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# Wellbeing and nature connectedness for emerging adult undergraduates after a short expedition: A small pilot study

## Abstract

**Issue addressed:** Emerging adult university undergraduates are a vulnerable population due to various life stressors. Previous studies have reported a range of positive outcomes from outdoor expeditions for this population. This small pilot study aimed to investigate the impacts of an outdoor expedition on wellbeing and connectedness to nature and possible confounding by gender and living environment. **Methods:** A sample of 54 Health and Physical Education emerging adult undergraduates in the second year of their four-year degree completed a 3-day/2-night immersion expedition. Pre-post differences and a repeated-measures analysis with confounders examined the expedition's impact on scores from the Warwick-Edinburgh Mental Well-being Scale and Connectedness to Nature Scale. **Results:** Involvement in a short expedition improved well-being and connectedness to nature. Females reported a stronger connectedness to nature than males, while living environments may affect well-being. **Conclusions/So what?** Incorporating regular contact with nature into the structure of undergraduate programs may improve wellbeing and protect this population's mental and emotional health. In a world adjusting to the effects of a global pandemic, opportunities for teaching in non-traditional classrooms (such as outdoors) may also protect physical health.

## Keywords

environmental health, healthy environments, mental health

## Introduction

Mental health issues are multidimensional, comprising social and emotional wellbeing and influencing how individuals can achieve their potential and cope with life stressors.<sup>1</sup> Keyes<sup>2</sup> proposed three levels of mental health in the general population, with some leading a life of quiet despair (*languishing*), others actively engaged with other people and enthusiastic about life (*flourishing*), with the remainder being referred to as moderately mentally healthy people. The association between emerging adulthood (18-26-year-olds) and psychological correlates such as mood, personality, and psychiatric disorders are risk factors for mental health issues.<sup>3</sup> For emerging adults, the transition from secondary school presents new challenges and developmental stressors, particularly shown in university undergraduates.<sup>4</sup> The most recent census data show that close to one million students were enrolled in undergraduate study in 2011, with the average age of undergraduates being 26.9 years.<sup>5</sup> The economic cost of emerging adult mental ill-health can have a large impact on the economies of middle and high-income countries, with mental illness (*languishing*) representing an economic burden to these countries.<sup>6</sup>

For university undergraduates, new challenges such as increased academic workload and time management expectations often require the management of psychosocial risks (e.g. heightened stress, depression, anxiety, dysfunctional thoughts) and adjustment difficulties to succeed.<sup>7-9</sup> Poor management of these risks can lead to negative outcomes such as decreased academic performance and poor wellbeing.<sup>7</sup> The effects of poor wellbeing for emerging adults are wide-ranging, with correlates between low self-efficacy, resilience, self-esteem, stress, anxiety, and depression all reported in the literature.<sup>7</sup> These effects are especially relevant for female undergraduates, with higher incidences of emotional problems and mental ill-health.<sup>10</sup> Adapting to undergraduate study stressors can lead to important skill developments that will benefit undergraduates after graduation.<sup>7-9</sup>

Due to urbanisation, opportunities for interaction with the natural world and green spaces have been reduced for people living in urban areas of middle and high-income countries. The innate emotional affiliation for the natural world known as *biophilia* is often attributed to supporting wellbeing by placing value on green spaces, with a lack of contact resulting in decreased wellbeing.<sup>11</sup> Children are disconnected from nature due to this urbanisation, with nature disconnectedness present in adolescence and emerging adulthood and onward through the life course.<sup>12</sup> Evidence suggests that time spent in nature or green spaces improves wellbeing and overall psychological health, though there appears to be a

lack of consensus of how much time is required to reap these wellbeing benefits.<sup>13-15</sup> Further, there is a link between nature connectedness, overall happiness, and positive wellbeing.<sup>16-19</sup> Research also suggests that some undergraduates prefer the natural environment as a leisure space, with positive benefits noted in the literature.<sup>20</sup>

Connectedness to nature is a subjective measure of how nature fits into an individual's identity.<sup>21</sup> Connectedness to nature is formed by individual or group experiences, with a strong connectedness to nature being a predictor of positive wellbeing for emerging adults.<sup>14,19,22</sup> The literature also notes a range of psychological and physical health benefits resulting from connectedness to nature, a reduction in stress-related illnesses, as well as increased positivity and happiness.<sup>12,14,16-19,21,23</sup> A connectedness to nature is also associated with improved self-efficacy, resilience, and self-esteem in emerging adults.<sup>18,24,25</sup> By providing opportunities for individual experiences that promote connectedness with the natural environment through incidental encounters, organised group activities in nature, or an intervention study, emerging adults can reap many benefits that ultimately lead to improved wellbeing.

