THE EFFECTS OF NATURE CONTACT AND MINDFULNESS ON MOOD

A Thesis Proposal

Submitted In Partial Fulfillment of the Requirements

for the Degree of

Bachelor of Arts (Honours) in Psychology

Supervised by Dr. Katherine Arbuthnott

University of Regina

by

Janelle Gerard

Regina, Saskatchewan

April, 2018

Abstract

Contact with the natural environment has been shown to produce extensive mood benefits (McMahan & Estes, 2015; Sandifer, Sutton-Grier, & Ward, 2015). including improving emotional well-being (Sandifer et al., 2015), increasing energy (Ryan et al., 2010; Stilgoe, 2001), increasing relaxation (Plante, Cage, Clements, Stover, & Carlson, 2006), and reducing stress (Ulrich, Simons, Losito, Fiorito, Miles, & Zelson, 1991). Another practice that has been shown to improve mood is mindfulness (Brown & Ryan, 2003; Davis & Hayes, 2011), "being attentive and aware of what is occurring in the present moment" (Brown & Ryan, 2003, p. 822). Currently, there is no research that has examined whether engaging in mindfulness during nature contact would further enhance mood benefits. The present study examined mood changes associated with both mindfulness and a natural setting. Participants completed measures of the Positive and Negative Affect Scale (Watson, Clark, & Tellegen, 1988), the Elevating Experience Scale (Huta & Ryan, 2010), the Mindful Attention Awareness Scale (Brown & Ryan, 2003), and the Immersion Scale (Weinstein, Przybylski & Ryan, 2009) both before and after 5 minutes or either nature contact, mindfulness, or both. Results indicated that nature contact increased ratings of positive affect, elevating experience, and immersion, when compared to the indoor condition. These effects did not interact with mindfulness. However, correlational analysis found a significant positive association of immersion ratings with MAAS scores, change in positive affect and elevating experience. These results confirm the beneficial effects of nature contact on mood and suggest that mindfulness does not influence mood as rapidly.

Table of Contents

List of Tables

Several studies have shown that there has been a substantial increase in the prevalence of mood disorders (e.g., depression) in recent decades, especially among adolescents and young adults (Twenge, 2011; Statistics Canada, 2013; Blanco et al., 2008). Some researchers have suggested the rise in technology has contributed to this epidemic (O'Donnell, 2015; Twenge, 2011). Due to the increasing prevalence of mood disorders, it is important to examine different avenues as possible treatment options. Both exposure to natural environments (McMahan & Estes, 2015) and mindfulness (Davis & Hayes, 2011) produce significant mood benefits. The research evidence for both of these areas, nature contact and mindfulness, will first be described.

Nature Contact

A large body of research has examined the impact of nature exposure on physical and psychological well-being (e.g., McMahan & Estes, 2015). The research provides evidence illustrating a wide array of physical and psychological benefits after brief contact with nature. These benefits include enhanced cognition (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Tennessen & Cimprich, 1995), reduced stress (Cole & Hall, 2010; Hartig, Evans, Jamner, Davis, & Garling, 2003), reduced blood pressure (Lee, Park, Tsunetsugu, Kagawa, & Miyazaki, 2009; Ulrich et al., 1991), improved self-esteem (Barton & Pretty, 2010; Wells & Evans, 2003), and increased emotional well-being (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet & Zelenski, 2011).

A meta-analysis, examining thirty-two studies, illustrates these findings. McMahan and Estes (2015) observed that brief exposure to nature (fifteen minutes) was related to increased levels of positive affect and decreased levels of negative affect. Indeed, research has consistently demonstrated evidence to support numerous psychological, cognitive, and physiological benefits as a result of nature contact (e.g., Sandifer et al., 2015). In addition to the positive effects of

nature contact, research also shows that contact with nature also results in a reduction in a wide array of negative emotions such as depression, anger, aggression, frustration, and hostility (Sandifer et al., 2015).

As an example of this research, Aspinwall, Mavros, Coyne, and Roe (2013) had participants walk through three urban areas, a large park, a busy commercial street, and a residential area, while wearing mobile electroencephalography EEG, to measure their physiological and psychological experiences. As compared to the other two areas, while in the park participants reported an increase in meditation and a reduction in frustration and arousal (Aspinwall et al., 2013).

The growing body of research provides evidence suggesting that nature can be an important means of intervention for physical and psychological health. The extensive benefits produced by nature contact have often been explained by Wilson's (1984) Biophilia hypothesis (Zelenski & Nisbet, 2014). The Biophilia hypothesis outlines that human beings evolved in natural settings and have an innate need to affiliate with nature. Therefore, spending time in nature fulfills this need and positively influences well-being and psychological health. As stated by Wilson's colleague, Kellert (1993, p. 60), "The pursuit of the 'good life' is through our broadest valuational experience of nature" (cited in Howell, Dopko, Passmore & Buro, 2011). Kellert (1997) also argued that being deprived of nature contributes to "maladaptive functioning" (Zelenski & Nisbet, 2014, p. 4) Subsequent research has supported these findings. Sundquist, Frank, and Sundquist (2004) conducted a study of 4.4 million people in Sweden and found that psychosis and depression levels rose with highly urbanized areas.

