

Parental Factors That Affect the Connectedness to Nature of Pre-School Aged Children in
Halifax, Nova Scotia

by

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Abstract

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Time spent in nature has been found to promote a connectedness to nature (CTN) in both children and adults (Gifford & Nilsson, 2014; Deville, 2021). However, it has been found that people in North America are spending increasingly less time outside and in nature, thus potentially jeopardizing their CTN (David Suzuki Foundation, 2012; Louv, 2005; Pyle, 1993). Time spent in nature is important for all human beings, but for children especially, as it has been found that developing CTN can lead to enhanced physical and mental health outcomes, but also to developing pro-environmental attitudes and behaviours as adults (Ewert, 2004; Zhang, Goodale & Chen, 2014). However, access to time in nature can largely depend upon the child's parental situation (Soga, 2019). Parental factors that may affect a child's time spent outside can include parental attitudes toward outdoor safety, their own ecological outlook, their level of income and education, or whether they have enrolled their child in a nature-based school. This study is part of a larger research program that looks at measuring pre-school children's connection with nature. This portion of the study aims to explore to what extent do a number of parental factors impact how much time that their child spends outside which can potentially impact a child's CTN. For this portion of the study, the parents of the 30 child participants were given a survey to complete, asking them questions regarding time spent outside, associated safety concerns with given environments, their ecological outlook, and their material and social welfare levels. Different factors were then compared with the time the children spent outside, or likelihood of placement in a nature-based school. Preliminary analysis shows little significance of the different factors on time spent outside. Further, the results seem to indicate that the study sample for this pilot test was biased due to the proportion of high incomes and education levels, and therefore potentially skewing the data. Yet the results of this research can still help to inform future studies to ensure a more robust sampling method in attempts for a more accurate picture of parental impact on their children's CTN and time spent

outside. Such learnings can be applied with future uses of such parental surveys in conjunction with the CTN tool.

Key words: Connectedness to Nature, Time spent in Nature, Parental Factors of Influence, Pre-Schoolers, Nature-based Schools

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1. Introduction

Anthropogenic climate change is well underway and is threatening many of Earth's planetary boundaries (Rockström, 2009; Steffen, 2015). While there have been many solutions suggested by scientists and experts on what must be done, serious action has yet to be taken by the majority of the world (IPCC, 2021). Many claim that the lag lies in the difficulty of changing the culture that produced the problem of the climate crisis in the first place (Fischer & Riechers, 2018; Ostrom, 2012; Rees, 2014). To begin taking successful adaptation and mitigation measures, humanity must first invest in changing social and cultural realms away from individualist and consumeristic thought and instead towards lifestyles of stewardship and appreciation of the environment (Bazerman & Hoffman, 1999; Klein, 2014; Miller, 1999; Williams, 2021). Understanding the factors that affect people's environmental attitudes and behaviours is key in learning how to enact large-scale social change solutions towards a more sustainable future.

Over recent decades, factors like increased urbanization and the everyday use of technology have contributed to a general decrease of time spent in nature (Soga & Gaston, 2016). Rapid urbanization rates can be represented looking at the United States, where the percent of population living in urban areas jumped from 64% to 80% between the years 1950 and 2000 and increased technology use can be viewed through the lens of increasing internet access, where only around 20-30% of select high income countries' population used the internet in 2000 to that population proportion jumping to 80-100 of most continents, save parts of Africa in 2019 (Roser & Ritchie, 2015; Roser & Ritchie, 2017). Such a decrease risks a loss of

connection people feel with nature or conservation efforts (Chawla, 2015; Miller, 2005;). Because of this risk, it has been suggested that spending more time outside can successfully reinvigorate people's connection to nature and can help develop more pro-environmental attitudes (Abson, 2017; Nisbet, 2008). Time spent in nature is especially important to reclaim for children as it helps to shape their environmental consciences during their development stages, resulting in more pro-environmental decision-making once they age into adults (Ewert, Place & Sibthorp, 2005; Wells & Lekies, 2006; Zhang, Goodale & Chen, 2014). If the time spent in nature could be an important leverage shift in making the culture more sustainably minded, then it is crucial to understand any barriers that may interfere with this natural experience such as cultural norms, socioeconomic factors and limitations, and behaviours patterns of individuals.