Outdoor expeditions are typically undertaken in natural, non-urban settings. As such, practitioners can use the expedition as a medium to implement nature-based interventions, areas of study such as science, the promotion of ecosystemic (human to nature) relationships,<sup>21,26</sup> developing interpersonal and intrapersonal relationships,<sup>27</sup> young offender or youth-at-risk programs,<sup>28,29</sup> and undergraduate (or college) orientation programs.<sup>25,29</sup> The expedition is also used extensively in outdoor education in schools and undergraduate programs, with outcomes such as facilitation skills, leadership, problem-solving, and practical skill development (such as cooking on a camping stove or erecting a shelter) noted in the literature.<sup>30,31</sup> The structure of an expedition will vary according to outcome goals (e.g. outdoor education may focus on leadership, young offenders may focus on reform) and will vary in length (from a day trip to multiple months), but strong and long-lasting self-control benefits (such as assertiveness, confidence, decision-making, internal locus of control, self-efficacy, and self-understanding) have been reported.<sup>30</sup> These self-control benefits are linked with wellbeing development in emerging adults, so an outdoor expedition may assist this population at their life course stage.

The literature supports the assertion that connectedness to nature improves emerging adults' wellbeing; however, there is minimal empirical data to support the impacts of nature for emerging adult undergraduates. Therefore, this study's main aim was to examine the impact of an outdoor expedition on emerging adult undergraduate wellbeing and

connectedness to nature. The second aim was to investigate how participant gender and home living environment influenced the study's main aim.

## **Method**

### **Participants**

A convenience sample of 54 undergraduate university students aged 18-to-32 years was recruited to participate in the outdoor expedition, of which 23 (43%) identified as male and 31 (57%) identified as female. Participants were enrolled in the Bachelor of Health and Physical Education undergraduate degree at a metropolitan private university and were in the second year of a four-year course. Participants were informed that participation was voluntary, anonymous, did not influence their grades or relationship with the university, and that data collection would be performed by researchers independent of the course they were enrolled in to minimise issues with coercion. Collected demographic information asked participants about the usual living environment that they travelled to university from home during the semester, resulting in a split between living in a rural environment (farmland, sparsely populated [ $n = 2$ , 4%]), suburban environment (residential areas of a large city [ $n = 40$ , 74%]), or urban environment (urbanised area with high population density [ $n = 12$ , 22%]). Institutional ethical approval was granted for the study by the XXX Human Research Ethics Committee (approval number 017009F), with all participants providing written consent. The study was conducted as per the Declaration of Helsinki.

### **Program**

This outdoor expedition was three days and two nights in duration. Due to the possibility of teaching Outdoor Education after graduating from their degree, this expedition aimed to expose pre-service Health and Physical Education teachers to a short expedition through immersion. This outdoor expedition was a course requirement of the degree, being the first of two mandatory Outdoor Education courses these students undertook as part of their studies. As the cohort size was considerably larger than the typical outdoor expedition group size, all students were randomly assigned into one of four groups ( $n = 14$ ) and participated in the same program. In their expedition groups and under the direction of an expedition instructor, students packed clothing, food, and camping equipment into a large hiking backpack at the beginning of the program and were not permitted to access their

vehicles or mobile phones for the program's duration. Students were taught how to erect a shelter and establish a campsite, cook their meals using a lightweight camping stove, complete their ablutions in an environmentally sound manner using minimal impact, receive briefings on technical skills and risk management in four-hour sessions of mountain biking, rock climbing and high ropes activities, flatwater canoeing, and navigation, followed by debriefing sessions about their experiences. In the first week of the semester, students were divided into pairs and required to plan a 15-minute team building activity for their peers, which they facilitated and debriefed during the expedition. The weighting of this assessment formed 10 per cent of the overall grade for the semester. No other assessments were conducted on the expedition.