Research has also shown that people who live in urban areas with greater green space reported higher life satisfaction and a reduction in mental distress (White, Alcock, Wheeler, &

Depledge, 2013). Moreover, a study conducted by Park and Mattson (2008) found that post-surgery patients who were recovering in a hospital room that contained foliage and flowers experienced less pain, anxiety, and fatigue than patients who were in a room without foliage and flowers (Zhang, Howell, & Iyer, 2014). Therefore, incorporating natural elements into man-made developments are beneficial.

There is also some evidence that the beneficial effects of nature contact on mood is observed across all seasons. Brooks, Oatley, Arbuthnott, and Sevigny (2017) examined mood effects of nature contact in the Fall (September-October) and Winter (January-March) months. Participants took a ten-minute walk either indoors or outdoors and observed an increase in both Positive Affect and eudaimonic emotions for participants who were assigned to the outdoor condition. These results were also observed when participants simply sat in an outdoor setting.

Mindfulness

In modern society, human beings live in a perpetual state of distraction. The rise in technology (cell phones, tablets, etc.) has contributed to this phenomenon (O'Donnell, 2015). As stated by Berardi, "[…] the constant solicitation of attention through a range of media, technological tools, and marketing strategies is connected to the brain and the nervous system (Berardi, 2009, p. 38)." "The consequence of this, he suggests, is panic, depression, attention-disturbance, hyper-activity, solitude, existential misery, anxiety, and so on" (O'Donnell, 2015, p.190).

Mindfulness is a concept that can be traced back to Buddhist traditions (Brown & Ryan, 2003). Mindfulness is most commonly described as "being attentive to and aware of what is taking place in the present" (Brown & Ryan, 2003, p. 822). Moreover, "mindfulness serves to

promote and enhance the richness and vitality of moment-to-moment experiences" (Brown & Ryan, 2003, cited in Howell et al., 2011, p. 167).

For example, research conducted by LeBel and Dube (2001) reported that participants who focused attention on the sensory experience of eating chocolate described more feelings of pleasure than those who were involved in a distraction task while eating chocolate (Brown & Ryan, 2003). It is suggested that rumination, preoccupation with past events, or anxiety about the future detracts from the present moment (Brown & Ryan, 2003).

Additionally, mindfulness emphasizes the importance of non-judgemental acceptance of emotions and thoughts (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). In this sense, mindfulness practice seeks to change an individual's relationship to their emotions, not change the nature of the emotions themselves (Teper, Segal & Inzlicht, 2013). Mindfulness also promotes the development of emotional regulation (Corcoran, Farb, Anderson, & Segal, 2010; Farb et al., 2010; Siegel, 2007). Moreover, in a meta-analysis examining 39 studies, researchers found that mindfulness-based therapy reduced anxiety and depressive symptoms among participants (Hoffman, Sawyer, Witt, & Oh, 2010). Similarly, Davidson, Kabat-Zinn, Schumacher, Rosenkranz, Muller, Santorelli, Urbanowski, Harrington, Bonus and Sheridan (2003) found that engaging in mindfulness results in increased positive affect and a reduction in anxiety and negative affect. Davidson et al. (2003) had participants take part in an 8- week mindfulness meditation program, and measured electrical activity of the brain upon completion, observing a significant increase in activation of brain areas associated with positive affect.

In sum, research indicates mood benefit for both nature contact and mindfulness which raises the possibility that the two experiences may interact. Although this specific question has not been examined, there is a small body of literature outlining the effects of mindful attention

during nature contact on nature connectedness which indirectly links mindfulness, nature contact, and well-being.

Nature Connectedness and Mindfulness

Evidence has shown that both nature contact (Sandifer et al., 2015; McMahan & Estes, 2015) and mindfulness (Davis & Hayes, 2011) have positive impacts on psychological health. Existing research has only examined the notion of mindfulness and nature in relation to nature connectedness (Zhang et. al., 2014). Mayer and Frantz (2004) describe connectedness to nature as the extent to which individuals feel affiliated with the natural world (Barbaro & Pickett, 2016), a conceptual rather than experiential manner. Mayer and Frantz (2004) and Tam (2013) observed that connection to nature predicts well-being. In these studies, individuals who are connected with nature, as compared to those who are less connected, reported increased satisfaction with life, greater happiness, and increased positive affect (Mayer & Frantz, 2004; Tam, 2013). Nisbet, Zelenski, and Murphy (2011) mirrored these findings, observing that connectedness to nature was associated with autonomy, personal growth, positive affect, and feeling a sense of purpose in life.

Some researchers found that connectedness with nature most strongly predicts well-being when individuals are attuned to nature's beauty (Zhang et al., 2014). That is to say, those who were more emotionally attuned (i.e., actively perceiving nature's beauty), reaped the most positive benefits when experiencing nature (Zhang et al., 2014). Although not direct evidence, such attention to the beauty of one's surroundings suggests more mindful engagement.

Howell et al. (2011) conducted two studies to examine whether a strong connection to nature would be associated with increased well-being and mindfulness. In study one, Howell et al. (2011) found that nature connectedness was positively correlated with psychological well-

being, but did not correlate with mindfulness. However, in study two, Howell et al. (2011) found that nature connectedness positively correlated with mindfulness, as well as psychological well-being, using the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), and the Philadelphia Mindfulness Scale (Cardaciotto et al., 2008). ,. The consistent finding across the two studies was the positive correlation between nature connectedness and psychological well-being. More recently, Barbaro and Pickett (2016) found that mindfulness promoted nature connectedness, supporting Howell et al.'s study two observations.

