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**MINDFULNESS, MORAL OUTRAGE, AND THE CLIMATE CRISIS: A NOVEL  
APPROACH TOWARD MOTIVATING PRO-ENVIRONMENTAL BEHAVIORS**

A prospectus in partial fulfillment of the requirements for the degree of Master of Science at  
Virginia Commonwealth University

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### **Abstract**

The consequences of anthropogenic climate change are severe, continuously accelerating, and pose serious threats to the human and natural world. It is imperative to address the climate crisis from a psychosocial perspective and incite lasting, individual-level behavioral change. Various theoretical models have been adapted or developed to explain pro-environmental behaviors. However, the predictive powers of the most commonly used models have proven to be limited, and the underlying psychological processes of pro-environmental behavior constitute a significant gap in the literature. The present study identifies two psychological processes that show significant promise in motivating pro-environmental behaviors: moral outrage and mindfulness. Moral outrage demonstrates powerful drive of positive social behaviors, and people are motivated to engage in moral outrage due to its various social and personal benefits. Robust evidence supports mindfulness as a consistent predictor of prosocial and pro-environmental behaviors. These two independent antecedents of behavior have been shown to interact with each other to create an amplified effect in other prosocial contexts, but the effect has never been studied in the context of pro-environmental behavior. The present study hypothesized that both trait and state mindfulness will increase the positive effect that moral outrage has on pro-environmental intentions and behavior. Preliminary results conducted from an underpowered sample revealed conflicting interactions and effects. However, if observed, the final results will greatly contribute to the literature, expanding upon traditional conceptualizations of moral outrage and mindfulness. The findings will also carry practical implications, demonstrating the complementary effects of two constructs in an innovative approach toward motivating pro-environmental behavior.

## **Mindfulness, Moral Outrage, and The Climate Crisis: A Novel Approach Toward Motivating Pro-Environmental Behaviors**

### **The Climate Crisis**

The climate crisis is an urgent and accelerating threat to the world. The National Oceanic and Atmosphere Administration's 2022 global summary reported that worldwide temperatures have risen 2° Fahrenheit since 1880 (Lindsey & Dahlman, 2023). The ten warmest years on record have all occurred since 2010, and the warming rate has more than doubled since 1981 (Lindsey & Dahlman, 2023). These changes have come with detrimental health and environmental consequences. Extreme weather patterns are one known effect of climate change. Weather-related events account for 90% of natural disasters (Sauerborn & Ebi, 2012), resulting in about 60,000 deaths per year over the past decade (Abbass et al., 2022). Rising sea levels cause destructive flooding, the disappearance of vulnerable coastal ecosystems such as coral reefs, and saltwater intrusion in freshwater areas and aquifers (Mimura, 2013). Climate change is also a key, and quickly emerging, driver of biodiversity loss in both ocean and land habitats (Abbass et al., 2022; Talukder et al., 2022).

Changes in temperature and precipitation are also conducive to pathogen replication and survival. 58% of known infectious diseases show aggravation in response to increased greenhouse gas emissions (Mora et al., 2022). Among the most affected diseases are vector-borne diseases, or those transmitted by blood-sucking insects such as mosquitos and ticks. This is largely due to increased proximity and prevalence, as warmer temperatures expand the range and survival rate of the disease carriers (El-Sayed & Kamel, 2020; Mora et al., 2022). For example, the United States experienced the first malaria cases in two decades this year (Harris, 2023).

Further, the CDC has identified 50 different diseases that are classified as recently emerging or re-emerging in connection with climate change (El-Sayed & Kamel, 2020).

### **Human Behavior and the Climate**

The detrimental consequences of climate change illustrate the urgent need to invest in mitigation tactics. Climate change is largely human induced, as the majority of warming can be attributed to aerosols and greenhouse gas emissions (IPCC, 2018). As such, targeting climate change from a behavioral perspective is necessary to mitigate the current environmental shifts. Specifically, motivating people to engage in pro-environmental behaviors can target anthropogenic warming from a widespread, base level.

### **Determinants of Pro-environmental Behavior**

*Pro-environmental behaviors* are those that are implemented with the goal of reducing one's impact on the natural world (Kollmuss & Agyeman, 2010). Current understandings of pro-environmental behavior are complex, as they are influenced by individual, social, and environmental factors. Although many motivational frameworks have been applied toward pro-environmental behaviors, no one theory or framework has been identified as a conclusive explanation (Kollmuss & Agyeman, 2010). However, previous research does point toward some psychological antecedents and individual determinants of these behaviors.

### ***Theory of Planned Behavior***

The theory of planned behavior (Ajzen, 1991) posits that an individual's performance of a behavior is heavily dependent on several psychological antecedents. Central to this model is the actor's intentions to engage in a behavior. Intentions are thought to be influenced by pre-existing attitudes about the target behavior, subjective norms, and perceived behavioral control (Ajzen, 1991). While actual control over a behavior may reflect the resources available to the



individual, perceived behavioral control is a more relevant psychological component in that it reflects the individual's perceptions of their own abilities to carry out the behavior. Thus, perceived behavioral control is theorized to affect both intentions and the behavior directly (Ajzen, 1991).

The theory of planned behavior has been applied to environmental behaviors for decades. In an early study, Sparks et al. (1992) found that attitudes and subjective norms pertaining to green consumerism and their perceived control over their own consumption behaviors significantly predicted their intentions to purchase organic vegetables. Since then, other researchers have provided evidence of the value of the model in predicting pro-environmental behaviors in various settings (Greaves et al., 2013; Yadav & Parthak, 2016).

#### ***Norm Activation Theory and Value-Belief-Norm Theory***

Norm activation theory (Schwartz, 1977) states that behavior is guided moral obligation, which is driven by the activation of personal norms. Awareness of the consequences of one's actions for others and denial of personal responsibility represent the two proposed conditions of norm activation (Schwartz, 1977; Tian & Liu, 2022). Value-belief-norm theory theoretically expands norm activation theory to provide a framework for pro-environmental behavior (Stern, 1999). Value-belief-norm theory proposes a causal chain where values, environmental attitudes, and beliefs (i.e., awareness of consequences, one's perceived responsibility, and personal norms) affect each other to eventually affect behavior (Oreg & Katz-Gerro, 2006; Stern, 1999). Value orientations related to biospheric-altruism, particularly toward both other humans and non-human species, were positive predictors of environmental attitudes and intentions. Conversely, egoistic values had the opposite effect (Van Riper et al., 2014). Evidence has supported the

causal mediation model and its ability to predict pro-environmental intentions (Chen, 2015; Wynveen et al., 2015).

### **Barriers to Pro-Environmental Behavior**

Despite decades of research on pro-environmental behaviors and empirical support for some theoretical models, gaps in the literature persist. For one, much of the current evidence has relied solely on self-report and intention measures. A scoping review of studies that utilized the theory of planned behavior found that one third of the studies reported intentions only (Yuriev et al., 2020). This is significant as the theory of planned behavior accounted for an average of 27% more explained variance in reported pro-environmental intentions compared to behavior, which itself indicated an average of 34.2% of explained variance (Yuriev et al., 2020). That is not to say that intention measures are not valuable. Behavioral intentions are still considered a key aspect in predicting behavior (Liu et al., 2017). However, while valuable in understanding psychological processes, the current models may be somewhat limited in their predictive power of actual behavior.

The nature of the self-report measures may have also introduced bias to studies of pro-environmental behavior. For example, the models discussed are the most commonly applied frameworks to pro-environmental behavior. However, they all include measures of self-identity, values, and/or social norms as antecedents to intentions and behaviors. Research evaluating these methods suggests that these environmental construct measures increase the salience of social identity and social norms. As a result, participants over-report their behaviors (Koller et al., 2023).

Attitude-behavior gaps and the nature of pro-environmental behaviors may also help explain variability in the literature. In general, pro-environmental attitudes have been found to

inconsistently predict pro-environmental behaviors (Kollmuss & Agyeman, 2010; Tarfaoui & Zkim, 2017). The psychological distance of climate change provides one explanation for this trend. Psychological distance refers to how removed an object or issue is perceived to be from the self (McDonald et al., 2015). Researchers typically distinguish four different dimensions of psychological distance: spatial, social, temporal, and hypothetical (Maiella et al., 2020; McDonald et al., 2015). Climate change exhibits certain characteristics that evoke these perceptions. With regards to spatial distance, people perceive the effects of climate change to be the most severe in geographically distant areas (Gifford et al., 2009). While social distance is often confounded with spatial distance, people may perceive those in more seriously affected areas, such as developing countries, as socially distant from themselves (McDonald et al., 2015). Temporal distance reflects the perceived immediacy of the issue. While people seem to agree that some consequences are evident now, they also believe more severe impacts will occur in the future (Maiella et al., 2020). Hypothetical distance reflects the perceived probability that an event will occur. Some popular disagreements about the legitimacy of anthropogenic climate change increase hypothetical distance, as do the other three dimensions of psychological distance (Maiella et al., 2020; McDonald et al., 2015).