## **Procedure**

Demographic information, namely gender (male/female), age in years, university degree, and living environment (rural/suburban/urban), and pre-program wellbeing and connectedness to nature survey data were collected from participants in a classroom on campus two weeks before the scheduled expedition. Post-program data were collected in a natural setting at the outdoor education setting at the conclusion of the expedition. All participants completed both surveys before and after the expedition. Wellbeing was assessed using the Warwick-Edinburgh Mental Well-being Scale (WEMWBS).<sup>32</sup> The WEMWBS is a validated (Cronbach's  $\alpha = 0.89$ )<sup>33</sup> and reliable (test-retest reliability  $r = 0.83$ )<sup>34</sup> tool to assessment wellbeing in emerging adults. It comprises 14 items that assess the psychological function and subjective wellbeing of respondents. Scores range from 14 to 70. A higher score indicates better wellbeing.

The Connectedness to Nature Scale (CNS) was used to measure connectedness to nature in this study.<sup>19,35</sup> This survey measured the subjective connectedness between nature and individuals and is widely considered a reliable and accurate survey tool.<sup>19</sup> Responses to 14 items are added together, with a higher score indicating a stronger connectedness to nature. The CNS is valid ( $\alpha = 0.84$ ) and reliable ( $r = 0.80$ ).<sup>35</sup>

## **Data Analysis**

SPSS version 27 was used for data analysis.<sup>36</sup> WEMWBS and CNS scale scores were computed according to scoring instructions. Both scales were described using mean ( $M$ ), standard deviation ( $SD$ ), median ( $Md$ ), interquartile range ( $IQR$ ), and range (minimum to

maximum) for the total sample as well as split for gender and living environment. The Shapiro-Wilk test for normality indicated WEMWBS data were not normally distributed, and CNS data were normally distributed. Pre- and post-expedition scores were compared using the Wilcoxon signed-rank test ( $Z$ ) for WEMWBS and the dependent t-test ( $t$ ) for CNS scores. For WEMWBS, a Mann Whitney U Test ( $U$ ) examined gender differences and a Kruskal-Wallis H test ( $H$ ) examined living environment differences. For CNS, an independent t-test ( $t$ ) examined gender differences, and an analysis of variance (ANOVA:  $F$ ) examined living environment differences. A repeated measures generalised linear model (GLM) for both WEMWBS and CNS examined fixed effects: time (pre- and post-expedition), with confounders gender and living environment. Bonferroni corrected pairwise comparisons were conducted for participants' living environment. Model residuals were examined with only a slight deviation at the tail noted for the WEMWBS model. Wald Chi-square ( $\chi^2$ ) model effects and confidence intervals (CI) are reported. Statistical significance for all analyses was  $p < 0.05$ , and standardised test statistics are reported for group comparison tests.

## Results

### Wellbeing

Descriptive statistics are provided for WEMWBS in Table 1. WEMWBS post-test ranks ( $Md = 55.00$ ) were significantly higher than the median pre-test ranks ( $Md = 51.0$ :  $Z = 3.7$ ,  $p < .001$ ), and no significant difference was detected in WEMWBS scores between males and females either before ( $U = -1.4$ ,  $p = .166$ ) or after the expedition ( $U = -0.6$ ,  $p = .583$ ). Similarly, no significant differences in pre-expedition ( $H = 4.05$ ,  $p = .132$ ) or post-expedition ( $H = 1.9$ ,  $p = .378$ ) scores across the three living environments.