Wang et al. (2016) found that mindful learning increased levels of connectedness to nature. Moreover, research shows that certain aspects of mindfulness, such as attentional capacity (Mayer et al., 2009) and internal awareness (Leary, Tipsord, & Tate, 2008) are particularly associated with increased connectedness with nature (Barbaro & Pickett, 2016).

Although no research has directly examined whether mindful attention while in a natural environment increases mood effects, Weinstein, Przybylski, and Ryan (2009) examined a concept known as Immersion. Immersion refers to when individuals are fully present within the environment and not distracted by thoughts or other external stimuli that are unrelated to the natural environment (Weinstein et al., 2009). Weinstein and her colleagues reasoned that the impacts of nature contact may be enhanced when individuals are fully immersed in the natural environment. Past research shows that immersion in nature accounts for greater memory (Mania & Chalmers, 2001) and is correlated with higher enjoyment (Ryan, Rigby, & Przybylski, 2006) of the natural environment (Weinstein et al., 2009). In their studies, Weinstein et al. (2009) employed a guided imagery script that encouraged participants to become attentive to different aspects of the environment to facilitate immersion. Using this manipulation they observed an increase in intrinsic goals (i.e., relationships, community, personal growth) compared to those

who were less attentive. Intrinsic aspirations such as love (Vining, Merrick, & Price, 2008). 2008), altruism, selflessness, and pro-environmental behaviour are significantly associated with connectedness to nature (Mayer & Frantz, 2004; Vining, 1987).

This research thus illustrates indirect mood benefits for engaging in mindfulness during nature contact. While there is evidence that engaging in mindfulness practice increases connection with nature, and that nature connection is related with improved mood and well-being, no research has directly examined whether mindful attention while exposed to nature influences mood effects. This is the purpose of the present study.

Hypothesis and Purpose

In the current study, the independent effects of mindfulness and nature contact, as well as their interaction, were examined. A mindfulness script was employed to encourage participants to become mindful of their surroundings either indoors or in a nature setting. Mood ratings were obtained both before and after these manipulations.

We hypothesized replication of the previously observed mood benefits of both mindfulness and nature contact. We also predicted their significant interaction - that individuals who are more present/mindful while experiencing nature would report the most mood benefit.

Method

Participants

One hundred and twenty-three participants (104 female, 19 male) were recruited through the University of Regina Psychology Department Participant Pool. Participants' average age was 21.02 years (*SD* = 3.7; range 17-45). Based on a G * Power 3.1 using a medium effect size = .25 alpha = .05, and power = .85, a sample size of *n* = 128 was sufficient. In exchange for their participation, participants received one bonus credit for an introductory psychology course of

their choice. Participants were randomly assigned to one of the conditions of a 2 (indoor or outdoor) x 2 (± mindfulness script) factorial design. Thirty one participants were assigned to the outdoor mindfulness script condition, 31 participants were assigned to the outdoor no mindfulness script condition, 32participants were assigned to the indoor mindful condition, and 29 participants were assigned to the indoor no mindfulness script condition.

Design and Procedure

The study used a 2 (indoor or outdoor setting) x 2 (± mindfulness script) between-participants factorial design. Mood was measured both before and after the exposure manipulation, adding a within-participants pre-test/post-test factor to the design.

Participants assigned to the indoor condition completed the study in a windowless room in a laboratory (i.e., no natural light or nature views). Participants in the outdoor condition completed the study in an urban park located on the border of the campus (i.e., Wascana park north of the Administration and Humanities building). This park location was chosen for its rich, moderately biodiverse beauty. Research suggests that environments with water, field, and rich vegetation are perceived as more pleasing than environments without these characteristics (Zhang et al., 2014). Participants were not taken outdoors in the event of poor weather conditions (i.e., temperatures below -20 degrees celsius or precipitation).

Participants were told the study was examining the influence of a short rest on mood, in order to distract attention from the manipulated factors. In all conditions participants were told to put all electronic devices away (i.e., cell phones) and focus on their setting while they sat for five minutes. Participants assigned to the mindfulness condition listened to a guided mindfulness script through a headset while focusing on their setting. The 5-minute mindfulness script was created for this study by incorporating the basic principles of mindfulness such as focusing on

the breath, attentiveness to sound, smells, and sights. (See Appendix A for the text of the script). Participants in the no-script condition simply sat in their assigned location for five minutes.

In all conditions, prior to their five-minute exposure experience, participants completed the Positive and Negative Affect Scale (PANAS; Watson et al., 1988) and the Elevating Experience Scale (EES; Huta & Ryan, 2010). Upon completion of these questionnaires, participants sat for five minutes in their designated condition and then once again completed the PANAS and the EES, as well as the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003) and a 4-item Immersion Scale (Weinstein et al., 2009).

Measures

Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988). The PANAS has been proven to be reliable, valid, and easy to administer (Crawford & Henry, 2004; Watson et al., 1988). It has also been used in previous nature-benefit studies (McMahon & Estes, 2014). Participants rate to what degree they currently feel 20 moods (10 positive & 10 negative) on a 5-point Likert format scale ranging from 1 (*very slightly*) to 5 (*extremely*). For this sample, the reliability was assessed using cronbach's alpha. For the current sample, pre-test reliability was PA α = .84; NA α = .76, while post-test reliability was PA α = .90; NA α = .85.

