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Journal of Outdoor and Environmental Education

ISSN 2206-3110

Journal of Outdoor and Environmental Education
DOI 10.1007/s42322-019-00031-9

Springer

Journal of Outdoor and Environmental Education
https://doi.org/10.1007/s42322-019-00031-9

ORIGINAL PAPER

Mindful adventures: a pilot study of the outward bound mindfulness program

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Published online: 08 March 2019

Abstract

Mindfulness can be successfully combined with adventure education but the area is understudied. This longitudinal quasi-experimental study investigated whether an 8-day Outward Bound Mindfulness Program in nature would increase levels of positive affect, savouring, and mindfulness. Results indicate the experimental group experienced a statistically significant increase in mindfulness, positive affect and savouring compared to the control group post-intervention, and that the increase was maintained at 3-months post-intervention. These results illuminate the lasting impact of an intervention which combines mindfulness with adventure education, and highlight the potential which natural environments may play in educational and therapeutic processes. Study limitations and need for further research are shared.

Keywords Mindfulness · Nature · Savouring · Positive affect · Outward bound · Adventure

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Introduction

The integration of mindfulness practices – including mindful walking, mindful eating, nature-based therapy, and applied positive psychology – with other activities, can accelerate the benefits which may accrue to participation (Ivtzan et al. 2016; Kristeller and Wolever 2010; Russell et al. 2016; Teut et al. 2013). Such initiatives increase the variety of interventions available for educational and therapeutic practice. They also support finding new ways to improve the capacity of a participant to manage emotional states, a factor key to the promotion of personal and community health (McGeeney 2016). Alignment between intervention type and participants' internal motivations and values improves the likelihood of successful adoption and maintenance of learning (Layous and Lyubomirsky 2014), yet few people currently have access to programs that venture beyond the application of conventional educational or therapeutic practices. In this small-scale pilot study we sought to understand what combined positive outcomes might be achievable when bringing mindfulness practices into cooperation with adventure education and the associated benefits of contact with nature. As a pilot study, the aim was to seek this understanding in order to inform possible development of a larger scale study in the future.

Mindfulness

While there are a number of ways of defining mindfulness, we draw specifically on an understanding of mindfulness as the process of self-regulating attention and awareness in the present moment, accompanied by the use of an open, curious and accepting attitude (Bishop et al. 2004; Brown and Ryan 2003). Mindfulness has been practiced in meditative forms for centuries, with roots in Buddhism; and has been adapted and researched in Western psychology over the last 50 years (Williams and Kabat-Zinn 2013). As a consequence, formal mindfulness interventions focused on meditative practices have been studied and used in both clinical and non-clinical settings (Dimidjian and Segal 2015; Shapiro and Walsh 1984; Van Der Velden and Roepstorff 2015). These meditative practices typically involve attending to the present moment and current experiences, such as thoughts, memories, or sensations (Hick 2008). Interventions have also been developed such as Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn 1990) and Mindfulness-Based Cognitive Therapy (MBCT; Teasdale et al. 2000). There have been many mental health benefits related to these specific interventions, such as decreased negative affect, reduced stress, and increased positive affect and wellbeing (Carmody and Baer 2008; Grossman et al. 2004; Marchand 2012).

Mindfulness, positive affect and savouring

Connections between mindfulness, positive affect, and savouring are important to understanding how mindfulness may work. Positive affect is the broad spectrum of positive states one experiences such as positive emotions, positive mood, and positive sentiment (e.g. feeling grateful, interested, proud) (Fredrickson and Branigan 2005). People can regulate positive affect and can enhance positive feelings through the process of savouring (i.e., holding on to the positive feelings) (Bryant and Veroff 2007). Mindfulness in turn, allows participants, as practitioners, to savour their experiences (such as sensations, emotions and thoughts) when mindfully focusing on a positive stimulus (Bryant et al. 2011). For

example, mindfulness enhances awareness of experiences, such as those of contentment or joy; and thus mindfulness can help practitioners *savour* and maintain such feelings (Young 2016). Thus, mindfulness can increase awareness of positive emotions due to increased awareness and attention (Jislin-Goldberg et al. 2012). Mindfulness can also allow greater awareness of negative affect, however mindfulness practitioners are taught to work with such experiences through awareness and acceptance (Brown and Cordon 2009).

