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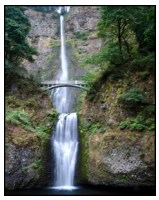

The psychological and social benefits of a nature experience for children: A preliminary investigation

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ABSTRACT

There are active movements to connect children with nature to improve their well-being. However, most of the research on children and nature has focused on cognitive benefits or used non-experimental designs. In a preliminary study, we examined the potential benefits of a 4-hour nature experience on children's mood, pro-sociality, and attitudes toward nature. Eighty students from an urban Canadian elementary school were recruited to participate in field trips to a nature school and an aviation/space museum. Children reported more positive and negative emotions, a closer connection to nature, and a greater willingness to protect nature when at the nature school. We also found indications that children were more pro-social at the nature school. Although further research is needed to replicate these findings with additional populations/environments, this study suggests that children largely benefit from spending time in nature.

1. Introduction

Children today are spending less time outside than previous generations (Burdette & Whitaker, 2005; Clements, 2004; Juster, Ono, & Stafford, 2004; Louv, 2005). This is concerning as spending time in nature during childhood is linked with increased pro-environmental behaviors later in life (Evans, Otto, & Kaiser, 2018). Longitudinal and cross-sectional studies support the idea that children who live near nature and spend more time in nature experience more well-being, have better social skills, and hold more environmentally friendly attitudes (Cheng & Monroe, 2012; O'Brien & Murray, 2007; Wells & Evans, 2003). However, causality is difficult to establish in these studies. We conducted a preliminary study to investigate whether spending time in nature could increase children's momentary mood, pro-sociality, nature connectedness, and willingness to protect nature.

1.1. The individual/social benefits of nature exposure for children

Children seem to enjoy being in nature. When children are asked to think of their favorite places, they often describe natural environments, and associate them with feelings of calmness and being relaxed (Chawla, 2014; Korpela, 2002). Living near nature or having green school yards is associated with less stress and higher psychological well-being among children (Chawla, Keena, Pevec, & Stanley, 2014; Kelz, Evans, & Roderer, 2015; Wells & Evans, 2003). There are also immediate benefits from spending time in nature, such as higher positive affect, increased energy, and less anger (Li, Deal, Zhou, Slavenas, & Sullivan, 2018; Roe & Aspinall, 2011). Although less studied than emotional benefits, time outdoors may also promote pro-social behaviors. For example, children who spent time at a forest school over an 8-month period were judged to have better social, language, and communication skills compared to baseline (O'Brien & Murray, 2007; see also Burdette & Whitaker, 2005 and Gill, 2014 for reviews). Experimental research with adults has also suggested a causal link between nature exposure and pro-sociality (Weinstein, Przybylski, & Ryan, 2009; Zelenski, Dopko, & Capaldi, 2015).

1.2. Children's nature connectedness and environmental attitudes

The construct of nature connectedness in children focuses on affective responses to nature (e.g., feeling love towards nature), and how children think about nature (e.g., the importance of protecting nature; Collado, Staats, & Corraliza, 2013; see also Mayer & Frantz, 2004; Frantz, Mayer, Norton, & Rock, 2005; and Nisbet, Zelenski, & Murphy, 2009 for discussions on the concept of trait and state nature connectedness in adults). Research suggests that nature exposure can foster children's nature connectedness and willingness to perform pro-environmental behaviors. Specifically, children who attended two-week nature camps had higher post-test scores on measures of nature connectedness, ecological beliefs, and willingness to engage in ecological

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behaviors, compared to children who went to an urban camp (Collado et al., 2013). However, children were not randomly assigned to camp locations, thus limiting causal inferences in this study.

Across many countries, environmentally oriented adults commonly mention that nature experiences during their childhood motivated their love towards nature and environmental stewardship (Chawla & Cushing, 2007). Indeed, longitudinal research shows that time spent outdoors at age six predicts pro-environmental behaviors at age eighteen (Evans et al., 2018). Researchers have also compared wild nature activities (e.g., camping, hiking) to domestic nature activities (e.g., gardening) during childhood and found a stronger relationship between wild nature activities and adult environmental attitudes and behaviors (Wells & Lekies, 2006).