Elevating Experience Scale (EES; Huta & Ryan, 2010). Thirteen items from the EES were presented directly following the PANAS list to measure eudemonia. Eudemonia is an important element of well-being and can be described as personal meaning in life, satisfaction, and high levels of elevating experiences (Huta & Ryan, 2010). Items from the EES included awe, inspired, enriched, and morally elevated, which were rated on a 7-point scale that ranges from 1(*very slightly or not at all*) to 7 (*extremely*). For this sample, the pre-test reliability was α = .94, while the post-test reliability was α = .97.

Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The MAAS measures individual differences in the occurrence of the level of mindful states over a period of time (e.g., "It seems I am 'running on automatic' without much awareness of what I'm doing"). In other words, the MAAS asks general questions about how mindful a person is in their daily lives to determine different levels of experience with mindfulness, in case this factor influences the efficacy of the mindfulness manipulation. There are 15 items in the scale and participants rate each item using a 6-point Likert scale from 1 (*almost always*) to 6 (*almost never*). Higher scores reflect stronger mindfulness. In order to control for socially desirable responses, participants are asked to answer the questions according to what "really reflects" their experience rather than what they think their experience should be (Brown & Ryan, 2003). Brown and Ryan (2003) have proven the measure's internal consistency, reliability and validity. For this sample, the reliability was $\alpha = .83$

Immersion Scale (Weinstein et al., 2009). The Immersion Scale was developed based on the Player Experience of Need Satisfaction Physical Presence Scale (Ryan et al., 2006). Weinstein et al. (2009) modified the original Player Experience of Need Satisfaction Physical scale to reflect immersion. For the purpose of the present study, we made further modifications to the Immersion Scale developed by Weinstein et al. (2009) to encompass both the outdoor and indoor conditions. Participants rated four items using a 5-point scale that ranges from 1 (*not at all*) to 5 (*very much*). Items were intended to assess the level of immersion after the independent variable manipulation as a manipulation check for the mindfulness manipulation (e.g., "How completely were all of your senses engaged?" and "How much did you feel that you were present in the moment?"). Weinstein et al., (2009) demonstrated high internal reliability for the 8-item Immersion Scale, and for the present sample, the 4-item scale showed a Cronbach's alpha of $\alpha =$

.64. The Immersion questionnaire was introduced after data collection had begun so only 96 of the 123 participants completed the Immersion questionnaire.

Results

Manipulation Checks

The Immersion Scale was primarily used to examine if the mindfulness manipulation (script) had the intended influence. For this purpose, the Immersion ratings were analyzed using an independent t-test of the script vs. no-script conditions. The Immersion Scale score means were 3.63 (sd = .71) and 3.92 (sd = .69) for the script and no-script conditions, respectively. The t-test analysis indicated that the difference between the means was not statistically significant, t (94) = 1.906, p = .060. Therefore, individuals who were in the mindfulness (script) condition did not report higher levels of immersion than individuals in the not mindful condition, so this manipulation was not successful.

The MAAS scores were primarily used to ensure randomization of participants with different mindful experiences into the two mindfulness conditions. An independent t-test was also used for this analysis. The MAAS scores showed means of 3.46 (SD = .69) and 3.60 (sd = .67) for participants assigned to the mindful (script) and not mindful conditions, respectively. The difference between the means was not statistically significant, t (117) = 1.129, p = .261. Therefore, there was good randomization across groups for individuals with stronger levels of experience practicing mindfulness, so this was not the reason for the failure of the mindfulness manipulation to produce greater immersion.

Mood Effects

Ratings for the PANAS and EES scales were analyzed using (time: pre-test/post-test) x 2 (setting: indoor/outdoor) x 2 (± mindfulness: script vs. no script) ANOVAs. Although the

manipulation of mindfulness was not effective, this factor was included in the analysis for completeness. The means for these analyses are shown in Tables 1-3.

Table 1: Mean (sd) Positive Affect (PA) scores by setting and mindfulness

	Outdoor		Indoor	
	Pre-test	Post-test	Pre-test	Post-test
Mindful	2.44 (0.60)	2.87 (0.64)	2.83 (0.78)	2.87 (0.87)
Not Mindful	2.85 (0.66)	2.99 (0.80)	2.69 (0.59)	2.78 (0.84)
Total	2.64 (0.66)	2.93 (0.72)	2.76 (0.69)	2.83 (0.85)

Table 2: Mean (sd) Negative Affect (NA) scores by setting and mindfulness

	Outdoor		Indoor	
	Pre-test	Post-test	Pre-test	Post-test
Mindful	1.27 (0.30)	1.11 (0.21)	1.36 (0.37)	1.20 (0.26)
Not Mindful	1.70 (0.49)	1.41 (0.46)	1.56 (0.42)	1.46 (0.57)
Total	1.48 (0.46)	1.26 (0.38)	1/45 (0.41)	1.32 (0.45)

Table 3: Mean (sd) Elevating Experience Scale (EES) scores by setting and mindfulness

