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## COMPARING THE EFFECTS OF MINDFULNESS MEDITATION AND RELAXATION IN A BRIEF LABORATORY INDUCTION

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COMPARING THE EFFECTS OF MINDFULNESS MEDITATION AND  
RELAXATION IN A BRIEF LABORATORY INDUCTION

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THESIS

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A thesis submitted in partial fulfillment of  
the requirements for the degree of Master of  
Science in the College of Arts and Sciences  
at the University of Kentucky

By

Carolina A. Caldera

Director: Dr. Ruth A. Baer, Professor of Psychology

Lexington, KY

2017

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## ABSTRACT OF THESIS

### COMPARING THE EFFECTS OF MINDFULNESS MEDITATION AND RELAXATION IN A BRIEF LABORATORY INDUCTION

Mindfulness is the practice of being nonjudgmentally aware of the present moment. Researchers often study the effects of mindfulness using brief laboratory-based mindfulness inductions in which participants are guided through mindfulness exercises, after which outcome measures are examined. However, most studies have not assessed whether participants achieved a mindful state during the induction, or whether the effects of mindfulness inductions differ from the effects of similar procedures such as relaxation. The present study compared a mindfulness exercise to a relaxation exercise and a control condition. After the induction, participants completed measures of the extent to which they attained a mindful state. Trait-levels of mindfulness, rumination, and openness were measured prior to the induction to test for moderating effects. Results revealed that the mindfulness induction led to higher state mindfulness scores than the control induction, but did not lead to higher scores as compared to the relaxation induction. No significant trait moderators were found. Findings suggest that brief mindfulness interventions may not be sufficient to induce a truly mindful state in a non-meditating sample. Findings also bring into question the results of studies that do not include a manipulation check post-induction, as well as the utility of self-report measures of state mindfulness in nonmeditating student samples.

**KEYWORDS:** Mindfulness, Relaxation, Inductions, Measurement, Laboratory

Carolina A. Caldera

April 6, 2017

COMPARING THE EFFECTS OF MINDFULNESS MEDITATION AND  
RELAXATION IN A BRIEF LABORATORY INDUCTION

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## **Chapter 1: Introduction**

Past research has demonstrated that mindfulness, the practice of being nonjudgmentally aware of the present moment, extends myriad benefits ranging from a more positive subjective life experience to reduced levels of anxiety and stress (Keng, Smoski, & Robins, 2011). Several therapeutic interventions, including dialectical behavior therapy (Linehan, 1993), mindfulness-based stress reduction (Kabat-Zinn, 1990), mindfulness-based cognitive therapy (Segal, Williams, & Teasdale, 2002; 2013) and acceptance and commitment therapy (Hayes et al., 1999) use mindfulness skills to reduce psychological symptoms in distressed individuals, and meta-analytic reviews support their efficacy (Khoury et al., 2013). However, mindfulness-based therapies typically include a variety of treatment strategies, making it difficult to determine whether effects are attributable to mindfulness itself or to other elements of the intervention. One approach to this problem is to manipulate mindfulness in laboratory experiments by guiding participants through a brief exercise (usually 15 minutes or less) intended to induce a mindful state and examining effects on outcomes such as responses to emotional stimuli or performance on laboratory tasks.

### **Laboratory studies using brief mindfulness inductions**

Levin, Hildebrandt, Lillis, and Hayes (2012) conducted a meta-analysis of laboratory studies that examined brief mindfulness inductions in students or community members. For example, Broderick (2005) examined whether mindfulness was more effective than distraction or rumination for reducing dysphoric mood. Undergraduate students read depressing statements intended to induce dysphoric mood, and were then randomly assigned to 8 minutes of rumination, distraction, or mindful awareness of

breathing. The rumination group read sentences instructing them to focus on aspects of themselves, such as “Think about why you react the way you do.” The distraction group was instructed to focus on a series of external images such as “a freshly painted door.” Participants in the mindfulness condition were guided in a mindfulness meditation exercise. Compared to the rumination and distraction conditions, the mindfulness condition showed significantly less negative mood following the 8-minute period.

In a widely cited study conducted by Arch and Craske (2006), participants were randomly assigned to one of three 15-minute inductions: guided mindfulness of breathing, worrying about various topics, or allowing their minds to wander freely. Participants then viewed slides of neutral, negative, or positive images. The mindful breathing group reported lower negative affect following the induction as compared to the other two groups, and were more willing to view negative slides. These results suggested that a laboratory mindfulness induction could lead to more adaptive responding to negative stimuli.

Based on their review of 19 such studies, Levin et al. (2012) concluded that mindfulness inductions in laboratory settings have small to moderate effects on a variety of outcome variables, including levels of positive and negative affect, willingness to persist in an unpleasant task, and believability of negative thoughts. Since their review, additional studies of mindfulness inductions have reported similar results. For example, Kiken and Shook (2014) investigated whether mindfulness is associated differently with thoughts that emphasize positive or negative valence. When comparing a brief mindful breathing meditation to a control condition (allowing the mind to wander freely), participants in the mindful breathing condition listed fewer negative thoughts in response

to negative images. These results provide evidence that mindfulness exercises may reduce cognitive emphasis on negativity.

The general conclusion from this growing body of research is that brief mindfulness inductions in a laboratory setting often produce changes within the laboratory session. However, two important limitations make it difficult to draw firm conclusions about the effects of mindfulness inductions. First, very few studies include manipulation checks to assess the extent to which participants followed the instructions or attained a mindful state. Second, mindfulness inductions are rarely compared to conditions that might have similar effects, such as relaxation.

### **Manipulation checks**

Manipulation checks are methods for evaluating whether the experimental manipulation produced the intended effect. This is necessary for the internal validity of a study, and produces valuable information regarding interpretation of the results. In laboratory studies of mindfulness inductions, two state mindfulness scales can be used to assess whether participants adopted a mindful state. The first is the Toronto Mindfulness Scale (TMS; Lau et al., 2006), a 13-item self-report measure of state mindfulness. The TMS assesses mindfulness during an immediately preceding mindfulness exercise and yields two factors: Curiosity (awareness of the present moment, with an attitude of interest), and Decentering (noticing feelings and thoughts, while maintaining distance from them). The second is the State Mindfulness Scale (SMS; Tanay & Bernstein, 2013), a 23-item measure that assesses “State Mindfulness of Mind” (being mindful of mental events such as thoughts and emotions) and “State Mindfulness of Body” (being mindful of bodily sensations).

Among the 19 laboratory studies identified by Levin et al., only one used a state mindfulness scale as a manipulation check following the mindfulness induction (Erisman & Roemer, 2010). Participants were randomly assigned to a 10-minute mindfulness induction or a control condition and then completed the TMS. Participants in the mindfulness condition reported higher levels on the decentering subscale than participants in the control condition, but no significant difference on the curiosity subscale, suggesting that the brief intervention was only partially successful in inducing a mindful state. Participants then watched emotional film clips; few group differences in their responses were observed.

Since the Levin et al review, a few other studies of mindfulness inductions have included manipulation checks. Ortner and Zelazo (2014) also used the TMS for this purpose in a study investigating the effects of a mindfulness induction on thoughts and emotions about a situation of conflict. Contrary to expectation, participants in a distraction condition scored significantly higher on the decentering subscale of the TMS than participants in the mindfulness condition. There were no differences between groups for scores on the curiosity facet of the TMS. This suggests that the mindfulness manipulation may not have induced a mindful state effectively. Vinci et al. (2014) examined the effects of a brief mindfulness induction on negative affect and urges to drink in college students at risk for excessive alcohol use. Participants were randomized into either a mindfulness meditation, relaxation, or control group and then viewed images intended to induce either negative or neutral affect. The TMS was used as a manipulation check, and results indicated that the mindfulness induction increased both subscales of the TMS. The relaxation induction also increased the decentering scale of the TMS but

not the curiosity subscale. Neither induction produced effects on negative affect or urges to drink that differed from the control group.

### **Comparing mindfulness to relaxation inductions**

The importance of distinguishing the psychological effects of mindfulness meditation from those of relaxation has been noted by Jain et al. (2007). Traditional relaxation exercises emphasize the goal of attaining relaxed state, using techniques such as guided imagery or progressive muscle relaxation. Through these exercises, bodily tension is released and physiological arousal is decreased, which counters the experience of stress (Jain et al., 2007). In contrast, mindfulness meditation instructs only that the individual pay attention to the present moment without judgment, and without an intention to relax or decrease bodily tension. However, many individuals who meditate experience relaxation due to decreased sympathetic nervous system activity (Sedlmeier et al., 2012). Given that both mindfulness and relaxation exercises may produce a relaxed state, it is important to compare mindfulness meditation to relaxation in order to determine their differential effectiveness in inducing a mindful state in a brief laboratory induction.

No studies among those identified by Levin et al. (2012) compared the mindfulness exercise to both a relaxation condition and a control condition. However, the above-mentioned study by Vinci et al. (2014) compared a mindfulness condition to relaxation and control conditions, and found that the mindfulness induction produced higher levels of state mindfulness than the control group (both scales of the TMS), and higher levels of state mindfulness than the relaxation group on the Curiosity subscale of the TMS. This indicates that the mindfulness and relaxation inductions produced

somewhat different though partially overlapping states. Lastly, Braun, Peters, and Baer (not published) investigated the effects of brief mindfulness and relaxation inductions on state mindfulness in a nonmeditating student sample. Participants were randomly assigned to a mindful breathing, mindful yoga, or relaxation condition for 15 minutes. Results indicated that the mindful breathing and mindful yoga interventions did not produce greater state mindfulness than the relaxation exercise.

### **The present study**

The current literature raises questions about the use of brief mindfulness inductions in laboratory studies with nonmeditating student samples. It is not clear whether participants are able to adopt a mindful state during an exercise of 10-15 minutes, or whether the effects of the induction can be distinguished from the effects of brief relaxation exercises. In addition, if there are differential effects of mindfulness and relaxation inductions in nonmeditating students, it is not clear whether the TMS can detect them. The present study contributes to this literature by making a more thorough assessment of the states induced by mindfulness and relaxation inductions. Previous induction studies have not assessed state mindfulness using the State Mindfulness Scale (SMS; Tanay & Bernstein, 2013), a measure that asks participants to rate the degree to which they were mindful of their mind and body. Furthermore, the present study incorporates a measure of mind-wandering, the Meditation Breath Attention Score (MBAS; Frewen & Unholzer, 2012). The present study also expands on the preliminary findings of Braun, Peters, and Baer (unpublished) regarding the psychometric properties of the Post-Induction Mindfulness Questionnaire, a new scale that assesses state-mindfulness and complements the Toronto Mindfulness Scale (TMS; Lau et al., 2006).

Inclusion of this broad range of state mindfulness measures is important because the nature and extent of state mindfulness in a non-meditating sample post-induction presently remains unclear. Furthermore, using a broad range of measures allowed for a more thorough examination of potential differences in the effects of mindfulness versus relaxation inductions. Unlike previous studies of mindfulness inductions, we also included a measure of state relaxation.

We hypothesized that individuals in the mindful breathing condition would report a more mindful state on all self-report state-mindfulness and mind-wandering measures post-induction than participants in the relaxation or control condition. We also hypothesized that participants in the mindfulness and relaxation conditions would report higher levels of relaxation and positive affect than the control group. We hypothesized that individuals with higher levels of trait mindfulness and trait openness would show higher increases in state mindfulness across conditions, as compared to individuals who scored lower in trait mindfulness and openness. Finally, we hypothesized that individuals who score higher in trait rumination would report lower state mindfulness across conditions than individuals who scored lower in trait rumination.