1.3. Rationale of study

Children who grow up near nature or spend time in nature appear to reap psychological and social benefits, and may engage in more pro-environmental behaviors. However, many of the studies examining childhood nature exposure and pro-environmental attitudes/behaviors had adults recall their childhood memories (Chawla, 2009; Kals, Schumacher, & Montada, 1999), or used non-experimental, longitudinal designs where many factors vary. We sought to complement this work by conducting a preliminary study that exposed children to a natural setting, and compared the experience to an indoor, control condition using a within-person design. This study focused on relatively short experiences in nature, and their potential to alter children's moods, attitudes about the environment, and pro-social behaviors. Although these changes are likely temporary, this study takes a preliminary step towards determining causal direction with more confidence.

To examine the effects of nature exposure, we assessed children after spending time at the Forest and Nature School in Ottawa, compared to spending time at the Canada Aviation and Space Museum. We hypothesized that children would (1) experience more positive affect and less negative affect, (2) report a stronger connection to nature and a greater willingness to protect it, and (3) be more pro-social after spending time outdoors at the nature school vs. indoors at the museum.

2. Method

2.1. Participants

Eighty students (M_{age} = 10.49, SD_{age} = 0.55) from an Ottawa public school attended at least one of the field trips. Sample size was determined largely by pragmatic limitations rather than an a priori power analysis. Nevertheless, to observe average sized effects (Richard, Bond, & Stokes-Zoota, 2003) with 80% power in a within-subjects design, a sample size of 45 was needed, which was met/almost met for all measures despite missing data (see Supplementary Material for additional information).

3. Materials

All materials are provided in the Supplementary Material. Overall descriptive statistics are reported in Table S1 of the Supplementary Material.

Children were asked to complete a shortened mood measure (Ebesutani et al., 2012) that was adapted from the Positive and Negative Affect Schedule for Children (Laurent et al., 1999). Items were added to also measure vitality, low arousal pleasant affect, and the amount of fun students had as outcomes for this study.

To assess state nature connectedness children rated 8 items that measured how they feel towards nature and 7 items about how they think about nature (Perkins, 2010; Silvas, 2013).

A 6-item measure was used to assess how willing children were to protect nature (Kals et al., 1999; Silvas, 2013).

Two tasks were used to assess children's pro-sociality. First, a windfall task (Richins & Dawson, 1992) asked children to imagine they unexpectedly received $100 and could decide how to spend the money. There were four categories that they could choose from: (1) buy things they want, (2) give to charity, (3) spend on gifts for other people, and (4) save for the future. In this study, allocating more money to charity and gifts for other people represented higher pro-sociality. As another measure of momentary pro-sociality, children were asked to complete a tangram task (Gentile et al., 2009). Children were asked to imagine they were assigning tangrams to someone else in their class and to choose 11 tangrams from three categories: easy, medium, and hard. Assigning more tangrams from the easy and medium categories, and fewer tangrams from the hard category represented higher pro-sociality.

3.1. Procedure

This study received ethical clearance from a university ethics board, and the local school board ethics committee. The design was within-person, where each student attended the nature school and the museum. Due to scheduling difficulties, the field trips were not counterbalanced in time: the students always attended the nature school first, and visited the museum approximately three weeks later. The students were transported to each location by school bus accompanied by their homeroom teachers and parent volunteers. At the nature school, children explored a forested area. The main purpose was to immerse children in wild nature (see Forest School Canada, 2014). At the museum, children were taken on a guided tour of the flight program where children learned how airplanes fly and then explored aircrafts (both are described in S1 of the Supplementary Material).

4. Results

Paired samples *t*-tests were used to analyze differences between the nature school and the museum (results are reported in Table 1 and visualized in Fig. 1; see Supplementary Material for information on data cleaning, missing data, outliers, and normality issues). For mood, children reported significantly more positive affect when at the nature school. Surprisingly, children also reported significantly more negative affect when at the nature school. Children did not significantly differ in their vitality, low arousal pleasant affect, or how much fun they had across locations. Children reported significantly higher overall nature connectedness, as well as higher scores on both subscales, and were more willing to protect the environment when at the nature school.