Habitual behavior represents another barrier to pro-environmental behaviors. Many daily behaviors are rooted in repeatedly reinforced habits; these can override attitudes and intentions to adopt behavior change (Linder et al., 2022). While values and attitudes were still significant moderating variables, a review of meat consumption behaviors identified habit as the most impactful psychological barrier to reducing meat consumption (Graves & Roelich, 2021).

Overall, research suggests that the most popular theoretical models are not always sufficient in explaining pro-environmental behaviors. These models emphasize values and

attitudes, but they often neglect other psychological processes. While values and attitudes are instrumental in understanding the nature of pro-environmental behaviors, other psychological factors have already shown to provide more explanatory power than these factors alone. Thus, more effort needs to be devoted to uncovering psychological mechanisms of pro-environmental behaviors. Identifying psychosocial processes that demonstrate motivational influence and transcend the current barriers to pro-environmental behaviors will be essential to the continued advancement of this matter. One such process that has demonstrated considerable promise is moral outrage.

## **Moral Outrage**

### *Defining Moral Outrage*

*Moral outrage* is anger that arises from the perceived violation of moral standards (Kay et al., 2023). Moral outrage is conceptually distinct from other easily confounded emotions that arise from unfair treatment, such as personal anger and empathic anger. Personal anger typically arises at the direct violation of one's own interest. Personal anger may also arise at the unfair treatment of others, but only if said treatment carries implications for how *oneself* could be treated. This has been deemed counterfactual anger (Batson et al., 2007). Thus, it is important to distinguish moral outrage as incited by a moral transgression on the behalf of others, not on the behalf of oneself. Empathic anger is another similar but distinct construct. While empathic anger arises from witnessing the actual harm of the victims, moral outrage is elicited by the perceived immorality of the perpetrator's action (Hechler & Kessler, 2018). Some researchers question the existence of moral outrage altogether. Batson et al. (2007) argues that there is insufficient evidence distinguishing the construct of moral outrage from personal and empathic anger. Since

then, however, research has challenged this claim and developed more nuanced approaches to moral outrage.

Hechler & Kessler (2018) conducted a series of studies to specifically test whether empathic anger and moral outrage emerge separately from each other. They found that the influence of a perpetrator's intention to harm elicited a much stronger anger response than the actual harmful consequences experienced by the victims (Hechler & Kessler, 2018). These results, which replicated across studies, suggest that anger at moral violations emerge separately and more strongly than the anger elicited by empathizing with the victims. Additionally, some researchers posit that moral outrage is a combination of anger, disgust, and contempt (Kay et al., 2023; Rothschild & Keefer, 2022). Indeed, it appears these constructs can be intertwined; contempt, anger, and disgust are studied as three main emotions typically elicited by moral violation in what is known as the CAD triad (Rozin et al., 1999). Hutcherson & Gross (2011) demonstrated unique antecedents and social responses of these three constructs. Namely, anger was uniquely related to overt behaviors such as retribution and damage mitigation, while disgust was associated with judgements of moral distrust, and contempt was associated with judgements of incompetence (Hutcherson & Gross, 2011). Disgust may also extend beyond morality, where depictions of impurity and contamination elicit disgust separate from perceived injustice (Lomas, 2019). The combination of these three emotions may also point toward other constructs. Anger, disgust, and contempt demonstrated a significant role in intergroup hostility and were perceived to be the basic components of hatred (Matsumoto et al., 2017). This is further supported by findings that these three emotions were necessary conditions in differentiating hatred from dislike, separate from degree of negativity (Pretus et al., 2023).

Taken together, current evidence supports the idea that the affective states commonly associated with moral outrage are related to, but not the equivalent of, moral outrage. I argue for the importance of defining moral outrage as a distinct emotion with unique implications.

### ***Motivation to Engage with Moral Outrage***

Moral outrage is often characterized as a destructive emotion. Critics warn that undesirable effects, such as conflict escalation and dehumanization of outgroup, may occur when moral outrage is incited (Crockett, 2017; Spring et al., 2018). Individual costs are also discussed, including negative affect, exhaustion, and possible retaliation from others (Spring et al., 2018). Digital media contributes to the spread of moral outrage by increasing exposure to outraging stimuli and reducing the personal costs of expression (Crockett, 2017). This raises concerns about “pile-ons”, or when displays of outrage generate more outrage through social networks to the point where transgressors are disproportionately punished (Spring et al., 2018). However, these instances of viral outrage were shown to increase sympathy for the transgressor and result in more negative views of the responders (Sawaoka & Monin, 2018).

There is robust evidence supporting various adaptive aspects of moral outrage. For one, moral outrage may promote positive feelings toward self. Research suggests that moral outrage may serve an important role in promoting personal meaning. Experiments specifically revealed that, in individuals who valued justice, experiencing moral outrage provided an opportunity to enact intrinsic values and, in turn, bolster a sense of personal meaning (Rothschild & Keefer, 2022). These results suggest that moral outrage is motivated by a desire to attain or maintain feelings of life meaning. Additionally, moral outrage may improve self-concept by attenuating feelings of guilt and affirming moral identity. Outrage at corporate injustice reduced both guilt

related to participants' own perceived moral failings and feelings of personal immorality (Rothschild & Keefer, 2017).

The expression of moral outrage may be socially adaptive as well. People are motivated to express moral outrage in order to publicly demonstrate their virtues (Grubbs et al., 2019). This act of virtue signaling can serve socially advantageous functions. For example, expressions of moral outrage increased the perceived desirability of potential long-term partners (Brown et al., 2022). These social functions of moral outrage are also met with criticism (Spring et al., 2018), as they are often associated with self-motivated desires to achieve status as described by the concept of "moral grandstanding" (Grubbs et al., 2019). Responses to these criticisms argue that virtue signaling does not undermine the functions of outrage in promoting moral progress (Westra, 2021). Thus, virtue signaling may be seen as a motivator of moral outrage expression, not a negation of its value.

### ***Moral Outrage as a Motivator of Behavior***

The positive effects of moral outrage on behavior are well-documented. Specifically, moral outrage increases motivation to engage in prosocial and activism behaviors (Spring et al., 2018). Outrage at hostile sexist beliefs increased both intentions to engage in activism and participation in actual behaviors (Becker & Wright, 2011). Moral outrage has also been implicated as a powerful motivator of other prosocial actions, such as increased engagement in protest against systemic injustices and attempted mitigation of moral violations (Thomas et al., 2009).

Evidence suggests these observed effects of moral outrage carry implications for pro-environmental behavior. Anthropogenic climate change is fundamentally a moral issue; the consequences are the result of perceived injustice committed by individual and systemic

perpetrators of environmental degradation (Antadze, 2020). Terry and Bowman (2020) analyzed the pro-environmental involvement of nurses, a population who are frequently exposed to the health consequences of climate change. Results identified outrage as the primary trigger for engagement in pro-environmental activism (Terry & Bowman, 2020). Although the literature is limited in its application of moral outrage to the context of pro-environmental behaviors, the discussed characteristics provide a strong argument for its utility in motivating such behaviors.

Synthesis of the literature reveals that, regardless of its somewhat negative reputation, moral outrage is undoubtedly a powerful motivator of behavior. Various social and personal benefits strongly drive motivation to experience and express moral outrage, suggesting an accessible emotional state for interventions to tap into. In sum, increasing moral outrage provides a promising avenue for promoting pro-environmental behavior.

### **Mindfulness**

*Mindfulness* is the awareness and nonjudgmental acceptance of present experience (Brown & Ryan, 2003). Five constituents of mindfulness: observing, describing, nonjudging, nonreactivity, and acting with awareness, define its multidimensional nature (Baer et al., 2006). Additionally, mindfulness is discussed as both a state and a trait construct. State mindfulness refers to temporary experiences of present-centered consciousness, while trait (or dispositional) mindfulness refers to one's stable, mindful disposition (Brown & Ryan, 2003). Although mindfulness interventions can induce state mindfulness, research also suggests that regular mindfulness training can increase trait mindfulness over time (Quaglia et al., 2016).