## **Chapter 2: Methods**

### **Participants**

This study included 162 college student participants, recruited and screened through the Introductory Psychology (PSY 100) subject pool in the Department of Psychology at the University of Kentucky. Students were screened to ensure that they had no previous experience with meditation. There were 133 female participants and 29 male participants, the majority of whom identified as Caucasian (78.4%). The rationale for

using an undergraduate sample is that a majority of laboratory studies utilizing brief mindfulness inductions have been conducted in undergraduate samples (Levin et al., 2012). It is therefore important to clarify whether mindfulness and relaxation inductions have distinct effects in this population.

### **Measures of state mindfulness and mind wandering**

State mindfulness during the induction was assessed using several self-report questionnaires. The State Mindfulness Scale (SMS; Tanay & Bernstein, 2013) is a 23-item self-report questionnaire that assesses “State Mindfulness of Mind” (being mindful of mental events such as thoughts and emotions) and “State Mindfulness of Body” (being mindful of bodily sensations). It is administered immediately following an exercise. Sample items include: “I noticed emotions come and go (*state mindfulness of mind*)” and “I noticed physical sensations come and go” (*state mindfulness of body*). Participants are asked to rate the degree to which each statement applies to them on a 5-point scale (1 = *Never or very rarely true*, 5 = *Almost always or always true*). SMS scores have demonstrated acceptable levels of test-retest reliability from one-week to six-week intervals ( $r = .65 - .68$ ) and adequate convergent validity with several other mindfulness questionnaires (Tanay & Bernstein, 2013).

The Toronto Mindfulness Scale (TMS; Lau et al., 2006) is a 13-item scale that yields two factors: Curiosity (awareness of the present moment, with an attitude of interest), and Decentering (noticing feelings and thoughts, while maintaining distance from them). Sample items include: “I was curious about my reactions to things” (*curiosity*) and “I experienced myself as separate from my changing thoughts and feelings” (*decentering*). Participants complete the TMS immediately after completing a



mindfulness practice and are asked to rate what they experienced during the exercise. In the development sample, alpha reliability values for the TMS were .88 for the Curiosity factor and .84 for the Decentering factor, and the factors have been shown to correlate significantly with related constructs, such as absorption, reflective self-awareness, and psychological mindedness (Lau et al., 2006).

A new measure of state mindfulness, the Post-Induction Mindfulness Questionnaire (PIMQ; Braun, Peters, Baer, unpublished) was developed for a previous study. The PIMQ is a 19-item instrument that yields two factors: *open observation* (awareness of thoughts or emotions during the exercise) and *nonjudgmental acceptance* (judgmental or avoidant responses to experiences – reverse scored). Internal consistencies were .84 for *open observation* and .85 for *nonjudgmental acceptance*. Participants indicated how much they were doing “each of the following things” during the exercise on a 5-point Likert-type scale (1 = *very slightly or not at all*, 5 = *very much*). Sample items include: “Noticing sensations in my body” (*open observation*) and “Telling myself I’m doing this wrong” (*nonjudgmental acceptance, reverse-scored*).

Meditation Breath Attention Score (MBAS; Frewen & Unholzer, 2012) is a performance measure of mind-wandering which assesses the extent to which individuals maintain attention to their breathing during a period of mindful breath awareness meditation. The MBAS is the self-reported frequency with which participants maintain their attention on their breathing as queried approximately every 3 minutes during a sitting meditation practice lasting 10-15 minutes. The MBAS has been previously shown to vary with other meditative experiences such as greater interest in the process of breathing as well as mindfulness-related traits including the *Acting with Awareness*

subscale of the FFMQ. Test-retest reliability of the MBAS has been supported (mean  $r$  between sessions = 0.50), and the MBAS was also shown to be sensitive to practice effects ( $\eta = 0.20$ ), which provides more evidence for its use as a performance measure. In this study, participants were asked five times during the 15-minute induction to rate the extent to which they were paying attention to the recording on 4-point scale (1 = completely paying attention, 2 = mostly paying attention, 3 = mostly focused on something else, 4 = completely focused on something else).

### **Measures of other effects of the inductions**

Positive and negative affect were assessed using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS consists of 10 positive and 10 negative affective descriptors such as “enthusiastic,” and “jittery”. For each descriptor, participants rated on a 5-point scale the extent to which they had experienced the described affective state during the preceding exercise (1 = *very slightly or not at all*, 5 = *extremely*). In previous research, alpha reliabilities were .86 and .87 for positive and negative affect scales, respectively. High positive correlations have also been found with measures of distress and psychopathology, such as the Beck Depression Inventory.

Relaxation during the induction was assessed using the Relaxation Inventory (Crist et al., 1989). The Relaxation Inventory consists of 45 items within three subscales: physiological tension, physical assessment, and cognitive tension. Sample items include: “My face feels flushed” (*physiological tension* – reverse scored), “My muscles feel loose” (*physical assessment*), and “Thoughts of failure seem to be creeping into my mind” (*cognitive tension* – reverse scored). For each statement, participants rate on a 5-point

scale the extent to which they agree or disagree with the statement (1 = *strongly disagree*, 5 = *strongly agree*). In previous research, alpha reliabilities were .80, .81, and .92 for the physiological tension, physical assessment, and cognitive tension subscales, respectively. For the present study, items were worded in the past tense to reflect that participants were rating how they felt during the exercise they just completed.

### **Measures of potential moderators**

Trait mindfulness was assessed using the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008). The FFMQ is a 39-item self-report questionnaire designed to assess five facets of mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. Sample items include: *observing* (“I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing”); *describing* (“I’m good at finding words to describe my feelings”); *acting with awareness* (“I rush through activities without being really attentive to them” – reverse scored); *nonjudging of inner experience* (“I disapprove of myself when I have irrational ideas” – reverse scored); and *nonreactivity to inner experiences* (“I perceive my feelings and emotions without having to react to them”). Participants are asked to rate the degree to which each statement applies to them on a 5-point scale (1 = *Never or very rarely true*, 5 = *Almost always or always true*). Alpha coefficients for all facets have been previously shown to be in the adequate-to-good range (.72 to .92). FFMQ scores have also been shown to have significant relationships in the predicted directions with a variety of constructs related to mindfulness (Baer et al., 2008), and to increase with mindfulness training (Carmody & Baer, 2008).

Rumination was measured using the rumination subscale of the Rumination and Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999). The RRQ rumination subscale is composed of 12 items. Sample items include: “I spend a great deal of time thinking back over my embarrassing or disappointing moments.” For each statement, participants rate on a 5-point scale the extent to which they agree or disagree with the statement (1 = *strongly disagree*, 5 = *strongly agree*). In previous research, alpha reliability was shown to be .90.

Openness was assessed using the Openness domain (48 items) from the NEO PI-R (Costa & McCrae, 1992), a well-established measure of the domains and facets of the five-factor model of personality. Sample items include: “I would have difficulty just letting my mind wander without control or guidance.” An extensive research base supports the reliability and validity of the NEO PI-R (Costa & McCrae, 1992).

### **Inductions**

The mindful breathing induction was adapted from an audio recording of a longer breathing meditation used in mindfulness-based stress reduction (Speca, Carlson, & Jones, 2005). The instructions guided participants in focusing on the movements of the breath, noticing the sensations that arise from the inhalation and exhalation, and maintaining a nonjudgmental and accepting attitude. The relaxation exercise was based on visualization of a relaxing scene. Participants were guided in using their five senses to imagine themselves on a beach. They were encouraged to immerse themselves in the sights, sounds, scents, and textures, and to allow their bodies to become as relaxed, calm, and peaceful as possible. The control condition listened to a recorded article from public radio on a topic judged to be neither relaxing, upsetting, nor mindfulness inducing

(Jeffrey, 2015). Tones for the MBAS were presented at the same points in each recording, approximately every three minutes. Participants were instructed to complete the attention rating described above when each tone sounded and then close their eyes and resume listening to the recording.

Exercises were audio-recorded to eliminate variability in the delivery of the induction across sessions. All exercises were conducted with participants sitting in chairs facing 180 degrees away from a large table. For the mindful breathing condition, participants were instructed to sit away from the backs of their chairs, with their spines self-supporting. The relaxation group was encouraged to lean into the back of the chair to facilitate a relaxed posture. For all conditions, instructions included closing the eyes.

### **Procedures**

Sessions were run in groups of 4 to 6 participants. Each group was randomly assigned to the mindful breathing, relaxation, or control group with time of day counterbalanced across conditions. Informed consent was obtained from all participants, after which they completed a demographic questionnaire. Participants were instructed to do their best to follow the instructions, and then either listened to the public radio recording, the guided mindful breathing recording, or the guided relaxation recording, according to their assigned condition. Every three minutes, a tone sounded in the recording, and participants were instructed to indicate whether or not they were engaged in the task by circling the appropriate rating on the 4-point Likert scale described earlier. A single sheet with all five ratings was available on a clipboard on each participant's lap. Immediately following the exercise, participants completed the post-induction state mindfulness measures (TMS, SMS, and PIMQ), followed by the measures of affect,

relaxation, rumination, openness, and trait mindfulness. Lastly, participants were debriefed and thanked for their participation.

### **Chapter 3: Results**

Data were collected from 177 participants. Data from 15 participants were excluded from analyses because they had practiced mindfulness in the past. Activities such as prayer and Tai Chi were not considered to be mindfulness meditation and were not used as exclusion criteria. Data from 162 participants were used in the final analyses.

To test for assumptions of normality, all data were screened for skewness and kurtosis (Tabachnick & Fidell, 2000). We also conducted analyses to confirm equivalence of the groups at baseline. Results are shown in Table 1. Differences for age, sex, race, and year in school were not significant, showing that the randomization process created groups that were equivalent on these variables.

The first hypothesis was that participants in the mindful breathing condition would report a more mindful state on all self-report state mindfulness and mind-wandering scales (SMS, TMS, PIMQ, MBAS) after the induction than participants in the relaxation or control condition. Findings are shown in Table 2. A one-way MANOVA revealed that there was a statistically significant difference in post-induction state mindfulness and mind-wandering based on condition, Wilks'  $\lambda = .737$ ,  $F(14, 240) = 2.82$ ,  $p < .001$ . Given the significance of the overall test, the univariate main effects were examined. Effect of condition was statistically significant or marginally significant ( $p = .05$ ) for all of the state mindfulness scales except the nonjudgmental acceptance scale of the PIMQ (see Table 2). Post-hoc Tukey's HSD analyses revealed that the control condition significantly differed from the mindfulness and relaxation conditions on all

scales. However, the mindfulness and relaxation conditions were not significantly different from each other in any of the scales. Thus, the hypothesis was partially supported.

A separate MANOVA was conducted to test the hypothesis that participants in the mindfulness and relaxation conditions would report higher levels of relaxation and positive affect as measured on the three subscales of the Relaxation Inventory and the PANAS than participants in the control condition. The analyses revealed that there was not a statistically significant difference in relaxation or affect between the three conditions, Wilks'  $\lambda = .01$ ,  $F(6, 100) = .72$ ,  $p = .68$ . Results are summarized in Table 3.

To reduce Type 1 error rate in the moderation analyses, we created a composite state mindfulness variable that included five state-mindfulness scales that were highly intercorrelated: SMS mind, SMS body, TMS decentering, TMS curiosity, and PIMQ open observation. Intercorrelations between these scales ranged from .69 to .84.