Time spent in nature can be understood to be any time spent in contact with the outdoors or in a natural environment, whether it be an urban nature environment or not. Spending time outdoors can lead to a development of one's connectedness to nature (CTN) (Colléony, 2019). Having high levels of CTN is associated with developing pro-environmental attitudes and behaviours (Zylstra, 2014). While many terms are used to denote our relationship with nature, such as Nature-Relatedness and *biophilia*, this paper takes into account the specific state in which an individual who has both a positive cognitive and affective attitude and awareness with nature when using the term "connectedness to nature".

There is still more to learn about how parental attitudes and behaviours, and how socioeconomic status and education levels, may influence their children's CTN. There is little literature exploring this relationship with younger children (age 5 and younger), particularly in

Canada. This study was part of a larger pilot study that was testing a tool to measure children's connection to nature. The portion of the study that is the focus of this thesis is the analysis of the survey given to the parents of the 30 pre-school participants that were being tested for CTN. The parent survey focused on the time they spend in nature, the parents' environmental attitudes, and their socioeconomic status.

This thesis was interested in the multiple factors that may influence a child's level of CTN to answer the following research questions:

1. Does a parent's socioeconomic characteristics (household income, level of education) effect their child's CTN?;
2. Does a parent's ecological outlook effect their child's CTN?;
3. What factors may affect the time a child spends playing outdoors in nature (parent's socioeconomic characteristics, ecological outlook, seasonal differences)?
4. In what locations of play is time most spent?

This study was completed between September 2021 to March 2022, with the data collection lasting from September to November 2021 and the subsequent analysis and discussion continuing until March. The study was limited to pre-school aged children (3-5 years old) and their parents living within the Halifax Regional Municipality in Nova Scotia, Canada.

The study addressed the research questions by collecting and analyzing data from the parent surveys, containing information related to child's time spent outside, environmental attitudes, and socioeconomic status. The use of a Likert scale in formatting the questions allowed the results to be coded to be able to create a descriptive statistical analysis of the results. The CTN results were analyzed and scored by Emily Lannigan, another member of the

larger research group. Once the children's CTN scores were completed, they were posited against the various parent scores to determine if any relationship existed.

2. Literature Review

This literature review will explore the relationships between people and their environment over the last 50 years, tracing social patterns of movement and their consequences on access to nature. It will discuss the benefits of exposure to nature, and how it can influence attitudes and behaviours of people towards their environment. Furthermore, the review will examine how children relate to nature and how their parents may influence their connections to nature. This review looks at articles spanning multiple disciplines including Ecology, Environmental Education, and Social Psychology. Such variety is important when capturing an issue that is encompassing both social and the environmental components. The literature studied is internationally published, allowing for many perspectives across cultures on what factors influence people's connections to nature. Knowledge gaps will be identified regarding lack of literature centring parent and young children (3-5yrs) relationship to nature in a Canadian context. This review will discuss some influencing factors on people's relationship to the natural environment. Similar studies will be examined for their insight, while also addressing any remaining gaps in knowledge.

2.1. Connectedness to Nature (CTN)

The study of human connectedness to nature (CTN) is relatively new, beginning only in the latter half of the 20th century, with many different scales that attempt to measure its phenomenon. Connectedness to nature is the state in which a person has a positive cognitive and affective attitude with nature displaying an awareness of the interrelation between themselves and nature (Zylstra, 2014). The Biophilia Hypothesis, developed by E.O. Wilson,

introduces the idea that there exists an “innate emotional affiliation of human beings to other organisms,” leading us to interact with nature more and potentially increase our evolutionary chances at survival (Wilson, 1993). Since then, there have been many different terms and related scales that have been created to evaluate an individual’s connection to nature that are targeted for both adults and children.

All scales differ in their purpose, however, are all generally related to measuring people’s affinity or feelings towards the environment (Omidvar, 2018). For example, a scale developed to better understand people’s understanding of human beings in the world amidst an ecological crisis is the New Environmental Paradigm scale, comprised of 15 Likert-scale statements (Dunlap, 2000). Different scales give insight into different components of connection to nature, focusing on themes such as emotional attachment, anthropocentrism, and responsibility. Though there are many different methods to studying CTN, we must first understand the factors that affect the results of the tests.

