



## Research Note

# Research Note: Relationship between childhood nature play and adulthood participation in nature-based recreation among urban residents in Tokyo area

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## ARTICLE INFO

## Keywords:

Adult environmentalism  
Conservation  
Extinction of experience  
Retrospective study  
Urban green space

## ABSTRACT

As urban areas and populations increase rapidly worldwide, experiences of nature play in urban green spaces would be a key for reconnecting people and natural environments. However, few studies have demonstrated the effects of childhood nature play on nature-related behavior among adults and its relative importance to socio-demographic factors. We conducted a retrospective questionnaire survey of 1030 adult residents in the Tokyo area, and found that the frequency of childhood play in green spaces was correlated positively with that of nature-based activities from gardening to international nature-based tourism, and even more strongly so than age, gender, and income. Given that participation in nature-based recreational activities reflects people's interest in and appreciation of nature and can contribute to nature conservation, the creation and effective design of urban green spaces where children can interact with nature will not only improve local environments, but also contribute to global nature conservation.

## 1. Introduction

As urban areas and populations increase rapidly worldwide, ecologists and conservationists have raised concerns about people's alienation from nature (Miller, 2005; Soga & Gaston, 2016). Many people, particularly those living in urban areas, may have fewer chances to interact with nature, including from wilderness environments to urban green spaces, due to the loss of available natural environments and changes in lifestyle, such as increasing indoor activity (Soga & Gaston, 2016). Alienation from nature can negatively affect human well-being and emotional and cognitive development (Pett, Shwartz, Irvine, Dallimer, & Davies 2016). Furthermore, it may lead to a cycle of extinction of experience (Pyle, 1993); people with few opportunities to interact with nature are less likely to appreciate nature and support conservation activities, which will cause further degradation of natural environments. Therefore, people's alienation from nature could be a great threat to the conservation of natural environments (Miller, 2005; Soga & Gaston, 2016).

Specifically, experiencing nature at an early age might have critical effects on one's perception of nature (Chawla, 2007). Interview surveys

of conservationists and environmentalists have consistently identified childhood nature experience as the important factor navigating these individuals toward conservation activities (Chawla, 2007). Chawla (2007) emphasized the role of adult mentors and fascinating hands-on opportunities in shaping one's attitudes toward nature. Bixler, Floyd, and Hammitt (2002) proposed childhood play hypothesis, that is, those frequently played in wild environments have more positive perceptions of natural environments, outdoor recreation activities and future occupations in outdoor environments. Frequent exposure to nature would decrease the perceived complexity and uncertainty while increasing preferences toward natural environments (Bixler et al., 2002).

Many previous studies, however, have exclusively focused on children/youth, or on adults engaged in environmental careers/activism. The former makes us difficult to understand long-term effects of childhood experience, and the latter limits generalizability of these findings about general publics (Wells & Lekies, 2006). Moreover, few studies have quantitatively demonstrated a relationship between the nature-related behavior of adults and their nature experience in childhood. Heberlein (2012) noted that positive attitudes toward nature do not necessarily lead to actual nature-related behavior, as attitude is

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<https://doi.org/10.1016/j.landurbplan.2018.08.002>

Received 26 March 2018; Received in revised form 30 July 2018; Accepted 5 August 2018

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often a necessary but not sufficient condition for behavior. Many other factors such as social, cultural and economic factors, and environmental knowledge, values and priorities will affect people's environmental behavior (Kollmuss & Agyeman, 2002). Therefore, a research examining how nature experience in childhood affects the nature-related behavior among general urban citizens is critical.

People's involvement in nature-based recreational activities can be used to measure their interest in or appreciation of natural environments (Pergams & Zaradic, 2006). Moreover, these activities can contribute to conservation by raising environmental concern among participants (Theodori, Luloff, & Willits, 1998) or providing economic incentives for conservation (Gossling, 1999), although some conditions must be met (Gossling, 1999). Few studies have examined the relationships between childhood nature experience and adulthood participation in nature-based activities (but Asah, Bengston, & Westphal 2012; Asah, Bengston, Westphal, & Gowan 2018; Ward Thompson, Aspinall, & Montarzano, 2007), and its relative importance to socio-demographic factors, such as age, gender and income, that are known to affect participation in nature-based activities (Meríc & Hunt, 1998).

### 1.1. Aim of the study

This study examined the effects of childhood nature play on participation in nature-related recreational activities in adulthood. We hypothesized that people who frequently played in green spaces in childhood would be currently involved in nature-based recreational activities more frequently than those who did not, and tested this hypothesis with a retrospective questionnaire survey of > 1000 urban residents in the Tokyo area.