We hypothesized that trait mindfulness would moderate the relationship between condition and state mindfulness after the induction. This was tested using three hierarchical regression analyses; one for the composite state mindfulness variable, one for PIMQ nonjudgmental acceptance, and one for the MBAS. In each analysis, trait mindfulness (FFMQ total score) was entered at Step 1, condition (mindfulness, relaxation, or control) at Step 2, and the interaction of FFMQ score and condition at Step 3. Trait mindfulness was not a significant moderator. Results are shown in Figures 1, 2 and 3.

We also predicted that trait rumination would moderate the relationship between condition and state mindfulness after the induction. This was also tested using three

hierarchical regression analyses. In each analysis, trait rumination (RRQ score) was entered at Step 1, condition at Step 2, and the interaction of RRQ score and condition at Step 3. Trait rumination was not found to be a significant moderator. Results are shown in Figures 4, 5, and 6.

Finally, we predicted that score on the NEO PI-R Openness scale would moderate the relationship between condition and state mindfulness after the induction. This was also tested using three hierarchical regression analyses. In each analysis, openness (NEO PI-R Openness score) was entered at Step 1, condition at Step 2, and the interaction of NEO PI-R Openness score and condition at Step 3. Openness was not found to be a significant moderator. Results are shown in Figures 7, 8, and 9.



Table 3.1  
*Demographic Characteristics of Participants by Group*

	Mindfulness	Relaxation	Control	<i>F</i> or chi squared ( <i>df</i> )
Age ( <i>M, SD</i> )	19.06 (1.28)	18.72 (.79)	18.71 (.88)	2.01 (2,161) ns
% Male	17%	23%	15%	1.28 (2, <i>N</i> =162) ns
% White	78%	81%	76%	11.36 (2, <i>N</i> =162) ns
% Fresh or Soph	78%	89%	91%	15.60 (2, <i>N</i> =162) ns

*Note.* Mindfulness *n*=54; relaxation *n*=53; control *n*=55. Groups were equivalent based on age, gender, race (defined as white and other) and in terms of grade in school.

Table 3.2

*Means and Standard Deviations for State Mindfulness Measures Post-Induction*

	Mindfulness		Relaxation		Control		<i>F</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
TMS Decenter	14.06	5.32	13.90	5.53	10.53	5.79	6.52	.00
TMS Curiosity	13.12	5.37	12.17	6.23	9.61	6.00	4.52	.00
PIMQ OpenObsn	31.47	7.60	29.69	7.65	25.21	8.22	8.04	.00
PIMQ NjdgAcc	35.81	8.67	35.80	7.81	38.24	8.66	1.67	.19
SMS Mind	46.14	12.95	46.16	12.68	40.13	12.49	3.47	.03
SMS Body	20.45	5.13	19.32	5.17	16.25	5.05	9.06	.00
MBAS Total	13.89	3.32	15.43	3.55	11.40	4.26	16.01	.00

*Note.* *N* = 162. TMS Decenter = Toronto Mindfulness Scale Decentering; PIMQ OpenObsn = Post Induction Questionnaire Open Observation; PIMQ NjdgAcc = Post Induction Questionnaire Nonjudgmental Acceptance; SMS Mind = State Mindfulness Scale Mind; SMS Body = State Mindfulness Scale Body; MBAS Total = Meditation Breath Awareness Score Total.

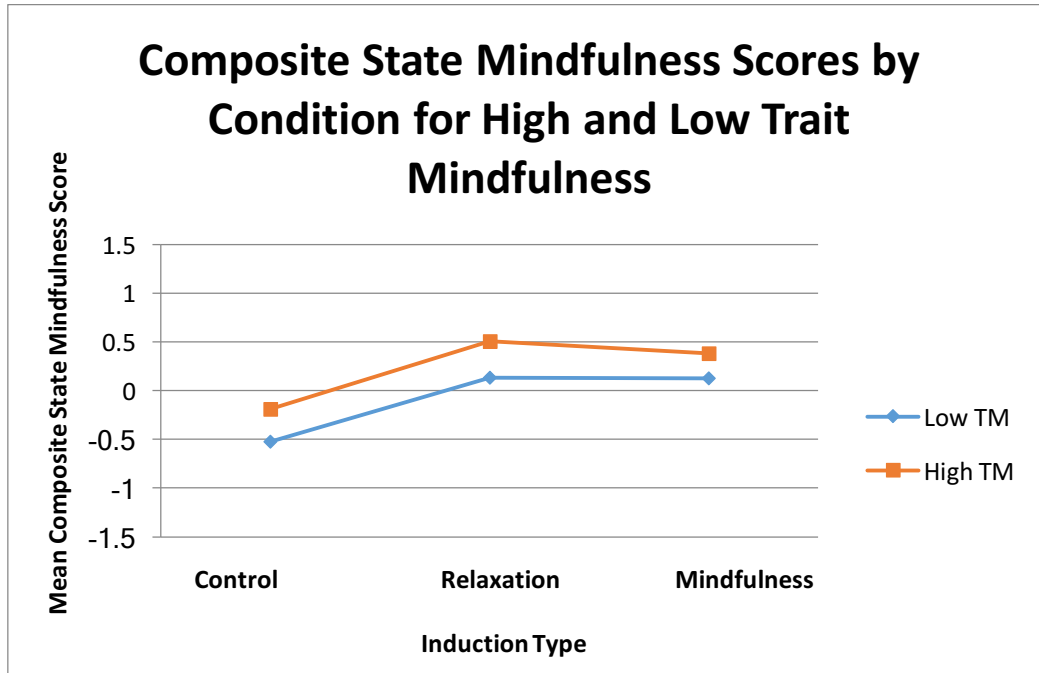
Table 3.3

*Means and Standard Deviations for Relaxation and Affect Measures Post-Induction*

	Mindfulness		Relaxation		Control		<i>F</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Rel. Physical	67.54	8.34	71.0	5.29	69.42	7.27	0.97	.39
Rel. Physio	50.31	18.56	52.35	15.67	48.74	16.80	0.23	.80
Rel. Cognitive	38.15	6.28	40.30	4.57	37.26	6.60	1.40	.26
PANAS Pos	19.77	5.82	19.90	5.82	18.79	8.46	0.14	.87
PANAS Neg	14.61	5.08	12.50	4.66	14.26	5.81	0.84	.44

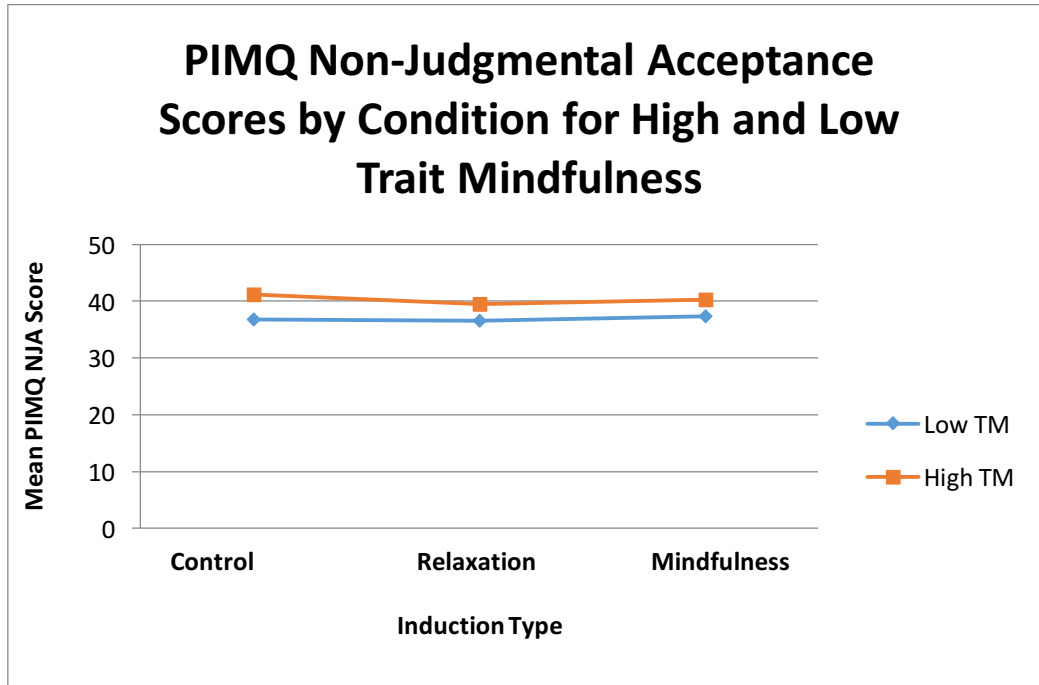
*Note.* *N* = 162. Rel. Physical = Relaxation Inventory Physical Tension; Rel. Physio = Relaxation Inventory Physiological Tension; Rel. Cognitive = Relaxation Inventory Cognitive Tension; PANAS Pos = Positive and Negative Affect Schedule Positive Affect; PANAS Neg = Positive and Negative Affect Schedule Negative Affect.

Figure 3.1



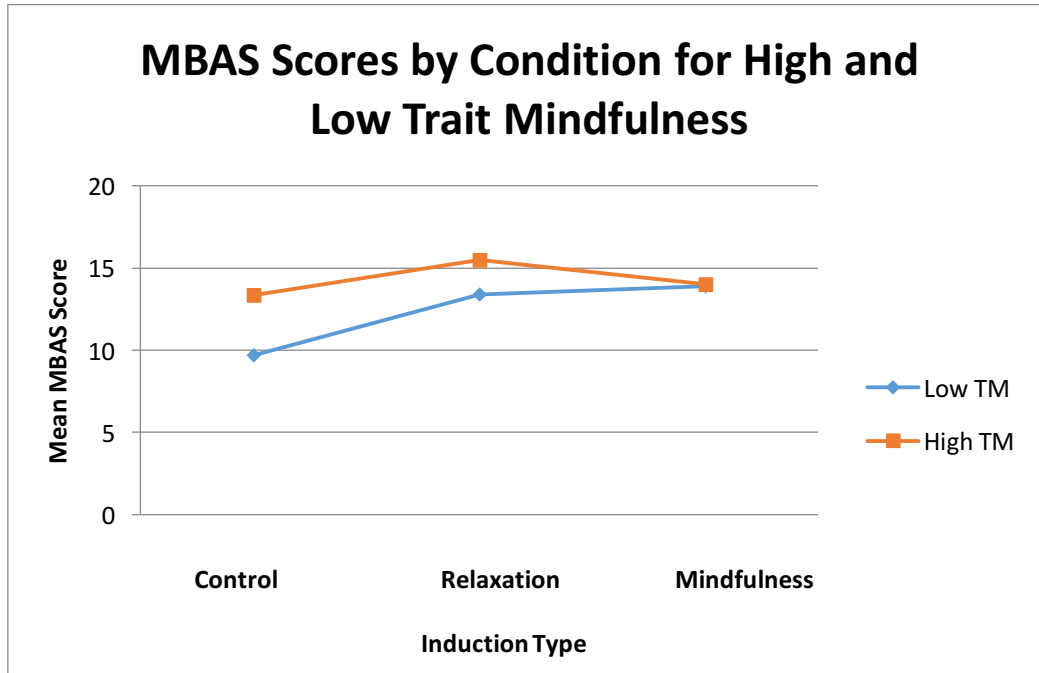
*Note:* Low TM = Low trait mindfulness; High TM = High trait mindfulness; Control – low trait mindfulness,  $M = -.52$ ,  $N = 9$ ; Control – high trait mindfulness,  $M = -.19$ ,  $N = 8$ ; Relaxation – low trait mindfulness,  $M = .13$ ,  $N = 7$ ; Relaxation – high trait mindfulness,  $M = .51$ ,  $N = 4$ ; Mindfulness – low trait mindfulness,  $M = .12$ ,  $N = 6$ ; Mindfulness – high trait mindfulness,  $M = .38$ ,  $N = 8$ .