2.2. Decreased Environmental Exposure

Over recent decades, the amount of time that adults and children spend exposed to the natural world has greatly diminished. In Canada, 70% of children spend only one or less hours per day outdoors (David Suzuki Foundation, 2012). Furthermore, children aged 7-14 years old have been found to spend around 8.3 hours per day engaging in sedentary behaviours indoors, and only 2.3 hours per day outdoors (Statistics Canada, 2016). Such a drastic loss of exposure has led to the phrases “extinction of experience,” coined by lepidopterist Robert M. Pyle in his memoir *Thunder Tre*, as well as a kind of “nature deficit disorder,” coined by best-selling author

Richard Louv in his book *Last Child in the Woods* (Louv, 2005; Pyle, 1993). The cause of such extinction or deficit can be linked back to factors like increased urbanization, greater parental supervision and safety concerns of outdoor play, and technology. The rate of global urbanization continues to increase, and with that urban populations too, while rural populations are projected to decline over the next decade (UN, 2018). Depending on their design, greenspaces can be limited and hidden within hazardous cityscapes for children to access on their own, often requiring supervision from increasingly concerned parents (Louv, 2005; Valentine & McKendrick, 1997). The act of playing outside then becomes reliant upon the availability of parents, limiting children's free access to nature. Technology, then, becomes a safer and preferable activity than venturing outside, with one study showing how high usage of technology relates to a lower importance given to spending time in nature (Michaelson, 2020). The modernization of society has resulted in losses of opportunity to experience the natural world.

Increased global urbanization has diminished the amount of time people are able to be exposed to the natural world. In 2015, just over 55% of the global population was living in urban areas (Ritchie & Roser, 2018). The built urban environment comes directly at the cost of losing critical green spaces for people to encounter nature. In China, a study surveyed 1119 students and found that those who were from rural schools had more exposure to nature than their peers in urban schools (Zhang, Goodale & Chen, 2014). Urban ecosystems, where many people will have their daily exposures to nature, have lower biodiversity levels due to the stress on natural spaces from human development (Turner, Nakamura & Dinetti, 2004). Environments with high environmental quality and biodiversity, such as natural parklands or reserves, offer

greater chances of connecting with nature and psychological well-being than urban green spaces (Dallimer, 2012; Wyles, 2017). As more and more people lose access to quality green spaces, questions of how to facilitate connections between people and the natural environmental are brought to the forefront.

The technological boom of the last two decades has also contributed to the turn away from the outdoors towards the indoor, virtual setting. Children were found to recognize and be drawn to virtual, electronic depictions of animals than real ones, displaying a greater exposure to the technological over natural beings (Ballouard, 2011). Additionally, a study done in South Carolina on sixth to eight-graders found that was an inverse relationship between time spent on screens and time spent outside, with every hour spent on a screen predicting an almost 30% decrease in the time spent outside (Larson, 2018). As discussed before, parents also find it increasingly easier and safer to point their children towards technology over the outdoors, leading to favouring use of technologies and electronic media (Carver, Timperio & Crawford, 2008; Jordan, 2006). Prioritizing the indoor, virtually accessed world over the outdoors limits people, especially children, to the many benefits that are associated with spending time in nature.

2.3. Benefits of Spending Time Outdoors

There are many health benefits that have been found to be associated with spending time outside, including both mental and physical health. Frameworks have been created to describe the main mechanisms that nature can lead to health benefits which include (1) nature's ability to protect humans from pollution and other harms, (2) nature's ability to

directly improve mental well-being and cognition, and (3) nature's ability to mediate health promoting behaviours such as physical activity (Markevych, 2017). Independent studies have confirmed the this framework, supporting the findings that access to green spaces ameliorates levels of physical activity, lowers stress levels, and improves moods (Kondo, 2018). Proximity and exposure to green space has been to be associated to better reported mental health status and decreased symptoms of depression and ADHD (Gascon, 2015; Tillman, 2018). For children who suffer from skin or respiratory issues, it was found that going outside helped to alleviate their symptoms for periods of time (Bento & Dias, 2017; Ruokolainen, 2015). While studies examining time spent outdoors vary greatly in design and scope, it is clear that time spent outdoors can be an important factor to consider when studying the maintenance and health of all ages of people.

More time spent in nature has been found to have a positive effect on the relationship between people and nature, sometimes leading to pro-environmental attitudes and behaviours. Overall time that is spent in nature has been generally found to increase people's valuation of nature (Deville, 2021). Time spent in nature during childhood, especially, can positively influence the individual's environmental views later in life (Ewert, 2004). In a study on young adolescents in various sized Chinese cities, it was found that time in nature significantly increased *biophilia*, or connection to nature, and significantly decreased *biophobia*, or fear of nature (Zhang, Goodale & Chen, 2014). Early exposure and development of a connection to nature is critical then, in creating a healthy, mutual relationship to nature. Surveyed environmentalists and conservationists have listed their childhood experiences outdoors as their number one predictor for their environmental concern (Gifford & Nilsson, 2014; Wells &

Lekies, 2006). If access to experiences in nature can so greatly impact an individual's connection to nature, it is important to investigate how to expand that access so to promote greater environmentalism.

