & Malinowski, 2009).

Summary: Mindfulness lowers reactance through increasing cognitive flexibility.

In summary, meditative mindfulness is related to increases in attentional control, and there is evidence suggesting it also increases cognitive flexibility. While there have not been many studies that directly assess meditative mindfulness and cognitive flexibility, I believe the evidence presented in this section offers a compelling case for such a link. Study 2 was designed to add to the literature by experimentally testing the causal connection between mindfulness and cognitive flexibility. Increasing cognitive flexibility was hypothesized to undercut the formation of reactance by preventing the participants from becoming fixated on negative cognitions (recall that reactance is comprised of negative cognition and anger).

However, it is important to note that improvements in cognition can easily be derailed; for example, negative mood can prompt ruminative thoughts, making it difficult to engage in balanced information processing. I next turn to emotion regulation, which is central to decreasing emotional reactivity and weakening reactance to environmental messages.

Meditative Mindfulness Improves Emotion Regulation

Evidence from trait, state (brief inductions), and intervention studies converge to suggest that mindfulness can improve emotional responding. Mindfulness is associated a lower level of negative affect and, potentially, increased positive affect (*trait*: Barnes, Brown, Krusemark, Campbell, & Rogge, 2007; Brown & Ryan, 2003; *state*: Broderick, 2005;

Erisman & Roemer, 2010; *intervention*: Jain et al., 2007; Robins, Keng, Ekblad, & Brantley, 2012). While mindful meditators with years of practice may experience changes in emotional functioning directly, early stage meditators' affect is influenced through enhanced emotion regulation (Arch & Landy, 2015). This is an important distinction, as Study 2 hinged on a short-term mindfulness intervention with non-meditators to weaken reactance.

Briefly, emotion regulation focuses on nurturing helpful emotions and managing maladaptive ones—it involves a goal of up- or down-regulating an affective response. Counter to common initial thoughts about emotion regulation, this could involve down-regulating 'positive' emotions, such as happiness, if the situation warranted it (e.g., while attending a somber event; Gross, 2013). There is a large array of potential regulatory actions. Gross proposes a process model of emotion regulation to help organize these possibilities (see Figure 1 below). This process model highlights five points at which emotions may be impacted. Arch and Landy (2015) suggest mindfulness can influence attentional deployment and cognitive change. In Study 2, I focused on the latter (i.e., cognitive reappraisal of emotions).

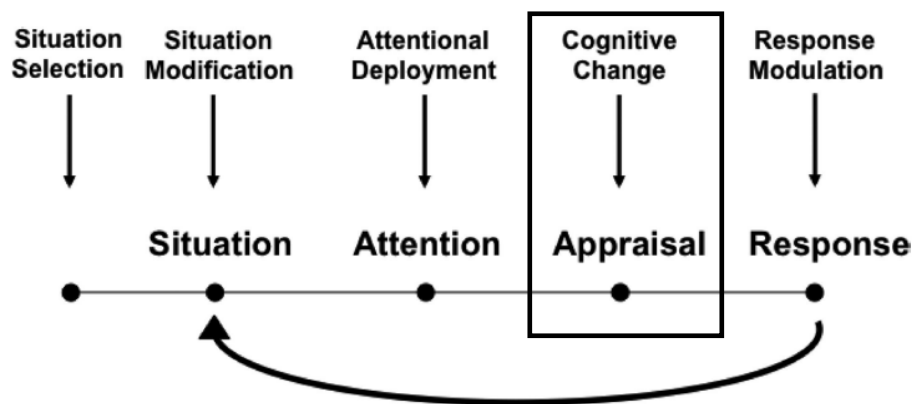


Figure 1: The process model of emotion generation and associated emotion regulation strategies (Arch & Landy, 2015).

Meditative Mindfulness Increases Tolerance of Emotional Experiences

Evidence from the Terror Management Theory

Research on Terror Management Theory shows evidence of a relationship between mindfulness and emotion regulation as seen through the absence of thought suppression. Suppression is a common emotion-driven response to a threatening train of thought, such as thinking about one's mortality. Conversely, tolerating threatening cognition indicates openness to experiencing emotional content. In a recent study of Terror Management Theory, dispositionally mindful participants did not suppress their potentially threatening thoughts after a mortality salience induction, unlike what is typically seen in such procedures. Rather, mindful participants had greater accessibility of death-related thoughts immediately, which then tapered off—this is the opposite pattern of that observed in an average participant. This indicates that mindful individuals are more open and attentive to experiences, as opposed to being likely to withdraw from them (Niemic et al., 2010). This openness to experience is vital for working through emotional experiences rather than being preoccupied with them.

Evidence from the Addiction Literature

Further evidence of emotional openness stemming from mindfulness can be found in studies of addiction. People in recovery often attempt to suppress the urges that previously led them to substance abuse. Unfortunately this often backfires (e.g., depletion of self-control, Garland, Carter, Ropes, & Howard, 2012; increased accessibility of substance-related thoughts, Klein, 2007). The willingness to approach or endure rather than run from unsettling experiences allows mindful people to undergo a sort of internal exposure therapy. Because they do not shy away from potentially negative stimuli, mindful individuals can more readily overcome personal challenges such as addiction.

In this vein, mindfulness training has been shown to help former addicts to break the link between addictive cues, which often have an emotional component, and the learned response of substance abuse. In a sample of incarcerated people, volunteers either received treatment as usual or an intensive, 10-day mindfulness training (i.e., chemical dependency treatment and substance use education vs. 8-10 hours of *daily* meditation; Bowen et al., 2006). The mindfulness group showed a substantial decrease in substance abuse at a three month follow-up, after participants were released from jail (e.g., 64.83 drinks during a high-use week to 8.38 after treatment, compared to 43.98 and 27.77 for treatment as usual; there were similar declines in crack cocaine use).

Importantly, the prevalence of attempted thought suppression in the above sample was lower at follow-up in the mindfulness condition. This change in thought suppression was a partial mediator of the impact of mindfulness on substance use (Bowen, Witkiewitz, Dillworth, & Marlatt, 2007). It should be noted that this study suffered from some severe limitations, such as the lack of random assignment to condition and a steep attrition rate (47% at three months). However, this study suggests that mindfulness training can impact real-world impulse control issues in a domain that is often linked to emotional instability—drug use. Furthermore, this impact at least partially operates through an openness to experiencing the bad with the good, so-to-speak (i.e., lowered negative thought suppression). As people build the ability to take a mental step back from the immediate experience, they move out of acting in a habitual way. This brings their behavior more in line with a thoughtful experience rather than a reactive one (e.g., moving away from former associations among triggers, typical emotional responses, and drug use).

Inducing a State of Mindfulness Enhances Emotion Regulation

Similar emotional benefits result from less intensive mindfulness interventions. A short mindfulness meditation resulted in faster recovery from a laboratory induction of negative mood compared to other conditions (Broderick, 2005). In this study, participants were subjected to negative mood through reading unpleasant, personal passages accompanied by 'sad' music. They were then randomly assigned to an eight-minute breath meditation condition or one of two reading/thinking conditions (rumination or control). They completed a measure of mood at three times during the study: 1) prior to the mood induction, 2) immediately after the mood induction, and 3) after the experimental task (the Positive and Negative Affect Scale, PANAS). They also listed their positive and negative thoughts after the experimental task. Importantly, there was no difference among conditions in the *amount* of positive or negative thoughts reported, yet participants in the mindful condition recovered from a dysphoric mood more rapidly than the others. The mindful participants continued to experience negative thoughts, yet those thoughts did not have the same impact on their mood as with the other conditions. These results suggest that even a brief mindfulness induction aids people in regulating their emotions.

Summary: Emotion Regulation Decreases Emotional Reactivity and Therefore

Reactance

The findings that indicate meditative mindfulness improves emotion regulation can be extended to emotional reactivity, a construct closer to reactance as applied to Study 2.

Emotional reactivity is a strong affective response to a stimulus or event (Nelson, Shankman, Olino, & Klein, 2011). Such reactions are often damaging, impairing things like communication, problem solving, and information processing, (Fruzzetti & Worrall, 2010).

One way to counteract reactivity is through regulating emotions. As evidenced in the studies already reviewed, as well as in a recent meta-analysis, mindfulness training is associated with improvement in areas linked to poor emotion regulation (e.g., addiction; meta-analysis with a minimum of 12 studies showed improvements in emotion regulation within patients exhibiting anxiety and depression, Hedges's $g_s = .63$ and $.59$; Hofmann, Sawyer, Witt, & Oh, 2010). In studies of mindfulness interventions ranging from a few days to a month or longer, participants displayed an increased capability of dealing with distressing situations, as compared to wait-list controls and relaxation training alternatives. That is, these participants report less negative affect associated with stressors, lower perceived stress, reductions in rumination, and reductions in biological indicators of stress (e.g., skin conductance; see Arch & Landy, 2015 for a brief review). Mindfulness allows people to reap emotional benefits by lowering the negative impact of potentially distressing triggers. An environmental message that calls for behavior-change is one example of such a trigger (i.e., elicits reactance). For these reasons outlined in the preceding sections, I hypothesized that lowering emotional reactivity would curtail the formation of reactance.

How Does Mindfulness Compare to Self-Affirmation Theory?

The above sections may call into question in what ways mindfulness differs from Self-Affirmation Theory. This is a question that has yet to be explored in the extant literature, but is important for placing mindfulness research in a larger theoretical context.

Self-Affirmation Theory

Self-affirmation theory is posited as a function of a *psychological immune system*. This immune system promotes a positive self-regard by adapting to various psychological threats that are bound to crop up in life (Gilbert, Pinel, Wilson, Blumberg, & Wheatley,

1998). One response option is to change according to the threat, for example by altering one's beliefs in light of new information. However, that option is not likely to occur, as people resist anything that may damage their illusion of rightness (Sherman & Cohen, 2007). Another option to lessen the degree of threat is through a *direct* psychological adaptation. That would involve seeing the same information or event in a different light, such as when one frames failure as an opportunity to learn rather than as an ego-threatening outcome. A third option—the option that includes self-affirmation—is an *indirect* psychological adaptation.

Self-affirmation frees up the ability to self-criticize or re-evaluate one's positions by boosting one's image in another realm. That is, people who self-affirm in an area unrelated to the one in which they face a threat are more open to evaluation of the threatening information (i.e., self-affirmation acts on threatening information indirectly). This is possible due to a global sense of self-integrity. Sources of self-integrity have a certain degree of fungibility. If people feel generally positive about themselves in one domain, they are more tolerant of a threat in another domain. Reflecting on a valued aspect of the self has a variety of positive outcomes, for example, being less biased in assessing a political or health information (Sherman & Cohen, 2007; for a comprehensive review of self-affirmation theory, please see Sherman & Cohen, 2006 and McQueen & Klein, 2006).

Similarity: Self-Integrity

It is in the theme of self-integrity that mindfulness may share similarities with self-affirmation. To have self-integrity is to perceive oneself as living up to the culturally-defined concepts of goodness, virtue, and agency (Sherman & Cohen, 2007). Taken together, different aspects of the self (i.e., domains) form the basis of self-integrity (see *Figure 2*

below). Self-affirmation preserves or restores self-integrity by operating in one of these lower-level domains, specifically one unrelated to whatever threat one's sense of self-integrity faced. For example, if someone threatened my identity as a data analyst, I could self-affirm as a good friend or partner and thus preserve my global sense of self-integrity.