Figure 3.2



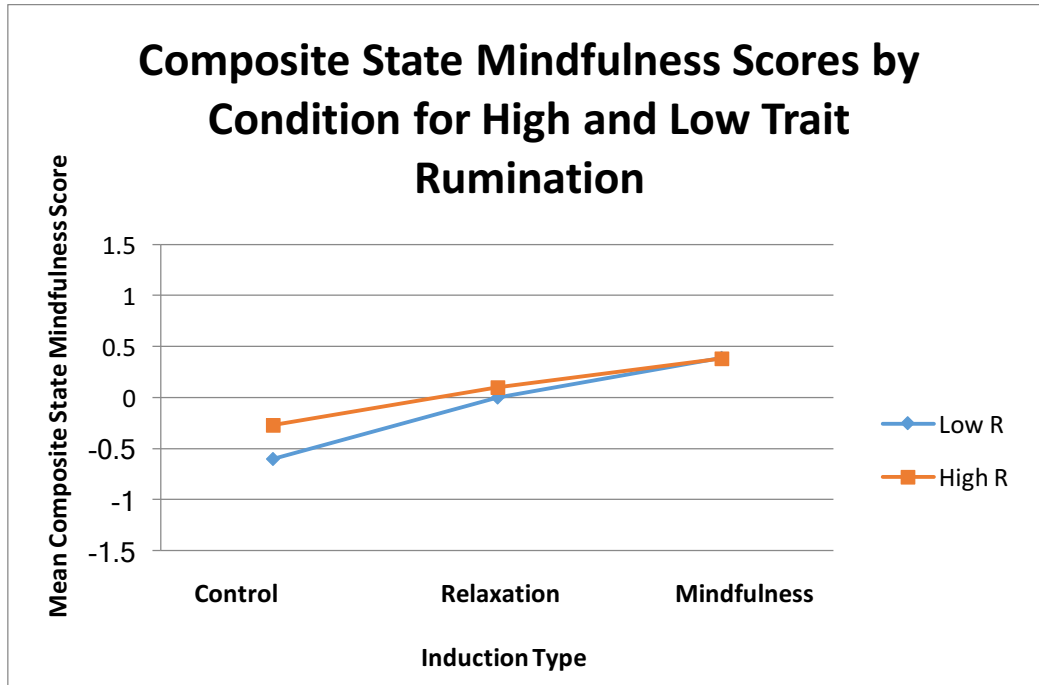
*Note:* Low TM = Low trait mindfulness; High TM = High trait mindfulness; Control – low trait mindfulness,  $M = 36.8$ ,  $N = 10$ ; Control – high trait mindfulness,  $M = 41.2$ ,  $N = 9$ ; Relaxation – low trait mindfulness,  $M = 36.6$ ,  $N = 8$ ; Relaxation – high trait mindfulness,  $M = 39.5$ ,  $N = 6$ ; Mindfulness – low trait mindfulness,  $M = 37.4$ ,  $N = 7$ ; Mindfulness – high trait mindfulness,  $M = 40.3$ ,  $N = 7$ .

Figure 3.3



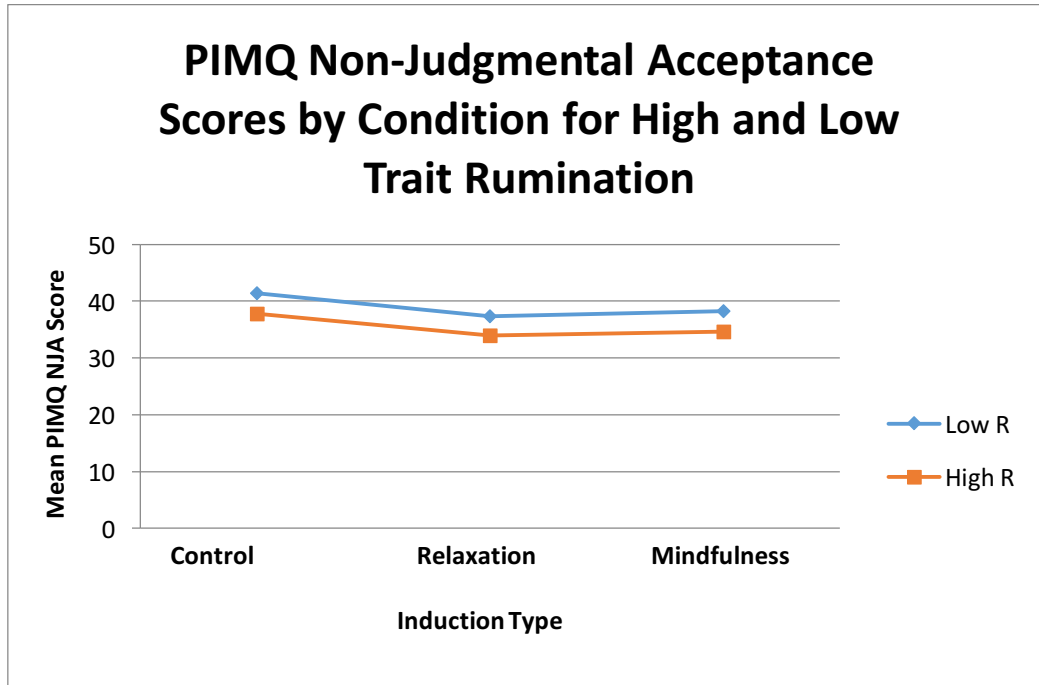
*Note:* Low TM = Low trait mindfulness; High TM = High trait mindfulness; Control – low trait mindfulness,  $M = 9.70$ ,  $N = 10$ ; Control – high trait mindfulness,  $M = 13.33$ ,  $N = 9$ ; Relaxation – low trait mindfulness,  $M = 13.38$ ,  $N = 8$ ; Relaxation – high trait mindfulness,  $M = 15.5$ ,  $N = 6$ ; Mindfulness – low trait mindfulness,  $M = 13.89$ ,  $N = 9$ ; Mindfulness – high trait mindfulness,  $M = 14.0$ ,  $N = 7$ .

Figure 3.4



*Note:* Low R = Low rumination; High R = High rumination; Control – low trait rumination,  $M = -.60$ ,  $N = 21$ ; Control – high trait rumination,  $M = -.27$ ,  $N = 18$ ; Relaxation – low trait rumination,  $M = -.00$ ,  $N = 13$ ; Relaxation – high trait rumination,  $M = .10$ ,  $N = 19$ ; Mindfulness – low trait rumination,  $M = .39$ ,  $N = 12$ ; Mindfulness – high trait rumination,  $M = .38$ ,  $N = 20$ .

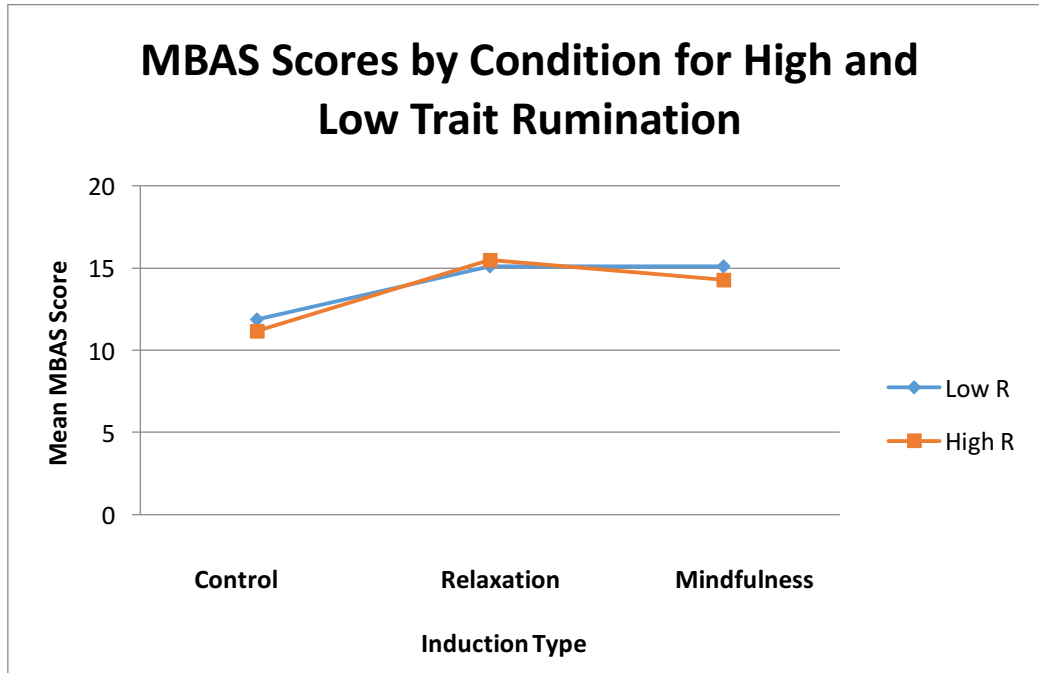
Figure 3.5



Note: Low R = Low rumination; High R = High rumination; Control – low rumination,  $M = 41.4$ ,  $N = 26$ ; Control – high rumination,  $M = 37.8$ ,  $N = 19$ ; Relaxation – low rumination,  $M = 37.3$ ,  $N = 19$ ; Relaxation – high rumination,  $M = 34.0$ ,  $N = 23$ ; Mindfulness – low rumination,  $M = 38.3$ ,  $N = 12$ ; Mindfulness – high rumination,  $M = 34.6$ ,  $N = 24$ .