	Outdoor		Indoor	
	Pre-test	Post-test	Pre-test	Post-test
Mindful	2.25 (0.91)	3.13 (1.36)	2.78 (1.26)	3.31 (1.59)
Not Mindful	2.97 (1.33)	3.66 (1.56)	3.07 (1.13)	3.27 (1.51)
Total	2.61 (1.19)	3.40 (1.47)	2.92 (1.20)	3.29 (1.54)

PANAS. The analysis of Positive Affect (PA) scores indicated a significant main effect for time (pre-test/post-test), F (1, 119) = 9.37, p = .003, and a significant interaction of setting by time, F (1, 119) = 3.92, p = 0.05. The main effect of time indicated that scores increased from pre-test to post-test, but this effect was modified by the interaction with setting. Specifically, participants in the outdoor condition showed a significant increase in PA scores from pre-test to post-test (t(61) = 3.83, p < .001), whereas those in the indoor condition did not (t(61) = 0.70, p = .489).

The analysis of Negative Affect (NA) indicated only significant main effects of time, F (1, 118) = 25.80, p < .001, and mindfulness, F (1, 118) = 21.81, p < .001. The main effect of time

indicated that participants showed a reduction of NA ratings (i.e., improvement) from pre-test to post-test. The main effect of mindfulness reflected that people in the not mindful condition rated their NA as slightly higher than people in the mindful condition. Given the observed ineffectiveness of the mindfulness script manipulation, as well as the absence of a mindfulness by time interaction, this result will not be discussed further.

EES. The analysis of EES scores revealed a significant main effect for time, F (1, 119) = 44.28, $p < .001$, and a significant interaction of setting by time, F (1, 119) = 5.99, $p = .016$. The significant interaction indicated that individuals in the outdoor condition reported a greater increase in ratings of Elevating Experience from pre-test to post-test ($t(60) = 5.99$, $p < .001$), than did those in the indoor condition ($t(60) = 3.31$, $p = .002$).

Immersion. The immersion scores were originally included as a manipulation check for the mindfulness manipulation. However, because that manipulation was not successful, these scores were submitted to a 2(setting) x 2 (mindfulness) ANOVA to assess whether reported immersion was influenced by the setting manipulation. Immersion scores indicated a significant main effect for setting (indoor/outdoor), F (1, 92) = 5.67, p =.019, but, as indicated by the manipulation check, no main effect for mindfulness, F (1, 92) = 2.30, $p = .132$, and no interaction of the two factors. These results indicate that participants reported greater levels of immersion in the outdoor setting condition, compared to the indoor setting condition.

Correlational Analysis

To examine the association between dependent variables, we examined the correlations between MAAS, Immersion scores, and the pre-test/post-test differences in PA, NA, and EES scores (see Table 4).

Although participants who listened to the mindfulness script did not report greater immersion, there was a significant positive correlation between MAAS scores and immersion scores, r (92) = .259, p = .012. Thus, individuals who reported stronger mindful experiences in their daily lives reported feeling deeper levels of immersion in this study. This suggests that, although a 5 minute mindfulness script was not effective at increasing attention in this study, longer durations of mindfulness practice were associated with immersion experiences.

Furthermore, the correlation between immersion scores and the change in PA scores was significant, r (94) = .352, $p < .001$, as was the association with change in EES scores, r (94) = .391, $p < .001$. Thus, although the manipulation of mindfulness did not increase the mood benefits of nature contact, as hypothesized, there is some indication that immersion may influence these effects.

Table 4 Correlation of scores

	Immersion	MAAS	PA	NA	EES
Immersion	---				
MAAS	.26*	---			
PA change	.35*	.03	---		
NA change	.18	.04	.30*	---	
EES change	.39*	.07	.65*	.37*	---

Note: * indicates p < .05

Discussion

The present study was conducted to examine the independent effects of mindfulness and nature contact on mood and their possible interaction. The results supported the nature contact hypothesis, but not the mindfulness nor the interaction hypotheses.

Mindfulness

Unfortunately, according to the Immersion ratings, the mindfulness manipulation in this study was not successful. Participants who were exposed to the mindfulness script did not report deeper levels of immersion than those who did not listen to the script. Therefore, in this study,

the five-minute mindfulness script had no effect on the level of immersion participants experienced, so the results associated with the experimental manipulation of mindfulness are not informative.

However, despite this, the results of this study do suggest that mindfulness itself is related to mood improvement. Specifically, the correlational analysis indicated a positive correlation between MAAS scores and Immersion ratings, as well as positive correlations between immersion and mood changes. Participants who scored higher on the MAAS, indicating stronger mindfulness experience in their daily lives, experienced deeper levels of immersion. This result suggests that individuals need more than 5 minutes of guided mindfulness to achieve its benefits. The positive association between immersion and mood changes provide some support for the hypothesis that mindfulness would improve mood. And, the significant difference in immersion scores for indoor and outdoor settings suggests that there may be an interaction between mindfulness and nature benefit, once a successful mindfulness manipulation is developed.

In addition, although the MAAS scores significantly correlated with immersion, they did not correlate with emotion change scores. Within the context of this study, this suggests that having more experience with mindfulness did not, by itself, improve mood. Rather, there was only a positive correlation between immersion and changes in mood (i.e., PA and EES). Therefore, individuals must be practicing immersion in order to observe the effect of mood changes. As there was a significant difference in immersion for the nature condition (stronger immersion), this suggests that engaging in mindfulness during nature contact may be particularly beneficial once sufficient skill has been developed.