2.4. Household Relationships to Natural Environments

People's relationships to nature do not exist in a vacuum but are mediated by cultural factors such as levels of socioeconomic status and education levels. For some people, it is opportunity that determines the frequency they will spend in nature. Opportunity largely depends on access to outdoor spaces such as ease of transportation, time, or funds (Soga, 2019). Personal preference also influences how often people will spend time in nature, with a study finding that regardless of ease of access, those who had strong affinity to nature would frequent a park more often than those who did not have such a strong affinity (Lin, 2014). Both are determined by personal factors which are influenced by existing pro-environmental attitudes and behaviours as well as socioeconomic factors such as income or education levels.

Pro-environmental attitudes and behaviours are not the same thing, despite often being termed as one single metric of environmental consciousness. Pro-environmental attitudes explain a person's beliefs around an issue while pro-environmental behaviour means the actions a person takes related to an issue (Shultz, 2005). While these two often go together, attitudes and behaviours are not necessarily interdependent: a person could have a high level pro-environmental attitude but never end up translating their beliefs into pro-environmental actions (Bamberg & Moser, 2007; Tam & Chan, 2017). This gap between one's attitude and

behaviour has been previously examined in attempts to discern some potential barriers that may exist between attitudes and behaviours related to the environment.

Barriers to enacting pro-environmental behaviour can include both psycho-social barriers as well as material barriers. Psycho-social barriers such as sentiments of distrust in institutions or living in a society that has perceived weaker social norms can lead to lack of pro-environmental behaviour (Bamberg & Moser, 2007; Tam & Chan, 2017). Material barriers such as a lack of financial resources or time can also lead to a lack of action (Kennedy, 2009). In a study by Uyeki & Holland, it was found that those with lower incomes and education levels displayed high pro-environmental attitudes, but also supported non-environmental behaviour like economic growth—probably due to having a lower economic status. Examining both the material and psycho-social barriers to enacting pro-environmental behaviour is important in understanding how the social norm of being disconnected from nature is formed.

There are also a variety of socioeconomic factors that can influence an individual's level of environmental concern. These can range from level of household income to education levels. Studies often observe these factors in tandem, looking for patterns between socioeconomic status and environmental concern. A study in China found that high household income and high education levels are positively associated with high levels of environmental concern (Shen & Shaijo, 2008). In an international review done by Gifford and Nilsson, it was found that high household income tended to have pro-environmental attitudes and behaviours, but that there are notable exceptions due to location and cultural differences (Gifford & Nilsson, 2014). Additionally, the review found higher education to be a factor in having environmental attitudes and behaviours (Gifford & Nilsson, 2014). These two factors of income and education

levels most likely influence each other as having a higher household income can allow individuals a better access to good education, thereby gaining the ability to acquire knowledge and shape one's values.

Due to systemic issues of oppression in the Western world, some marginalized communities do not have the same access to nature and therefore may feel a disconnect to its properties and its associated movement. Social inequities can also contribute to a lack of pro-environmental attitudes and behaviours due to a negative association with the environmental movement and environmental education initiatives which have, for the most part up until recently, been led by privileged people (white, able-bodied, straight, male, etc.) – excluding the participation and consideration of many marginalized people (Stapleton, 2020). For some marginalized groups, like African Americans, green spaces like parks can be associated with racial conflicts within the greater community. Parks can seem unwelcoming in their racialized nature to those who have suffered from historic racism (Lee & Scott, 2014). Histories of environmental racism can deter marginalized populations from spending time in their natural environments, due to safety and access concerns associated with higher levels of pollutants within the air and/or waterways (Waldron, 2018). Historic discriminatory practices contribute to the 'nature-gap' experienced by marginalized peoples compared to their more privileged community members, influencing their perceptions and interactions with the environment.