For measures of pro-sociality, children at the nature school allocated significantly more money to charity in the windfall task compared to when they were at the museum. The paired samples *t*-test on the amount of money allocated for gifts was marginally significant; unexpectedly, children at the nature school gave less money for gifts, compared to when they were at the museum. The two other categories (buying stuff for themselves and saving) did not differ significantly between locations. On the tangram task, when children were at the nature school, they assigned significantly fewer hard tangrams to another hypothetical student in their class (suggesting more pro-sociality), compared to when they were at the museum. They also assigned more easy tangrams when at the nature school. When children were at the nature school, they assigned more medium difficulty tangrams, compared to when they were at the museum, but this difference was only marginally significant. Collectively, these differences suggest that children made more pro-social choices after spending the day in nature. See Table S2 in Supplementary Material for correlations between outcome variables at each location.

Table 1
Comparing dependent variables across locations.

	Nature School		Museum						
Outcome	*M (SD)*	α	*M (SD)*	α	M_{diff} (95% CI)	*t*	*df*	*p*	d_z (95% CI)
Mood									
Positive Affect	4.22 (0.76)	.84	3.98 (0.94)	.87	0.24 (0.02, 0.45)	2.22	61	.03	0.28 (0.03, 0.54)
Negative Affect	1.43 (0.62)	.76	1.17 (0.34)	.43	0.26 (0.11, 0.42)	3.42	59	.001	0.44 (0.18, 0.71)
Vitality	3.72 (1.08)	.64	3.57 (1.19)	.79	0.16 (−0.19, 0.50)	0.90	61	.37	0.11 (−0.14, 0.36)
Pleasant Affect	3.63 (0.99)	.57	3.48 (1.09)	.72	0.15 (−0.14, 0.45)	1.03	58	.31	0.13 (−0.12, 0.39)
Fun Today	4.88 (0.37)		4.71 (0.79)		0.18 (−0.05, 0.40)	1.59	58	.12	0.21 (−0.05,0.46)
Nature Connectedness									
Feel	4.20 (0.74)	.83	3.93 (0.88)	.85	0.28 (0.11, 0.44)	3.42	62	.001	0.43 (0.17, 0.69)
Think	4.26 (0.67)	.71	4.11 (0.78)	.83	0.15 (0.01, 0.29)	2.19	61	.03	0.28 (0.02, 0.53)
Overall	4.23 (0.65)	.88	4.01 (0.79)	.90	0.22 (0.09, 0.35)	3.40	62	.001	0.43 (0.17, 0.69)
Willing Protect Nature	4.17 (0.78)	.82	4.00 (0.88)	.85	0.17 (0.02, 0.32)	2.29	61	.03	0.29 (0.04, 0.54)
Windfall Task									
Buy Stuff	23.66 (17.96)		21.73 (15.12)		1.93 (−4.65, 8.51)	0.59	40	.56	0.09 (−0.22, 0.40)
Charity	36.34 (14.54)		32.68 (11.94)		3.66 (0.06, 7.26)	2.05	40	.047	0.32 (0.01, 0.63)
Gifts	16.22 (13.08)		20.37 (12.01)		−4.15 (−8.32, 0.03)	−2.01	40	.051	−0.31 (−0.63, 0.002)
Save	23.78 (18.33)		25.22 (15.33)		−1.44 (−7.95, 5.07)	−0.45	40	.66	−0.07 (−0.38, 0.24)
Tangram Task									
Easy	3.71 (2.87)		2.98 (2.35)		0.74 (0.01, 1.46)	2.06	41	.046	0.32 (0.01, 0.63)
Medium	3.50 (1.95)		2.98 (1.62)		0.52 (−0.02, 1.07)	1.93	41	.06	0.30 (−0.01, 0.61)
Hard	3.76 (2.55)		5.05 (2.85)		−1.29 (−2.15, −0.42)	−2.99	41	.005	−0.46 (−0.78, −0.14)

Note. Cronbach's alphas are missing for some dependent variables when they were only measured with one item.