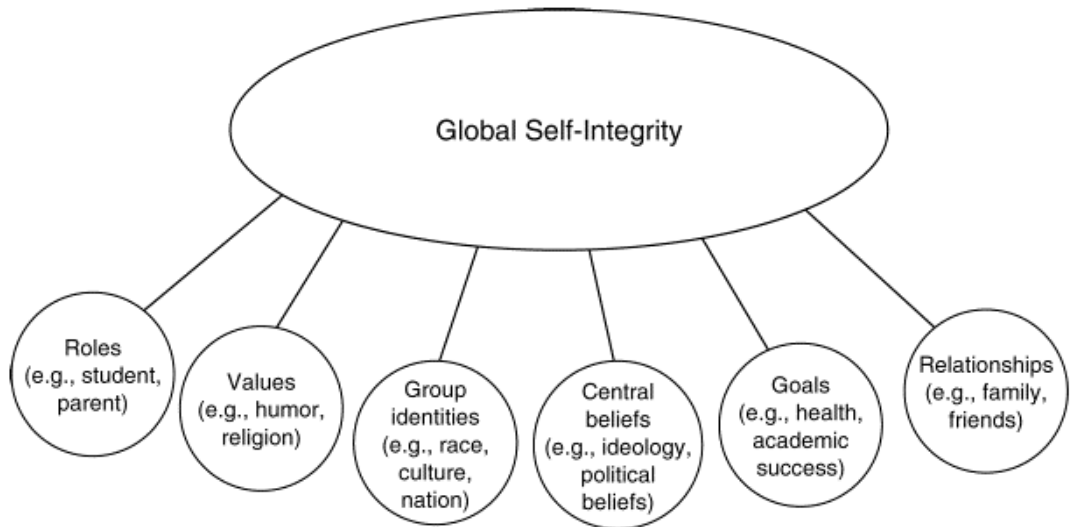


Figure 2: Schematic representation of the self-system (Sherman & Cohen, 2006)

Mindfulness could be construed as a form of self-affirmation. This may indeed be the case in experienced meditators, but it is not as clear-cut with novice meditators, for whom mindfulness would not be a valued aspect of the self. It could be that mindful meditation serves to affirm the self in a general way, as opposed to a specific one. Alternatively, mindfulness could be another form of *indirect psychological adaptation* to threat—meaning that self-affirmation and mindfulness share an overarching heading rather than mindfulness being construed as a form of self-affirmation. To my knowledge, there is no evidence addressing this issue as of yet.

Difference: Mood

One way to attempt to distinguish between self-affirmation and mindfulness is to evaluate their impact on mood. Converging evidence from a variety of methods indicates that self-affirmation exerts its influence *without* impacting mood in any way. Self-affirmation of important values has no effect on self-reported mood (e.g., Fein & Spencer, 1997; Sherman, Nelson, & Steele, 2000; Schmeichel & Martens, 2005). Mindfulness, on the other hand, has been reported to influence mood, as discussed in the “Meditative Mindfulness Improves Emotion Regulation” section above. Taken together, measuring mood and self-integrity thus offer two ways to potentially disentangle mindfulness and self-affirmation. This adds to the knowledge base on mindfulness while also helping to clarify it as one of the main constructs being assessed in the current studies.

CHAPTER 3. STUDY 1

Overview of Study 1

In Study 1 I examined the relationships among trait mindfulness, reactance, and pro-environmental outcomes. Specifically, I expected that trait mindfulness would moderate participants' responses to high threat vs. low threat environmental messages, such that people higher on trait mindfulness would be less prone to reactance after reading threatening environmental messages than those lower on trait mindfulness. Furthermore, I expected that higher trait mindfulness would predict greater willingness to engage in pro-environmental behaviors and environmental advocacy. I also tested whether or not trait mindfulness is associated with self-integrity. To examine these propositions, I measured trait mindfulness, manipulated environmental message type (high and low threat), and measured pro-environmental behavioral intentions and willingness to engage in environmental advocacy. I also included a measure of self-integrity, as investigating if trait mindfulness is associated with self-integrity informs our understanding of the similarities and differences between mindfulness and self-affirmation.

Study 1 Method

Participants

Participants were recruited from Amazon's Mturk. Mturk is a crowdsourcing platform in which businesses, researchers, or individuals (Requesters) can solicit the work of other Mturk users (Workers). Mturk has been successfully used in psychological research in the past (Cheung, Burns, Sinclair, & Sliter, 2016). While concerns have been raised about the quality of Mturk Workers' responses (Goodman, Cryder, & Cheema, 2013), research has

shown that these participants score above the traditional college student participants in measures of attention (Hauser & Schwarz, 2016).

In total, 200 Mturk Workers were recruited for Study 1. Of those participants, 11 were excluded for failing at least one attention check. The remaining participants ranged in age from 20-77 years old ($M = 35.34$, $SD = 11.524$), 42% self-identified as female, 67.7% self-identified as White/European American, 12.7% self-identified as Asian/Pacific Islander, 9% self-identified as Black/African American, 6.9% self-identified as Hispanic/Latin American, 2.1% self-identified as multiple ethnicities, and 1.6% self-identified as Native American. On average, participants reported being slightly more liberal than conservative (two items, conservative $M = 3.32$, $SD = 1.98$; liberal $M = 4.62$, $SD = 1.96$). Of the demographic information, age and political ideology influenced the some of the results, so they were included as covariates in the analyses.

Procedure

The participants were told the purpose of the study was to situational influences and individual differences in perceptions of global issues and that they would be randomly assigned to one of several areas. All participants were “randomly” placed in the “Environmental Issues” condition. All data were collected online, and the participants received a credit code upon completion of the questionnaire. Participants then entered that code into their Mturk account to receive payment. All participants were paid \$1.75 for their time; the study took between 10 and 15 minutes to complete. This pay is above average for psychological studies conducted on Mturk (Buhrmester, Kwang, & Gosling, 2011).

Questionnaires. After participants provided consent, they received a series of questionnaires, including the following:

Marlowe-Crowne Social Desirability Scale. The MC-SDS is designed to measure whether or not participants are responding in a socially desirable way and potentially misrepresenting themselves, independent from psychopathy (33 items, $\alpha = .897$; Crowne & Marlowe, 1960).

Self-Integrity Scale. The self-integrity scale is designed to assess the degree to which participants see themselves as globally moral, adequate, and efficacious, rather than the assessing those things in a specific domain that is important to the self (8 items, $\alpha = .896$; Sherman, Cohen, Nelson, Nussbaum, Bunyan, & Garcia, 2009).

Environmental attitudes and identity. The New Ecological Paradigm assesses the extent to which participants endorse a pro-environmental worldview and are concerned about the environment (15 items, $\alpha = .909$; Dunlap, Van Liere, Mertig, & Jones, 2000). Six items were included to assess environmental identity ($\alpha = .696$); two items assessed participants degree of control in how often they interact with a natural environment ($r = .498$), and four items assessed the influence natural environments have on participants' emotions ($\alpha = .889$).

Five Facet Mindfulness Questionnaire. The FFMQ is based on a factor analysis of commonly used self-report measures of mindfulness. The resulting five facets assess individual differences in elements associated with mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (FFMQ Observe facet, 8 items, $\alpha = .852$, FFMQ Describe facet, 8 items, $\alpha = .879$, FFMQ Aware facet, 8 items, $\alpha = .918$, FFMQ Nonjudgment Facet, 8 items, $\alpha = .920$, FFMQ Nonreact Facet, 7 items, $\alpha = .833$, Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006).

Positive and Negative Trait Affect Scale. The PANAS assesses mood or emotion, depending on the instructions given. In the present study, the participants were asked to

respond based on how they had felt over the prior two weeks, thus this would an indication of mood (note: Study 2 uses the PANAS to assess current emotional states; PANAS; positive affect, 10 items, $\alpha = .915$; negative affect, 10 items, $\alpha = .938$; Watson, Clark, & Tellegen, 1988; see Appendixes 1-7 for scales).

Other information. They also provided demographic information during this portion. As with any sample, there are both strengths and weaknesses to Mturk data. Building in attention checks is one way to combat the weaknesses; therefore, attention checks were included throughout the questionnaire.

Threat manipulation. After completing the first questionnaire portion, participants read one of two messages (high threat vs. low threat; Appendix 8). The messages were pilot tested and results indicated a significant difference in the expected direction on the manipulation check ($t(47) = 3.08, p = .003, 95\% \text{ CI of mean difference} = .412, 1.96$). After reading the message, participants responded to a brief manipulation check (Dillard & Shen, 2005; see Appendix 9). The anger component of reactance was measured via four items that have been validated in previous studies. Both anger and negative cognition were assessed through the participants' written responses to the message. Participants were asked to type out any thoughts and feelings they had while reading the message. These responses were coded by pairs of research assistants following the procedure outlined by Dillard and Shen (2005; see Appendix 10). Each coder broke the written response into "thought units," then determined whether the thought unit was primarily affective or cognitive in its content. From there the units were determined to contain anger or other affect, or negative, supportive, or neutral cognitions. Interrater agreement at initial assessment indicated high levels of agreement; discrepancies were resolved by coders coming to a consensus on the nature of the

thought unit. (Given the dimensional nature of the data, correlation coefficients are more appropriate than Kappa statistics; $r_{affective} = .79$, $r_{anger} = 1.0$, $r_{supportive} = .74$, $r_{negative} = .93$, $r_{neutral} = .61$).

Environmental outcomes. After a brief filler task, participants were asked questions assessing whether or not they would be willing to engage in environmental advocacy. One item asked if they would be willing to talk to roommates, family, or friends about ways to conserve natural resources. If they indicated agreement on this item, they were directed to a screen in which they could list items or topics they would discuss with people they knew. Following this, they indicated their intentions to behave in a pro-environmental way (Appendix 11).

Study 1 Results

Reactance

Manipulation check. The manipulation check indicated the message manipulation had the intended effect. Participants responded feeling more threatened after reading a threatening (proscriptive) environmental message than after reading the non-threatening message (4 items, $\alpha = .86$; $M_{threat} = 2.88$, $SD = 1.02$; $M_{low_threat} = 2.11$, $SD = 1.02$; $F(1, 187) = 26.43$, $p < .001$, $d = .75$, 95% CI of mean difference = .47, 1.06).

Descriptive statistics of reactance (coded and self-report). Participants' written responses to environmental messages tended to fall under the cognitive heading than the affective heading. That is, few participants wrote anything about an emotional response to the message ($M_{anger} = .02$, $SD = .13$; $M_{other_affect} = .11$, $SD = .39$). Assessing the self-report measure of anger revealed low levels as well (4 items, $\alpha = .92$; $M = 1.67$, $SD = .96$). Of the types of cognitive responses, participants primarily were supportive or neutral in their

statements ($M_{supportive} = 2.31, SD = 1.91; M_{negative} = .55, SD = 1.80; M_{neutral} = 3.08, SD = 2.02$).

The coded data were not normally distributed. However, given the lack of appropriate normality transformations for data including zeros, they were analyzed in their raw form. The following analyses are relatively robust to violations of normality, but the results should be interpreted with caution.

The impact of the threat manipulation reactance. The results of the analysis testing for the effect of message type (threat vs. low threat) on reactance were mixed. A MANOVA revealed that the threatening message yielded marginally greater self-reported anger and negative cognition than did the low threat message, but there was not a significant difference with coded anger (see *Table 1* below).

Table 1: Reactance by Message Type

	Message Type	Mean	SD	F	p	d	95% CI
Self-Reported Anger	Low Threat	1.47	.79	2.99	.086	.26	-.032, .490
	Threat	1.70	1.00				
Coded Anger	Low Threat	.02	.15	.50	.479	.08	-.053, .025
	Threat	.01	.11				
Negative Cognition	Low Threat	.39	.99	2.73	.100	.27	-.053, .599
	Threat	.69	1.23				

Note: $df(1, 170)$, 95% CI = 95% CI of mean difference

Trait Mindfulness and Reactance

Trait mindfulness had a complex relationship with reactance. Assessing the different facets of mindfulness indicated that the strongest relationships were with lower self-reported anger. Given that there was a floor effect among the coded aspects of reactance, it is unsurprising that self-reported anger yielded the strongest correlations to the facets of mindfulness. That is, there was more power to detect differences in the self-reported measure than among the coded measures. Based on these results, the analyses to follow focused primarily on self-reported anger; it is important to note that the effect of message type on

self-reported anger was marginally significant and the mean difference between groups was quite small.