Previous findings (Hoffman et al. 2010, Davidson et al., 2003) indicate that engaging in mindfulness increases positive affect and decreases negative affect. As discussed above, our

mindfulness script was only five minutes in length whereas Hoffman et al.'s manipulation involved mindfulness-based therapy, which was a much more intensive and lengthy approach to incorporating mindfulness. Similarly, Davidson et al. (2003) introduced mindfulness in the form of an 8-week training program, providing additional evidence that more time is needed to develop a skilled practice with mindfulness in order to obtain mood benefits. The five-minute mindfulness script employed in this study likely did not provide enough time for participants to develop a deep level of mindfulness that impacted mood levels. Future research is needed to explore whether mindfulness experience less than weeks-long training can improve mood.

Nature Contact

The significant difference between indoor and outdoor settings supports the hypothesis that nature contact would cause mood benefits. In this study, these benefits were confined to increasing positive affect and elevating experience, or the transcendent emotions. This is consistent with the previous research reviewed in the introduction, including the findings that nature contact impacts positive emotions more than negative emotions (McMahan & Estes, 2015). One noteworthy feature in the current study is that these effects were observed after only five minutes of nature contact, suggesting that the mood effects of nature contact occur even more rapidly than previously thought (e.g., McMahan & Estes, 2015; Brooks et al., 2017).

Although this study did not examine nature connectedness, previous research has shown that nature connectedness is associated with greater happiness and increased positive affect (Mayer & Frantz, 2004; Tam, 2013; Nisbet, Zelenski, & Murphy, 2011). Moreover, Zhang et. al. (2014), found that nature connectedness most strongly predicts well-being only when individuals are actively perceiving nature's beauty. Therefore, in relation to our findings, the level of immersion

participants experienced in the outdoor setting may have influenced PA and EES scores, which is similar to findings in other research areas (Zhang et al. 2014).

Our findings provided additional support to the extensive research that has been conducted in the area of nature contact on overall psychological and physical health (McMahan & Estes, 2015). Specifically, our results indicated an increase in Immersion, positive affect and elevating emotions that occurred in only five minutes of nature contact. Most of the research that has been conducted has examined nature contact within the realm of a 10-15 minute time frame (McMahan & Estes, 2015; Brooks et. al., 2017). Our findings replicated these results and also provided evidence to suggest that nature benefit can be obtained within a very short time frame (five minutes).

Contrary to other findings (Aspinwall et al., 2013), our research did not show any significant effects in the reduction of NA as a result of nature contact. Although five minutes was enough time to influence PA, EES, and Immersion, it may not have been enough time to influence NA levels. In their meta-analysis, McMahan and Estes (2015) noted that there was a smaller effect size across studies for NA than for PA. Given this, perhaps shorter exposures to nature are not sufficient to evoke significant changes in NA.

One other element of the current results should be mentioned. This study was conducted from late October to early March, which were winter months. Thus, these findings also provide support for findings of Brooks et al. (2017) in relation to season. Our findings extend and replicate findings that nature benefit is not restricted to warm months.

Implications

Initially, we reasoned that although individuals may be physically present in nature, they may not be psychologically present (i.e., mindful of their surroundings). In this regard, it was

hypothesized that eliciting a mindful presence would result in increased nature benefit. The failure of our mindfulness manipulation prevented us from examining this possibility. Practice is apparently needed in order for mindfulness to be effective in influencing mood. It is unclear how much practice/the optimal length of time needed in order to develop strong mindfulness skills, so this should be examined in future research.

Given our findings, the vast amount of research illustrating the many benefits of nature (Sandifer et al., 2015), and the negative impact of highly urbanized areas on psychological health (Sundquist et al., 2004), it is of crucial importance to maintain and preserve natural environments. Nature has been proven to be a critical component in the overall health and well-being of human beings. Indeed, Sandifer et al. (2015) argue that we have reached a crucial point in human history where biodiversity and habitat loss have skyrocketed due to climate change and rampant development. Given the observed impact of nature contact on human health, this loss of biodiversity also has implications for our well-being.

In addition to preserving natural environments, it would also be equally important to incorporate green space into urban developments. Past research shows that nature benefit can be obtained from urban areas that have been incorporated with natural elements (i.e., parks) (McMahan & Estes, 2015; Aspinwall et al., 2013). Therefore, future policies should emphasize the importance of incorporating green space into new urban developments.

Other research indicates that the biodiversity of the natural settings with which we have contact influences the magnitude of health benefits (e.g., Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007). Specifically, psychological benefit increases in urban greenspaces containing greater richness in species (i.e., plant and bird species). Therefore, emphasis must be placed on not only the incorporation of green space in urban developments, but also ensuring richness in

the type and quality of the green space. For instance, although the natural setting used in the current study was urban, it contained a moderate level of biodiversity, which may have been important for evoking significant mood benefits in such a short period of time.

Although the effects of mindfulness during nature contact have seldom been examined, there is a small body of research that has examined the role of attentional focus during nature contact. More specifically, researchers are examining attentional focus as a potential factor in explaining why some nature visits are more restorative than others (Pasanen, Neuvonen, & Korpela, 2017). Researchers found that directed attentional focus (or attention on oneself and the environment) was positively associated with several components of psychological health such as post-visit restorativeness, creativity, and emotional well-being. These findings indicate promise for our hypothesis of a connection between mindfulness, or at least a strong attentional focus, and the level of nature benefit obtained.