4.1. Missing data analyses

To account for missing data, we also conducted latent growth curve analyses using maximum likelihood estimation in Mplus (Voelkle, 2007). The trends in the data did not change, but a few findings crossed significance signposts: the nonsignificant effect on self-reported fun became marginally significant (p = .08), the marginally significant effect where students spent more on gifts at the museum became nonsignificant (p = .15), and the marginally significant effect where students assigned more medium difficulty tangrams at the nature school became significant (p = .02; see Tables S3–S6 in Supplementary Material).

5. Discussion

This preliminary study suggests that spending time in nature has psychological and social benefits for children, though some results were mixed. For example, children reported higher levels of both positive and negative affect at the nature school. The link between nature and positive affect accords well with correlational and adult studies (e.g.,

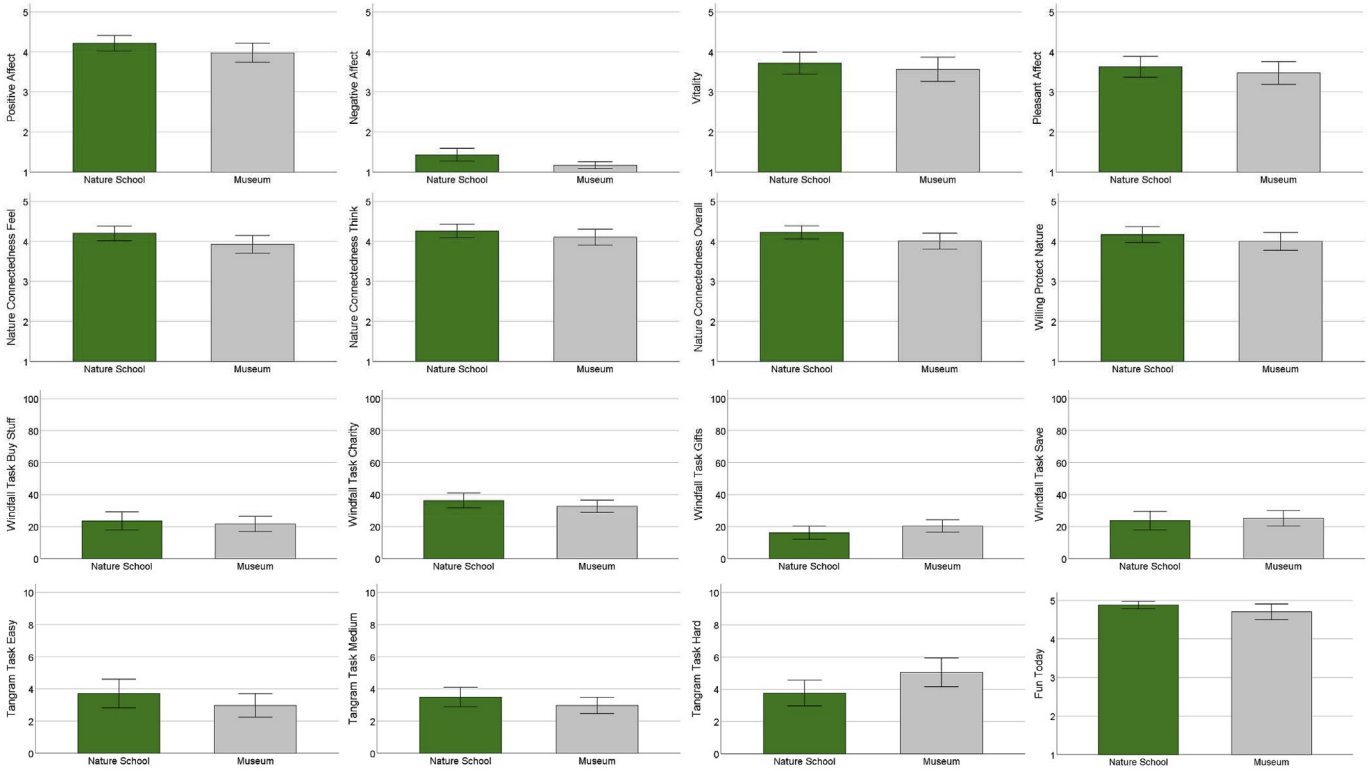

Fig. 1. Comparing dependent variables across locations. Error bars are 95% confidence intervals.