### **Mindfulness and Prosocial Behavior**

Across definitions, mindfulness has demonstrated considerable impact on prosocial behaviors. Donald et al. (2019) conducted a meta-analysis of studies that investigated the link



between mindfulness and prosocial behavior. They found a universal positive relationship with medium-sized pooled effects. These effects were found across trait correlational studies, intervention studies, meditation types, meditation intensity, closeness of recipient, and prosociality measures (i.e. self-report vs. observational). Notably, there were no significant differences in effect sizes between self-report measures and observational measures of prosociality in mindfulness intervention studies (Donald et al., 2019). Regarding the dimensions of mindfulness, all five facets of trait mindfulness have been positively associated with prosocial behavior (Lv et al., 2021).

Various mechanisms have been explored to explain the link between mindfulness and prosocial behavior. Some studies point toward mindfulness' ability to increase empathy (Block-Lerner et al., 2007). The relationship between mindfulness and online prosocial behavior was found to be mediated by cognitive empathy (Lv et al., 2021). In another study, empathic concern mediated the relationship between mindfulness and helping behavior toward ostracized strangers (Berry et al., 2018). Mindfulness' tendency to increase awareness is also theorized to play a role in increasing prosocial behavior, as greater attention to the needs of others may encourage greater social response (Brown & Ryan, 2023; Donald et al., 2019).

Research has also investigated morality as a potential mechanism. Mindfulness is connected to greater moral reasoning (Baer, 2015). Xiao et al. (2020) demonstrated positive correlations between the facets of mindfulness, moral sensitivity, and moral identity. These two moral constructs mediated the relationship between mindfulness and increased prosocial tendencies (Xiao et al., 2020). Acting with awareness was found to have the strongest relationship with internal identified prosocial motivations, or the motivation to act in line with

one's values (Kil et al., 2021). Thus, the mindfulness facet of acting with awareness may have particular implications for internal motivation to act in a prosocial manner.

### **Mindfulness and Pro-Environmental Behavior**

Mindfulness' effects on pro-environmental behaviors have been less frequently studied than other forms of prosocial behavior. Nevertheless, evidence supports a positive relationship and similar underlying mechanisms. Brown and Kasser (2005) demonstrated a positive relationship between mindfulness and ecologically responsible behaviors. Barbaro & Pickett (2016) expanded upon these findings, demonstrating a positive relationship between mindfulness and daily pro-environmental behavior, with connectedness to nature as a significant mediator. The facets of nonreactivity and observation were particularly relevant in this mediation pathway.

Mindfulness may help bridge the environmental attitude-behavior gap, which is one of the primary reasons that currently applied models of pro-environmental behavior often fall short. Colombo et al. (2023) demonstrated that dispositional mindfulness is related to greater performance of actual pro-environmental behavior. The observing facet of mindfulness in particular predicted pro-environmental behaviors, suggesting that increased concern for the environment motivates action. However, when the predictive power of attitudes on behavior was analyzed, nonjudging and acting with awareness specifically amplified this relationship. This suggests that heightened awareness of attitude-behavior discrepancies can increase conscious alignment of values and actions. Nonjudgement may contribute by preventing interference of negative emotions that arise when thinking about the environmental crisis (Colombo et al., 2023)

Mindfulness may be particularly effective in combatting the previously discussed psychological barriers to pro-environmental behavior. One such way is through disruption of habitual behavior. A key benefit of mindfulness is its demonstrated ability to disrupt automatic

thought patterns and behaviors (Brown & Ryan, 2003). This is pertinent to issues such as unsustainable consumption. Consumption choices are often habitual, and mindfulness may enhance conscious decision-making and increase the likelihood of consumers choosing a sustainable alternative (Bahl et al., 2016). Mindfulness may also help mitigate the barrier of psychological distance. Mindfulness has been shown to decenter self-referential appraisals of the world (Garland & Frederickson, 2019). Decreasing self-relevancy may result in less distinct conceptualizations of self and other, promoting broader contextual representations of experience. This state of mind is associated with lower psychological distance (Abraham et al., 2023).

Empirical explorations of mindfulness, pro-environmental behavior, and the underlying mechanisms of this relationship present converging evidence supporting the utility of mindfulness to increase pro-environmental behaviors. Mindfulness possesses characteristics that allow its impact to excel where current theories of pro-environmental behavior fall short. Namely, mindfulness can diminish the environmental attitude-behavior gap and alleviate two key psychological barriers to pro-environmental behavior. Therefore, the argument of incorporating mindfulness into pro-environmental behavioral interventions is a compelling one.

### **The Intersection of Mindfulness and Moral Outrage**

The current review of the literature has thus far established several similarities between mindfulness and moral outrage: they are both implicated in morality, they both demonstrate strong relationships with prosociality, and they both show considerable promise at increasing pro-environmental behavior. Recent research has also displayed an interactive effect of the two constructs; Kay et al. (2023) illustrated mindfulness' ability to increase experiences of moral outrage when witnessing injustice. Additionally, mindfulness amplified participants' behavioral

responses, as both state and trait mindfulness were associated with greater attempts to enact retribution against the moral transgressors (Kay et al., 2023).

### ***Mindfulness Tempers Negative Emotions***

These results seem contradictory to the well-established connection between mindfulness and tempered emotion. Mindfulness has been consistently related to emotional regulation and less intense experience of negative emotion (Roemer et al., 2015). This may occur due to mindfulness' tendency to enhance positive reappraisal of negative emotions and reduce negative self-referential processing that can exacerbate distress (Garland et al., 2011). Both trait and state mindfulness can reduce anger and aggression (Borders et al., 2010; Eisenlohr-Moul et al., 2016), and the negative relationship between mindfulness and aggression was shown to be mediated by reduced rumination and lower intensity of anger (Eisenlohr-Moul et al., 2016). Long and Christian (2015) demonstrated that mindfulness decreased experiences of anger and retaliatory actions in victims of injustice. In light of these findings, it may seem that logical that mindfulness would dampen the emotional responses elicited by third-party injustice. However, it is essential to consider mindfulness' nuanced effects on emotions, as well as the distinct characteristics of moral outrage, when examining this relationship.

### ***Does Mindfulness Heighten Moral Outrage?***

Mindfulness has been shown to heighten emotions in some cases, including gratitude, guilt, benign envy, and empathic emotional experience as a result of increased affective empathy (Kay et al., 2023). These findings illustrate that mindfulness' emotional dampening effect is not universal, and its influence may depend on the characteristics of the particular emotion. The pertinent difference between moral outrage and other experiences of injustice-fueled anger is third-party perspective, or the other-oriented response. This may be key to the enlivening effect

mindfulness demonstrates on moral outrage. Mindfulness' ability to decrease self-referential thought can produce a hypo-egoic state characterized by decreased self-concern. As a result, more mindful individuals tend to display decreased reactions to social threats (Brown et al., 2017). This may help explain why mindfulness tempers anger when injustice is specifically directed toward self.

The specific dimensions of mindfulness may also help explain its predicted amplifying effect on moral outrage. Attentional awareness is heavily implicated in mindfulness' potential to enliven moral outrage due to 1) greater attendance and concern to the needs of others and 2) its unique connection to morally driven prosocial behaviors (Kil et al., 2021). Counterintuitively, non-reactivity and nonjudgement may also play important roles in this relationship. Distressing emotions may cause avoidant reactions and hinder individuals' abilities to act, which is observed in the context of pro-environmental behaviors (Colombo et al., 2023). Nonreactivity to emotional state and increased coping by nonjudgement can mitigate these avoidant reactions (Colombo et al., 2023; Kil et al., 2021). Similarly, nonreactivity and nonjudgment could feasibly allow one to approach the discomfort caused by moral outrage with acceptance instead of avoidance, thereby facilitating actionable responses. While the facets of mindfulness may serve unique mechanisms with which they impact emotional experience, I will approach mindfulness as a unified construct. The Five Factor Mindfulness Questionnaire (FFMQ) originally designates the facets but maintains that they are components of an overall mindfulness construct (Baer et al., 2006).