Cultivating mindfulness through connection with nature

A significant evidence-base has grown to support associations between nature and improved physical and mental health (Bratman et al. 2012; Bowler et al. 2010; Maller et al. 2006; Tzoulas et al. 2007). Taking advantage of these associations is becoming more popular, with stronger advocacy by clinicians for nature-based approaches to be integrated into therapeutic practices (Greenleaf et al. 2013; Reese et al. 2014). For example, forests in Korea have now been specifically allocated for therapy and medical intervention, demonstrating the commitment to nature-based approaches to healing (Woo et al. 2012). Nature exposure has also been associated with an increase in positive affect (Jislin-Goldberg et al. 2012). For example, people experienced an increase in positive emotions, such as appreciation and wonder, when simply viewing nature-oriented films (Saraglou et al. 2008).

Formal research investigation of direct connections between nature and mindfulness is on the increase, taking into account further development of practices that focus on mindfulness in nature, such as forest walking, forest therapy, forest bathing or Shinrin-yoku, ecotherapy, and ecopsychology (Ambrose-Oji 2013; Jordan and Hinds 2016; Shin et al. 2010). Past mindfulness intervention studies have included various levels of exercise and exposure to nature. For example, a randomized controlled trial by Teut et al. (2013) found that participants who undertook mindfulness walking sessions in parks experienced significant reductions in psychological distress. Some studies have found positive correlations between nature connectedness—a sense of cohesion with the natural world—and increased mindfulness (Howell et al. 2011). Kim et al. (2009) found improvements in clients' perception of their depression through an intervention involving mindful walking in the forest and mindful meditation.

The links between mindfulness practices and nature are more evident when exploring key characteristics of mindfulness such as directed attention. Nature can cultivate direct attention, mindfulness, due to the sensory impact of the environment (Hartig et al. 2014; Mayer et al. 2008). Natural environments possess characteristics which hold our attention and interest, which contributes to their capacity to be restorative (Kaplan and Berman 2010; Kaplan and Kaplan 1989; Kaplan 1995). Kaplan (1995) explored how natural environments influence attention, linking it to three core aspects: 1) fascinating objects that draw attention and are effortless to observe such as clouds, hills, and trees; 2) an engaging environment different to that experienced everyday, such as a flowing river or green space; and finally, 3) a natural connection between nature and human inclinations, revealing the compatibility of the natural environment with achievement of human propensities.

A number of studies have reinforced the relationship between increased time in natural environments and increased capacity for directed attention. For example, Berto (2005) found that when study participants were exposed to scenes judged to be restorative (natural scenes of lakes, mountains and rivers) and non-restorative (urban centers), exposure to natural scenes was associated with improvements in attention. Similarly, Mayer et al.

(2008) had participant groups watch a video of a natural setting or walk for 15 min in a natural setting, and found that both forms of nature exposure increased attention capacity. These studies both suggest that exposure to nature, under favourable conditions, helps maintain and even revive the capacity for directed attention; a core facet of mindfulness.

Outdoor education and adventure programming

An engaging method for connecting with nature is through outdoor education, which involves experiential place-based learning, conducted primarily outdoors, aimed at improving relationships, including those between people and natural environments (Harper et al. 2011; Priest 1986). Meta-analyses indicate that outdoor education programs have small to moderate impacts on outcomes such as teamwork, self-concept, and locus of control which can last for extended periods of time (Bunting and Donley 2002). These reviews identified the most effective programs to be longer and involve adult participants and teamwork, as has been the case for many years in outdoor programs emphasizing adventure education.