McMahan & Estes, 2015). Anecdotal observations may help explain the unexpected negative affect in nature (e.g., some children expressed a fear of seeing snakes/bears/wolves). Many of the children also reported having minimal experience in the wilderness, which may explain why children reported more negative affect at the nature school. Additionally, the weather was not ideal while students were at the nature school which might have also contributed to more negative feelings. Despite the comparatively higher negative affect at the nature school, the mean levels of negative affect were low across both conditions.

Turning to pro-sociality, children in nature assigned fewer difficult tangrams, more easy tangrams, and more (albeit only marginally significant in the paired samples *t*-test) medium tangrams to a hypothetical student, and gave more money to charity. These results suggest that children may act in more pro-social ways, to both strangers and known others, after spending time in nature. Based on informal discussions after the field trips, parents and teachers commented on how the children played cooperatively at the nature school (e.g., parents and teachers mentioned that students worked together to build forts). This could be another way to measure pro-sociality in future research. However, some caution is warranted as many children had questions about the tangram and the windfall measures, suggesting that they might have had a difficult time understanding the instructions. This may be problematic as children visited the nature school first. Future research will need to counterbalance time spent outside in nature vs. indoors in a built environment as this study was not able to, due to pragmatic limitations.

At the museum, children allocated more money to gifts for others, suggesting some element of pro-sociality or thinking of others (although this effect was only marginally significant in the paired samples *t*-test and not significant in the latent growth curve analysis). Alternatively, there was a gift shop at the museum that most children explored. Seeing gifts may have primed the children to think of gifts they could buy for family and friends, and contributed to their decisions on the windfall task. However, these are speculative explanations regarding the windfall measure that future research may wish to explore.

Finally, our results support the notion that experiences in nature are one possible way to motivate pro-environmental intentions in children. This extends past studies showing that growing up near nature and spending time in nature are predictors of pro-environmental attitudes and behaviors (Chawla, 2009; Chawla & Cushing, 2007; Lohr, Person-Mims, Tarnai, & Dillman, 2000). Although this was a preliminary study, the within-person experimental design utilized in the present study allows us to examine causality in a way that correlational research does not. Specifically, all children attended both locations so potentially confounding variables such as parents' attitudes are not associated with location, as they might have been in Collado et al. (2013). However, the present study only measured willingness to protect nature, not pro-environmental behaviors. In addition, our methods establish the plausibility of causal links, but the attitude changes are presumably temporary. Future research might explore how much nature immersion is needed to foster meaningful changes in attitudes and behaviors.

Although an effort was made to match the indoor and outdoor conditions, the nature school differed from the museum in a few ways. With only two locations, differences other than the degree of nature immersion are possible alternative explanations for the effects we observed. For example, the nature school had a different way of teaching that was more freely structured, giving the children more autonomy. Children did not sit down while the teachers taught a lesson. Instead if children had questions, the instructor would help the children think through the question and come up with an answer. At the museum, there was more structure (even though there were some hands-on experiments and some free time for the children to explore the exhibits). To further understand the effects of natural environments, compared to the effects of free play on mood and pro-sociality, researchers will need to manipulate structured versus unstructured play in natural and built environments.

6. Conclusion

This preliminary study was unique in taking an experimental approach to studying children in nature, and testing for differences in affect, attitudes towards nature, and pro-sociality. Overall, allowing children time for unstructured activities in nature seemed beneficial for children's positive affect, attitudes towards nature, and pro-sociality. These findings seem especially relevant given that free play outdoors in nature is declining (Burdette & Whitaker, 2005). Moreover, the social benefits of nature contact for children observed in the current study extends the research that has been conducted on nature exposure and pro-sociality with adults (e.g., Raihani & Bshary, 2012; Weinstein et al., 2009; Zelenski et al., 2015). Although these initial results need to be replicated and extended, they suggest that short exposures to nature can lead to momentary increases in children's connection to nature and their willingness to protect nature. Over time, these moments may add up to meaningful individual differences. As such, the momentary causal link seems to complement previous research suggesting that early nature exposure may be a 'key entry-level variable' (Chawla & Cushing, 2007; see also; Evans et al., 2018) that increases children's interest in nature and motivates pro-environmental behaviors.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2019.05.002.

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The authors have no competing interests to declare.

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