References

Aspinwall, P., Mavros, R., & Coyne, J. Roe (2013). The urban brain: Analyzing outdoor physical activity with mobile EEG. *British Journal of Sports Medicine,1-6.*

Barbaro, N., & Pickett, S. M. (2016). Mindfully green: Examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior. *Personality and Individual Differences, 93*, 137-142. doi:10.1016/j.paid.2015.05.026

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science and Technology, 44*, 3947–3955. doi:10.1021/es903183r10.1021/es903183r

Berardi, F. (2009). *Precarious Rhapsodies* London, England: Minor Compositions.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science, 19*, 1207–1212. doi:10.1111/j.1467-9280.2008.02225.x10.1111/psci.2008.19.issue-12

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. *Journal of Environmental Psychology, 25*, 249–259. doi:10.1016/j.jenvp.2005.07.00110.1016/j.jenvp.2005.07.001

Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B.F., Liu, S., & Olfson, M. (2008). Mental health of college students and their non-college attending peers: Results from the National Epidemiologic Study on alcohol and related conditions. *Archives of General Psychiatry, 65*, 1429-1437.

Brown, K., & Ryan, R., (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84(4),* 822-848.

Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment, 15*, 204–223.

Cole, D. N., & Hall, T. E. (2010). Experiencing the restorative components of wilderness environments: Does congestion interfere and does length of exposure matter? *Environment and Behavior, 42*, 806–823. doi:10.1177/001391650934724810.1177/0013916509347248

Corcoran, K. M., Farb, N., Anderson, A., & Segal, Z. V. (2010). Mindfulness and emotion regulation: Outcomes and possible mediating mechanisms. In A. M. Kring & D. M. Sloan (*Emotion regulation and psychopathology: A transdiagnositc approach to etiology and treatment*) (pp. 339–355). New York: Guilford Press.

Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large non-clinical sample. *British Journal of Clinical Psychology, 43,* doi:https://doi.org/10.1348/0144665031752934.

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., Urbanowski, F., Harrington, A., Bonus, K., Sheridan, J. F. (2003) Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine,* (65), 564-570. doi: 10.1097/01.PSY.0000077505.67574.E3

Davis, D. M., & Hayes, J. A. (2011). What are the benefits of mindfulness? A practice review of psychotherapy-related research. *Psychotherapy, 48*, 198-208.

Farb, N. A. S., Anderson, A. K., Mayberg, H., Bean, J., McKeon, D., & Segal, Z. V. (2010). ones emotions: Mindfulness training alters the neural expression of sadness. *Emotion, 10*, 25–33. doi:10.1037/a0017151.supp

Fuller, R.A., Irvine, K.N., Devine-Wright, P., Warren, P.H., & Gaston, K.J. (2007). Psychological benefits of greenspace increase with biodiversity. *Biological Letters, 3,* 390-394. doi: 10.1098/rsbl.2007.0149

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology, 23*, 109–123. doi:10.1016/S0272-4944(02)00109-310.1016/S0272-4944(02)00109-3

Hoffman, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, *78*, 169–183. doi:10.1037/a0018555

Howell, A. J., Dopko, R. L., Passmore, H., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences, 51* (2), 166-171.

Huta, V., & Ryan, R. M. (2010). Pursuing pleasure or virtue: The differential and overlapping well-being benefits of hedonic and eudaimonic motives. *Journal of Happiness Studies, 11,* doi:https://doi.org/10.1007/s10902-009-9171-4.

Kellert, S. R. (1997). (*Kinship to mastery: Biophilia in human evolution and development*.) Washington, DC: Island Press.

Kellert, S. R., & Wilson, E. O. (1993). *The biophilia hypothesis*. Washington, DC: Island Press.

Leary, M. R., Tipsord, J. M., & Tate, E. B. (2008). Allo-inclusive identity: Incorporating the social and natural worlds into one's sense of self. In H. A. Wayment & J. J. Bauer (Eds.), *Decade of behavior. Transcending self-interest: Psychological explorations of the quiet ego* (pp. 137-147). Washington, DC, US: American Psychological Association. http://dx.doi.org/10.1037/11771-013

LeBel, J. L., & Dube, L. (2001, June). *The impact of sensory knowledge and attentional focus on pleasure and on behavioral responses to hedonic stimuli.* Paper presented at the 13th annual American Psychological Society Convention, Toronto, Ontario, Canada

Lee, J., Park, B., Tsunetsugu, Y., Kagawa, T., & Miyazaki, Y. (2009). Restorative effects of viewing real forest landscapes, based on a comparison with urban landscapes. *Scandinavian Journal of Forest Research, 24*, 227–234. doi:10.1080/0282758090290334110.1080/02827580902903341

Mania, K., & Chalmers, A. (2001). The effects of levels of immersion on memory and presence in virtual environments: A reality centered approach. *CyberPsychology and Behavior, 4,* 247-264.

Mayer, F., Frantz, C., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*, 607–643. doi:10.1177/0013916508319745

Mayer, F., & Frantz, C., (2004) The connectedness to nature scale: A measure of individual feeling in community with nature. *Journal of Environmental Psychology, 24*, 503-515.