Adventure programs involve participants being physically active away from their usual everyday environments (Hattie et al. 1997). Outward Bound was founded in 1941 and is often viewed as the original adventure program; helping participants gain physical fitness, craftsmanship, self-reliance, and compassion (Goldenberg et al. 2005). In a meta-analysis of adventure programs that included Outward Bound, Hattie et al. (1997) found medium effect sizes and suggested that 65% of participants gained from the programs.

An early exploration of mindfulness in outdoor experiential learning settings showed reduced boredom and increased focused awareness, with some students referring to the mindful adoption of a "beginner's mind" (Trunnell et al. 1996) as assisting to revitalize their more common outdoor experiences. Further, it has been suggested that mindfulness can improve achievement of educational goals and objectives in outdoor settings, as well as increase overall student satisfaction (Frauman 2011), or in terms used by Quay (2013), mindfulness in outdoor activity raises awareness of the aesthetic experience which underpins the more commonly accentuated reflective experience. Nicholls and Gray (2006) focused on stillness and quiet as key aspects of mindful practices during nature immersion programs. Their qualitative inquiry identified these practices as critical in developing the potential for transformational experiences during wilderness programs. More specifically, Mutz and Müller (2016) conducted two pilot studies of outdoor adventure programs involving an eight and a nine-day backpacking trip; both studies identified increased mindfulness and life satisfaction following the trips.

While there is a small amount of research demonstrating links between adventure programs and mindfulness, such as that mentioned above, to our knowledge there are few adventure programs which deliberately incorporate mindfulness practices. The aim of the current study was to investigate such a program: the Outward Bound Mindfulness Program.

Methods

Design

A longitudinal quasi-experimental design was used in this study, with an experimental group and comparative control group (Cook et al. 2002). The control group was not

randomly assigned but closely matched in size, and by age and gender. The experimental group participated in an eight-day Outward Bound Mindfulness Program (the intervention) while the control group did not undertake the intervention nor any Outward Bound program. It was hypothesized that levels of positive affect, savouring and mindfulness would increase immediately following the intervention, and, that this increase would still be present three months later. The independent variable was participation in the intervention (experimental vs control group) and dependent variables were levels of mindfulness, positive affect, and savouring. Measures of the dependent variables were completed by both groups at three timepoints: T1, prior to the start of the intervention; T2, immediately after the completion of the intervention; and T3, three months after the completion of the intervention.

Participants

Table 1 provides experimental and control group participant demographics. All participants were Canadian residents. Participants in the experimental group ($N = 14$) were recruited from two Outward Bound Mindfulness Programs, conducted by Outward Bound Canada, which ran July 17 to July 24, 2016 (Rocky Mountain Backpacking) or July 31 to August 7, 2016 (West Coast Sea Kayaking). Twenty-one individuals enrolled in the two programs and all were invited to participate in the research. Participation was voluntary, and individuals were provided with details about research protocols and process. Fourteen participants from the two cohorts agreed to take part in the study (4 from the kayak program and 10 from the backpacking program). There were twelve females and two males in the experimental group.

Participants in the control group ($N = 16$) were recruited via social media. The invitation to participate was a call for individuals who would be open to signing up for the Outward Bound Mindfulness Program, although the control group did not undertake any course, intervention, or alternative protocol. They were a collection of people interested in participating in the Outward Bound Mindfulness program, but this interest was not (as yet anyway) channelled into actual participation. There were twelve females and four males in the control group. This study was reviewed and approved by the Ethics Committee at the University of East London, UK.

Table 1 Experimental and control groups, sample size, gender, age, and treatment

Group	Experimental	Control
Sample size	$N = 14$	$N = 16$
Gender	12 Female, 2 Male	12 Female, 4 Male
Age	30–39 = 1 40–49 = 11 50–59 = 3 60+ = 1	20–29 = 2 30–39 = 6 40–49 = 4 50–59 = 2
Treatment	Outward Bound Mindfulness Program	∅