**Table 1. Wellbeing Descriptive Statistics.**

	Pre-expedition WEMWBS						Post-expedition WEMWBS				
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Md</i>	<i>IQR</i>	Range	<i>M</i>	<i>SD</i>	<i>Md</i>	<i>IQR</i>	Range
<b>Total</b>	52	50.9	7.8	51.0	46.0 – 56.0	49.0	54.1	7.2	55.0	50.0 – 57.0	38.0
<b>Gender</b>											
Male	23	52.1	6.2	53.0	47.0 – 57.0	24.0	55.8	6.6	55.0	54.0 – 56.0	28.0
Female	29	50.0	8.9	51.0	44.0 – 55.0	49.0	53.4	7.4	56.0	48.0 – 57.0	34.0
<b>Living environment</b>											
Rural	2	39.0	8.5	39.0	33.0 – 45.0	12.0	47.0	12.7	47.0	38.0 – 56.0	18.0
Suburban	39	51.7	7.9	52.0	46.0 – 56.0	44.0	55.6	6.3	56.0	51.0 – 59.0	25.0
Urban	11	50.2	6.2	51.0	45.0 – 56.0	20.0	51.8	8.1	55.0	48.0 – 56.0	30.0

*Note.* Higher scores indicate better wellbeing<sup>32</sup>. *IQR* = interquartile range.

The WEMWBS GLM reported a significant model effect for time (pre/post) ( $\chi^2 = 6.9$ ,  $p = .009$ ) and living environment ( $\chi^2 = 9.6$ ,  $p = .008$ ) but not gender ( $\chi^2 = 1.7$ ,  $p = .196$ ). Parameter estimates are provided in Table 2, showing a model estimated improvement of 3.6

units in WEMWBS scores post-expedition. Bonferroni post hoc comparisons indicated that the living environment difference was significant only between the rural and suburban environment ( $p = .020$ ), with rural students having lower scores.

**Table 2. Generalised Linear Model for Wellbeing.**

	$\beta^a$	SE <sup>b</sup>	Confidence Interval		<i>p</i> -value
			Lower	Upper	
<b>Intercept</b>	51.8	1.7	48.4	55.2	< .001
<b>Time: Pre-expedition<sup>c</sup></b>	-3.6	1.4	-6.2	-0.9	.009
<b>Gender: Male<sup>d</sup></b>	1.8	1.4	-0.9	4.5	.196
<b>Living Environment<sup>e</sup></b>					
Rural	-7.0	3.9	-14.6	0.6	.070
Suburban	2.9	1.6	-0.4	6.1	.085

<sup>a</sup>  $\beta$  beta estimate,

<sup>b</sup> SE standard error,

<sup>c</sup> comparison group post-expedition with the parameter set to zero,

<sup>d</sup> comparison group female with the parameter set to zero,

<sup>e</sup> comparison group urban with the parameter set to zero.

### Connectedness to Nature

Descriptive statistics are provided for CNS in Table 3. A significant increase in connectedness to nature after the expedition ( $M = 3.6$ ,  $SD = 0.4$ ) compared to before the expedition ( $M = 3.4$ ,  $SD = 0.4$ :  $t(54) = -4.5$ ,  $p < .001$ ). Males scored significantly lower ( $M = 3.3$ ,  $SD = 0.5$ ) than females ( $M = 3.5$ ,  $SD = 0.3$ ) in pre-expedition scores ( $t(54) = -2.1$ ,  $p = .046$ ), but no significant gender differences ( $t(53) = -1.2$ ,  $p = .255$ ) were detected after the program. No significant differences in CNS scores were detected for participant's living environment pre- ( $F = 0.4$ ,  $p = .667$ ) or post-expedition ( $F = 0.2$ ,  $p = .786$ ).

**Table 3. Connectedness to Nature Descriptive Statistics**

	Pre-expedition CNS						Post-expedition CNS				
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>Md</i>	<i>IQR</i>	Range	<i>M</i>	<i>SD</i>	<i>Md</i>	<i>IQR</i>	Range
<b>Total</b>	54	3.4	0.4	3.4	3.1 – 3.7	1.9	3.6	0.4	3.6	3.3 – 3.9	2.5
<b>Gender</b>											
Male	23	3.3	0.5	3.3	2.9 – 3.6	1.6	3.5	0.5	3.5	3.2 – 3.9	2.1
Female	31	3.5	0.3	3.5	3.2 – 3.7	1.2	3.6	0.4	3.6	3.4 – 3.9	1.9
<b>Living environment</b>											
Rural	2	3.2	0.2	3.2	3.1 – 3.3	0.2	3.7	0.6	3.7	3.3 – 4.1	0.8
Suburban	40	3.4	0.4	3.4	3.3 – 3.7	1.9	3.6	0.4	3.6	3.3 – 3.9	2.5
Urban	12	3.4	0.3	3.3	3.1 – 3.6	1.1	3.5	0.4	3.5	3.1 – 3.8	1.4

*Note.* Higher scores indicate better connectedness to nature [26]. *IQR* = interquartile range.