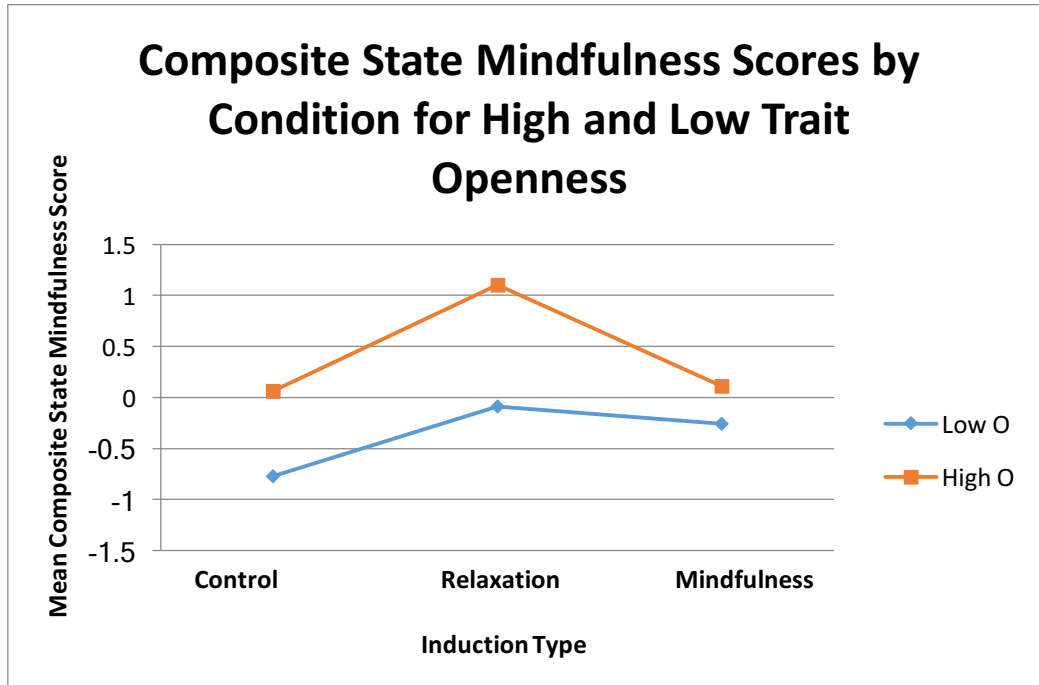


Figure 3.6



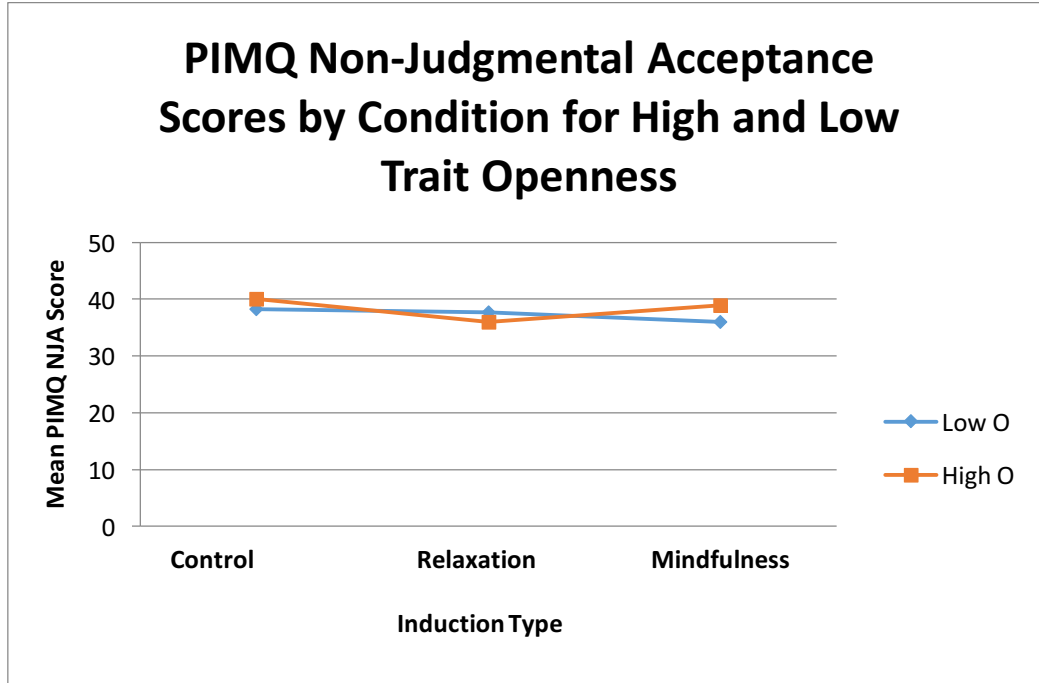
*Note:* Low R = Low rumination; High R = High rumination; Control – low rumination,  $M = 11.85$ ,  $N = 26$ ; Control – high rumination,  $M = 11.15$ ,  $N = 19$ ; Relaxation – low rumination,  $M = 15.10$ ,  $N = 19$ ; Relaxation – high rumination,  $M = 15.52$ ,  $N = 23$ ; Mindfulness – low rumination,  $M = 15.08$ ,  $N = 12$ ; Mindfulness – high rumination,  $M = 14.27$ ,  $N = 26$ .

Figure 3.7



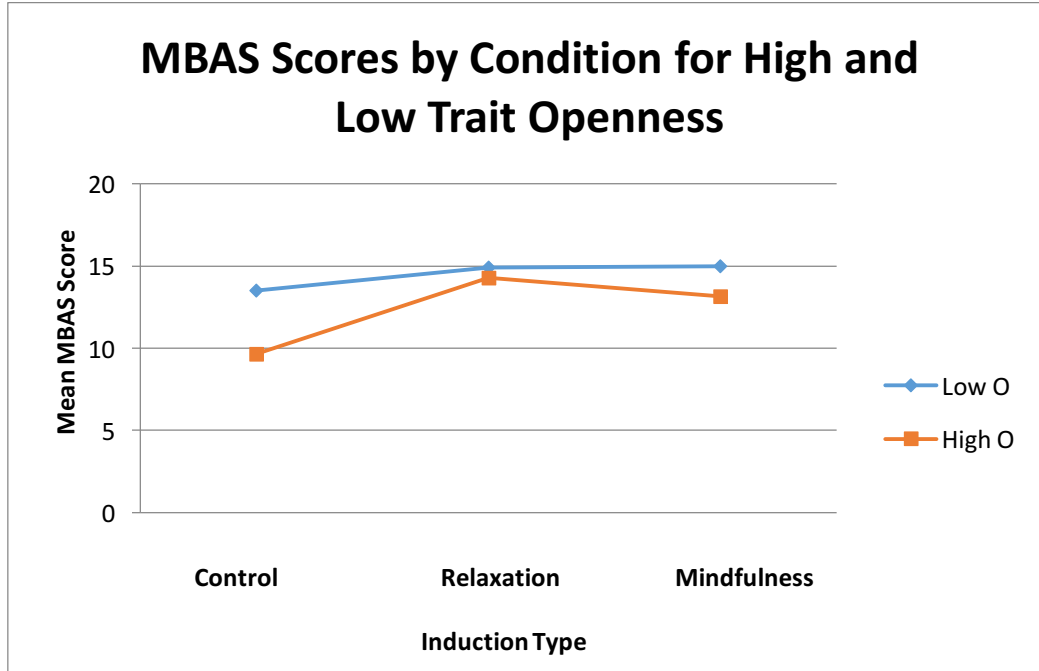
Note: Low O = Low openness; High O = High openness; Control – low trait openness,  $M = -.77$ ,  $N = 8$ ; Control – high trait openness,  $M = .06$ ,  $N = 8$ ; Relaxation – low trait openness,  $M = -.09$ ,  $N = 7$ ; Relaxation – high trait openness,  $M = 1.10$ ,  $N = 6$ ; Mindfulness – low trait openness,  $M = -.26$ ,  $N = 6$ ; Mindfulness – high trait openness,  $M = .11$ ,  $N = 7$ .

Figure 3.8



*Note:* Low O = Low openness; High O = High openness; Control – low openness,  $M = 38.3$ ,  $N = 9$ ; Control – high openness,  $M = 40.1$ ,  $N = 10$ ; Relaxation – low openness,  $M = 37.7$ ,  $N = 10$ ; Relaxation – high openness,  $M = 36.0$ ,  $N = 7$ ; Mindfulness – low openness,  $M = 36.0$ ,  $N = 7$ ; Mindfulness – high openness,  $M = 38.9$ ,  $N = 7$ .

Figure 3.9



*Note:* Low O = Low openness; High O = High openness; Control – low trait openness,  $M = 13.50$ ,  $N = 9$ ; Control – high trait openness,  $M = 9.66$ ,  $N = 10$ ; Relaxation – low trait openness,  $M = 14.90$ ,  $N = 10$ ; Relaxation – high trait openness,  $M = 14.29$ ,  $N = 7$ ; Mindfulness – low trait openness,  $M = 15.00$ ,  $N = 7$ ; Mindfulness – high trait openness,  $M = 13.14$ ,  $N = 7$ .

## Chapter 4: Discussion

The purpose of this study was to determine whether a mindfulness meditation exercise would produce higher levels of self-reported state mindfulness than a relaxation induction or control condition in a student sample of inexperienced meditators. Our primary hypothesis was only partially supported. Our results demonstrated that although the mindfulness meditation and relaxation inductions both produced significantly higher scores on state mindfulness than the control condition, the mindfulness and relaxation conditions did not differ from each other on measures of state mindfulness. These findings suggest that for inexperienced meditators a relaxation exercise is as successful at inducing a self-reported mindful state as a mindfulness exercise.

A single, brief exercise may not be sufficient to experience the subtleties of being in a mindful state as opposed to simply being relaxed. Many individuals who complete a mindfulness exercise for the first time report that it was very relaxing. The effects of mindfulness and relaxation may take more time and practice for self-report measures to detect differences. For example, Jain et al. (2007) found differences in the effects of relaxation and mindfulness meditation practice, but tested participants only after 4 weekly 90-minute group sessions in the context of a stress reduction intervention. Clinical experience with mindfulness-based interventions suggests that participants may require multiple sessions before they fully grasp the nature of a mindful state and what it means to be nonjudgmental and accepting of one's present-moment experiences. Therefore, it is possible that participants may also have been confused by the instructions given in the mindfulness induction, which may have led to lower levels of self-reported state mindfulness.

Our findings also showed no differences between groups on self-reported relaxation or positive or negative affect during the inductions. Neither the relaxation induction nor the meditation induction was more relaxing than listening to the public radio story. Although we expected that the mindfulness and relaxation inductions might be equally relaxing, we predicted that both would be more relaxing than the control condition. Moreover, we expected the public radio story to be experienced by participants as somewhat dull, possibly leading to lower positive affect and higher negative affect than the other two conditions, but no differences were observed. It is possible that a different activity for the control condition might have yielded different effects.

A secondary aim of our study was to investigate whether trait-level characteristics would moderate the relationship between induction and reported state-mindfulness. We found no moderation effects for trait mindfulness, trait rumination, or openness. Again, the brief nature of the induction, and the similar effects of the mindfulness and relaxation inductions may explain these findings.

It is possible that our nonsignificant findings might be related to the limitations associated with self-report measures of relaxation and state mindfulness. Differences between mindfulness and relaxation inductions might be more easily detectable at the psychophysiological level. Biological measures such as vagal tone, muscle tension, or EEG biofeedback may be more effective techniques to detect differences between the effects of brief relaxation and mindfulness meditation. Presently, there is no consensus as to what a “mindful brain” looks like in inexperienced meditators undergoing a single short exercise, although a few studies have examined neural mechanisms in mindfulness-based treatments for specific disorders (e.g., Brewer, Elwafi, & Davis, 2013) or in long-term meditators (Zeidan, 2015). Future research should focus on distinguishing physiological states after relaxation vs. mindfulness meditation.

Another limitation of our study was that we did not assess state mindfulness before the induction. Existing state mindfulness scales were developed and validated to assess participants' experiences during an immediately preceding exercise, not to measure state mindfulness at any point in time. These scales could potentially be administered twice in the same participants, perhaps following a baseline period with minimal instructions and again following the induction of interest. However, the language of these scales is very mindfulness-consistent and might create a demand for participants to report mindful experiences during the second period, regardless of which condition they are assigned to. Therefore, because we assessed state mindfulness only once, our findings do not reflect a change in state mindfulness over the course of the inductions, but only participants' reports of their state mindfulness immediately following the induction. Development of a measure to assess state mindfulness pre-induction would be useful in assessing such change, as well as making it possible to identify mindfulness exercises that produce greater changes in state mindfulness than others.

An additional limitation is that the present study was focused on whether participants attained a mindful state during the inductions and did not examine outcome variables such as level of negative affect or persistence on difficult tasks. Future studies should examine whether mindfulness and relaxation inductions produce distinct patterns of responding on such variables.