Outward bound mindfulness program

The mission of Outward Bound Canada is to "cultivate resilience, leadership, connections, and compassion through inspiring and challenging journeys of self-discovery in the natural world" (Outward Bound Canada 2014). The Outward Bound Mindfulness Program was the intervention that the participants in the experimental group engaged with. It comprised mindfulness-based practices in nature and aimed at helping participants to integrate positive learning experiences into their everyday life after the program. Program participants gained an understanding of mindfulness, how nature enables awareness, skills for attention and observing, and how this newly acquired knowledge and abilities can be integrated back into their lives post-program. The program lasted eight days, with each day including approximately five hours of mindfulness practice (i.e., meditation, observing relationships with one's thoughts, self-compassion activities etc), while the rest of each day was consumed with outdoor living and travel, with its inherent physical exertion, risk, and social group dynamics. Participants also undertook a solo experience exploring how to integrate relevant learning back into their everyday lives. The program was undertaken in remote natural environments with outdoor living forming a core element of the experience.

Measures

The three measures utilized in this study were the Positive and Negative Affect Schedule (PANAS), the Savouring Beliefs Inventory (SBI), and the Freiburg Mindfulness Inventory (FMI). The PANAS is a 20-item scale that is a subjective measure of positive and negative affect and is commonly used in studies due to its strong psychometric properties, validity, and reliability (Crawford and Henry 2004; Watson et al. 1988). Only the results from the positive affect scale across the three timepoints were analyzed for this study. The SBI is a 14-item measure used to assess participants' beliefs about their capacity to savour positive experiences, anticipate upcoming events, and reminisce about past positive experiences (Bryant 2003). The FMI is a 14-item questionnaire designed to assess trait mindfulness with a focus on self-regulation of emotions, the ability to reperceive life experiences and attention in the present moment (Walach et al. 2006).

Procedure and data analysis

Data was collected for both groups using an online survey tool. The data collection process was conducted with a secure network and SSL/TLS (digital) encryption. Data was consolidated into one excel file and then uploaded to SPSS Version 23 software for statistical analysis. Prior to analysis, tests of normality were run to increase study validity by reducing the chance of statistical errors (Ghasemi and Zahediasl 2012). A boxplot was created which indicated there were no outliers in the data. Shapiro-Wilk's test of normality was conducted to ensure the data was normally distributed. Levene's test of homogeneity of variances and Box's M test was conducted to ensure there was homogeneity of variances ($p > .05$) and covariances ($p > .05$). Mauchly's test of sphericity indicated that the assumption of sphericity was met for the two-way

interaction. The data met all the required assumptions outlined above to run a two-way mixed analysis of variance (ANOVA).

The analysis was run to determine if change occurred, over time, for the control and experimental groups, across measures of positive affect, savouring and mindfulness. A 3×2 mixed ANOVA was employed to determine if there was an interaction between the within-subject factor (time: pre, post, follow up) and between-subject factor (condition: experimental vs control) on the dependent variables (mindfulness, savouring, and positive affect). We also wanted to know if the mindfulness intervention could be responsible for measurable change relative to the control group who did not take part in the mindfulness program nor any other intervention. Mixed ANOVAs were also conducted to determine differences in the dependent variables at different time points for the experimental group and to determine if there was a statistically significant effect of condition (intervention vs control).

Results

The results explore the hypothesis that participation in the Outward Bound Mindfulness Program will increase levels of positive affect, savouring, and mindfulness. Each of these dependent variables is discussed separately below.

Positive affect

Table 2 outlines changes in positive affect for the two conditions. There was a significant effect of time on positive affect for the experimental group, $F(2, 26) = 8.98$, $p = .001$. More specifically, an increase in positive affect was found at the completion of the mindfulness program (T2) and was found to have decreased slightly 3 months later (T3), while the control group remained fairly consistent across all time points. There was a significant interaction of condition x time on positive affect, $F(2, 56) = 5.88$, $p = .005$, partial $\eta^2 = .17$, indicating support for the hypothesis that participation in the mindfulness program led to increases of positive affect over time. It is interesting to note that the mean T1 positive affect score for the experimental group