Overall, the proposed ability of mindfulness to amplify outrage is directly implicated in pro-environmental behaviors. There is a general consensus in psychology that emotions function to drive and sustain behaviors (Blasi, 1999). Moral outrage in particular may drive acts that enact retribution toward the perpetrator, restore the violated moral standard, and work toward a

common cause (Thomas et al., 2009). Thus, the increased felt intensity of moral outrage, in combination with the motivating power of mindfulness, will likely amplify the two effects to create an even greater impact on pro-environmental behavior.

### **The Present Study**

Moral outrage and mindfulness are both strong independent motivators of prosocial behavior. Both constructs display characteristics that transcend the identified psychological barriers to pro-environmental behaviors, indicating their potential value in the mobilization of pro-environmental behaviors. They also display an interactive effect, whereby mindfulness heightens the experience and expression of moral outrage incited by witnessing third-party injustice. The present study aims to integrate these ideas into a novel model of pro-environmental behavior, where mindfulness amplifies the positive effects of moral outrage to increase pro-environmental intentions and action. This model may fill the critical gap in pro-environmental behavior literature, as current models do not paint a comprehensive picture of the underlying psychological motivations of pro-environmental behavior. The proposed model will target pro-environmental intentions, an important antecedent and traditionally studied aspect of pro-environmental behavior (Lv et al., 2021), but it will also examine actual behavior to demonstrate the model's ability to bridge the prevalent attitude-behavior gap.

### ***Specific Aims and Hypotheses***

**Aim 1.** Investigate both state and trait mindfulness as forces that increase the pro-environmental intentions of morally outraged individuals

Hypothesis 1a, within-participants main effect: Moral outrage induced by environmental injustice will increase pro-environmental intentions.

Hypothesis 1b, between-participants main effect: Individuals higher in trait mindfulness and who undergo mindfulness inductions will show increased pro-environmental intentions.

Hypothesis 1c, between-participants moderation: Individuals higher in trait mindfulness and who undergo mindfulness inductions will show an increased effect of moral outrage on increased pro-environmental intentions.

**Aim 2.** Investigate behavioral applications of the observed effects

Hypothesis 1a, within-participants main effect: Moral outrage induced by environmental injustice will increase pro-environmental behaviors.

Hypothesis 2b, between-participants main effect: Individuals higher in trait mindfulness and who undergo mindfulness inductions will show increased pro-environmental behaviors.

Hypothesis 2c, between-participants moderation: Individuals higher in trait mindfulness and who undergo mindfulness inductions will show an increased effect of moral outrage on increased pro-environmental intentions.

Experimental manipulations will induce moral outrage and mindfulness, respectively. In order to induce environmental moral outrage, vignettes depicting environmental injustice were created and validated in a pilot study.

### **Pilot Study**

#### **Method**

##### ***Participants***

Fifty-one undergraduate students were recruited through Virginia Commonwealth University SONA system and compensated with research participation credits. An a priori power analysis was completed using G\*Power (Faul et al., 2007) to estimate sample size. Results indicated that the sufficient sample size to achieve 95% power for detecting a medium effect size

( $d = .5$ ) at a significance criterion of  $\alpha = .05$  was 45 for a paired samples t-test. To account for anticipated missing data or excluded data, I recruited 51 participants.

### ***Materials***

**Moral Outrage Vignettes.** A total of 50 vignettes were developed for the purpose of the moral outrage manipulation. Each vignette displayed two or three sentences describing an environmental scenario. Twenty-five of the vignettes served as environmentally outraging stimuli, characterized by the depiction of a clear perpetrator's intentional act of environmental injustice. For example, one outraging vignette depicted the devastation caused by a large company's oil spill. Twenty-five vignettes served as control stimuli, depicting natural occurrences of environmental degradation. For example, one neutral vignette depicted the destruction caused by a volcanic eruption. Vignettes were all inspired by real human and natural occurrences, developed and modified from news outlets and historical events. The outrage and control vignettes were specifically designed to elicit themes of environmental destruction, with the difference lying in whether or not a clear moral transgressor is implicated to target moral outrage. For example, the depiction of the oil spill was directly attributed to an oil company's unsustainable practices, while the volcanic eruption was emphasized to be a natural occurrence. Highlighting a transgressor served the purpose of eliciting feelings of moral outrage specifically, as this is the key characteristic that differentiates moral outrage from similar emotions such as empathic anger.

**Moral Outrage.** A single-item scale assessed participants' felt moral outrage. Participants rated the degree to which they felt outraged by the vignette on a scale of 1 (*not at all*) to 5 (*extremely*).



**Contempt, Anger, Disgust.** Three, single-item scales assessed participants' experiences of anger, disgust, and contempt. Participants rated the degree to which the vignette made them feel anger, disgust, and contempt respectively on scales of 1 (*not at all*) to 5 (*extremely*).

**Pro-environmental Behavior Pretest.** Three, single-item scales assessed participants' likelihood of participating in three different pro-environmental behaviors. Participants rated how likely they were to donate time to help the environment, donate money to an environmental organization, and donate their earned credit hours to promote environmental research respectively on scales of 1 (*very unlikely*) to 5 (*very likely*). This measure was developed to inform the creation of a pro-environmental behavior task in the main study, but it was not used in favor of implementing an online, pre-validated behavior task in the main study.

## **Procedure**

Participants completed the study online via a Qualtrics survey. After consenting to participate in the study, participants viewed a series of vignettes and corresponding measures. The survey implemented a planned missingness design, such that each participant viewed 10 randomly selected environmentally outraging vignettes and 10 randomly selected control vignettes from the pool of 50 total vignettes. This limited participant burden by reducing measures from 50 to 20, while still allowing for all 50 vignettes to be evaluated. After reading each vignette, participants completed the moral outrage and contempt, anger, and disgust measures as they pertained to the individual vignettes.

## **Stimulus Selection**

Missing data was imputed by multiple imputation predictive mean metric (PMM) using the Mice package in R (Van Buuren & Groothuis-Oudshoorn, 2011) using 20 imputed datasets and 50 iterations. Vignettes that displayed collinearity were excluded from the analysis. Mean

outrage scores were aggregated across participants and sorted from highest to lowest values. The 5 vignettes with the highest outrage score were selected for the moral outrage experimental condition, and the 5 vignettes with the lowest outrage score were selected for the control condition.

In order to establish discriminate validity and establish the vignette's effects on moral outrage separate from contempt, anger, and disgust, the nomological shockwave was estimated. For each of the four affect measures (outrage, anger, contempt, and disgust), we averaged the 5 outrage condition vignettes and the 5 control condition vignettes, creating 8 aggregate scores per participant. Four paired-samples t-tests were conducted using JASP software (JASP Team, 2024) to compare each of the 4 affect measures (outrage, contempt, anger, and disgust) between the outrage and the control conditions. Outrage scores for the outrage vignettes ( $M = 3.90$ ,  $SD = 0.53$ ) were significantly higher than outrage scores for the control vignettes ( $M = 2.05$ ,  $SD = 0.51$ ),  $t(50) = 23.23$ ,  $p < .001$ ,  $d = 3.25$ . Contempt scores for the outrage vignettes ( $M = 2.98$ ,  $SD = 0.84$ ) were significantly higher than contempt scores for the control vignettes ( $M = 1.91$ ,  $SD = 0.50$ ),  $t(50) = 7.80$ ,  $p < .001$ ,  $d = 2.52$ . Anger scores for the outrage vignettes ( $M = 3.73$ ,  $SD = 0.54$ ) were significantly higher than contempt scores for the control vignettes ( $M = 1.97$ ,  $SD = 0.44$ ),  $t(50) = 20.40$ ,  $p < .001$ ,  $d = 2.86$ . Disgust scores for the outrage vignettes ( $M = 3.82$ ,  $SD = 0.60$ ) were significantly higher than disgust scores for the control vignettes ( $M = 1.94$ ,  $SD = 0.45$ ),  $t(50) = 19.53$ ,  $p < .001$ ,  $d = 2.73$ . The greater calculated effect size for the outrage scores compared to anger, disgust, and contempt indicated the elicitation of outrage above and beyond the other affect measures, achieving the target effect of the manipulation.