McMahan, E.A., & Estes, D. (2015). The effect of contact with natural environments on positive and negative affect: A meta-analysis. *Journal of Positive Psychology, 10*, 507-519. https://doi.org/10.1080/17439760.2014.994224

Nisbet, E. K., & Zelenski, J. M. (2011). Underestimating nearby nature: Affective forecasting errors obscure the happy path to sustainability. *Psychological Science, 22,* doi:https://doi.org/10.1177/0956797611418527

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies, 12*, 303–322. doi:10.1007/s10902-010-9197-710.1007/s10902-010-9197-7

O'Donnell, A. (2015). Contemplative pedagogy and mindfulness: Developing creative attention in an age of distraction. *Journal of Philosophy of Education, 49*(2), 187-202. doi:10.1111/1467-9752.12136

Park, S., & Mattson, R., (2008). Effects of flowering and foliage plants in hospital rooms on patients recovering from abdominal surgery. *HortTechnology, 18*, 563-56.

Pasanen, P., Neuvonen, M., Korpela, M. (2017). The psychology of recent nature visits (how) are motives and attentional focus related to post-visit restorative experiences, creativity, and emotional well-being? *Environment and Behaviour, 32,* doi:10.1177/0013916517720261

Plante, T., Cage, C., Clements, S., Stover, A., & Carlson, John G. (2006). Psychological benefits of exercise paired with virtual reality: Outdoor exercise energizes whereas indoor virtual exercise relaxes. *International Journal of Stress Management, 13(1),* 108-117.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30,* 347-363.

Ryan, R., Weinstein, N., Bernstein, J., Brown, K.W., Mistretta, L., & Gagné, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology, 30(2),* 159-168.

Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services, 12*, 1-15.

Siegel, D. J. (2007). *The mindful brain: Reflection and attunement in the cultivation of well-being.* New York: Norton.

Statistics Canada. (2013). *Canadian community health survey: Annual component.*

Stilgoe, J. (2001). Gone barefoot lately? *American Journal of Preventive Medicine, 20(3),* 243-244.

Sundquist, K., Frank, G., & Sundquist, J. (2004). Urbanisation and incidence of psychosis and depression: Follow-up study of 4.4 million women and men in Sweden. *The British Journal of Psychiatry, 184* doi*:* https://doi.org/10.1192/bjp.184.4.293

Tam, K. (2013). Concepts and measures related to connection to nature: Similarities and differences. *Journal of Environmental Psychology, 34,* 64-78.

Tennessen, C. M., & Cimprich, B. (1995). Views to nature: Effects on attention. *Journal of Environmental Psychology, 15*, 77–85. doi:10.1016/0272-4944(95)90016-010.1016/0272-4944(95)90016-0

Teper, R., Segal, Z. V., & Inzlicht, M. (2013). Inside the mindful mind. *Current Directions in Psychological Science, 22*(6), 449-454. doi:10.1177/0963721413495869

Twenge, J. (2011). Generational Differences in Mental Health: Are Children and Adolescents Suffering More, or Less? *American Journal of Orthopsychiatry, 81*(4), 469-472.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology, 11,* 201-230.

Vining, J. (1987). Environmental decisions: The interaction of emotions, information, and decision context. *Journal of Environmental Psychology, 7,* 13-30.

Vining, J., Merrick, M. S., & Price, E. A. (2008). The distinction between humans and nature: Human perceptions of connectedness to nature and elements of the natural and unnatural. *Research in Human Ecology, 15,* 1-11.

Wang, X., Geng, L., Zhou, K., Ye, L., Ma, Y., & Zhang, S. (2016). Mindful learning can promote connectedness to nature: Implicit and explicit evidence. *Consciousness and Cognition, 44*, 1-7. doi:10.1016/j.concog.2016.06.006

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063e1070. https://doi.org/10.1037//0022-3514.54.6.1063.

Weinstein, N., Przybylski, A., & Ryan, R. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. *Personality and Social Psychology Bulletin, 35*(10), 1315-1329.

Wells, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment and Behavior, 35*, 311–330. doi:10.1177/0013916503035003001 10.1177/001391650303500300

White, M., Alcock, I., Wheeler, B., & Depledge, M. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science, 24,* 920-928.

Wilson, E. O. (1984). *Biophilia*. Cambridge: Harvard University Press.

Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and feeling connected. *Environment and Behavior, 46*(1), 3-23. doi:10.1177/0013916512451901

Zhang, J. W., Howell, R. T., & Iyer, R. (2014). Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being. *Journal of Environmental Psychology, 38,* 55-63.

Appendix A

Be aware of yourself in this present environment. Feel your feet on the ground. Take a deep breath in, now let it out. Take another deep breath in, as you exhale, make the intention that the breath will help you push away all internal distractions. Allow yourself to become fully immersed in this present moment. Focus on the environment around you. What do you see? If a distracting/negative thought comes to mind, accept it with presence and just let it pass. Then gently bring yourself back to this present moment. Do you notice any smells? Any sounds? Take another deep, cleansing breath and slowly exhale. Quietly observe all aspects of the environment.

Note: There will be a pause after each sentence. The length of the pause will vary, depending on the instructions in each sentence.