Table 2: Reactance and Mindfulness Facet Correlations

	1	2	3	4	5	6	7
1. Self-Reported Anger							
2. Coded Anger	.082						
3. Negative Cognition	.328**	.049					
4. FFMQ Observe	-.099	.070	-.025				
5. FFMQ Describe	-.207**	.020	.132	.319**			
6. FFMQ Awareness	-.320**	-.005	.230**	-.043	.399**		
7. FFMQ Nonjudgment	-.203**	-.060	.099	-.099	.374**	.653**	
8. FFMQ Nonreact	-.134	.028	-.098	.446**	.271**	.108	.063

Note: ** $p < .01$, FFMQ scales “Awareness” = Act with Awareness

Self-reported anger. Due to multicollinearity concerns among the facets of mindfulness, I submitted the facets to an exploratory factor analysis with varimax rotation, which suggested a two-factor solution (initial eigenvalues—2.06 and 1.51—indicated that these two factors explained 41.26% and 30.18% of the variance, which became 38.71% and 32.73% after rotation). Factor one was comprised of Act with Awareness and Nonjudgment. This made sense conceptually, as mindfulness is often defined as awareness in the present moment without judgment. Factor two was comprised of Observe and Nonreact. This pairing also makes sense conceptually, as both are grounded in perception. The Nonreact component has an additional feature of not reacting to what has been perceived. The Describe facet cross-loaded on both factors (.59 and .52 respectively) and was analyzed separately. I collapsed across facets based on the factor analysis and used the resulting mid-level structure in the following multiple regression analysis (hereafter facet one is referred to as “*mindfulness*” and facet two is referred to as “*perception*”).

The multiple linear regression with *mindfulness*, *perception*, and message type as factors significantly predicted self-reported anger ($R^2_{adj} = .14$, $SE = .89$, $F(6, 176) = 6.02$, $p <$

.001). People higher on trait *mindfulness* reported less anger to the environmental message regardless of threat level ($\beta = -.23, p = .004, 95\% \text{ CI of } b \text{ weight} = -.37, -.09$). People higher on trait *perception* tended to report less anger as well, but not to a significant degree ($\beta = -.11, p = .123, 95\% \text{ CI of } b \text{ weight} = -.24, .04$). The addition of interaction terms between message type and the two mindfulness factors did not explain more variance in the model ($\Delta R^2 = .01, SE = .89, F(8, 174) = 4.71, p < .001$; sig. of $\Delta F = .44$) and neither interaction term was a significant predictor ($ps > .215$). This pattern of results was repeated with the separate analysis of the FFMQ Describe facet. *Describe* predicted self-reported anger in the expected direction, but did not interact with message type ($\beta = -.14, p = .072, 95\% \text{ CI of } b \text{ weight} = -.30, .02$; interaction term $\beta = .01, p = .854$). To summarize, the main effects of *mindfulness* and *describe* were in the expected direction; as people increased in these facets of mindfulness, they were less likely to report experiencing anger in response to an environmental message, but were not differentially impacted by the level of threat in the message [(FFMQ Facets: Act with Awareness and Nonjudgment, Describe (marginal))].

Negative cognition. The result of a multiple linear regression with *mindfulness*, *perception*, and message type predicting coded negative cognition was significant, but in an unexpected direction ($R^2_{adj} = .05, SE = 1.10, F(5, 170) = 3.01, p = .012$). People higher on *mindfulness* reported more negative cognition in response to the environmental message, regardless of threat level ($\beta = .18, p = .024, 95\% \text{ CI of } b \text{ weight} = .05, .36$). People higher on *perception* tended to report slightly less negative cognition, but this did not approach significance ($\beta = -.05, p = .544, 95\% \text{ CI of } b \text{ weight} = -.28, .18$). Adding the interaction terms between message type and the two mindfulness factors did not explain additional variance in the model ($\Delta R^2 = .01, SE = 1.09, F(7, 168) = 2.34, p = .026$; sig. of $\Delta F = .50$) and neither

interaction term was a significant predictor ($ps > .252$). This pattern of results was repeated with the separate analysis of the FFMQ Describe facet. *Describe* predicted more negative cognition, but did not interact with message type ($\beta = .15, p = .061, 95\% \text{ CI of } b \text{ weight} = -.01, .33$; interaction term $\beta = .10, p = .201$). To summarize, the main effects of *mindfulness* and *describe* were unexpected; people higher in these facets of mindfulness were more likely to write negative comments in response to an environmental message.

Trait Mindfulness and Environmentalism

The hypothesis that trait mindfulness would predict environmentalism was partially supported. Some aspects of trait mindfulness (i.e., *perception* and FFMQ Describe) were positively related to environmental outcomes, while others were unrelated (*mindfulness*; see Table 3 below). Based on these results, the analyses to follow excluded the FFMQ *mindfulness* factor described above (i.e., Awareness and Nonjudgment).

Table 3: Trait Mindfulness and Environmentalism

	1	2	3	4	5	6	7
1. Behavioral Intentions							
2. Environmental Advocacy	.442**						
3. Environmental Attitudes	.592**	.435**					
4. FFMQ Observe	.405**	.227**	.232**				
5. FFMQ Describe	.169*	.198**	.049	.319**			
6. FFMQ Awareness	.011	.038	-.017	-.043	.399**		
7. FFMQ Nonjudgment	.046	.107	.125	-.099	.374**	.653**	
8. FFMQ Nonreact	.320**	.146*	.202**	.446**	.271**	.108	.063

Note: ** $p < .01$, * $.01 > p > .05$; FFMQ scales “Awareness” = Act with Awareness; Environmental Attitudes = New Ecological Paradigm.

Trait mindfulness as a predictor of pro-environmental behavioral intentions. The result of a multiple linear regression with *perception* and FFMQ Describe predicting self-reported pro-environmental behavioral intentions was significant ($R^2_{adj} = .43, SE = .97, F(6, 176) = 23.71, p < .001$). While environmental attitudes (NEP) were the strongest predictor of behavioral intentions, *perception* predicted pro-environmental behavioral intentions beyond

the variance accounted for by attitudes (*Perception*: $\beta = .26$, $p < .001$, 95% CI of b weight = .18, .49; Attitudes [NEP]: $\beta = .53$, $p < .001$, 95% CI of b weight = .44, .72). *Describe* was not a significant predictor of behavioral intentions. To summarize, people higher on the FFMQ Observe and Nonreact facets (the *perception* factor) reported stronger intentions to behave in a pro-environmental way regardless of prior attitudes.

Trait mindfulness as a predictor pro-environmental advocacy. Participants were asked whether they would be willing to talk to their friends, family, or roommates about conservation. If they indicated that they were willing to talk to others about conservation, they were given an option to list the topics that they would discuss. In total, 81% of respondents indicated that they would be willing to talk to others about conservation. On average, those participants listed 4.78 topics for discussion ($SD = 2.80$).

Perceptions and FFMQ *Describe* were tested as predictors of the number of topics participants indicated for discussion (hereafter referred to as pro-environmental advocacy). The result of a multiple linear regression with *perception* and *describe* predicting pro-environmental advocacy was significant ($R^2_{adj} = .25$, $SE = 2.60$, $F(6, 176) = 11.21$, $p < .001$). Again, environmental attitudes emerged as the strongest predictor in the model. However, *perception* was not a significant predictor of environmental advocacy (unlike with pro-environmental behavioral intentions); whereas, *describe* was a marginally significant predictor of environmental advocacy, beyond the variance accounted for by attitudes (*Perception*: NS; *Describe*: $\beta = .13$, $p = .073$, 95% CI of b weight = -.01, .82; Attitudes [NEP]: $\beta = .40$, $p < .001$, 95% CI of b weight = .60, 1.37).

Trait Mindfulness and Self-Integrity (Exploring a Connection to Self-Affirmation)

Recall that mindfulness could potentially be construed as a form of self-affirmation, particularly among people who practice mindful meditation. However, non-meditators may not hold mindfulness as a valued aspect of the self. It is possible that mindfulness—in a broad sense—is another form of indirect psychological adaptation to threat, meaning that self-affirmation and mindfulness may share a common base. As a preliminary investigation of this relationship, I assessed the association among facets of trait mindfulness and self-integrity (recall that global self-integrity is the possible commonality between mindfulness and self-affirmation; see *Figure 2*). As seen in Table 4 below, all facets of trait mindfulness were positively associated with self-integrity. This suggests that mindfulness—broadly construed—could be placed among the self-system discussed earlier.

Table 4: Correlations between Self-Integrity and FFMQ Facets

	Observe	Describe	Awareness	Nonjudgment	Nonreact
Self-Integrity	.347**	.429**	.350**	.235**	.330**

Note: ** $p < .01$, * $.01 > p > .05$; FFMQ scales “Awareness” = Act with Awareness

Study 1 Discussion

Studying the relationships among trait mindfulness, reactance, and pro-environmental outcomes produced mixed results. To a marginal extent, the threat manipulation worked in producing self-reported anger, but very few participants indicated reactance in their written responses (i.e., low levels of coded anger and negative cognition even among participants in the threatening condition). While participants were inclined to indicate that they felt manipulated and threatened by the threat version of the message, they were less inclined to articulate that in their writing. This may be due to the remote nature of online data collection. While the anonymity of the internet can certainly embolden some people (e.g., the participant who was “tired of all the environmentalists” and preferred that they “all jump off a cliff so

they can quit spewing out carbon dioxide and reduce pollution”), it could also reduce motivation to think about the written message and therefore limit the responses. This is an issue addressed by the in-person nature of the second experiment.

Mixed Reactance Results: Higher Trait Mindfulness, Less Anger, More Negative Thoughts?

Although only partial support was found for the hypothesis that mindfulness would be inversely related to reactance, the results were promising. Higher levels of the facets of mindfulness—particularly nonjudgment, describe, and acting with awareness—were clearly related to lower self-reported anger in response to environmental messages. As anticipated, people who report being able to understand, articulate, and accept their emotions (describe and nonjudgment) and can focus on the present moment (act with awareness) are better able to cope with emotionally provocative content, such as a threatening message. These findings support the notion that mindfulness may undercut the formation of reactance.

Conversely, there were some unanticipated results concerning the negative cognition component of reactance. Some facets of mindfulness—acting with awareness and describe—were associated with higher levels of negative cognition. While being focused in the present moment and being able to articulate and understand one’s feelings may help to curtail the development of anger, it may also aid one’s ability to clearly express disagreement. This is an interesting possibility, but it is important to note that any of the results involving coded responses must be interpreted cautiously due to the non-normality of the data.

Trait Mindfulness is Linked to Greater Environmentalism

There was also support for the hypothesis that mindful individuals are more supportive of environmentalism. People who can notice the interplay of the various systems

that exist around themselves (observe) and can acknowledge their emotions without getting “caught up” in them (describe and nonreact) report greater intentions to behave in a pro-environmental way. Similarly, participants who were higher on the *describe* facet of mindfulness tended to produce more topics that they would use when discussing conservation and environmental concerns with their friends and family. It seems that people who were higher on the internal aspects of mindfulness were more willing to engage in personal action (behavioral intentions). Conversely, people who scored higher on a more external aspect of mindfulness (being able to put their thoughts and feelings into words) were more likely to engage in interpersonal environmentalism (advocacy). Perhaps people who are better able to articulate their own thoughts and feelings are generally better communicators, thus scoring higher on this measure advocacy. It is important to note that the facets of mindfulness were predicting environmentalism after environmental attitudes were accounted for. That is, these results were not capturing mere overlap between mindfulness and environmental attitudes—facets of mindfulness were predicting higher levels of environmentalism above and beyond what could be explained by attitudes.

Trait Mindfulness and Self-Affirmation: Connected by Self-Integrity

Study 1 provided an exploration of a potential link between mindfulness and self-affirmation via self-integrity. Recall that global self-integrity is theorized to be the superordinate construct from which other aspects of the self originate and that self-affirmation works by acting upon a given component or components of the self. All facets of trait mindfulness were positively associated with self-integrity. This suggests that mindfulness—broadly construed—should indeed be placed among the self-system discussed earlier. Whether the act of mindful meditation serves as a form of self-affirmation is a subject

that would need much more rigorous testing. The results of Study 1 do suggest, however, that trait mindfulness relates to the higher-level concept on which self-affirmation is based: a global sense of self.