## Study 1

### Method

#### *Participants*

Twenty-six VCU students were recruited through Virginia Commonwealth University SONA system to participate in a study called “Environmental Emotions”. An a priori power analysis was conducted using G\*Power (Faul et al., 2007) to estimate sample size. Results indicated that the sufficient sample size to achieve 90% power for detecting a small-medium effect size ( $f = .08$ ) at a significance criterion of  $\alpha = .05$  was 242 for a mixed model ANOVA with five repeated measures. However, project timeline and recruitment difficulties related to the university participant pool severely limited the total achieved sample size. Due to changes in experimental protocol after the start of data collection, 3 participants’ results were excluded from the analyses, leaving  $N = 23$ . Participant demographics are described in Table 1. Participation was limited to English-speaking individuals 18 years of age or older.

**Table 1**

#### *Participant Demographics*

Age: $M (SD)$	19.18 (1.40)
Gender: $N (%)$	
Cisgender woman	5 (26.3%)
Cisgender man	5 (26.3%)
Non-binary	1 (5.3%)
Prefer not to say	1 (5.3%)
Race/Ethnicity: $N (%)$	
Black or African American	3 (15.8%)
Asian	2 (10.5%)
Hispanic/ Latino/a/x	1 (5.3%)
White	5 (26.3%)
Other	1 (5.3%)
Political Identity $N (%)$	
Liberal	7 (36.8%)
Moderate	2 (10.5%)
Other	3 (15.8%)

### *Materials*

**Moral Outrage Vignettes.** Ten vignettes, pretested in the pilot study, each displayed two to three sentences describing an environmental scenario. 5 of the vignettes served as environmentally outraging stimuli, characterized by depictions of a clear perpetrator's intentional act of environmental injustice. 5 vignettes served as control stimuli, depicting natural occurrences of environmental degradation.

**Moral Outrage.** A single-item scale assessed participants' felt moral outrage. Participants rated the degree to which they felt morally outraged by the vignettes on a scale of 1 (*not at all*) to 5 (*extremely*).

**Trait Mindfulness.** Trait mindfulness was assessed using two scales: the Mindful Attention and Awareness Scale (MAAS) (Brown & Ryan, 2003) and the Five Factor Mindfulness Questionnaire (FFMQ) (Baer et al., 2006). For the MAAS, participants responded to a 15-item scale indicating how frequently they experience the described experience (e.g., "I could be experiencing some emotion and not be conscious of it until some time later"), using a 6-point Likert scale from 1 (*almost always*) to 6 (*almost never*). Items were reverse-coded and standardized into z-scores. For the FFMQ, participants completed a 39-item scale comprised of five subscales: observing, describing, acting with awareness, nonjudging, and nonreactivity. Participants will rate their agreement with each statement (e.g., "I pay attention to how my emotions affect my thoughts and behavior") using a 5-point Likert scale from 1 (*never or very rarely true*) to 6 (*very often or always true*). Items were appropriately reverse coded and standardized into z-scores. All standardized item scores for both scales were combined and

averaged to create a composite trait mindfulness score, with higher scores indicating greater trait mindfulness.

**State Mindfulness.** The State Mindfulness Scale (SMS) (Tanay & Bernstein, 2013) was used to assess state mindfulness. Participants responded to a 21-item scale indicating how much they agree with each statement describing their experience during the mindfulness meditation (e.g., “I noticed physical sensations come and go”) on a 5-point Likert scale from 0 (*not at all*) to 4 (*very much*). Scores from each item were averaged to create a total state mindfulness score, with higher scores indicating greater state mindfulness.

**Pro-Environmental Intentions.** A modified version of the Recurring Pro-Environmental Behavior Scale (REBS; Brick et al., 2017) was used to measure pro-environmental intentions. Scale instructions were modified to reflect intentional rather than current behavioral language, and the 21-item scale was shortened to the 6-item version used by Brick and Lai (2018). Participants reported their intended frequency to engage in pro-environmental behaviors (e.g., using alternative transportation) using a 5-point Likert scale from 1 (*never*) to 5 (*always*).

**Pro-Environmental Behavior.** Pro-environmental behavior was operationalized through an online task and an observational measure.

***The Work for Environmental Protection Task.*** The Work for Environmental Protection Task (WEPT; Lange & Dewitte, 2022) is an online task where participants are able to sort numbers in exchange for small donations to OroVerde, an environmental organization that plants trees in South America. Participants view a page of two-digit numbers and are asked to read through and select numbers that fit a certain criterion (all numbers that contain an even first digit and an odd second digit). The original version of the WEPT includes 15 pages of numbers, each with varying numbers of items (40-200) and amounts of associated donation money (€0.10-

€0.30). In order to shorten the task, the current study presented participants with two trials of 120 numbers and were told that each number they correctly identified would result in a \$.02 donation to OroVerde. WEPT scores were calculated for each trial based on the number of correct items each participant selected, with a greater number of items representing greater pro-environmental behavior.

***Observational Sink Measure.*** Participants witnessed a sink left running after the completion of the study survey, and researchers recorded whether or not the participant turned off the sink and how long it took them to do so while the participant was waiting alone in the room. Pro-environmental behavior was indicated by whether or not the participant turned off the sink. The design attempts to limit the influence of social desirability and external determinants of behavior by presenting a low-cost, private task that seemingly offers no benefit to the participant outside of acting on pro-environmental tendencies.

### **Procedure**

Participants first arrived at the laboratory and were escorted to a private room. After consenting to participate in the study, participants were directed to a computer displaying the study's Qualtrics survey. Participants were then randomly assigned to either the experimental condition (mindfulness induction) or the control condition (mind-wandering). Both conditions listened to 15-minute recordings developed by Hafenbrack et al. (2014). The mindfulness induction is a focused-breathing meditation, where participants were instructed to focus on the psychological sensation of breath and repeatedly redirect their attention to this sensation. The mind-wandering induction repeatedly instructed participants to think of whatever comes to mind. As a manipulation check, participants responded to the state mindfulness scale immediately after completing the induction. Next, participants completed the moral outrage manipulations and

corresponding scales. Participants completed the outrage block, which included all 5 outrage vignettes. After reading each vignette, participants were instructed to complete the moral outrage and pro-environmental intentions measures as they pertained to each vignette. At the end of the vignette block, participants had the opportunity to complete as much, if any, of the WEPT. The control block was identical to the outrage block, but participants viewed the 5 control vignettes in place of the outrage ones. All participants completed both blocks, but the order with which they were presented was randomized.

Finally, participants completed the trait mindfulness and demographic measures. At this point, the Qualtrics survey was complete. The experimenter returned to the room, began to wash their hands, and then expressed that they needed to get the debriefing materials from the filing cabinet in the hallway. The experimenter purposefully left the sink running and stepped into the hallway, leaving the participant alone in the room with the running sink. The experimenter recorded if and how long it took each participant to turn off the sink. If the participant didn't turn off the sink after two minutes, the experimenter returned to the room and recorded the participant as having not turned off the sink.

## **Results**

### *Descriptive Statistics*

All descriptive and internal consistency statistics were calculated using IBM SPSS Statistics (Version 27) and displayed in Table 2. Descriptive statistics were calculated for all measures, including the pro-environmental intentions and WEPT outcome measures for each of the four experimental groups.

### **Table 2**

#### *Descriptive Statistics*

Measure	Mindfulness Condition	Outrage Condition	<i>M</i>	<i>SD</i>	Range	<i>N</i>	<i>α</i>
SMS			3.61	0.71	2.24 – 4.76	23	.91
Trait mindfulness			.00	1.00	-2.59 – 1.86	20	.63
REBS	Mindful	Outrage	2.88	0.85	1.33 – 4.20	12	
REBS	Mindful	Control	2.80	0.81	1.33 – 3.83	12	
REBS	Control	Outrage	2.51	0.93	1.30 – 4.27	10	
REBS	Control	Control	2.56	1.01	1.33 – 4.30	11	
Outrage	Mindful	Outrage	19.02	1.94	15.60 – 21.00	11	
Outrage	Mindful	Control	10.63	4.51	4.20 – 16.80	12	
Outrage	Control	Outrage	17.93	3.01	10.60 – 21.00	11	
Outrage	Control	Control	12.51	5.08	4.40 – 21.00	11	
WEPT	Mindful	Outrage	28.42	10.53	0.00 – 36.00	12	
WEPT	Mindful	Control	25.25	4.72	11.00 – 28.00	12	
WEPT	Control	Outrage	27.64	11.78	1.00 – 36.00	11	
WEPT	Control	Control	20.91	10.35	1.00 – 28.00	11	

### *Manipulation Checks*

**State Mindfulness.** An independent samples t-test was conducted using SPSS to compare the state mindfulness scores of participants who underwent the mindfulness induction and participants who experienced the mind-wandering control condition. Contrary to the predicted effect, participants who were in the mindfulness condition ( $M = 3.79$ ,  $SD = 0.64$ ) did not significantly differ in state mindfulness scores compared to participants who were in the mind-wandering control condition ( $M = 3.40$ ,  $SD = 0.75$ ),  $t(21) = 1.35$ ,  $p = .190$ , suggesting the manipulation was not successful.