## 2. Methods

### 2.1. Research design

We conducted a cross-sectional and retrospective questionnaire survey that examined the frequency of childhood play in green spaces and the frequency of current involvement in nature-related recreational activities. We asked about the frequency of play in four types of green space commonly found in Japan—parks, forests, farmlands, and rivers/oceans—in childhood ( $\leq 12$  years old). Respondents scored the frequencies using 5-point scales ranging from 1 (never) to 5 (very often). Although the retrospective self-report approach is limited when quantifying the actual frequency of activities, we adopted this method following previous studies (Bixler et al., 2002; Wells & Lekies, 2006) due to the ease of answering for respondents and the difficulty of collecting reliable objective data. We asked about the frequency of current involvement in the following nature activities: bird watching, fishing, insect catching, gardening and hiking by asking the respondents to choose one of the following: 1 (never), 2 (less than a few times a year), 3 (a few times a year), 4 (a few times a month), and 5 (more than once a week). We also asked about the frequency of domestic and international nature-based tourism (visit to nature-rich tourism destination) during the preceding two years and asked them to choose one of the following: 1 (never), 2 (less than once a year), 3 (once a year), 4 (a few times a year), 5 (once every a few months), and 6 (once a month or more). We also collected sociodemographic data on the respondents, such as age, gender, and household income.

### 2.2. Research context

We conducted a questionnaire survey in the capital area of Japan, Tokyo and its surrounding areas including Chiba, Saitama, and Kanagawa prefectures. The area is home to the world's largest urban population, 38 million inhabitants (United Nations., 2014). Recent studies in the area have shown that residents with less greenspaces nearby their home used the spaces less frequently (Soga et al. 2015) and

those with less nature experiences in childhood showed less appreciation of biodiversity around them (Hosaka, Sugimoto, & Numata, 2017; Soga, Gaston, Koyanagi, Kurisu, & Hanaki 2016).

### 2.3. Participants and sampling

We administered a web-based questionnaire survey to 1030 residents (20–69 years old) living in the Tokyo area in January 2016 using a research company (Macromill, Tokyo, Japan). The number of respondents was equal for each gender and age class (i.e., 103 men and 103 women aged 20–29 years ... 103 men and 103 women aged 60–69 years). The company distributed the questionnaire to all the monitors (18,996 individuals) who met the criteria of this study (aged 20–69 and living in the area mentioned above), and then collected responses up to the number (103) that we designated for each sex and age category. The respondents were similar in most characteristics to those participating in other nationwide surveys, such as public opinion polls by Japan Government, including with respect to frequency of involvement in outdoor activities, and environmental concerns (although not for frequency of Internet use) (Macromill, 2013).

### 2.4. Procedure and ethics

The data are totally anonymized when we obtain the data, and will have no potential risks to individuals or individual privacy. The participants provided their informed consent to participate in this study via online prior to the survey.

### 2.5. Analysis

We used cumulative link models with a proportional odds logit-link function (also known as proportional odds models) to examine the relationship between adulthood nature-based recreational activities and childhood nature play. Cumulative link models are powerful for modeling ordinal response variables (Christensen, 2018). We used the frequency of each activity (1–5 or 1–6) as a response variable and the mean score of childhood play in the four green spaces (Cronbach's  $\alpha = 0.72$ ) as an explanatory variable. We included age, gender, and household income as explanatory variables to investigate relative importance of childhood nature play to those sociodemographic parameters that are known to affect preference in nature-based activities (e.g., Meríc & Hunt, 1998). Although the frequency of each activity was correlated moderately with those of the other activities (Table S1), Spearman's coefficients for these correlations were not very high (0.13–0.61, mean = 0.33). Therefore, we constructed a regression model for each activity. We calculated standardized regression coefficients to compare relative importance of explanatory variables. The  $p$  values for each explanatory variable were adjusted by Bonferroni correction to control the false discovery rate of multiple testing. We computed McFadden's pseudo- $R^2$  based on log-likelihood as a measure of model fitness. All analyses were conducted with R 3.4.3 and its "ordinal" package (Christensen, 2018).

## 3. Results

Around two thirds of respondents played in parks frequently in their childhood, and 36–40% of them frequently played in forests, farmlands and rivers/oceans (Fig. S1). Around 40% of the respondents were involved in hiking and gardening either frequently or infrequently while 74–83% were not involved in bird-watching, fishing and insect-catching at all (Fig. S2). Sixty percent of respondents had been involved in domestic nature-based tourism while only 26% involved in international nature-based tourism during the preceding two years (Fig. S3).

Supporting our hypothesis, the frequency of childhood play in green spaces was correlated positively with that of all nature-based recreational activities in adulthood after controlling for gender, age, and

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