The CNS GLM reported a significant model effect for time (pre/post) ( $\chi^2 = 6.1, p = .014$ ) and gender ( $\chi^2 = 5.3, p = .021$ ), but not living environment ( $\chi^2 = 0.7, p = .628$ ). Parameter estimates are provided in Table 4, showing a model-estimated improvement of 0.2 units in CNS scores post expedition. Overall, male CNS scores were significantly lower than females.

**Table 4. Generalised Linear Model for Connectedness to Nature.**

	$\beta$	SE	Confidence Interval		<i>p</i> -value
			Lower	Upper	
<b>Intercept</b>	50.6	1.4	47.9	53.3	< .001
<b>Time: Pre-expedition<sup>c</sup></b>	-2.7	1.1	-4.8	-0.5	.014
<b>Gender: Male<sup>d</sup></b>	-2.6	1.1	-4.8	-0.4	.021
<b>Living Environment<sup>e</sup></b>					
Rural	-1.3	3.1	-7.4	4.7	.670
Suburban	0.9	1.3	-1.7	3.4	.502

<sup>a</sup>  $\beta$  beta estimate,

<sup>b</sup> SE standard error,

<sup>c</sup> comparison group post-expedition with the parameter set to zero,

<sup>d</sup> comparison group female with the parameter set to zero,

<sup>e</sup> comparison group urban with the parameter set to zero.

## Discussion

This pilot study's primary aim was to examine the impacts of an outdoor immersion expedition on undergraduate student wellbeing and connectedness to nature. The literature trend supports the positive effects of time spent in nature for various populations and outcomes.<sup>12,18,21-23</sup> However, minimal empirical data support the impacts of nature on emerging adult undergraduate wellbeing.

This small Australian study's findings indicated a relationship between a short immersive outdoor expedition and improved emerging adult undergraduate wellbeing. These findings align with literature examining university outdoor orientation programs internationally, with baseline data being similar to other studies.<sup>37</sup> Our findings indicate a value in immersive outdoor expeditions to support student wellbeing during undergraduate study. As this student cohort was in the second semester of their second year of study, strong interpersonal bonds between students were likely already established, but the novel environment and activities of an outdoor expedition may have resulted in new opportunities for social interaction and corresponding wellbeing outcomes. Between 2018-2019, the cost of mental health issues to the Australian economy was estimated to be AUD 9.9 billion.<sup>38</sup> Further, 4.3 million people received medications to treat various mental health issue-related conditions. Suicide and self-inflicted injuries are the leading health burden for emerging adult

males, and anxiety is the leading burden for females.<sup>38</sup> To reduce the economic, health and social burdens caused by mental health issues, time spent in a natural setting as part of an expedition may benefit emerging adult undergraduates, with research suggesting that occasional, immersive, nature-based expeditions may be beneficial in reducing mental health stressors.<sup>10</sup> As a typical undergraduate program takes three to four years to complete, opportunities for such experiences may exist throughout a program.<sup>10</sup>

Participants in our small pilot study also experienced an increased connectedness to nature after the expedition, with our findings showing similarities to studies with this population.<sup>39</sup> There is an established relationship in the literature between nature connectedness, ecological and conservation behaviour, and subjective wellbeing. The effects of regular time spent in nature can act as a powerful protective factor for emerging adult mental health issues and wellbeing, leading to increased pro-social behaviour and self-esteem,<sup>12,24</sup> academic efficacy,<sup>40</sup> and resilience.<sup>25</sup> Due to increased urbanisation, opportunities for interaction with the natural environment should promote emerging adult wellbeing.<sup>11,21</sup> An opportunity exists to provide such programs within university settings, particularly as some universities encourage broadening study units within their undergraduate programs.<sup>41</sup> In addition to connectedness to nature, outdoor expeditions are linked to nature and place appreciation, correlates of good wellbeing.<sup>42</sup> These opportunities may partially explain why some of the student cohort had chosen to undertake a minor (six Outdoor Education units) or specialisation (four Outdoor Education units) as part of their degree, resulting in a preconceived bias toward the natural environment. However, it should be acknowledged that being in a natural setting may invoke negative responses such as fear or anxiety in some students.<sup>43</sup>