Summary of Study 1

Study 1 provided the first known assessment of the relationship between mindfulness and reactance. The results offered evidence linking higher trait mindfulness to lower levels of the anger component of reactance. These results also shed light on the nuances of trait mindfulness, as they related differently to the variables of interest. Furthermore, this is the first study to broach the potential relationship between mindfulness and self-affirmation by assessing a potential shared structure.

Taken together, these results serve a foundation for an experimental test of mindfulness undercutting the formation of reactance. While the results were less promising concerning negative cognition, Study 1 delivered a compelling case that mindfulness may minimize anger in response to an environmental message. Inducing a state of mindfulness affords a more thorough test of this hypothesis and was the focus of Study 2.

CHAPTER 4. STUDY 2

Study 2 Hypotheses

Reactance occurs in response to a perceived threat to one's freedom and is comprised of negative cognition and anger. Environmental messages often prescribe behavior and could be perceived as restricting freedom of choice; there was suggestive evidence of this in Study 1, although it did not reach conventional levels of significance. Likewise, there was some evidence supporting that mindfulness is inversely related to reactance, at least with the anger component. Critically, I proposed that inducing a state of mindfulness would interrupt the formation of reactance in response to an environmental message. By increasing cognitive flexibility and decreasing emotional reactivity through meditative mindfulness, the formation of negative cognition and anger—reactance—should be curtailed. To examine this proposition, I manipulated both environmental message type (high and low threat) and state mindfulness (meditation vs. control). Evidence of the effect of message type on reactance already exists (e.g., Dillard & Shen, 2005; see Reactance above). I included it in Study 2 to a) clarify reactance in response to an environmental message and b) provide a platform on which to study the effect of meditative mindfulness in response to such messages. Critically, cognitive flexibility and emotional reactivity were proposed to be the driving force behind the effect of mindfulness in this scenario. I anticipated that mindfulness and its underlying features would moderate the impact of message type on reactance. That is, I expected that mindful participants would experience lower reactance in response to threatening environmental messages and that this effect would be partially mediated by their cognitive flexibility and emotional reactivity (see *Figure 3* below).

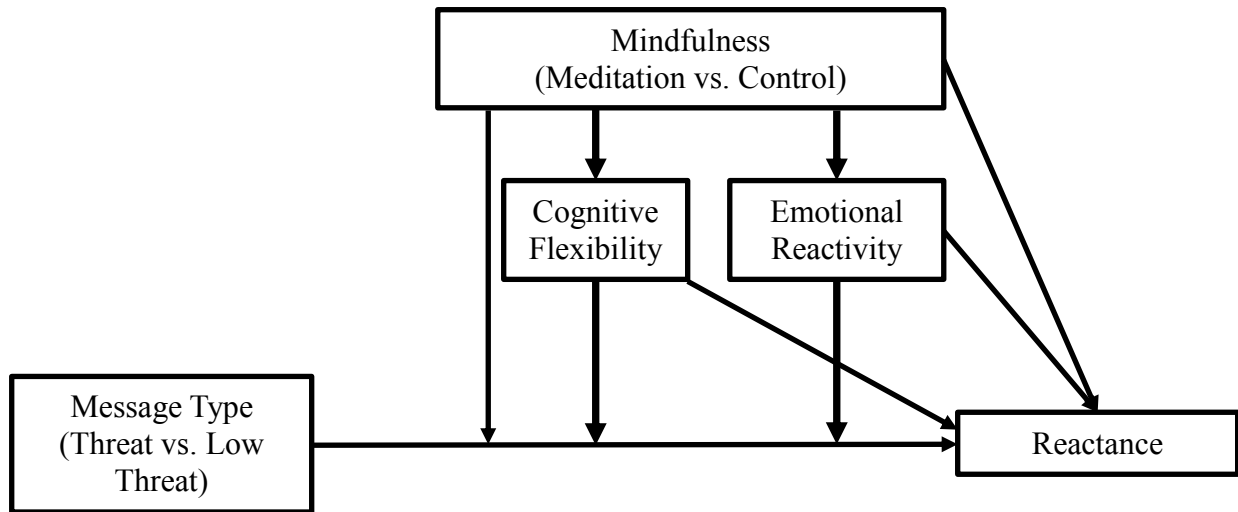


Figure 3: Illustration of hypothesized relationships among message type, mindfulness condition and its underlying components, and reactance. Paths central to the hypotheses are bolded.

Expanding on the results of Study 1, I proposed several key effects of environmental attitudes in Study 2. Given that individuals who hold less favorable attitudes toward conservation initiatives likely perceive more threat from an environmental message, I expected that attitudes would predict reactance. Specifically, individuals with low environmental attitudes would perceive greater threat from either message than would participants with high environmental attitudes. This difference would be most apparent after exposure to the threatening message, but would exist regardless of message type (i.e., a “spreading” interaction pattern). Environmental attitudes were likely to influence the effects illustrated in Figure 2; therefore, attitudes and the attitude by message interaction were assessed as covariates in the proposed model.

Furthermore, the inclusion of a measure of mood allowed for continued exploration of the relationship between mindfulness and self-affirmation. While Study 1 indicated some similarity between trait mindfulness and self-affirmation (self-integrity), Study 2 assessed an

important difference. To the extent that the mindfulness manipulation impacted the measure of affect that followed it, there would be evidence that mindfulness and self-affirmation are not subject to the jangle fallacy (i.e., are identical or almost identical with their only difference being in their labels).

Overview of Study Two

Evidence for the effects hypothesized in *Figure 3* were collected in one laboratory session under a cover story about examining factors involved in perceptions of issues of global importance. The first portion of the study was comprised of a series of questionnaires presented on a computer. This included a measure of environmental attitudes. After the questionnaire portion, participants were randomly assigned to either the meditative mindfulness or control condition. They engaged in their assigned task for 20 minutes and moved on to behavioral assessments of cognitive flexibility and emotional reactivity, which were counter-balanced in order. Next, participants read and evaluated a randomly assigned message (high threat vs. low threat). Their evaluation was coded for reactance to the message. This design was intended to reveal how mindfulness—through increased cognitive flexibility and decreased emotional reactivity—may undercut the formation of reactance in response to environmental messages. Due to the available resources and number of estimated paths, there was limited power to detect additional effects such as measures of environmentalism (e.g., indications of environmental attitude change, assessment of environmentally friendly behaviors). Therefore, Study 2 focused on the proposed underlying processes and did not assess the additional outcomes covered in Study 1.

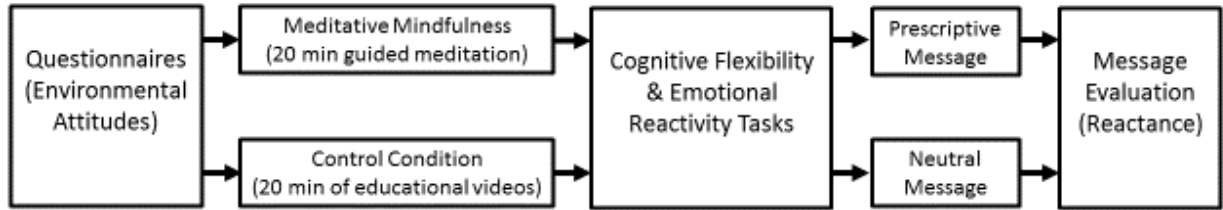


Figure 4. Basic flowchart of Study 2 procedures.

Method

Power Analysis and Participants

A series of Monte Carlo simulations were conducted in Mplus v.7 to determine the necessary sample size to detect significant mediated moderation. Effect sizes were estimated from published studies or pilot data; unknown effect sizes were estimated as small to medium ($r = .10-.30$). The most conservative estimates yielded a suggested sample of 900 to detect the proposed paths with sufficient power (.80). Slightly less conservative estimates yielded a suggested sample size of 150 to 320. Based on the results, I proposed a minimum sample size of 200 participants with the goal of recruiting more than 250.

In total, 296 undergraduate students who were registered in the Iowa State University participant pool were recruited through SONA Systems and received course credit in exchange for their participation. Of these participants, 21 were excluded (eight due to technical difficulties during the study, five due to distracting levels of construction noise in the lab during the study, and eight due to the participant's failure to follow directions). The remaining 275 participants ranged in age from 18-38 years old ($M = 19.53$, $SD = 1.93$), 48.4% self-identified as female, 71.7% self-identified as White/European American, 13.4% self-identified as Asian/Pacific Islander, 6.9% self-identified as Black/African American, 3.3% self-identified as multiple ethnicities, 2.5% self-identified as Hispanic/Latin American,

and 1.9% responded as “other” or “not listed.” Of the demographic information, only gender influenced the some of the results, so it was included as a covariate in the analyses.

Procedure

Participants were randomly assigned to one cell of a two (message: high threat vs. low threat) by two (meditative mindfulness vs. control) design. They were run individually to guard against interference from others’ responses. The first part of the session took place on a desktop computer in the lab via a Qualtrics survey platform. While this portion of the study could feasibly have been conducted online before the laboratory study, prior experience with two-part online studies suggests an extremely high attrition rate therefore making the laboratory a better option for retaining research participants. The participants were told the purpose of the study was to assess students’ thoughts, feelings, and responses regarding topics of global importance and that they would be randomly assigned to one of several areas. All participants were “randomly” placed in the “Environmental Issues” condition.

Measures

After participants provided consent, they received a series of questionnaires. This included standard measures of environmental attitudes, the New Ecological Paradigm (Dunlap, Van Liere, Mertig, & Jones, 2000, see Appendix 1). They also provided demographic information during this portion.

Mindfulness Manipulation

After completing the questionnaires, participants were asked to step into the lobby for a moment while the research assistant readied the next portion of the study. They then were directed to return to the computer they had previously used in Part 1. The research assistant said:

“This study will take place almost entirely on the computer. Please take your time and really think about what you’re being asked to do. You’ll start with a task that will last roughly 20 minutes. This portion is to help you get acclimated to the laboratory environment before we do some performance tasks. The instructions will all be on the computer screen. After this task, you’ll come to a screen that asks you to come get me so I can set up the next phase of the study. I’ll be in the control room on the other side of the lobby. Do you have any questions? Please wait for me to leave, then you may click ‘next.’”

Participants then engaged in either a 20 minute guided mindfulness meditation presented via an audio clip or will watch roughly 20 minutes of educational videos (How It’s Made: Blackboards, Pavers, Legos, and Bowling Balls). The guided meditation was primarily breath-focused, but also included a portion of open awareness meditation. A pilot study with a shorter version of this meditation and a writing control yielded a significant difference on mindfulness-related items of the PANAS (*calm, attentive, relaxed, interested, at ease, and concentrating*; 7 items, $\alpha = .82$; mean difference = .53, $SE = .20$, $p = .027$, 95 % CI = .05, 1.00). Increasing the time of the meditation session and lowering active engagement in the control (i.e., passively watching videos rather than actively writing) were expected to strengthen the manipulation. Both conditions were presented through Qualtrics. Following the mindfulness condition, participants responded to a brief manipulation check (the Mindful Attention Awareness Scale, state version; see Appendix 3). The next screen had a large, bolded message asking participants to stop and notify the research assistant.

Assessment of Cognitive Flexibility

The participants were asked to wait in the lobby area for a moment while the research assistant prepared the next step of the study. The assistant switched the computer screen from

Qualtrics to Inquist Software, which had been open in the background. In the Inquist Software, participants underwent the *Wisconsin Card Sort Test* to assess their cognitive flexibility (Berg, 1948). The assistant asked the participant to return to his or her seat by the computer and said:

“The next two portions are to help us understand how you tend to approach different puzzles and tasks. They both will be on the computer, but I will have to set them up individually. When you’re done with this one, please come get me so I can set up the next one. All of the instructions are on the computer screen. You may begin when I leave.”