Despite these limitations, our findings raise important questions about laboratory studies that use brief mindfulness inductions in nonmeditating student samples, the most common population for such studies to date. It is not clear whether the effects of the inductions in these studies are attributable to mindfulness specifically, rather than to relaxation. Future research should emphasize the use of biological measures to detect differences in the effects of various inductions, as well as developing measures to assess state mindfulness at any point in time. Both

of these directions would lead to more definitive conclusions about the differential effects of mindfulness and relaxation in single-induction studies. Finally, it would be useful to explore further the relationship between trait-level characteristics and state mindfulness during inductions. This could provide more information about how mindfulness meditation may produce different effects based on individual differences.



*Appendix A: Five Facet Mindfulness Questionnaire*

**FFMQ**

**Sub #** \_\_\_\_\_

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes your own opinion of what is generally true for you.

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

- \_\_\_\_\_ 1. When I'm walking, I deliberately notice the sensations of my body moving.
- \_\_\_\_\_ 2. I'm good at finding words to describe my feelings.
- \_\_\_\_\_ 3. I criticize myself for having irrational or inappropriate emotions.
- \_\_\_\_\_ 4. I perceive my feelings and emotions without having to react to them.
- \_\_\_\_\_ 5. When I do things, my mind wanders off and I'm easily distracted.
- \_\_\_\_\_ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.
- \_\_\_\_\_ 7. I can easily put my beliefs, opinions, and expectations into words.
- \_\_\_\_\_ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
- \_\_\_\_\_ 9. I watch my feelings without getting lost in them.
- \_\_\_\_\_ 10. I tell myself I shouldn't be feeling the way I'm feeling.
- \_\_\_\_\_ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- \_\_\_\_\_ 12. It's hard for me to find the words to describe what I'm thinking.
- \_\_\_\_\_ 13. I am easily distracted.
- \_\_\_\_\_ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
- \_\_\_\_\_ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.
- \_\_\_\_\_ 16. I have trouble thinking of the right words to express how I feel about things.
- \_\_\_\_\_ 17. I make judgments about whether my thoughts are good or bad.

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

- \_\_\_\_\_ 18. I find it difficult to stay focused on what’s happening in the present.
- \_\_\_\_\_ 19. When I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it.
- \_\_\_\_\_ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- \_\_\_\_\_ 21. In difficult situations, I can pause without immediately reacting.
- \_\_\_\_\_ 22. When I have a sensation in my body, it’s difficult for me to describe it because I can’t find the right words.
- \_\_\_\_\_ 23. It seems I am “running on automatic” without much awareness of what I’m doing.
- \_\_\_\_\_ 24. When I have distressing thoughts or images, I feel calm soon after.
- \_\_\_\_\_ 25. I tell myself that I shouldn’t be thinking the way I’m thinking.
- \_\_\_\_\_ 26. I notice the smells and aromas of things.
- \_\_\_\_\_ 27. Even when I’m feeling terribly upset, I can find a way to put it into words.
- \_\_\_\_\_ 28. I rush through activities without being really attentive to them.
- \_\_\_\_\_ 29. When I have distressing thoughts or images I am able just to notice them without reacting.
- \_\_\_\_\_ 30. I think some of my emotions are bad or inappropriate and I shouldn’t feel them.
- \_\_\_\_\_ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
- \_\_\_\_\_ 32. My natural tendency is to put my experiences into words.
- \_\_\_\_\_ 33. When I have distressing thoughts or images, I just notice them and let them go.
- \_\_\_\_\_ 34. I do jobs or tasks automatically without being aware of what I’m doing.
- \_\_\_\_\_ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

\_\_\_\_ 36. I pay attention to how my emotions affect my thoughts and behavior.

\_\_\_\_ 37. I can usually describe how I feel at the moment in considerable detail.

\_\_\_\_ 38. I find myself doing things without paying attention.

\_\_\_\_ 39. I disapprove of myself when I have irrational ideas.

Appendix B: State Mindfulness Scale

SMS

Sub # \_\_\_\_\_

Please rate each of the following statements using the scale provided. Indicate the extent to which each statement describes what you just experienced.

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Very well

- \_\_\_\_ 1. I was aware of different emotions that were arising in me.
- \_\_\_\_ 2. I was trying to pay attention to pleasant and unpleasant sensations.
- \_\_\_\_ 3. I found some of my experiences interesting.
- \_\_\_\_ 4. I noticed many small details of my experience.
- \_\_\_\_ 5. I felt aware of what is happening inside of me.
- \_\_\_\_ 6. I noticed pleasant and unpleasant emotions.
- \_\_\_\_ 7. I actively explored my experience in the moment.
- \_\_\_\_ 8. I clearly physically felt what was going on in my body.
- \_\_\_\_ 9. I changed my body posture and paid attention to the physical process of moving.
- \_\_\_\_ 10. I felt that I was experiencing the present moment fully.
- \_\_\_\_ 11. I noticed pleasant and unpleasant thoughts.
- \_\_\_\_ 12. I noticed emotions come and go.
- \_\_\_\_ 13. I noticed various sensations caused by my surroundings (e.g., heat, coolness, the wind on my face).
- \_\_\_\_ 14. I noticed physical sensations come and go.
- \_\_\_\_ 15. I had moments when I felt alert and aware.
- \_\_\_\_ 16. I felt closely connected to the present moment.
- \_\_\_\_ 17. I noticed thoughts come and go.
- \_\_\_\_ 18. I felt in contact with my body.
- \_\_\_\_ 19. I was aware of what was going on in my mind.
- \_\_\_\_ 20. It was interesting to see the patterns of my thinking.
- \_\_\_\_ 21. I noticed pleasant and unpleasant physical sensations.

Appendix C: Toronto Mindfulness Scale

TMS

Sub # \_\_\_\_\_

We are interested in what you just experienced. Below is a list of things that people sometimes experience. Please read each statement. Below are five choices: “not at all,” “a little,” “moderately,” “quite a bit,” and “very much.” Please indicate the extent to which you agree with each statement. In other words, how well does the statement describe what you just experienced, just now?

0	1	2	3	4
Not at all	A little	Moderately	Quite a bit	Very much

- \_\_\_\_\_ 1. I experienced myself as separate from my changing thoughts and feelings.
- \_\_\_\_\_ 2. I was more concerned with being open to my experiences than controlling or changing them.
- \_\_\_\_\_ 3. I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings, or sensations.
- \_\_\_\_\_ 4. I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things ‘really’ are.
- \_\_\_\_\_ 5. I was curious to see what my mind was up to from moment to moment.
- \_\_\_\_\_ 6. I was curious about each of the thoughts and feelings that I was having.
- \_\_\_\_\_ 7. I was receptive to observing unpleasant thoughts and feelings without interfering with them.
- \_\_\_\_\_ 8. I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.
- \_\_\_\_\_ 9. I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.
- \_\_\_\_\_ 10. I remained curious about the nature of each experience as it arose.
- \_\_\_\_\_ 11. I was aware of my thoughts and feelings without over-identifying with them.
- \_\_\_\_\_ 12. I was curious about my reactions to things.
- \_\_\_\_\_ 13. I was curious about what I might learn about myself by just taking notice of what my attention gets drawn to.

*Appendix D: Post-Induction Mindfulness Questionnaire*

**PIMQ**

**Sub #** \_\_\_\_\_

Indicate how often you were doing each of the following things during the exercise you just completed.

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Very much

- \_\_\_\_ 1. Noticing sensations in my body.
- \_\_\_\_ 2. Noticing the thoughts that were going through my mind.
- \_\_\_\_ 3. Observing my breathing.
- \_\_\_\_ 4. Just trying to be aware of how I'm feeling.
- \_\_\_\_ 5. Being understanding toward myself.
- \_\_\_\_ 6. Noticing any sensations that came along.
- \_\_\_\_ 7. Focusing on what I was doing in each moment.
- \_\_\_\_ 8. Being open to whatever might happen in my mind or body.
- \_\_\_\_ 9. Noticing what I was thinking about.
- \_\_\_\_ 10. Trying to get certain thoughts out of my mind.
- \_\_\_\_ 11. Trying to calm myself down.
- \_\_\_\_ 12. Trying to focus on something else.
- \_\_\_\_ 13. Criticizing myself for how I'm feeling.
- \_\_\_\_ 14. Telling myself I shouldn't have certain thoughts or feelings.
- \_\_\_\_ 15. Telling myself I'm doing this wrong.
- \_\_\_\_ 16. Trying to push things out of my mind.
- \_\_\_\_ 17. Thinking about why I feel and react the way I do.
- \_\_\_\_ 18. Trying to make negative emotions go away.
- \_\_\_\_ 19. Trying to think about something good.

*Appendix E: Positive and Negative Affect Schedule*

**PANAS**

**Sub #** \_\_\_\_\_

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment.

1	2	3	4	5
Very slightly or not at all	A Little	Moderately	Quite a Bit	Extremely

- \_\_\_ 1. Interested
- \_\_\_ 2. Distressed
- \_\_\_ 3. Excited
- \_\_\_ 4. Upset
- \_\_\_ 5. Strong
- \_\_\_ 6. Guilty
- \_\_\_ 7. Scared
- \_\_\_ 8. Hostile
- \_\_\_ 9. Enthusiastic
- \_\_\_ 10. Proud
- \_\_\_ 11. Irritable
- \_\_\_ 12. Alert
- \_\_\_ 13. Ashamed
- \_\_\_ 14. Inspired
- \_\_\_ 15. Nervous
- \_\_\_ 16. Determined
- \_\_\_ 17. Attentive
- \_\_\_ 18. Jittery
- \_\_\_ 19. Active
- \_\_\_ 20. Afraid

*Appendix F: Relaxation Inventory*

**RI**

**Sub #** \_\_\_\_\_

Please rate each of the following statements using the scale provided. Indicate the extent to which each statement describes what you just experienced.

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Very well

- \_\_\_\_ 1. My face felt flushed.
- \_\_\_\_ 2. My forehead felt tense.
- \_\_\_\_ 3. I was sweating because I was tense.
- \_\_\_\_ 4. I felt somewhat hot.
- \_\_\_\_ 5. I felt hot.
- \_\_\_\_ 6. I seemed to be perspiring more than usual.
- \_\_\_\_ 7. My palms were sweaty.
- \_\_\_\_ 8. My breathing was faster than normal.
- \_\_\_\_ 9. My breathing was accelerated.
- \_\_\_\_ 10. My jaw was set tight.
- \_\_\_\_ 11. Some of my muscles seemed to be on the verge of cramping.
- \_\_\_\_ 12. My heart rate was increasing.
- \_\_\_\_ 13. The muscles in my back were tense.
- \_\_\_\_ 14. I felt a headache coming on.
- \_\_\_\_ 15. My heart was beating faster than usual.

- 
- \_\_\_\_ 1. My muscles felt loose.
  - \_\_\_\_ 2. My whole body was at rest.
  - \_\_\_\_ 3. I felt content.
  - \_\_\_\_ 4. I felt very peaceful.
  - \_\_\_\_ 5. My body felt loose.
  - \_\_\_\_ 6. I felt a kind of peacefulness.