**Moral Outrage.** A paired samples t-test was conducted using SPSS to compare the outrage scores of participants after viewing the outraging vs. the control vignettes. Participants were significantly more outraged after viewing the outrage vignettes than the control vignettes  $t(21) = 6.57$ ,  $p < .001$ ,  $d = 1.40$ , suggesting the manipulation was successful.

### *Order Effects*



An independent samples t-test was conducted using JASP to test for order effects of vignette blocks on participants' outrage scores. Contrary to the predicted effect, there were no differences between participants' outrage scores in response to the outrage vignette block when viewing this block first ( $M = 17.74$ ,  $SD = 2.94$ ) compared to participants' outrage scores in the response to the outrage vignette block when viewing the control block first ( $M = 19.34$ ,  $SD = 1.70$ ),  $t(20) = -1.51$ ,  $p = .147$ ). Similarly, there were no differences between participants' outrage scores in response to the control vignette block when viewing the control block first ( $M = 11.75$ ,  $SD = 4.62$ ) compared to participants' outrage scores in the response to the control vignette block when viewing the outrage block first ( $M = 11.24$ ,  $SD = 5.22$ ),  $t(20) = 0.25$ ,  $p = .805$ .

### ***Effects of Moral Outrage and Mindfulness on Pro-Environmental Intentions and WEPT Scores***

The lme4 package for R, Linear Mixed-Effects Models using 'Eigen' and S4 (Bates et al., 2015) was used to determine the interactive effects of moral outrage and mindfulness on pro-environmental intentions and behaviors through four, two-level multilevel models.

**Model 1.** Level one of Model 1 consisted of the within-participants effects of the vignette types on pro-environmental intentions scores, and level two of Model 1 consisted of the between-participants effects of trait mindfulness scores on pro-environmental intention scores. The model revealed a significant main effect of the outrage vignette condition on pro-environmental intentions, such that outrage predicted increased pro-environmental intentions, and a significant main effect of trait mindfulness on pro-environmental intentions, such that greater mindfulness scores predicted increased pro-environmental intentions. No significant cross-level interaction was observed (Table 3, Table 4, Figure 1).

### **Table 3**

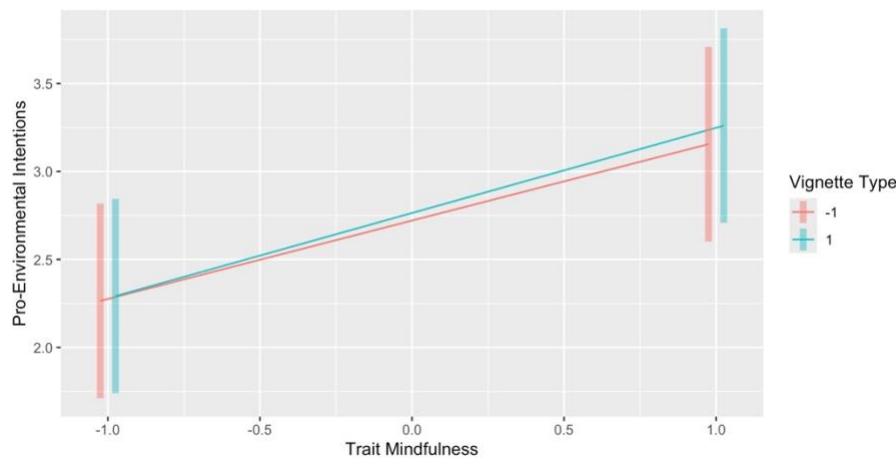
*Model 1: Effects of Trait Mindfulness and Vignette Type on Pro-Environmental Intentions*

Effect	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Vignette Type*	0.03	0.02	2.15	.036
Trait Mindfulness*	0.46	0.18	2.53	.021
Vignette x Trait Mindfulness	0.02	0.02	1.23	.224

*Note.* \**p* < .05

**Figure 1**

*Interactive Effects of Trait Mindfulness and Vignette Type on Pro-Environmental Intentions*



**Table 4**

*Simple Effects and Simple Slopes of Model 1*

Effect of:	Probed at:	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Vignette Type	Low Mindfulness	0.01	0.02	0.60	.550
	High Mindfulness	0.05	0.02	2.31	.025
Trait Mindfulness	Control Condition (Control vignettes)	0.45	0.19	2.36	.030
	Outrage Condition (Outrage vignettes)	0.48	0.19	2.57	.020

**Model 2.** Level one of Model 2 consisted of the within-participants effects of the vignette types on WEPT scores, and level two of Model 2 consisted of the between-participants effects of trait mindfulness scores on WEPT scores. The model revealed a significant main effect of outrage vignette condition, such that the outrage condition predicted decreased WEPT scores but

no main effect of the mindfulness manipulation or significant cross-level interaction was observed (Table 5, Figure 2).

**Table 5**

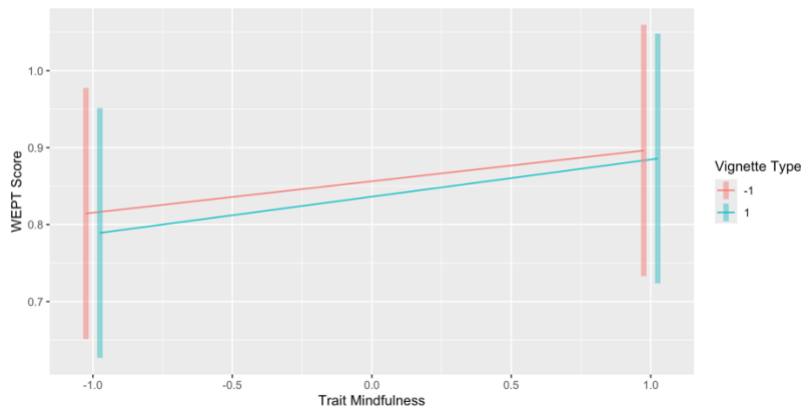
*Model 2: Effects of Trait Mindfulness and Vignette Type on WEPT*

Effect	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Outrage***	-0.01	0.00	-2.25	<.001
Trait Mindfulness	0.04	0.05	0.85	.409
Outrage x Trait Mindfulness	0.01	0.00	0.91	.365

Note. \**p* < .05, \*\**p* < .01, \*\*\**p* < .001

**Figure 2.**

*Interactive Effects of Trait Mindfulness and Vignette Type on WEPT Scores*



**Table 6**

*Simple Effects and Simple Slopes of Model 2*

Effect of:	Probed at:	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Vignette Type	Low mindfulness	2.16	0.18	11.79	<.001
	High mindfulness	3.89	0.18	21.17	<.001
Trait Mindfulness	Control Condition (Control vignettes)	-11.36	4.78	-2.38	.029
	Outrage Condition (Outrage vignettes)	0.48	4.78	-2.02	.059

**Model 3.** Level one of Model 3 consisted of the within-participants effects of the vignette types on pro-environmental intention scores, and level two of Model 3 consisted of the between-

participants effects of mindfulness manipulation on pro-environmental intention scores. The model revealed a significant main effect of outrage condition on pro-environmental intentions, such that outrage predicted increased pro-environmental intentions, but no main effect of the mindfulness manipulation or significant cross-level interaction was observed (Table 7, Table 7, Figure 3).