In this task, participants were shown images of cards with different patterns and colors on them (see Appendix 4 for card examples). They were told to match the cards but were not told the rules for matching. They are only told whether or not the match was correct. Over the course of the test, the matching rules changed. The Wisconsin Card Sort Test yields a variety of measurements. Of interest for the current work, particularly Study 2, was the *number of perseverative errors*; that is, errors from applying an old rule after the rule has changed. A larger number of perseverative errors indicates a lower cognitive flexibility score (Chelune & Baer, 1986). At the end of the task, the participants reached a screen instructing them to notify the research assistant. This task was counter-balanced with the assessment of emotional reactivity; the research assistant script changed accordingly.

Assessment of Emotional Reactivity

After notifying the research assistant, participants again momentarily waited in the lobby as the next portion was prepared. The assistant switched the screen to another window running Inquist Software for a modified Stroop Task. The assistant asked the participant to return to his or her seat by the computer and said:

“As with the previous task, please come get me when you’re done. All of the instructions are on the computer screen. You may begin when I leave.”

This version of the Stroop Task called for participants to correctly indicate the color of ink in which a word was displayed. Words were displayed in red, yellow, blue, or green. Participants indicated the target color by pressing the appropriate keys on the computer keyboard. They were given a 10-item, neutral word practice trial to get accustomed to the response keys. In the main trial, there were three types of words: neutral words (e.g., Chair), negative emotion words (e.g., Anger), and positive emotion words (e.g., Happiness). The errors and rate of responding (i.e., latency between word presentation and response) were indications of interference caused by the participant having read the word. The interference in emotion words, particularly negative emotion words, indicates emotional reactivity. At the end of the task, the participants reached a screen instructing them to notify the research assistant.

Message Manipulation

The participants momentarily waited in the lobby as the research assistant returned the computer screen to Qualtrics and proceeded to a hold screen. The assistant asked the participant to return to his or her seat by the computer and said:

“Now we’re going to have you read and think about a message concerning a topic of global importance. After that, you’ll answer a few questions about the topic. You were randomly assigned to one of several categories at the beginning of the study; you’ll be in the same category for this. The rest of the study will take place on this program (gestures to Qualtrics), so you won’t need to come get me until the very end. Please take your time, and let me know when you’re done.”

The participant advanced through the hold screen on Qualtrics. On the next page they saw one of two messages (see Appendix 5). Following the message condition, participants responded to a brief manipulation check (Dillard & Shen, 2005; see Appendix 6). The messages were pilot tested and results indicated a significant difference in the expected direction on the manipulation check ($t(47) = 3.08, p = .003, 95\% \text{ CI of mean difference} = .412, 1.96$).

Message Response

The anger component of reactance was measured via four items that have been validated in previous studies (Dillard & Shen, 2005; see Appendix 6). Anger was also assessed through the participants' written responses to the message, as was negative cognition. Participants saw a screen on Qualtrics asking them to type out any thoughts and feelings they had while reading the message. These responses were coded by pairs of research assistants following the procedure outlined by Dillard and Shen (2005; see Appendix 7). The coding was conducted in the same way as with Study 1 (given the dimensional nature of the data, correlation coefficients are more appropriate than Kappa statistics; $r_{affective} = .91, r_{anger} = .65, r_{supportive} = .95, r_{negative} = .86, r_{neutral} = .88$). Following the procedure, the participants were fully debriefed by the research assistant. In total, the study took between 31 and 60 minutes.

Study 2 Results

Manipulation Checks

The manipulation checks indicated the message manipulation had the intended effect while the mindfulness manipulation had mixed results. Participants responded feeling more threatened after reading a threatening environmental message than after reading the non-

threatening message (4 items, $\alpha = .85$; $M_{threat} = 2.64$ $SD = .97$; $M_{low_threat} = 2.09$, $SD = .90$; $F(1, 253) = 19.13$, $p < .001$, $d = .59$, 95% CI of mean difference = .28, .74).

There was no difference in self-reported state mindfulness between the mindful meditation condition and the control condition (5 items, $\alpha = .836$; $F(1, 253) = .04$, $p = .842$). However, assessing the *serenity* and *attentiveness* subscales of the Positive and Negative Affect Scale indicated the mindfulness manipulation had effects in the expected direction or trending in the expected direction (*PANAS serenity*: “calm,” “relaxed,” and “at ease,” $\alpha = .84$; $M_{mindful} = 3.71$, $SD = 1.01$; $M_{control} = 3.18$, $SD = .87$; $F(1, 253) = 17.73$, $p < .001$, $d = .56$, 95% CI of mean difference = .26, .72; *PANAS attentiveness*: “alert,” “attentive,” “concentrating,” “determined,” $\alpha = .73$; $M_{mindful} = 2.63$, $SD = .88$; $M_{control} = 2.49$, $SD = .85$; $F(1, 253) = 1.17$, $p = .280$, $d = .16$, 95% CI of mean difference = -.10, .33).

Reactance in Response to the Environmental Message

Descriptive statistics of reactance (coded and self-report). Similar to Study 1, participants’ written responses to environmental messages tended to fall under the cognitive heading rather than the affective heading. That is, few participants wrote anything about an emotional response to the message ($M_{anger} = .04$, $SD = .28$; $M_{other_affect} = .19$, $SD = .50$).

Assessing the self-report measure of anger revealed low levels as well ($\alpha = .94$, $M = 1.65$, $SD = .85$). Of the types of cognitive responses, participants primarily were supportive or neutral in their statements ($M_{supportive} = 2.63$, $SD = 1.91$; $M_{negative} = .46$, $SD = .96$; $M_{neutral} = 2.54$, $SD = 1.95$). As with Study 1, the coded data were not normally distributed but were analyzed in their raw form due to the lack of appropriate transformations. The following analyses are relatively robust to violations of normality, but the results should be interpreted with caution.

Environmental attitudes and reactance. Environmental attitudes were assessed with the New Ecological Paradigm (NEP, fifteen items measured on a seven-point scale, $\alpha = .85$, $M = 4.79$, $SD = .80$). NEP was not a significant predictor of either coded aspect of reactance (β s $< .04$, p s $> .50$), but was a significant predictor of less self-reported anger ($\beta = -.15$, $p = .002$). NEP did not interact with message type to significantly predict any measure of reactance. Therefore, NEP (but not the interaction term) was included as a covariate in subsequent analyses.

The impact of the threat manipulation reactance. The message type (threat vs. low threat) significantly predicted reactance as measured by anger and negative cognition. While the threat manipulation did not reach conventional levels of significance in predicting reactance in Study 1, the effects of the manipulation were significant in Study 2. A MANOVA revealed that the threatening message yielded greater self-reported anger, coded anger, and negative cognition than did the low threat message (see *Table 5* below). This is likely due to the more controlled nature of the laboratory setting. As an interesting side note, there were no differences between groups on the number of supportive or neutral cognitions. That is, participants in the threatening condition were equally as likely to write comments in support of the message as were participants in the non-threatening condition.

Table 5: Reactance by Message Type

	Message Type	Mean	SD	F	p	d	95% CI
Self-Reported Anger	Low Threat	1.50	.73	6.37	.012	.27	.06, .45
	Threat	1.72	.87				
Coded Anger	Low Threat	.00	.00	5.03	.026	.11	.01, .15
	Threat	.08	.39				
Negative Cognition	Low Threat	.27	.71	11.03	.001	.43	.16, .64
	Threat	.68	1.14				

Note: df (1, 245), 95% CI = 95% CI of mean difference

The Role of Mindfulness in Reactance

Participants in the mindful condition tended to write more non-anger affective content than did participants in the control condition ($M_{mindful} = .25, SD = .60; M_{control} = .12, SD = .38; F(1, 244) = 3.41, p = .066, d = .26, 95\% \text{ CI of mean difference} = -.01, .24$). However, there were no significant differences between mindfulness conditions on any measure of reactance (i.e., coded anger, self-reported anger, or negative cognitions, see *Table 6* below).

Table 6: Reactance by Mindfulness Condition

	Mindfulness	Mean	SD	F	p	d	95% CI
Self-Reported Anger	Control	1.59	.79	.01	.966	.05	-.21, .20
	Mindful	1.63	.82				
Coded Anger	Control	.04	.23	.04	.835	<.01	-.06, .08
	Mindful	.04	.33				
Negative Cognition	Control	.38	.84	1.59	.182	.21	-.40, .08
	Mindful	.58	1.09				

Note: $df(1, 244)$, 95% CI = 95% CI of mean difference

Mindfulness by Message Type Interaction. Assessing the interactive effects of mindfulness and message type yielded results consistent with Study 1. Participants in the mindful condition wrote significantly more negative comments in the threat condition as compared to the low threat condition and more than the participants in the control/threat condition (see *Table 7* below). While the results stemming from the coded responses must be interpreted cautiously, this interesting and unexpected finding that mindfulness predicts more negative responses appears with both trait and state mindfulness.

Table 7: Reactance by Interaction Effect

	Mindfulness	Message Type	Mean	SD	F	p	η_p^2
Self-Reported Anger	Control	Low Threat	1.52	.76	.12	.727	.001
		Threat	1.70	.84			
	Mindful	Low Threat	1.48	.68			
		Threat	1.75	.90			
Coded Anger	Control	Low Threat	.00	.00	.03	.854	.000
		Threat	.09	.34			
	Mindful	Low Threat	.00	.00			
		Threat	.07	.43			
Negative Cognition	Control	Low Threat	.32	.73	5.53	.019	.022
		Threat	.44	.96			
	Mindful	Low Threat	.19	.90			
		Threat	.88	1.24			

Note: $df(1, 243)$

Cognitive flexibility. The mindfulness manipulation had no effect on the measure of cognitive flexibility (sum of perseverative errors, $M_{mindful} = 8.51$, $SD = 4.97$; $M_{control} = 8.04$, $SD = 3.66$; $F(1, 250) = .711$, $p = .40$, $d = .11$, 95% CI of mean difference = -1.54, .62).

Emotional reactivity. Emotional reactivity was assessed by participants' reaction times on the emotional Stroop task. Participants in the mindful condition showed less interference on the Stroop Task in every section; that is, they had faster reaction times than control participants.

Table 8: Response Time by Mindfulness Condition

	Message Type	Mean	SD	F	p	d	95% CI
Neutral	Control	6.65	.22	5.54	.019	.33	.01, .11
	Mindful	6.58	.20				
Negative	Control	6.65	.22	4.45	.036	.29	.01, .10
	Mindful	6.59	.20				
Positive	Control	6.63	.23	3.49	.063	.24	-.01, .10
	Mindful	6.58	.18				

Note: $df(1, 249)$; 95% CI = 95% CI of mean difference; Removing one extreme outlier and performing a natural log transformation brought the data within acceptable ranges of normality (all outlier RTs > 6 SDs above the mean; post transformation: all measures of skewness < .813, all measures of kurtosis < .974).

How cognitive flexibility and emotional reactivity relate to reactance. Assessing the relationships among reactance, cognitive flexibility, and emotional reactivity revealed results trending in the expected direction with self-reported anger. Participants who experienced stronger interference during the emotional reactivity task tended to report higher levels of anger after reading the environmental message, although this did not approach significance. Likewise, participants who had more errors in the Wisconsin Card Sort Task (i.e., had lower cognitive flexibility) tended to report more anger in response to the environmental message (see Table 9 below). There was a similar pattern between coded anger and reaction times.

Table 9: Reactance, Cognitive Flexibility, and Emotional Reactivity Correlations

	1	2	3	4	5	6
1. Self-Reported Anger						
2. Coded Anger	.288**					
3. Negative Cognition	.317**	.197**				
4. Neutral Word (RT)	.082	.099	-.007			
5. Negative Word (RT)	.095	.097	-.031	.870**		
6. Positive Word (RT)	.057	.071	-.004	.877**	.860**	
7. Sum of Perseverative Errors	.085	.017	-.033	-.101	-.064	-.085

Note: ** $p < .01$; RT = Reaction Time, 1-3 are measures of reactance, 4-6 are measures from the Stroop task (5 and 6 are measures of emotional reactivity with lower numbers indicating less reactivity), 7 is a measure of cognitive flexibility with higher numbers indicating less flexibility.