The time a child spends outdoors is mediated by their parents, and therefore dependent upon the factors that make up their parents' lives. A recent study that examined parents and their reasons for not frequenting nature with their children found that the biggest perceived barrier was "a lack of time and interest" (Gustafsson, 2021). Safety plays a big part in parents'

levels of comfort with their children playing outside, citing concerns of traffic, strangers, and general risk of injuries (Sandseter, 2020). Both studies related some reported concerns with increased urban environments that are not traditionally built with the intention of preserving green spaces in which their children could play more safely (Gustafsson, 2021; Sandseter, 2019). A Dutch study found that parents belonging to ethnic minority communities were less likely to have their children participate in organized outdoor sports (Wijtzes, 2014). The same study also found that the socioeconomic position of parents also contributed to lesser time spent playing outside (Wijtzes, 2014). Many of these factors vary depending on a family's socioeconomic status, pointing to the importance of understanding the deeper causes of these discussed limitations to nature exposure.

2.5. Parental Influence on Children's Connectedness to Nature

Understanding how a parent passes down their values associated with the environment to their children has only begun to be examined recently. In Japan, a study found that direct communication between parents and their children affected both pro-environmental attitudes of their children and their willingness to conserve biodiversity (Soga, 2016). In China, researchers also found that communication between parents and their children result in a partial connection to developed pro-environmental behaviours, while the children's perceptions of their parents' environmental actions was found to be a direct connection to the children's pro-environmental behaviours (Jia & Yu, 2021). Such studies were done on elementary aged children (6-12 years old), while Ahmetoglu's study in Turkey focuses on 4-6-year-olds. Ahmetoglu also found that there is a strong relationship between a parent's

educational background and their child's level of CTN, with those whose parents had only a high school degree or below scoring lower (Ametoghlu, 2019). In the same study, it was found that household income also plays a part in influencing how much a parent will place importance on playing outdoors, with those who have higher incomes placing more importance than those with lower incomes (Ametoghlu, 2007). In a Spanish study, parental socialization styles were evaluated on how well they promoted an empathic connection with nature, finding an indulgent authoritarian parenting style to best enhance a connection to nature amongst their children (Musitu-Ferrer, 2019). While the field of studies is emerging on the subject, there is wide variability in the age range studied, and the cultural landscape in which the studies have taken place.

The influence of parents on value-exchange can look different based on what age of children are studied. A college-aged student cohort were studied for their environmental involvement, finding that parents played a role in building a space to discuss environmental issues with their children which helps to develop an autonomy of environmental decision making (Villacorta, 2003). An adolescent cohort was found to be significantly influenced by their perceptions of their parents' environmental actions, recalling the difference between pro-environmental attitudes and behaviours (Grønhøj & Thøgersen, 2012). In one study, pre-adolescent children, aged 11-13-year-old, were studied after the implementation of a school waste-management that involved discussions with parents who oversaw the programme's activities at home. The supervision of the programme facilitated a shared learning between the parents and children on environmental issues, and in some cases resulted in better practices being adopted (Grodzińska-Jurczak, 2003). Environmental education can play a role in

equipping parents who do not have the means or knowledge to begin undertaking environmental conversations or actions with their children at home. The social influence of parents on their children seems to vary based on ages examined, raising questions of the most impressionable ages when it comes to instilling environmental values and behaviours in their children.

Some parents may also choose to enrol their child/children into nature-based schools, which deliver a nature-based, often hands-on, environmental education as opposed to traditional education which delivers classroom-based learning. In a Spanish study comparing the environmental attitudes and behaviours of children attending nature-based primary schools and traditional primary schools, it was found that those who attended nature-based schools had increased environmental attitudes but no difference in environmental behaviours (Collado, 2020). In another study, it was found that 4th to 6th graders who attended a nature-based school had increases in environmental knowledge and CTN, which related to their greater ecological behaviour (Otto & Pensini, 2017). Such education styles allow children to spend more time in nature that is not dependent upon their parents' time. However, the private-nature of nature-based schools produces a potential financial barrier for parents wishing to enrol their child into a more outdoor experiential learning education. The benefits of nature-based education may then be limited to those with financial means, therefore limiting the reach of the benefits reaped.

2.6. Knowledge Gaps

While there has been emerging research on the effects parents and family life have on their children's level of CTN, there is limited knowledge of children under the age of 10. A classroom setting serves as a kind of equalizer of experiences, where students from many different backgrounds can be given the same lessons and exposure to nature. However, it is pertinent to consider the role of influence outside of the classroom, which is very much mediated by unequal socioeconomic factors. It is important to understand all factors that may influence a child's development, including within and outside of the classroom, to better understand how to foster CTN.