1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Very well

- \_\_\_\_ 7. My muscles felt relaxed.
- \_\_\_\_ 8. I felt really easy going.
- \_\_\_\_ 9. I felt very calm.
- \_\_\_\_ 10. I felt a sense of tranquility throughout my body.
- \_\_\_\_ 11. I felt very relaxed.
- \_\_\_\_ 12. I felt serene.
- \_\_\_\_ 13. I felt really laid back.
- \_\_\_\_ 14. I felt extremely comfortable.
- \_\_\_\_ 15. I felt limber.
- \_\_\_\_ 16. I had a clear mind.
- \_\_\_\_ 17. My muscles were at rest.
- \_\_\_\_ 18. Very few things bothered me.
- \_\_\_\_ 19. I felt no tension in my muscles at all.
- \_\_\_\_ 20. I felt refreshed.

- 
- \_\_\_\_ 1. Thoughts of failure seemed to be creeping into my mind.
- \_\_\_\_ 2. I was thinking about my problems.
- \_\_\_\_ 3. I was really concerned about all of my problems.
- \_\_\_\_ 4. I felt a little scared.
- \_\_\_\_ 5. I was thinking about the future.
- \_\_\_\_ 6. I felt like I was in a state of mental strain.
- \_\_\_\_ 7. I was thinking about my career.
- \_\_\_\_ 8. I was worried about how much money I have.
- \_\_\_\_ 9. I didn't want others to know what I felt.
- \_\_\_\_ 10. I seemed to be worrying about others.

Appendix G: Rumination and Reflection Questionnaire

RRQ

Sub # \_\_\_\_\_

For each of the statements located on this page, please indicate your level of agreement or disagreement by circling one of the scale categories to the right of each statement. Use the scale as shown below:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

- \_\_\_\_\_ 1. My attention is often focused on aspects of myself I wish I'd stop thinking about.
- \_\_\_\_\_ 2. I always seem to be "re-hashing" in my mind recent things I've said or done.
- \_\_\_\_\_ 3. Sometimes it is hard for me to shut off thoughts about myself.
- \_\_\_\_\_ 4. Long after an argument or disagreement is over with, my thoughts keep going back to what happened.
- \_\_\_\_\_ 5. I tend to "ruminate" or dwell over things that happen to me for a really long time afterward.
- \_\_\_\_\_ 6. I don't waste time re-thinking things that are over and done with.
- \_\_\_\_\_ 7. Often I'm playing back over in my mind how I acted in a past situation.
- \_\_\_\_\_ 8. I often find myself re-evaluating something I've done.
- \_\_\_\_\_ 9. I never ruminate or dwell on myself for very long.
- \_\_\_\_\_ 10. It is easy for me to put unwanted thoughts out of my mind.
- \_\_\_\_\_ 11. I often reflect on episodes in my life that I should no longer concern myself with.
- \_\_\_\_\_ 12. I spend a great deal of time thinking back over my embarrassing or disappointing moments.

*Appendix H: NEO PI-R Openness Domain Inventory*

**NEO - O**

**Sub #** \_\_\_\_\_

Please read each item carefully and indicate the answer that best corresponds to your agreement or disagreement. Answer every item. There are no right or wrong answers, and you need not be an “expert” to complete this questionnaire. Describe yourself honestly and state your opinions as accurately as possible.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

- \_\_\_\_\_ 1. I have a very active imagination.
- \_\_\_\_\_ 2. I try to keep all my thoughts directed along realistic lines and avoid flights of fantasy.
- \_\_\_\_\_ 3. I enjoy concentrating on a fantasy or daydream and exploring all its possibilities, letting it grow and develop.
- \_\_\_\_\_ 4. I would have difficulty just letting my mind wander without control or guidance.
- \_\_\_\_\_ 5. I have an active fantasy life.
- \_\_\_\_\_ 6. If I feel my mind is starting to drift off into daydreams, I usually get busy and start concentrating on some work or activity instead.
- \_\_\_\_\_ 7. As a child I rarely enjoyed games of make believe.
- \_\_\_\_\_ 8. I don't like to waste my time daydreaming.
- \_\_\_\_\_ 9. I'm not really interested in the arts.
- \_\_\_\_\_ 10. I am sometimes completely absorbed in music I am listening to.
- \_\_\_\_\_ 11. Poetry has little or no effect on me.
- \_\_\_\_\_ 12. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.
- \_\_\_\_\_ 13. Watching ballet or modern dance bores me.
- \_\_\_\_\_ 14. Certain kinds of music have an endless fascination for me.
- \_\_\_\_\_ 15. I am intrigued by the patterns I find in art and music.
- \_\_\_\_\_ 16. I enjoy reading poetry that emphasizes feelings and images more than story lines.
- \_\_\_\_\_ 17. I experience a wide range of emotions or feelings.
- \_\_\_\_\_ 18. I rarely experience strong emotions.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

- \_\_\_ 19. Odd things – like certain scents or the names of distant places – can evoke strong moods I me.
- \_\_\_ 20. I seldom pay much attention to my feelings of the moment.
- \_\_\_ 21. Without strong emotions, life would be uninteresting to me.
- \_\_\_ 22. I seldom notice the moods or feelings that different environments produce.
- \_\_\_ 23. I find it easy to empathize – to feel myself what others are feeling.
- \_\_\_ 24. How I feel about things is important to me.
- \_\_\_ 25. I’m pretty set in my ways.
- \_\_\_ 26. I believe variety is the spice of life.
- \_\_\_ 27. On a vacation, I prefer going back to a tried and true spot.
- \_\_\_ 28. I often try new and foreign foods.
- \_\_\_ 29. I prefer to spend my time in familiar surroundings.
- \_\_\_ 30. I think it’s interesting to learn and develop new hobbies.
- \_\_\_ 31. I like the old-fashioned methods I’m used to.
- \_\_\_ 32. I follow the same route when I go someplace.
- \_\_\_ 33. I often enjoy playing with theories or abstract ideas.
- \_\_\_ 34. I find philosophical arguments boring.
- \_\_\_ 35. I enjoy working on “mind-twister”-type puzzles.
- \_\_\_ 36. I have little interest in speculating on the nature of the universe or the human condition.
- \_\_\_ 37. I enjoy solving problems or puzzles.
- \_\_\_ 38. I sometimes lose interest when people talk about very abstract, theoretical matters.
- \_\_\_ 39. I have a lot of intellectual curiosity.
- \_\_\_ 40. I have a wide range of intellectual interests.
- \_\_\_ 41. I believe we should look to our religious authorities for decisions on moral issues.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

\_\_\_\_\_ 42. I believe that laws and social policies should change to reflect the needs of a changing world.

\_\_\_\_\_ 43. I think that if people don't know what they believe in by the time they're 25, there's something wrong with them.

\_\_\_\_\_ 44. I consider myself broad-minded and tolerant of other people's lifestyles.

\_\_\_\_\_ 45. I believe that it's better to stick to your own principles than to be open-minded.

\_\_\_\_\_ 46. Our ideas of right and wrong may not be right for everyone in the world.

\_\_\_\_\_ 47. I believe letting students hear controversial speakers can only confuse and mislead them.

\_\_\_\_\_ 48. People should honor traditional values, not question them.

## *Appendix I: Mindful Induction Script*

### **Mindful Induction Script**

Throughout this fifteen-minute seated meditation, please listen carefully and do your best to follow all instructions, focusing on your own personal experience.

Find a comfortable sitting position where the spine is upright, pelvis lightly tilted forward, chest lifted, shoulders drawn back and sliding down the spine. Ears over shoulders, shoulders over hips. Move forward to the edge of your chair so that you can feel the contact of the sitting bones with the chair, you want the sensation to be even on both sides. And place the feet flat on the floor; spine balanced without leaning into the back of the chair. Rest the hands on the knees or in the lap. Settle into a position in which you can remain comfortable and still for some time, but that is also a position in which you maintain a long spine and open chest. Do not strive for a particular outcome; simply be aware of bodily sensations. If your mind wanders, ask yourself what you are feeling, how are you reacting or responding? Then, gently bring your attention back to your breath. (Pause) Allow the gaze to be soft yet steady, on one spot in front of you, lids slightly shut. If you prefer, even allowing the eyes to close.

Now allow focus to come to the in and out flow of breath. Simply feel the gentle rise of belly, the abdomen with each in breath and falling with each out breath. Allow the breath to be natural noting its in and out flow, not trying to force or control the breath in anyway. Noting each in and out, each rising and falling, allowing a settling into the even rhythm of the breath. Allow your mind to rest in that place. Feeling the in and out movement of the breath. As you feel the breath you can make a silent mental note, just noting 'in' as you feel the breath move in, 'out' as you feel it leave the body. Or note rising and falling with the sensations in your chest or belly. Without judging the experience, be curious of the sensations. Very gently, very quietly just support the awareness of the actual sensations. Just note in and out, rising and falling. Bringing the mind back to the breath time and time again. (Pause) You don't need to make the breath special; each breath is unique in itself. It doesn't have to be deep or long or different from how ever it is. And however it may change. This process is happening anyway so simply be aware of it one breath at a time. (Pause)

Become aware of how the breath may change. Allow the changes to happen; without judgment. Without controlling the length or depth of the breath, simply allow the body to be breathed; however that may be for you, in this moment. Experience the body as the inhalation happens, and experience the body as the exhalation happens. Becoming aware of the expansion of the abdomen and rib cage on the inhalation and the extension of the midline on the exhalation. However this may be for you, in this moment, simply being with the breath. Noticing the different sensations created by the inhale and the exhale. Feeling for each breath. Aware of each inhale and each exhale. Simply being here with your breath. Maybe even finding joy in the simplicity of this breath awareness. (Pause)

You may find the attention wandering. Perhaps lost in thought, planning, remembering, worrying. Perhaps it's even been quite some time since you've noticed the breath with conscious awareness. Don't worry, no need to judge or analyze or try to figure out how you slipped away. It doesn't matter just gently let go of the distraction and begin again. Beginning again and again is the essential art of the practice; over and over we begin anew with patience and equanimity. Let go and return attention to the easy in and out flow of breath. (Pause)

Begin to bring awareness to the end of the inhalation and the end of the exhalation. Noticing the change from the inhale to exhale, and the change from the exhale to inhale. Focusing

on where the inhale stops and becomes the exhale and where the exhale stops and becomes the inhale. Notice if there is a slight pause for you between the end of the exhalation and beginning of the inhalation. Simply noticing. Without judging, without controlling, just curious if there is a pause. Focusing on the breath, but awareness of the mind's tendency to wander. Gently inviting the mind to refocus on the breath when you become distracted. Finding space between the end of the exhalation and the beginning of the next inhalation. Experiencing the stillness between breaths. No matter how slight the pause between breaths may be, just take note of the stillness that is there.

Awareness, now, of the entire experience of the breath moving in and out of the body. Awareness of all the sensations the breath may bring. No need to judge the sensations as they arise. Just focusing on the breath. (Pause) Feel the beginning of this very breath and the end of it. The beginning of the rising movement and the end. The beginning of the out breath and the end. The beginning of the falling of the belly and end. See if you can be with each breath. Apply this immediacy of attention. Simply being here, nowhere to go, nothing to do, just simply here. This is your life right in this moment, in this one breath. In and out. (Pause)

Nothing you need to do, just be with the breath. Aware of each in and out flow. Even as distractions arise just note as you've lost touch. And simply come back again and again without judgment. The heart of the practice, beginning again and again. Returning with patience and gentleness. (Pause)

Ending the session by gently opening the eyes. Take a few moments to listen to sounds, feel the body. See if you can bring with you some of this quality of presence and connection as you move out into the world.