Mediated moderation model. Surprisingly, despite the lack of relationships among some of the key variables of interest, the full mediated moderation model fit the data well ($\chi^2(9) = 14.594, p = .103$; RMSEA = .050, CFI = .940). This was likely due to the strong predictive power of environmental attitudes as a covariate. Despite a lack of support for many of the main hypotheses of the study, it is informative to frame the data in terms of the proposed model (see *Figure 5* below). Through the full model we can see that the interaction of the message type and cognitive flexibility produced the expected effect on reactance. That is,

participants who had greater cognitive flexibility were not affected by the message manipulation; whereas, participants who scored lower on cognitive flexibility self-reported higher levels of anger after reading the threatening message than the non-threatening message (see *Figures 5 and 6* below).

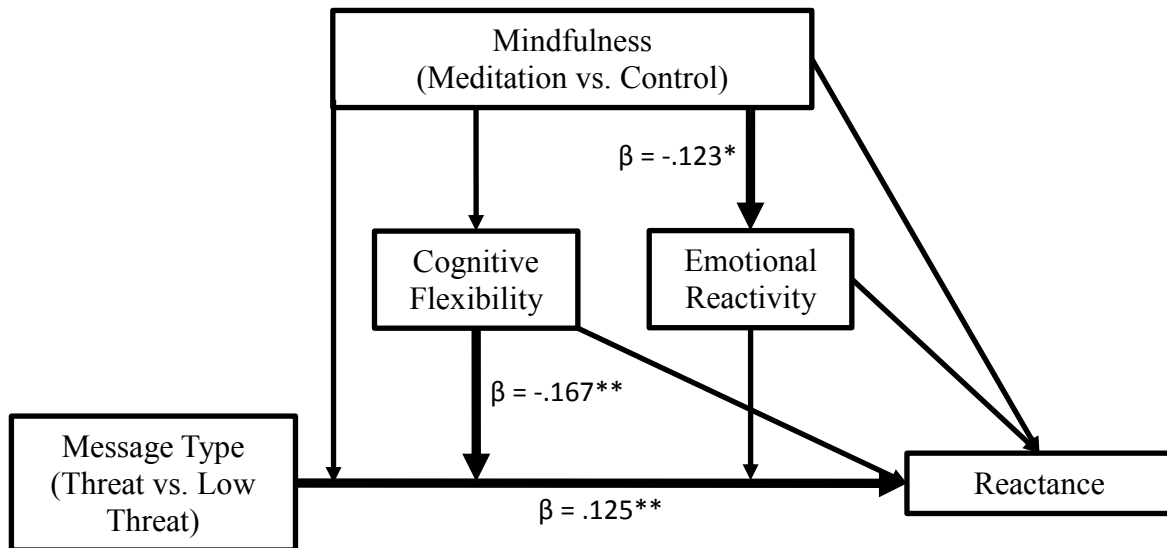


Figure 5: Cognitive flexibility = sum of perseverative errors in the Wisconsin Card Sort Task. Emotional Reactivity = mean of positive and negative reaction time in the Stroop Task. Bolded paths indicate supported hypotheses. The path from message type to reactance was significant on all measures of reactance. The remaining bolded paths refer to self-reported anger.

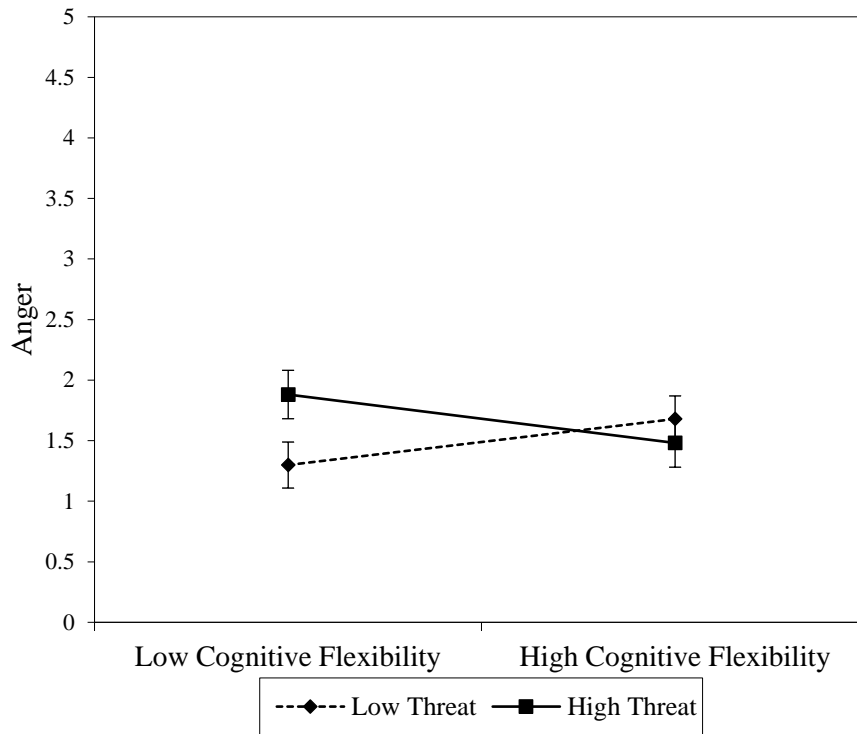


Figure 6: Simple slopes of the cognitive flexibility ($\pm 1 SD$) by message type interaction.

State Mindfulness and Affect (Exploring a Distinction from Self-Affirmation)

One possible way to disentangle mindfulness and self-affirmation is to assess their relationships to mood. Recall that self-affirmation is not expected to affect mood; whereas, mindfulness has been reported to influence mood. The latter was partially supported in this study. The mindfulness manipulation significantly predicted differences in participants' reporting of negative affect on the Positive and Negative Affect Scale. On both the positive and negative subscales, participants in the mindfulness condition tended to report slightly higher levels of affect, but the mean differences were quite small with only negative affect reaching significance (see *Table 10* below). Regarding affect reported immediately after the mindfulness manipulation, there is some support for differentiating between mindfulness and

self-affirmation. While that support is minimal in the current study, it is likely due to features of manipulation rather than a lack of relationship between mindfulness and mood.

Table 10: Positive and Negative Affect Scale by Mindfulness Condition

	Message Type	Mean	SD	F	p	d	95% CI
Negative	Control	1.30	.54	4.58	.033	.27	.01, .29
	Mindful	1.45	.59				
Positive	Control	2.04	.76	.58	.448	.09	-.07, .29
	Mindful	2.10	.77				

Note: *df* (1, 252); 95% CI = 95% CI of mean difference

Study 2 Discussion

What Did Participants Say About the Message?

As with Study 1, the participants in Study 2 were reluctant to write emotional content and tended to write neutral comments. Unlike in Study 1, however, the message manipulation significantly impacted reactance, although the effect size was quite small. While that was certainly a stumbling block for the results of Study 2, the small effect on the reactance measure is promising. That is, many participants mentioned hearing the general message most of their lives and agreeing with its premise, even in the threat condition (e.g., “It seemed pushy but it is pushing people in the right direction,” “When I read this passage I thought that this was information that I have heard over and over again.... The passage made me think that only if everyone in the USA practiced these small things everyday maybe some sort of difference could be made”). Furthermore, several participants reported thinking about the suggestions in the passage, checking whether or not they regularly do the tasks listed, and planning on making the tasks a habit if they weren’t already. A few participants even indicated they would take it a step further by writing about additional conservation behaviors they would begin or by working with others to start environmentally friendly habits (see Table 11 below).

Table 11: Examples from Participants' Written Responses

Message Type	Written Response
No Threat	It made me reevaluate how I live my day to day life and what I can change to be more environmentally friendly. <i>One of the most specific things that came to mind is how I would like to do something with sustainable fashion. That being something that uses recycled materials or that helps reduce the amount of water and chemicals used to make fabrics.</i> I am in apparel design right now but think that it would be really cool to incorporate sustainability into that major. It also made me think of what I can do each day to just save a little bit. Such as using less water when I shower or not keeping the water running when I am brushing my teeth. It also made me want to inform others of what they can do to better their usage of water. Not all places in the world have the luxury like we do to be so capable of using so much water. Instead we need to limit the amount we use.
No Threat	While reading the message, <i>I began to think about whether or not I do the listed suggestions.</i> That led to me starting a mental list of all the things that I should be doing if not already. For example, I told myself to check the power strips at my dorm to make sure that I do not have any on that are not absolutely essential. I also realized how silly all the decorative lights are that I have hanging up. <i>While reading about reducing water use I thought of the people that I see in the dorms that use more water than what needs to be used. I have always thought of saying something, but never have. I now might mention it to some of the people that leave the sink running while brushing their teeth or washing their dishes.</i>
Threat	My fraternity house. We leave our lights on all [sic] the time and I think it would be a good idea to turn them off when we go to bed. Also people run the water all the time and never even worry about saving water. they will even keep it running and go to the room and come back. <i>I think we need to put in a system that will conserve energy and water and something that will be effective.</i>
No Threat	I felt as though it was only giving me options on how to reduce the amount of harm I do. I did not feel heavily pressured, just informed. I also felt some stress at the idea of having to cut back on my use of things such as electronics. <i>I also immediately began to picture ways that I could cut back on my water usage, electronic usage, and even how I would shop for products at the store. I sort of began to plan it without even meaning to.</i>

Note: All italics added

Mindfulness Did Not Curtail Reactance (and Possibly Had the Opposite Effect)

While some of the anecdotal evidence from Study 2 was promising, unfortunately state mindfulness did not curtail the small amount of reactance that did occur. In fact, participants in the mindful condition wrote significantly more negative comments after reading a threatening message than participants in the low threat condition and more than the participants in the control/threat condition. This echoes the trait mindfulness results from Study 1. One potential explanation is that mindfulness condition left participants more open and attentive to a potentially negative experience, similar to Niemiec et al.'s (2010) study on the accessibility of death-related thoughts. In that study, mindful participants had greater accessibility of death-related thoughts immediately following a mortality salience cue, which then tapered off—the opposite pattern of what is typically observed. In Study 2, it is possible that mindful participants were more likely to process the threatening information and respond accordingly, as opposed to skimming over the message. However, drawing strong conclusions from the coded data is not warranted, particularly given the low frequency of negative cognition (196 of the 258 written responses were coded as having no negative thoughts).

Insights from the Mediated Moderation Model

However, some interesting information can still be gleaned from the mindfulness results. For instance, participants in the mindful condition experienced less interference from emotion words on the modified Stroop task. This finding lends credence to the literature suggesting that brief mindfulness manipulations can influence the processing of emotion.

Likewise, the measure of cognitive flexibility yielded insights into the formation of reactance. In line with the predictions for Study 2, participants who were more flexible in

their thinking were less likely to experience reactance. Specifically, they were less influenced by the threatening message than those participants who were lower on cognitive flexibility. Interestingly, these results were on the affective rather than cognitive component of reactance. This could indicate cognitive reappraisal of emotions (see *Figure 1*).

State Mindfulness and Affect (Exploring a Distinction from Self-Affirmation)

There was little evidence differentiating mindfulness from self-affirmation in regard to emotion states. The mindfulness manipulation significantly predicted differences in participants' reporting of negative affect, but the mean difference was quite small and in the opposite direction (more negative affect) of what would be expected from the mindfulness literature. This could be due to the limited nature of the induction of state mindfulness, or it could be due to the lack of a meaningful difference between self-affirmation and state mindfulness.