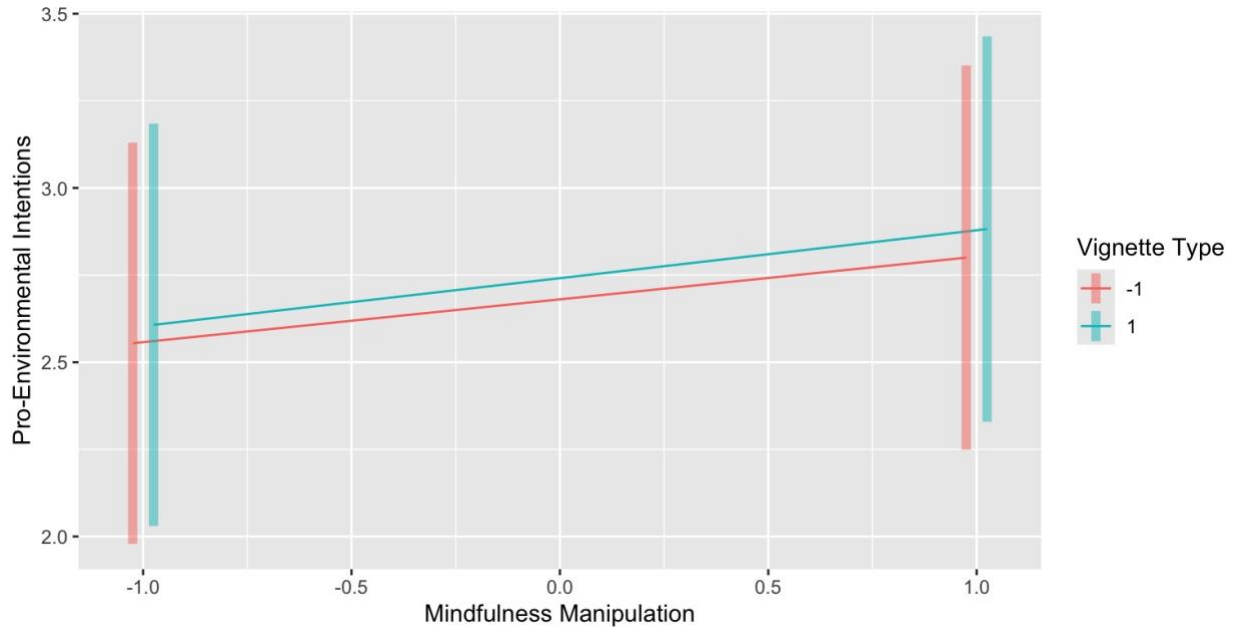
**Table 7**

*Model 3: Effects of Mindfulness Manipulation and Vignette Type on Pro-Environmental Intentions*

Effect	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Vignette Type*	0.03	0.01	2.31	.025
Mindfulness Manipulation	0.13	0.19	0.69	.496
Vignette x Mindfulness	0.01	0.01	0.50	.617

Note. \**p* < .05

**Figure 3**



*Interactive Effects of Mindfulness Manipulation and Vignette Type on Pro-environmental Intentions*

**Table 8**

*Simple Effects and Simple Slopes of Model 3*

Effect of:	Probed at:	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Vignette Type	Control (Mind-wandering) Condition	0.03	0.02	1.22	.228
	Mindfulness (Induction) Condition	0.04	0.02	1.98	.052
Mindfulness	Control Condition (Control vignettes)	0.12	0.19	0.64	.528
Manipulation	Outrage Condition (Outrage vignettes)	0.14	0.19	0.72	.482

**Model 4.** Level one of Model 4 consisted of the within-participants effects of the vignette types on WEPT scores, and level two of Model 4 consisted of the between-participants effects of the mindfulness manipulation on WEPT scores. The model revealed a significant main effect of outrage condition on WEPT scores, such that outrage predicted decreased WEPT scores. No main effect of the mindfulness condition was observed, but there was a significant cross-level interaction of outrage and mindfulness manipulation (Table 9). Specifically, the effect of outrage on WEPT scores was higher for those in the mind-wandering control condition compared to those in the mindfulness induction condition (Figure 4, Table 10).

**Table 9**

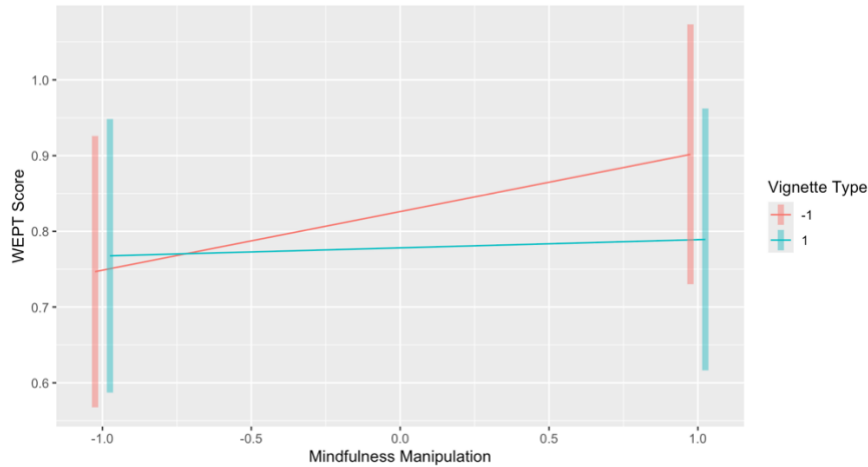
*Model 4: Effects of Mindfulness Manipulation and Vignette Type on WEPT*

Effect	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Outrage**	-0.02	0.01	-3.18	.002
State Mindfulness	0.04	0.06	0.77	.448
Outrage x State Mindfulness**	-0.03	0.01	-4.64	<.001

*Note.* \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Figure 4**

*Interactive Effects of Mindfulness Manipulation and Vignette Type on WEPT Scores*



**Table 10**

*Simple Effects and Simple Slopes of Model 4*

Effect of:	Probed at:	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Outrage	Control (Mind-wandering) Condition	0.08	0.06	1.30	.208
	Mindfulness (Induction) Condition	0.01	0.06	0.18	.859
State Mindfulness	Control Condition (Control vignettes)	0.01	0.01	1.00	.320
	Outrage Condition (Outrage vignettes)	-0.06	0.01	-5.60	<.001

***Effects of Mindfulness and Moral Outrage on the Observational Pro-Environmental Behavior Measure (The Sink Task)***

Two logistic regressions were performed using JASP Software (JASP Team, 2024) to examine the effects of both trait and state mindfulness and outrage on the behavioral sink task. Participant reactions were coded as yes (1) and no (-1) depending on whether or not they turned off the sink in the 2-minute window. Unlike previous analyses, outrage was coded as a between-participants variable. Participants were considered to be in the outrage condition if the most recent block they viewed was the outrage vignette block, and they were considered to be in the control condition if they most recently viewed the control vignette block.

**Trait mindfulness and outrage.** The regression model did not reveal any significant main effects of vignette type or trait mindfulness on sink outcomes. There was also no significant interaction between vignette type and trait mindfulness (Table 11).

**Table 11**

*Effects of Trait Mindfulness and Vignette Type on Behavioral Sink Task*

Effect	<i>B</i>	<i>SE</i>	Odds Ratio	<i>z</i>	<i>p</i>	Confidence Interval	
						Lower Bound	Upper Bound
Vignette Type	-0.43	1.01	0.65	-0.41	.685	-2.50	2.33
Trait Mindfulness	0.81	1.39	2.25	0.58	.560	-1.91	1.64
Vignette x Trait Mindfulness	-1.81	1.58	0.17	-1.14	.254	-4.91	1.30

**State Mindfulness and Moral Outrage.** The regression model did not reveal any significant main effects of vignette type or mindfulness manipulation on sink outcomes. There was also no significant interaction between vignette type and mindfulness manipulation (Table 12).

**Table 12**

*Effects of Mindfulness Manipulation and Vignette Type on Behavioral Sink Task*

Effect	<i>B</i>	<i>SE</i>	Odds Ratio	<i>z</i>	<i>p</i>	Confidence Interval	
						Lower Bound	Upper Bound
Vignette Type	-0.46	1.01	0.63	-0.45	.651	-2.44	1.53
Mindfulness Manipulation	0.81	0.74	2.24	1.09	.278	-0.65	2.26
Vignette x Mindfulness	0.46	1.01	1.58	0.45	.651	-1.53	2.44

## Discussion

I predicted to observe main effects of moral outrage, state mindfulness, and trait mindfulness on increased pro-environmental intentions and behaviors. Notably, outrage consistently predicted increased pro-environmental intentions, but predicted *decreased* WEPT

scores. This may be partially explained by inconsistencies in the scoring of the WEPT, as the outrage condition had fewer correct answers than the control condition. The task will be revised in continuing data collection to mitigate this inconsistency. Trait mindfulness significantly predicted increased pro-environmental intentions but was not a significant predictor of WEPT scores. State mindfulness via mindfulness induction was not a significant predictor of intentions or behavior. This may be at least partially due to the manipulation itself; analyses revealed that the mindfulness induction was not successful at increasing state mindfulness compared to the control condition, thereby failing the manipulation check. So, the analyses are not able to accurately make assumptions about state mindfulness due to the seemingly ineffective manipulation.