This pilot study's secondary aim was to examine whether participant gender and living environment impacted wellbeing and connectedness to nature scores. In the current study, participant gender was a variable that influenced connectedness to nature, but not wellbeing, with males reporting a significantly lower connectedness to nature. The role of gender in the outdoors has produced mixed results in the literature, with some studies showing females eliciting larger changes than males in outcome variables.<sup>44</sup> In our study, compared to females, males were less connected to nature pre-program, but this difference was no longer detected post-expedition. This result may be interpreted as an outdoor expedition potentially benefiting males in general or that a greater benefit is seen when CNS baseline scores are lower. Our GLM, which examined all factors together, suggest that gender is an important factor concerning connectedness to nature. Cook<sup>45</sup> surmised that

perceived competence and experiences in the outdoors generally tended to reflect wider social assumptions about the role of each gender. Thus, these different scores may be influenced by preconceived notions of comfort and competence in an expedition or natural setting.

Further, a participant's home living environment influenced well-being findings, but not connectedness to nature. Of interest was the small number of participants who lived in rural areas and had the lowest pre-expedition wellbeing but experienced twice as much positive change in WEMWBS scores as those in suburban areas. It could be expected that the living environment of most participants in this study would be similar to other undergraduates worldwide, namely, living in urban or suburban areas. A future qualitative study should explore the differences between undergraduate living environments and their connectedness to nature.

The authors acknowledge some limitations in this small pilot study. Pre-expedition mean scores for wellbeing and connectedness to nature were both relatively high, indicating statistical ceiling effects were likely in place and limiting the possible magnitude of changes to survey scores. These relatively high scores may also be attributed to the type of student cohort (health and physical education students) who may have a preconceived bias towards the natural environment, outdoor education, and outdoor expeditions. Therefore, this study provides evidence to conduct sample size calculations to adequately power future studies to detect such changes in participants who already feel somewhat connected to nature and have high wellbeing scores.<sup>46</sup> Post-program data collection occurred while still in a natural setting, potentially influencing survey responses (particularly the CNS).

Further, this study did not account for confounding variables such as the weather or prior participant experience outdoors. These factors may have influenced findings,<sup>47</sup> and require an adequately powered study sample. The social aspect of the expedition may have had a bearing on post-program survey scores, resulting in inflated results for the two outcome domains.<sup>48</sup> Further, while the study design focused on the impact of outdoor immersion, it did not consider this social aspect in terms of an activity that promotes connection with others, although the impact for students in the later stage of their degrees is expected to be less than those in their early stages.<sup>48</sup> While demographic questions captured participant living environment, it did not capture their living situation and whether they lived in university accommodation, with family, friends, or alone, potentially affecting responses to the domain measures.<sup>49</sup> Finally, program implementation fidelity was not controlled for,

which may account for different student group experiences as a result of instructor personality or approach, and result in different post-expedition survey results.<sup>50</sup>

This small pilot study's findings indicate that for Western Australians, outdoor expeditions show potential as a successful medium for improving connectedness to nature and wellbeing for emerging adult undergraduates, especially those living in rural areas. The stressors for this population can lead to mental health issues if left unaddressed, with this study demonstrating the role that connectedness to nature can play in reducing stress and improving wellbeing. By developing a connectedness to nature through an outdoor expedition, emerging adult undergraduates can actively engage with others in a flourishing state, an important protective factor for mental health issues.

This research has implications for emerging adult undergraduates and the administrators of undergraduate university programs, where nature connectedness opportunities could improve the wellbeing of some students. In a world adjusting to the effects of a global pandemic, opportunities for teaching in non-traditional classrooms (such as the outdoors) have necessitated novel approaches to protect the physical health of undergraduate students. Incorporating regular contact with nature into the structure of undergraduate programs may improve wellbeing and protect this population's mental and emotional health.

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