CHAPTER 5. GENERAL DISCUSSION, LIMITATIONS, AND CONCLUSIONS

General Discussion and Limitations

The present studies were conducted with three goals in mind: 1) confirming that stronger pro-environmental attitudes predicted lower reactance in response to conservation messages, 2) assessing whether mindfulness had an inverse relationship with reactance, and 3) testing whether increased cognitive flexibility and lowered emotional reactivity mediate the impact of mindfulness training on reactance to conservation messages. Evidence from the two studies largely supported the first proposal, but the evidence for the other two was less conclusive.

A Mixed Message with Mindfulness: Conflicting Reactance Results

Evidence from the two studies leaves us with more questions than answers, at least regarding mindfulness mitigating reactance. Trait mindfulness was associated with *less* anger in response to environmental messages. However, both Studies 1 and 2 indicated that mindfulness (trait and state) was associated with *more* negative cognition in response to a threatening environmental message.

As mentioned in the discussion section for Study 2, the increased negative cognition was possibly due to mindful participants' willingness to engage with potentially disturbing material. Previous studies have found that people with higher trait mindfulness showed less evidence of thought suppression regarding topics such as mortality and drug use (e.g., Niemiec et al., 2010; Bowen, Witkiewitz, Dillworth, & Marlatt, 2007). It is possible that mindful participants in the present studies were more likely to think through the threatening (i.e., behavior-restricting) nature of the environmental messages. A follow-up study could shed light on this possibility by strengthening both the reactance and mindfulness

manipulations, assessing the duration of negative cognitions (i.e., higher accessibility in the short term which then tapers off, as was the pattern in the mortality salience work), and the level of processing associated with negative cognitions.

It is also important to note that there are important differences among novice meditators, meditators with a moderate level of experience, and highly experienced meditators. Assessing the developmental trajectory of the changes associated with mindfulness practice would be informative, particularly with research regarding reactance. It is possible that people with more meditative experience are better able to recognize and list their thoughts—while staying removed from their typical ramifications—than those with less meditative experience. This would impact reactance as it was operationalized in the current studies, given that negative cognition and anger were coded from written responses with a greater number of such thoughts equating to higher reactance. People with more mindfulness experience may be better able to recognize their thoughts and accurately report them, yet still remain detached from the potential impact of such thoughts. Developing a different coding structure that captured potential nuances in written responses (e.g., depth of processing), assessing physiological responses to threatening messages, and assessing the effect of cumulative meditative experience as well as individual differences in mindful tendencies would shed light on these possibilities.

Mechanisms of mindfulness. The processes by which trait and state mindfulness influence how people perceive and use information require further study. In Study 2, a short, 20-minute mindfulness intervention significantly lowered the amount of interference participants experienced from emotion words. Behavioral tasks such as the modified Stroop and Wisconsin Card Sort used in the second study offer a glimpse into mechanisms by which

mindfulness interventions exert their influence. Assessing the decay rate of a state induction of mindfulness is an important next step and a shortcoming in the method of Study 2. While a brief manipulation of state mindfulness may have had the intended effect, it is possible its duration was not sufficient to fully reach and impact whichever behavioral task was presented second (as they were counterbalanced), thus reducing the power of the design. Likewise, the mindfulness manipulation may have deteriorated before the participants reached the reactance portion of the study.

The short intervention used in Study 2 does not appear to influence cognitive flexibility. It is not possible to determine if this is due to a lack of relationship between mindfulness and cognitive flexibility or if it is due to faulty methods. Future research could address this limitation. There was, however, evidence that the brief mindfulness induction lowered emotional reactivity. With a stronger mindfulness intervention, it is likely that lower emotional reactivity would have led to lower levels of the anger component of reactance. Given mindfulness' relationship with negative cognition in Studies 1 and 2, reconciling the possible conflicting nature of mindfulness' influence on reactance (i.e., anger vs. negative cognition) is an interesting line of research.

Informing Environmental Initiatives

Returning to the problem that framed this work, environmental initiatives are often voluntary, generally reaching only those who are already motivated to act. Both studies provided evidence for that assertion, as the measure of environmental attitudes was a strong predictor of environmentalism and lower reactance. However, attitudes did not account for all of the variance in predicting environmentalism and reactance. In Study 1, facets of trait mindfulness predicted pro-environmental behavioral intentions and environmental advocacy

above and beyond what was accounted for by the attitude measure. As a result, aspects of trait mindfulness promoted environmental consciousness not covered by existing environmental concerns.

Among people likely to act in a pro-environmental way, regardless of the source of that likelihood, some barriers remain to actual action. Pro-environmental attitudes predict “good intentions”; Study 1 suggests that trait mindfulness may show a similar pattern (i.e., predicting behavioral intentions). Such predictive power usually declines as the behaviors in question become costlier or inconvenient (Guagnano, Stern, & Dietz, 1995; Bamberg & Schmidt, 2003; see Lindenberg & Stern, 2007 for a review). What can spur people to move past these good intentions and engage in actual action? Participants’ responses to the written messages in Studies 1 and 2 suggest that simple reminders may be enough to prompt planning for environmental conservation (i.e., anecdotal evidence of previous knowledge about resource conservation that the participant intends to begin applying in daily life). Furthermore, targeting environmental messages toward those most receptive to them [people higher on trait mindfulness (Study 1) and environmental attitudes (Studies 1 and 2)] may result in a much larger reach through advocacy.

Regarding reactance, Study 2 suggested that people with higher levels of cognitive flexibility are not as reactive to a threatening environmental message as people with lower levels of cognitive flexibility. While environmental messages can and should pull from communication literature to best convey a persuasive message, any message that is asking for behavior change may be interpreted as threatening (Brehm & Brehm, 1981). Finding insight into a mechanism that underlies reactance serves to better inform future interventions. While a brief induction of state mindfulness may not be a viable option for such an intervention,

understanding the relationship between cognitive flexibility and reactance may aid in developing a more effective intervention.

Reconciling Mindfulness and Self-Affirmation

Mindfulness is likely closely related to self-affirmation. Study 1 showed that trait mindfulness is associated with self-integrity. This may indicate a relationship with the larger system of global self-integrity, a system shared with self-affirmation. However, it is important to note that this was based on an assessment of trait mindfulness. As mindful meditation is geared toward lowering an attachment to the self, it is likely this relationship would change as meditation experience increases. Study 2 failed to provide strong evidence differentiating mindfulness and self-affirmation regarding the former's impact on affect. Given other studies indicating that mindfulness does indeed impact mood (Broderick, 2005, Erisman & Roemer, 2010) it is likely that the mindfulness manipulation in Study 2 was not strong enough to sufficiently test this hypothesis.

Reconciling mindfulness and self-affirmation may be as easy as recognizing meditative mindfulness as a form of self-affirmation among moderately-experienced meditators (or among people who are willingly choosing to meditate). For naïve participants being asked to meditate as part of an experiment, mindfulness is not likely to serve as a form of self-affirmation. That is, it would not have a basis for affirming specific aspect of the self. It is possible that the act of meditation, even among those who would not typically meditate, serves to reaffirm a global sense of self-integrity, if only because of the popular connotations of meditation being a positive and healthy activity (references to the health benefits of mindful meditation can be found in a variety of popular media, e.g., the Netflix series *Orange is the New Black*; Morelli, Kohan, & Kerman, 2014).

Highly experienced meditators who have trained themselves to move away from a specific sense of self or attachment to the idea of “self” are likely to relate to self-affirmations in different way (i.e., are likely to be less influenced by either attacks on or affirmations of specific domains of the self). Exploring the potentially non-linear relationship between mindfulness and self-affirmation would be an interesting line of research. That is, mindfulness may serve as a form of self-affirmation in mid-level meditators but not in novice or highly experienced meditators.

Conclusions

The purpose of the present research was to investigate perceptions of and reactions to threat in environmental messages. Given that environmental initiatives often call for restricting behavior, they can elicit reactance—a motivational state thought to occur when a freedom is eliminated or threatened with elimination. The present research was designed to assess mindfulness as a potential moderator of reactance.

Study 1 tested the relationships among trait mindfulness, reactance, and environmentalism, revealing some interesting associations. Importantly, facets of trait mindfulness predicted less anger in response to environmental messages, greater intentions to behave in a pro-environmental way, and more environmental advocacy. Study 2 tested whether inducing a state of mindfulness would mitigate the formation of reactance to a pro-environmental message by increasing cognitive flexibility and decreasing emotional reactivity. While Study 2 failed to support the main hypotheses, it yielded some interesting results, specifically regarding cognitive flexibility and emotional reactivity. Inducing a state of mindfulness decreased emotional reactivity, but had no relationship to cognitive flexibility. Cognitive flexibility interacted with the type of environmental message

(threatening vs not) in predicting reactance. As it turned out, the threatening environmental messages elicited very little reactance in either Study 1 or Study 2. While that was problematic for the intended investigations, it is promising in terms of the larger picture. It is certainly not a bad thing that most participants agreed that they carried personal responsibility for environmental conservation.

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APPENDIX 1. MARLOWE-CROWNE SOCIAL DESIRABILITY SCALE

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

1. Before voting I thoroughly investigate the qualifications of all the candidates.
2. I never hesitate to go out of my way to help someone in trouble.
3. It is sometimes hard for me to go on with my work if I am not encouraged.
4. I have never intensely disliked anyone.
5. On occasion I have doubts about my ability to succeed in life.
6. I sometimes feel resentful when I don't get my own way.
7. I am always careful about my manner of dress.
8. My table manners at home are as good as when I eat out in a restaurant.
9. If I could get into a movie without paying and be sure I was not seen, I would probably do it.
10. On a few occasions, I have given up doing something because I thought too little of my ability.
11. I like to gossip at times.
12. There have been times when I felt like rebelling against people in authority even though I knew they were right.
13. No matter who I'm talking to, I'm always a good listener.
14. I can remember "playing sick" to get out of something.
15. There have been occasions when I took advantage of someone.
16. I'm always willing to admit it when I make a mistake.
17. I always try to practice what I preach.
18. I don't find it particularly difficult to get along with loud-mouthed, obnoxious people.
19. I sometimes try to get even, rather than forgive and forget.
20. When I don't know something I don't at all mind admitting it.
21. I am always courteous, even to people who are disagreeable.
22. At times I have really insisted on having things my own way.
23. There have been occasions when I felt like smashing things.

24. I would never think of letting someone else be punished for my own wrongdoings.
25. I never resent being asked to return a favour.
26. I have never been irked when people expressed ideas very different from my own.
27. I never make a long trip without checking the safety of my car.
28. There have been times when I was quite jealous of the good fortune of others.
29. I have almost never felt the urge to tell someone off.
30. I am sometimes irritated by people who ask favours of me.
31. I have never felt that I was punished without cause.
32. I sometimes think when people have a misfortune they only got what they deserved.
33. I have never deliberately said something that hurt someone's feelings.

APPENDIX 2. SELF-INTEGRITY SCALE

Please indicate your agreement or disagreement with the following statements.

	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have the ability and skills to deal with whatever comes my way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that I'm basically a moral person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I am a capable person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a good person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I think about the future, I'm confident that I can meet the challenges that I will face.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try to do the right thing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even though there is always room for self-improvement, I feel a sense of completeness about who I fundamentally am.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am comfortable with who I am.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX 3. THE NEW ECOLOGICAL PARADIGM SCALE

Read each item and then mark the appropriate answer in the space next to that statement.

Indicate to what extent you agree or disagree with each of the statements. Use the following scale to record your answers:

1) Strongly Disagree, 2) Mildly Disagree, 3) Unsure, 4) Mildly Agree, 5) Strongly Agree

1. We are approaching the limit of the number of people the Earth can support.
- *2. Humans have the right to modify the natural environment to suit their needs.
3. When humans interfere with nature it often produces disastrous consequences.
- *4. Human ingenuity will insure that we do not make the Earth unlivable.
5. Humans are seriously abusing the environment.
- *6. The Earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
- *8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities, humans are still subject to the laws of nature.
- *10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
11. The Earth is like a spaceship with very limited room and resources.
- *12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
- *14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

*indicates reverse-scored items

APPENDIX 4. OTHER ENVIRONMENTAL ITEMS

Env_ID

Please indicate how much you agree or disagree with each statement.