I also predicted cross-level interactions between outrage and mindfulness, such that mindfulness increases the effect of outrage on pro-environmental intentions and behaviors. One significant interaction was observed between outrage and state mindfulness on WEPT scores. Unexpectedly, state mindfulness showed a *buffering* effect on WEPT scores, where the effect of outrage on increased WEPT scores was *lower* for those in the mindfulness induction condition. I also predicted main and interactive effects of mindfulness and outrage on whether or not participants turned off the sink. The analyses did not reveal any significant effects. One explanation is the absence of observed order effects. That is, it did not make a significant difference on outrage levels whether participants viewed the outrage or control vignettes first. Therefore, the recency effect hypothesized to affect subsequent pro-environmental behavior may not have been present.

When interpreting these results, it is important to note that the current study was severely underpowered, as the sample size of 23 significantly undershot the pre-determined target of 250



participants. Analyses were conducted at this point due to practical limitations, including time constraints and difficulties with recruitment due to an underactive university participant pool. However, data collection is still in progress, and we plan to revisit analyses once the sample size target is achieved and amendments are made to the WEPT task. It is likely that future results will look dramatically different than those reported in this preliminary analysis. Nonetheless, the current data trends reveal interesting patterns; although the outrage manipulation increased pro-environmental intentions and trait mindfulness predicted increased pro-environmental intentions as expected, outrage showed *decreased* effects on WEPT scores and state mindfulness had an unexpected interactive effect with outrage on WEPT scores. The failed mindfulness manipulation, WEPT scoring inconsistencies, and the heightened influence of outliers with such a small sample size could have all contributed to this effect. It will be interesting to see, once the target sample size is reached, whether these trends continue or evolve completely.

The expected results will significantly contribute to the literature in several ways. For one, they will help fill a substantial gap in the pro-environmental behavior literature. Current theories of pro-environmental behavior center around attitudes and beliefs. While they have been valuable toward understanding underlying processes of pro-environmental cognition, their predictive power of actual behavior is limited (Yuriev et al., 2020). As such, the pro-environmental literature suffers a substantial attitude-behavior gap (Kollmuss et al., 2002). The proposed model utilizes the two lesser-studied psychological processes of moral outrage and mindfulness. Both constructs have demonstrated success in overcoming the most common psychological barriers to pro-environmental behaviors and transcending discrepancies between attitudes and behaviors (Bahl et al., 2016; Colombo et al., 2023; Donald et al., 2019; Spring et al., 2018). Thus, their particular value in promoting pro-environmental behaviors is well

supported. Further, these two concepts have been demonstrated to interact in a complementary way that amplifies both emotional experience and behavioral response. This effect has been demonstrated to mobilize retribution in the context of workplace injustice (Kay et al., 2023), but it has never been studied in the context of pro-environmental behavior. The present study would thus demonstrate an innovative approach to targeting the motivation of pro-environmental behaviors. The incorporation of a novel behavioral measure will further demonstrate the anticipated practical impact of the proposed model.

Additionally, the present study carries strong theoretical implications. The research challenges traditional conceptualizations of moral outrage and mindfulness. Moral outrage's reputation as a destructive emotion has evoked criticism in the past (Spring et al., 2018). However, the present study has begun to and continues to seek to reinforce outrage's constructive value, harnessing its powerful motivating nature to effect positive social change. Mindfulness is often assumed to dampen emotions (Roemer et al., 2015), but the current research investigates its emotion-amplifying potential. These nuanced perspectives of moral outrage and mindfulness could both uncover untapped potential for driving social progress and contribute to the greater understanding of these psychological processes as a whole.

### ***Limitations and Future Directions***

Besides the small sample size, the present study possesses several methodological limitations. For one, part of the model relies on self-report measures of pro-environmental intentions. While valuable, reports of behavioral intentions may be inflated compared to actual behaviors (Yuriev et al., 2020), limiting the practical application of these measures. The current study attempts to mitigate this limitation by including two pro-environmental behavioral tasks. The WEPT provides a pre-validated, easily implemented computer task that allows us to observe

participants' willingness exert effort on a tedious task for the purpose of benefitting the environment. We also designed a novel, observational measure of actual pro-environmental behavior. However, the outcome of this measure is dichotomous (turning off the sink or not turning off the sink). While still valuable in determining behavioral impact, some nuance may be lost regarding relevant factors such as the degree, type, and frequency of pro-environmental behaviors that the model attempts to predict. Future studies may benefit from incorporating other, higher-cost observational measures of pro-environmental behaviors (e.g., activism and monetary donations) to investigate whether the effects replicate across dimensions of pro-environmental behaviors.

Another limitation lies in the definitions and measurements of moral outrage and mindfulness. Both concepts have faced construal uncertainty in the literature. Moral outrage appears to abut several other similar constructs, which has resulted in the questioning of its distinct existence. The present research argues for the unique emergence and consequences of moral outrage, which will be targeted by the specific nature of the vignettes (i.e., the environmental outrage vignettes and the control vignettes will depict similar themes of environmental degradation, but they will notably differ in whether a clear perpetrator of injustice is implicated). Nonetheless, future research may consider specifically targeting similar constructs such as empathic anger to reinforce moral outrage's distinct emergence and effect on behavior. Additionally, moral outrage was measured with a single-item, unvalidated scale. We chose to implement this measure to target the construct as directly as possible, and outrage is a colloquially accessible term. The pilot study also demonstrated that participants successfully demonstrated a distinction between outrage and similar constructs (contempt, anger, and disgust) based on terminology alone.

The construct of mindfulness is complicated in that it is defined and measured in various ways across the literature. As a result, scales that claim to measure the same thing may in fact target different constructs or dimensions of mindfulness (Bravo et al., 2022). The present study attempts to mitigate this by incorporating two different measures of dispositional mindfulness. MAAS (Brown & Ryan, 2003) represents the most frequently cited and consistently validated mindfulness measurement (Black et al., 2012), but the present study combines it with the FFMQ, which features a multidimensional approach to mindfulness with distinct components (Baer et al., 2006). The intent is to generate a more comprehensive dispositional mindfulness score incorporating multiple perspectives. The SMS (Tanay & Bernstein, 2013), which will be used to assess state mindfulness after the meditation induction, was not created to reflect the specific dimensions targeted by the MAAS and FFMQ. Thus, there may be slight measurement variation between the two scales which may cause inconsistent results between state and trait outcomes. Future analyses may benefit from analyzing sub-facets of mindfulness separately to tease out specific effects. For example, it would be valuable to observe which aspects of trait mindfulness may contribute to the unique interactive effect between outrage and mindfulness on pro-environmental behaviors. Nonjudging and nonreactivity may serve a particularly significant role in this relationship, as the ability to step out of engagement with emotions may facilitate an acceptance approach vs. an avoidant reaction to the discomfort that may arise when experience emotions such as outrage. Future research would benefit from the investigation of this mechanism.

The present study has the potential to demonstrate empirical evidence for mindfulness' potential to increase moral outrage's effect on pro-environmental behaviors. One mindfulness intervention is unlikely to cause lasting change due to its induction of a temporary mindful state.

However, regular mindfulness training has shown to increase trait mindfulness over time (Quaglia et al., 2016). This basic research may set the stage for future applied interventions that can be implemented to achieve lasting impact. Specifically, longitudinal studies can investigate this proposed effect through longer-term mindfulness intervention programs. This may be beneficial toward developing a practical intervention model designed to enact wide-spread, lasting behavioral change.

### **Conclusion**

Overall, this thesis study aimed to contribute to the basic psychological literature by identifying previously unexplored psychological mechanisms of pro-environmental behavior: mindfulness, and moral outrage. In addition, the study aimed to establish the practical values of these psychological mechanisms by demonstrating their power to drive meaningful environmental intentions and behavior. Preliminary analyses displayed conflicting trends, but further investigation is required to make meaningful conclusions about the variables of interest. Mindfulness and moral outrage are both effective individual motivators of pro-environmental behaviors, but their interactive effect is of particular interest to the current research. Demonstrating the effectiveness of this completely novel approach to pro-environmental behavior could revolutionize the way we address the climate crisis.

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