Table 2 Descriptive statistics for positive affect scores (PANAS)

Time	Group	Mean	Std. Deviation	N
T1	Experimental	29.64	4.700	14
	Control	38.88	7.702	16
	Mean	34.57	7.908	30
T2	Experimental	36.64	5.329	14
	Control	37.88	5.760	16
	Mean	37.30	5.503	30
T3	Experimental	33.79	5.686	14
	Control	38.88	6.459	16
	Mean	36.50	6.538	30

was markedly lower than for the control group, and further, even though showing a statistically significant gain, the mean T1 positive affect score for the experimental group did not reach the baseline control group score across time. This difference remains unexplained, however we speculate as to possible reasons for this occurrence in the discussion section.

Savouring

Table 3 outlines changes in savouring for the two groups. There was statistically significant two-way interaction between the intervention and time on savouring, $F(2, 56) = 3.645$, $p = .032$ partial $\eta^2 = .115$ indicating that participation in the mindfulness program increased reported levels of savouring over time. There was a significant effect of time on savouring for the experimental group, $F(2, 26) = 6.646$, $p = .005$. Table 3 illustrates that the experimental group's increase in savouring across the mindfulness program (T1 to T2) remained consistent 3 months later (T3), and while the control group showed small improvements, these improvements did not change significantly at the different time points. In summary, the findings supported the hypothesis. Of note, again, is the experimental group's pre-program (T1) score which was considerably lower that of the control group pre-program (T1) score, and further, this score did not reach the baseline control group score across time.

Mindfulness

Table 3 outlines changes in mindfulness for the two conditions. There was no statistically significant interaction between the intervention and time with regard to mindfulness, $F(2, 56) = 2.213$, $p = .119$, partial $\eta^2 = .073$. Specifically, this mindfulness program did not produce sustained improvement across participant T1 to T3 scores. The main effect of time showed a statistically significant difference in mindfulness at the different time points, $F(2, 56) = 7.38$, $p = .001$, partial $\eta^2 = .21$ (i.e., increase between T1 and T2). The main effect of group (control or experimental) showed that there was a statistically significant difference in mean FMI between the experimental group and the control group $F(1, 28) = 4.70$, $p = .039$, partial $\eta^2 = .14$, with the

Table 3 Savouring descriptive statistics (SBI)

Time	Group	Mean	Std. Deviation	N
T1	Experimental	15.00	21.469	14
	Control	36.56	25.049	16
	Total	26.50	25.512	30
T2	Experimental	26.29	17.574	14
	Control	35.13	18.935	16
	Total	31.00	18.547	30
T3	Experimental	26.29	16.002	14
	Control	38.38	20.356	16
	Total	32.73	19.151	30

experimental group showing greater levels of change in mindfulness. As illustrated in Table 4, mindfulness was found to have increased at the end of the mindfulness program (T2) for the experimental group and then decreased again 3 months post-program (T3). The hypothesis was supported in that the intervention produced an overall increase in mindfulness. The control group experienced a minor increase in mindfulness over time. Of note, yet again, is the experimental group's T1 score which was lower than that of the control group T1 score, and which did not quite reach the baseline control group score across time.

Discussion

Results indicate that the mindfulness intervention in this study, an eight-day Outward Bound Mindfulness Program, led to an increase in positive affect, savouring and mindfulness for the 14 participants in the experimental group. The most significant impact was on positive affect and savoring, where participants reported higher scores on positive affect and savoring post-intervention (T2) when compared to the control group. These positive results echo evidence in the literature for mental health benefits of mindfulness practice (Carmody and Baer 2008; Grossman et al. 2004) even though the measure of mindfulness itself was not significant longitudinally. The noted increases in positive affect are important as positive emotions can broaden thought and action responses (Fredrickson et al. 2008), resulting in positive outcomes such as an increase in creativity, cognitive flexibility, and positive affect (Fredrickson and Branigan 2005; Lopez-Gomez et al. 2015). Positive affect at the end of an outdoor adventure program (also known as post-program euphoria) is common, so the results need to be taken into context when interpreting relative to the broader literature of the field (Leather 2013; Williams et al. 2018).