	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I see myself as someone who empathizes with the natural environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For me, engaging with the natural environment gives me a greater sense of who I am.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I identify with the natural environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think of myself as an environmental activist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To engage in environmental activism is an important part of who I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not the type of person who would be involved in environmental activism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This item is an attention check. Please select "somewhat agree" for this question.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much control do you have over whether or not you engage with the natural environment? (That is, do you have the time, access, etc.?)

No Control	Very Little Control	Some Control	A Moderate Amount of Control	A Fair Amount of Control	A Lot of Control	Complete Control
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

It is mostly up to me whether or not I engage with the natural environment.

- Strongly Disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Please indicate how much you agree or disagree with the statements

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Sometimes when I am unhappy I find comfort in nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It makes me sad to see natural environments destroyed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being out in nature is a great stress reducer for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need time in nature to be happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX 5. FIVE FACET MINDFULNESS QUESTIONNAIRE

Please indicate how true each statement is for you.

	never or rarely true	rarely true	sometimes true	often true	very often or always true
When I'm walking, I deliberately notice the sensations of my body moving.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm good at finding words to describe my feelings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I criticize myself for having irrational or inappropriate emotions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I perceive my feelings and emotions without having to react to them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I do things, my mind wanders off and I'm easily distracted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I take a shower or bath, I stay alert to the sensations of water on my body.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can easily put my beliefs, opinions, and expectations into words.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	never or rarely true	rarely true	sometimes true	often true	very often or always true
I watch my feelings without getting lost in them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tell myself I shouldn't be feeling the way I'm feeling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's hard for me to find the words to describe what I'm thinking.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am easily distracted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I pay attention to sensations, such as the wind in my hair or sun on my face.

I have trouble thinking of the right words to express how I feel about things.

never or rarely true

rarely true

sometimes true

often true

very often or always true

I make judgments about whether my thoughts are good or bad.

I find it difficult to stay focused on what's happening in the present.

When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.

I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

In difficult situations, I can pause without immediately reacting.

When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

It seems I am "running on automatic" without much awareness of what I'm doing.

When I have distressing thoughts or images, I feel calm soon after.

never or rarely true

rarely true

sometimes true

often true

very often or always true

I tell myself that I shouldn't be thinking the way I'm thinking.

I notice the smells and aromas of things.

Even when I'm feeling terribly upset, I can find a way to put it into words.

I rush through activities without being really attentive to them.

When I have distressing thoughts or images I am able just to notice them without reacting.

I think some of my emotions are bad or inappropriate and I shouldn't feel them.

I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

My natural tendency is to put my experiences into words.

never or rarely
true

rarely true

sometimes true

often true

very often or
always true

When I have distressing thoughts or images, I just notice them and let them go.

I do jobs or tasks automatically without being aware of what I'm doing.

When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

I pay attention to how my emotions affect my thoughts and behavior.

I can usually describe how I feel at the moment in considerable detail.

I find myself doing things without paying attention.

I disapprove of myself when I have irrational ideas.

APPENDIX 6. POSITIVE AND NEGATIVE AFFECT SCALE

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer (1-5). Indicate to what extent you currently feel this way.

	Very Slightly Or Not at All	A Little	Moderately	Quite a Bit	Extremely
cheerful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
sad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
angry at self	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
disgusted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
calm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
enthusiastic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
joyful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
downhearted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Very Slightly Or Not at All	A Little	Moderately	Quite a Bit	Extremely
bashful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
tired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
sheepish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
sluggish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
amazed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lonely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Very Slightly Or Not at All	A Little	Moderately	Quite a Bit	Extremely
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Qualtrics Survey Software					
distressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
daring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
shaky	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
sleepy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
blameworthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Very Slightly Or Not at All	A Little	Moderately	Quite a Bit	Extremely
surprised	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very Slightly Or Not at All	A Little	Moderately	Quite a Bit	Extremely
excited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
timid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
frightened	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
scornful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
proud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
astonished	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
loathing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
delighted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
bold	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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at ease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
energetic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
fearless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
blue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
concentrating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
disgusted with self	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
shy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
drowsy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
dissatisfied with self	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX 7. MESSAGES

Neutral Statement:

As an ISU student, there are steps you could take to help reduce your and your school's negative impact on the environment, if you wanted to. You may consider taking measures to promote sustainability. When it comes to buying cleaning supplies, you could look for certain things. For example, you could buy products that use environmentally responsible formulas (i.e., cleaning products that meet the "Safe Choice Standard," such as Seventh Generation products). Likewise, if you were willing, you could lower water waste by taking shorter showers, not leaving the tap on when it's not in use (e.g., while washing your dishes or brushing your teeth), making sure your laundry loads are appropriately sized (not too large or too small), or by promptly fixing any leaks that may develop. When it comes to electronics, there are measures you can take to lower your usage. Small things like turning off lights and power strips when they aren't in use can make a difference. If you remember, you could consider doing a sweep of your living area for these things before leaving for the day or going to bed.

These are just a few of the things you might consider doing. Ultimately, the choice is yours.

Proscriptive Statement:

As an ISU student, there are steps you should take to help reduce your and your school's negative impact on the environment. You should be taking measures to behave sustainably. When it comes to buying cleaning supplies, you should buy products that use environmentally responsible formulas (i.e., cleaners that meet the "Safe Choice Standard," such as Seventh Generation products). Likewise, you should lower your water waste by

taking shorter showers, not leaving the tap on when it's not in use (e.g., while washing your dishes or brushing your teeth), making sure your laundry loads are appropriately sized (not too large or too small), or by promptly fixing any leaks that may develop. When it comes to electronics, there are measures you should be taking to lower your usage. Things like turning off lights and power strips when they aren't in use can make a difference. You should always do a sweep of your living area for these things before leaving for the day or going to bed. These are just a few of the things you should already be doing.

APPENDIX 8. MANIPULATION CHECK 1: REACTANCE INDUCTION CHECK &
FOUR ITEMS ASSESSING ANGER

Reactance Induction Check:

1. The message tried to make a decision for me.
2. The message tried to pressure me.
3. The message threatened my freedom to choose.
4. The message tried to manipulate me.

Anger:

1. I felt angry while viewing this message.
2. I felt annoyed while viewing this message.
3. I felt irritated while viewing this message.
4. I felt aggravated while viewing this message.

APPENDIX 9. CODING PROCEDURES

(adapted from Dillard & Shen, 2005, p. 153-154)

Participants will be asked to write out whatever was in their minds when they finished reading the message. The resulting data will be coded in a five-step sequence by coders working in inter-locking pairs.

First, the coders will segment the data into psychological thought units (i.e., displaying a single idea). Second, affective and cognitive responses will be separated. To assist with this step, coders will reference a list of feeling terms compiled by Shaver, Schwartz, Kirson, and O'Connor (1987). A unit will be classified as affective whenever those words appeared and cognitive otherwise. Third, affective units that express any of the "anger" words as listed by Shaver et al. (1987) will be coded as an anger thought. Fourth, coders will evaluate whether or not the cognitive responses are relevant to the message. The purpose of this step is to eliminate irrelevant cognitions and thereby reduce the level of noise in the data.

Finally, the remaining data will be coded either as (a) supportive thoughts, (b) neutral thoughts, or (c) negative thoughts. Supportive thoughts will be defined as responses that express agreement with the message, self-identification, and positive thoughts toward the message or the message source and intention to comply with the advocacy in the message, etc. Negative thoughts will be defined as responses that express disagreement with the message, negative intention to comply with the advocacy, derogations of the source, etc. Neutral thoughts will be defined as non-evaluative responses to the message, such as "This message was presented online." The negative thoughts are the main focus of the cognitive units.

APPENDIX 10. PRO-ENVIRONMENTAL INTENTIONS

	Disagree	Disagree	Disagree	Disagree	Agree	Agree	Agree
When I have a disposable container, I intend to discard it in the appropriate recycling bin rather than throwing it in the trash.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I see my friends litter, I intend to tell them to stop.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I intend to take shorter showers to save water.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I see a candy wrapper or other litter, I intend to pick it up and discard it in the garbage.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I see a stranger litter, I intend to ask them to pick it up.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I intend to use one small piece of paper towel to dry my hands, in order to use less paper towel.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX 11. MANIPULATION CHECK 2: THE MINDFUL ATTENTION
AWARENESS SCALE, STATE VERSION

Instructions: Using the 0-6 scale shown, please indicate to what degree you were having each experience described below during the previous part of the study. Please answer according to what really reflects your experience rather than what you think your experience should have been.

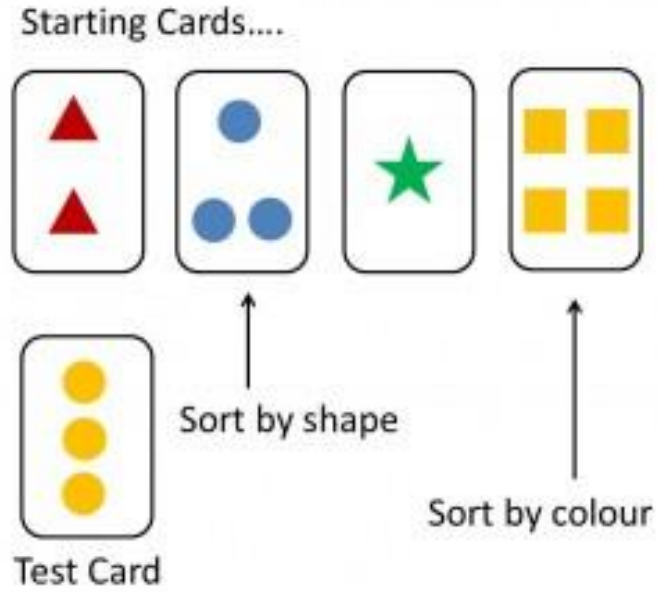
not at all			somewhat			very much
0	1	2	3	4	5	6

1. I was finding it difficult to stay focused on what was happening.
2. I was doing something without paying attention.
3. I was preoccupied with the future or the past.
4. I was doing something automatically, without being aware of what I was doing.
5. I was rushing through something without being really attentive to it.

Scoring

To have high scores reflect higher state mindfulness, reverse score all items then average all 5 values.

APPENDIX 12. WISCONSIN CARD SORT TEST EXAMPLE



APPENDIX 13. IRB APPROVAL DOCUMENT: STUDY 1

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
220 Lincoln Way, Suite 205
Ames, Iowa 50012
515-294-4566

Date: 12/9/2016

To: Anne Herlache
W112 Lagomarcino

CC: Dr. Zlatan Krizan
W112 Lagomarcino Hall

From: Office for Responsible Research

Title: Global Issues 2

IRB ID: 16-524

Approval Date: 12/9/2016 **Date for Continuing Review:** 12/8/2018

Submission Type: New **Review Type:** Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.
- **Retain signed informed consent documents for 3 years after the close of the study**, when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.
- **Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
- **Stop all research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- **Complete a new continuing review form at least three to four weeks prior to the date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. IRB approval in no way implies or guarantees that permission from these other entities will be granted.

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 202 Kingland, to officially close the project.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX 14. IRB APPROVAL DOCUMENT: STUDY 2

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2507
515 294-4566
FAX 515 294-4267

Date: 6/30/2016

To: Anne Herfache
W112 Lagomarcino

CC: Dr. Zlatan Krizan
W112 Lagomarcino Hall

From: Office for Responsible Research

Title: Global Issues

IRB ID: 15-275

Approval Date: 6/28/2016 **Date for Continuing Review:** 6/27/2018

Submission Type: New **Review Type:** Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.
- **Retain signed informed consent documents for 3 years after the close of the study**, when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.
- **Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.
- **Stop all research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- **Complete a new continuing review form at least three to four weeks prior to the date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **IRB approval in no way implies or guarantees that permission from these other entities will be granted.**

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 202 Kingland, to officially close the project.

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