## *Appendix J: Relaxation Visualization Script*

### **Relaxation Visualization Script**

I would like to help you become more relaxed by imagining a tranquil, comforting experience. As you become more involved in the image, your mind will be freed of troubling thoughts, and your bodily processes will conform to the peaceful atmosphere you create in your mind. Get comfortable. Please find a comfortable position relax into the chair behind you and close your eyes. I will assist you in imagining a scene by directing or guiding your imagery to different aspects of the scene. Try to experience the sensations of the described scene to make the image as realistic as possible. Try to feel as though you are actually living the imagined scene. To begin, relax your body by releasing any areas of tension. Allow your arms to go limp... then your legs.... Feel your arms and legs becoming loose and relaxed... Now relax your neck and back by relaxing your spine.... release the hold of your muscles all the way from your head, down your neck.... along each vertebra to the tip of your spine... Breathe deeply into your diaphragm, drawing air fully into your lungs.... and release the air.... Breathe in again, slowly.... pause for a moment.... and breathe out.... Draw a deep breath in.... and out.... In.... out.... Become more and more relaxed with each breath.... Feel your body giving up all the tension.... becoming relaxed.... and calm.... peaceful.... Feel a wave of relaxation flow from the soles of your feet, to your ankles, lower legs, hips, pelvic area, abdomen, chest, back, hands, lower arms, elbows, upper arms, shoulders, neck, back of your head, face, and the top of your head.... Allow your entire body to rest heavily on the surface where you sit. Now that your body is fully relaxed, allow the visualization relaxation to begin.

Imagine you are walking toward the ocean.... walking through a beautiful, tropical forest.... You can hear the waves up ahead.... you can smell the ocean spray.... the air is moist and warm.... feel a pleasant, cool breeze blowing through the trees....

You walk along a path.... coming closer to the sea.... as you come to the edge of the trees, you see the brilliant aqua color of the ocean ahead.... You walk out of the forest and onto a long stretch of white sand.... the sand is very soft powder.... imagine taking off your shoes, and walking through the hot, white sand toward the water....

The beach is wide and long.... Hear the waves crashing to the shore.... Smell the clean salt water and beach.... You gaze again toward the water.... it is a bright blue-green....

See the waves washing up onto the sand.... and receding back toward the ocean.... washing up.... and flowing back down.... enjoy the ever-repeating rhythm of the waves... Imagine yourself

walking toward the water.... over the fine, hot sand.... you are feeling very hot.... As you approach the water, you can feel the mist from the ocean on your skin. You walk closer to the waves, and feel the sand becoming wet and firm.... A wave washes over the sand toward you.... and touches your toes before receding... As you step forward, more waves wash over your feet... feel the cool water provide relief from the heat.... Walk further into the clear, clean water.... you can see the white sand under the water.... the water is a pleasant, relaxing temperature.... providing relief from the hot sun... cool but not cold.... You walk further into the water if you wish.... swim if you want to.... enjoy the ocean for a few minutes.... allow the visualization relaxation to deepen.... more and more relaxed... enjoy the ocean....

Now you are feeling calm and refreshed... You walk back out of the water and onto the beach... Stroll along the beach at the water's edge.... free of worries... no stress... calm.... enjoying this holiday.... Up ahead is a comfortable lounge chair and towel, just for you. Sit or lie down in



the chair, or spread the towel on the sand.... relax on the chair or towel.... enjoying the sun.... the breeze.... the waves..... You feel peaceful and relaxed.... allow all your stresses to melt away.... When you are ready to return from your vacation, do so slowly.... Bring yourself back to your usual level of alertness and awareness.... Keep with you the feeling of calm and relaxation.... feeling ready to return to your day.... Open your eyes, stretch your muscles... and become fully alert... refreshed... and filled with energy.

Now, take a few moments to listen to sounds, feel the body. See if you can bring with you some of this quality of presence and connection as you move out into the world.

## *Appendix K: Control Group Script*

### **Control Script**

Much of our furniture is made from timber. The wood to make that furniture has to be harvested from a felled tree that is then milled, sawed, planed, sanded, put back together with glue and screws, and finished. Wouldn't it be easier to avoid most of these steps and simply coax a tree to grow into a piece of furniture? That way, it would be one-piece, inherently strong, and could potentially last many years longer than assembled furniture. Gavin Munro thought this too, and about a decade ago set about achieving this goal. He now creates furniture by cajoling trees to grow into one-piece items that are not only inherently practical, they are also eminently beautiful.

The idea for the method came when he was working as a gardener in California and making furniture from washed-up driftwood on the side. He recalled how a bonsai tree his mother had when he was a child outgrew itself to resemble a throne. “Why do we need to bring all of these things together – chop the trees down, make them small, stick them back together again. We can just start from growing the tree from the beginning.”

Munro is a man with a great deal of patience. Over a period of between four to eight years, he trains trees to grow over plastic formers to become chairs; carefully interlacing their branches to form a solid, intricate unit. Each tendril is slowly and deliberately coerced into creating entwined legs, stiles, rails, and stretchers that create a fully-formed piece of furniture. Each of the pieces have grown from one tree, planted specifically for that reason, its limbs guided in an exact shape and later grafted together to produce the unique pieces of furniture, which he hopes are the pioneers of a new method of sustainable, efficient and ecologically aware production.

Of course, to support his business, and probably help retain his sanity, in the intervening years between tree chairs, he is also creating quicker-growing mirror surrounds and lamp shades for sale before the chairs reach maturity. Though, when we say "quicker" these, too, take more time than the average person would call fast; the standard tree in Munro's repertoire – the willow – still takes several years to grow big enough for a mirror surround.

To create this fascinating, one-off furniture, Munro has been slowly bending and shaping trees over plastic formers for nearly nine years now. Another year or so away from a large harvest of fully-formed furniture, Munro has still managed to produce the aforementioned mirror surrounds, some lamp shades and one or two prototype larger pieces to prove the concept.

But, with every 100 trees grown there are an attendant 1,000 branches that grow with them that must be shaped, coaxed, and cared for and, in turn, a further 10,000 shoots that must be pruned at precisely the right time to preserve the health of the tree while maintaining the desired shape. It is not work for the flighty or the impatient. With the 400 pieces of furniture growing, there are about 4,000 shoots that need to be managed and guided. This leaves a huge logistical operation for Munro and his team in a sometimes-frustrating process that he dubs “mass production meets delayed gratification”.

The process starts by shaping the young tress around molds by bending the growing tips in the direction they need to go with small plastic clasps. When the different strands of the tree need to be brought together to form one solid piece of wood, parts of the bark are shaved off and they are aligned, eventually growing together again. Once the final shape has been formed, the trees are left to mature and thicken, leaving a solid piece of wood without any joints. The pieces are harvested in winter and allowed to season for some months afterward until dry enough to plane

the faces of the seats and arms to provide practical flat surfaces and to reveal the wood-grain inside. The method is described as being more about persuasion than manipulation.

Along with the willow that Munro and his company, "Full Grown", started with, he is now branching out into other species, including Ash, Sycamore, Hazel, Crab Apple, Sessile Oak and Red Oak. This inclusion of new timber types means that other products can be grown to take advantage of different grain, hardness, finish, and texture. A fully-grown, one-piece table is just one such item that may be fashioned from one or more of these new sorts of timber.

The idea of turning trees directly into furniture isn't exactly new; apparently the Chinese put rocks in holes with trees so that the roots grew up around them to form stools, and one man in England has been promoting the art of growing stools in people's garden for some time now. But Munro's process of farming trees into furniture at an industrial scale – rather than at a dispersed or cottage-industry level – is a significant point of difference for Full Grown furniture.

Another point of difference is that, despite being produced on a largish scale, the tree furniture does not consume enormous amounts of energy as ordinary tree farming does. The trees are not sawed down, chopped up, carted away, and milled, for a start, which saves a lot of energy.

Further, the tending of the trees uses the least amount of water possible, the new plastic formers used to shape the trees are made from recycled plastic, and the office area (a caravan) has solar power and a composting toilet. This all means, from early calculations conducted by Munro and his team, that they barely use around 25 percent of the energy required to make a timber chair using ordinary methods.

When Munro founded his firm, Full Grown, in 2006, one of his goals was to create the world's most eco-friendly furniture design company. "My chairs and tables are formed from one solid piece of wood," he says. "No joints, no nails, no weak points, and no unnecessary waste." The Full Grown website points out that, with the current system for furniture production, trees are grown for more than 50 years, and then cut down into smaller and smaller pieces creating a lot of waste along the way. Then, those pieces are reassembled to create furniture. And unlike Munro's farm which does every step of the process on site, these trees have to be transported from the sawmill to the timber yard to a factory and then, finally to a store, using up a whole lot of resources.

Not quite yet available for sale, Munro is in discussions with a few galleries, with the first commercially-available chairs expected to be ready for sale by around the middle of 2017. Other pieces – such as the geometric lamps and mirror frames are expected to be made available sometime late in 2016. Each piece will be a unique heirloom for generations to come, and duly marked with a Certificate of Provenance. The first solid chairs will be sold for £2,500, while lamps will be between £1,000 and £1,500 – targeted at people who are looking for a unique art piece and "believe in the mission", said Munro. When Full Grown has scaled up production to hundreds and thousands of units in future years, products will be sold at more affordable prices, he said.

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*Mindfulness Skills Group Therapist* September 2015 – December 2015  
Jesse G. Harris, Jr. Psychological Services Center; Lexington, KY

*Understanding Self and Others Interpersonal Group Process Observer* August 2015 – December 2015  
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*Intelligence Assessment Practicum* November 2014 – December 2014  
University of Kentucky; Lexington KY

*Telephone Crisis Counselor* June 2013 – May 2014  
Hopeline Suicide and Crisis Hotline; Cary, NC

## **PRESENTATIONS**

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**Caldera, C.A.,** Smart, L.M., Baer, R.A. “Comparing the Effects of Mindfulness Meditation to Relaxation in a Brief Laboratory Induction.” Poster submitted to be presented at the Association for Behavioral and Cognitive Therapies Conference. 2016.

Smart, L.M., Shanahan, M., **Caldera, C.A.,** Baer, R.A. “Examining the Self-Injury Implicit Association Test in an Undergraduate Population.” Poster submitted to be presented at the Association for Behavioral and Cognitive Therapies Conference. 2016.

**Caldera, C.A.,** Baer, R.A. “Deficits in Mindfulness Facets Partially Mediate the Relationship between Features of Borderline Personality Disorder and Self-Injury.” Poster presented at the Association for Behavioral and Cognitive Therapies Conference. Chicago, IL, November 2015.

**Caldera, C.A.,** Fredrickson, B.L. “Contingencies of self-worth and positive emotions in college students.” Poster presented at the Undergraduate Research Celebration. Chapel Hill, NC, April 2014.

**Caldera, C.A.,** Fredrickson, B.L. “Contingencies of self-worth and positive emotions in college students.” Poster presented at the Psychology Honors Thesis Poster Session. Chapel Hill, NC, May 2014.

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Geiger, P. J., Boggero, I. A., Brake, C. A., **Caldera, C. A.**, Combs, H. L., Peters, J. R., & Baer, R. A. (2015). Mindfulness-based interventions for older adults: A review of the effects on physical and emotional well-being. *Mindfulness*, doi:10.1007/s12671-015-0444-1.

## HONORS AND AWARDS

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University of Kentucky

Lyman T. Johnson Fellowship

August 2014 - present

University of North Carolina at Chapel Hill

Honors in the Major Program in Psychology

May 2013 – May 2014

Dean's List

January 2012 – May 2014

Carolina Covenant Scholarship

August 2010 – May 2014

Psi Chi Honor Society

August 2013 - present