As discussed, the savouring of positive states enhances positive affect and increases the frequency and intensity of positive emotions (Bryant 2003; Quoidbach et al. 2010). Savouring is linked to being more present, which is a key aspect of both mindfulness and nature exposure, a connection deserving further inquiry (Ambrose-Oji 2013), specifically in the outdoor adventure field. The Outward Bound Mindfulness Program

Table 4 Mindfulness descriptive statistics (FMI)

Time	Group	Mean	Std. Deviation	N
T1	Experimental	31.29	7.332	14
	Control	37.38	6.292	16
	Total	34.53	7.357	30
T2	Experimental	37.07	6.006	14
	Control	38.88	6.811	16
	Total	38.03	6.403	30
T3	Experimental	35.21	5.886	14
	Control	40.00	5.099	16
	Total	37.77	5.905	30

includes numerous opportunities for solitude, and quiet reflective time. Outdoor travel and living is a mosaic of action and rest; travel can be physically burdensome and one must focus on being present to the environment. Watching the trail for rocks on even terrain, focusing on certain paddle strokes and balance to achieve a beach landing in a kayak demand mindful moments. It is the times in between travel, meals, and group meetings where participants can take rest, write, or in the case of the mindfulness program, practice meditation, breathing exercises, or simply to sit and reflect on the day's activities or whatever is on their minds. It is in this reflective space that savouring may have the best opportunity to develop as a trait. This premise aligns with Kaplan's (1995) research that explores how nature can improve attention by providing a restorative environment. These results illustrate how nature exposure combined with mindfulness can be a conduit for increasing positive affect and savouring, leading to important positive effects for health and wellbeing.

It is also important to highlight that longitudinal data show positive affect and savouring maintained an increase three-months post-intervention (T3). This result suggests both state and trait levels are affected by the intervention as a short-term and sustainable impact was found on these facets of mindfulness. This finding is consistent with Hattie and colleague's (Hattie et al. 1997) meta-analysis which identified that short-term immediate gains from outdoor education programs were maintained after completion. These are important findings as they show that time in nature combined with mindfulness can have a sustained impact. It appears the control group's participation in the study also produced minor improvement in savouring and mindfulness without intervention. This is not a new phenomenon. In a recent large-scale Canadian mental health study, researchers found that young people who simply believed in the human connection with nature as a health benefit were found to have reduced prevalence of heightened psycho-somatic issues, along with those who were actively engaging in nature-connection weekly (Piccininni et al. 2018). The act of being asked to participate in a study of mindfulness no doubt had an impact on the minds of the control group.

A different pattern of results emerged between levels of mindfulness, as assessed with the FMI post-intervention. The magnitude of the change is smaller than the other variables measured, but an increase nonetheless, suggesting possible state mindfulness (mindfulness understood as a state that one can move in and out of, in comparison to mindfulness considered a more permanent trait) during the program and potentially minor gains in trait mindfulness found at T3. Previous research has suggested the trajectory of state mindfulness as a predictor of longitudinal trait mindfulness (Kiken et al. 2015). The results of this pilot study partially support that finding.

The FMI measure of mindfulness focuses on self-regulation of emotions, the ability to re-perceive life experiences and attention in the present moment (Walach et al. 2006). A reported increase in these areas was maintained between pre-intervention through to three-months post-intervention. Even though there was an increase in mindfulness for the experimental group, it was not as substantial as increases for positive affect and savouring. From an organizational program design and marketing perspective, these results are important to reflect on. How is it that a curriculum designed to accentuate mindfulness practice and philosophy didn't produced stronger outcomes? From a research perspective, was the survey chosen accurately measuring the learning and change experienced by students on Outward Bound courses? We know numerous

mindfulness measures have been developed are available, and as such, may measure different qualities and aspects of the construct (Park et al. 2013).

One concern with the interpretation of these results includes the lower pre-program (T1) scores for the experimental group across measures. What does this mean? As researchers we can only speculate. Our experimental and control groups were matched on basic elements (i.e., group size, interest in the mindfulness program, age, gender) but not randomized. We can, as one way of trying to understand, suggest that a psychological phenomenon has occurred amongst those in the experimental group prior to attending the Outward Bound intervention. Knowing the demands and content of an adventure course, including specific itinerary and details of the physical and social expectations, may have influenced their self-reports of positive affect, savouring, and mindfulness. This may be due, in part, to the worry one has prior to embarking on an adventurous undertaking, where one's perceptions of risk and engagement with others may invoke stress and doubt (Davis-Berman and Berman 2002). Conversely, the experimental group may also have simply perceived lower levels of these traits in themselves, as they had already signed up for a course to develop mindfulness. Their preparation for the course may have led to increased critical assessment of their abilities and resulted in lower scores. How this relates to the psychology of the control group participants is also unknown. Without the stress of course preparation, it may be that the control group's self-assessments were more accurate. As we have reported in Tables 2, 3 and 4, the control group scores remained fairly consistent across time, although they too saw a slight increase on all measures.

Strengths, limitations and future research

This is the first study we are aware of which investigated a program which combined the two areas of adventure programs and mindfulness practice. While there were promising results, there are a number of limitations that should be considered, including the small sample size ($N = 30$), lack of random assignment, and the question of why we found lower T1 scores for the experimental group. We recognize that the study had a small sample size and random assignment was not used due to constraints on group size for safety, costs of programs, and logistical and ethical reasons—a common issue in adventure program research (Gabrielsen et al. 2016). The size of the sample impacted the ability to conduct further analysis on demographics and other factors (e.g., by age, gender and activity type). In addition, the use of quantitative data aggregated the results of the participants and it would be useful for future research to examine individual differences and use qualitative approaches to collect participant reflections. Finally, the experimental versus control group baseline measures were questioned and we can only speculate as we did above as to why the difference existed. Ideally, one way to fully understand this phenomenon, would be to have all measures completed by participants prior to assignment to experimental or control groups. A second option, especially if one's perception or understanding of the construct being measured changes or develops over the time of the study, would be to use a post measure only with a retrospective pre and post measure—where the participant fills out the survey with both T1 and T2 scores at the end of the intervention (Meyer et al. 2013) thereby reporting a clear measure of self-perceived change over time.

A further limitation was lack of clarity regarding which element(s) of the intervention led to the positive results. The intervention included mindfulness teaching, outdoor adventure activity, and time in nature, which are all likely to be mediating or confounding variables. This leads to a question of whether similar results would have been observed if there was no mindfulness teaching embedded in the Outward Bound Mindfulness Program. A future design should include an additional group engaged only with mindfulness practices and/or a control group participating in an adventure program without mindfulness training. This would support identification of the unique contribution of mindfulness practices combined with nature exposure and help outdoor educators to understand how to design effective mindfulness programs in the future. Last, consideration is warranted for the review of mindfulness curriculum, best-practices in mindfulness pedagogy and mindfulness measures for future research informed in part by the results of this pilot study.

Conclusion

The growing body of research focusing on mindfulness and the role of nature suggests that these are complementary intervention strategies connected with management of mental health. When people are in natural environments and away from the normal distractions of everyday living, awareness of the present moment and attention are heightened. This pilot study investigated an adventure program in nature augmented by mindfulness practices. It demonstrated benefits of such a program, which were maintained at three months following the end of the program. This study has a number of limitations which must be taken into consideration, however the results indicate the promise of combining adventure, nature and mindfulness and the need for further investigation to truly understand what mechanisms are at play.

Compliance with ethical standards

Conflict of interest The first, third and fourth authors on this paper have no affiliations with, or involvement in, the organization where the study occurred. The second author holds a volunteer position with the organization as coordinator of research. His involvement in this study was to assist in the study's logistics and the writing of the manuscript. He was not involved in data collection or analysis.

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