In a Canadian context, studies that incorporate a CTN or connectedness to nature are not centred around young children nor necessarily regarding direct environmental outcomes. A study compared non-Indigenous undergraduate students' connections to nature with their attitudes towards reconciliation, finding a positive correlation citing a more expansive morality (Starzyk, 2021). Another study surveyed Canadians across the country, from adolescence to adulthood, on their connectedness to nature and pro-environmental behaviours. Their findings included differences between rural and urban populations in their pro-environmental behaviours, but not their connectedness to nature, implying infrastructure differences or industry influences (Krettenaur, 2021). While these studies help bring the topics of connection to nature to a Canadian context, there is yet to be comprehensive data on young children and their greater environments' influence on their CTN.

There is emerging data from a series of studies regarding CTN in young children in Nova Scotia using a modified testing tool. While investigating the bioaffinity of pre-school aged students enrolled in a Reggio-Emilia preschool in Halifax, NS, Omidvar's study introduces a

Swedish developed games testing approach (Omidvar, 2018). Expanding upon Omidvar's work, MacKeen's study modifies the games testing approach to suit a more Canadian cultural context as well as become more age appropriate (MacKeen, 2020). While this foundation of work in the Canadian context has begun framing the area of study for future research in CTN studies in young children, there are still unanswered questions related to the larger factors that can impact the CTN results.

2.7. Conclusion

This literature review highlights the importance of spending time outside for the wellbeing of adults and their children and the environment, while exploring the barriers that may prevent people from being able to frequent their natural surroundings. As our lifestyles become increasingly urban and online, time spent outside begins to diminish, depriving children with the chance to develop pro-environmental attitudes and behaviours. Successful mitigation of our societal shift inwards can depend upon if parents have access to means that would allow them to overcome barriers of time or funds to pay for outdoor programming. Additionally, parents' pro-environmental attitudes and behaviours can also have a large influence on the CTN of children. Examining the literature, there is a need for further research on the impacts that family positionality (socioeconomic status, education level, etc.) has on young children's level of CTN in a Canadian setting.

3. Methods

3.1 Overview

The research conducted in this project involved 30 children from within the Halifax Regional Municipality and at least one of their parents/guardians. The children in the study participated in a pilot test that used a games testing tool to gauge their CTN. The parent(s)/guardian(s) completed a survey to determine their own connectedness to nature (CTN) and external factors of the child's life such as parental environmental attitudes and socioeconomic status. This Honours thesis focused on analyzing the survey data collected from the parents/guardians with the aim to better understand what, if any, factors influence a child's CTN.

3.2 Study Population

Non-probabilistic, purposive and snowball sampling were used to recruit both children (aged 3-5) and their parents in the Halifax Regional Municipality (HRM). Recruitment began first by contacting Directors of local pre-schools who were known contacts of the research team. Care was taken in targeting students from regular pre-schools as well as nature-based pre-schools like Regio Emilia Schools and/or Forrest Schools. Directors were emailed asking permission to allow recruitment through their schools through the distribution of the study's invitational information (Appendix III). Further, parent contacts known to the research team were also contacted through email asking their interest in participation. Once interested participants contacted the lead researchers, initial recruitment emails were sent out (Appendix IV). If committed to participating, final consent forms were sent out to parents/guardians

(Appendix V). An incentive of a \$25 gift card to Woozle’s Children’s Bookstore was offered to any participants who had completed the process. Only one gift card given per child/parent pair was offered for participation. Snowball sampling was also used once recruited parents had participated, asking them to share the information with any other parents that they knew who would be eligible. Due to the non-probabilistic, purposive sample, and type of psychometric assessments planned for analysis, a total of 30 children and their parents was considered an appropriate size.

3.3 Research Tools

Research tools for the project include the modified games testing tool developed by MacKeen & Wright to be completed by the children (Appendix 1) as well as a survey to be completed by parents (Appendix VII). The modified games testing tool was used to measure the CTN of the pre-school aged children through a series of six games. Each game is different and involves the testing of different perceptions of nature such as the ability of items (animate and inanimate) to get hurt, or the ecosystem services of different items like wood or a river. The last two games revolved around questions of where the child likes to play (or does not like to play) and why, giving options of inside, on the street, in the backyard, on the playground, the forest, or the farm.

The parent survey is comprised of four sections. The first section asks how many hours a week their child spends outside of school time in seven different environments – these environments mirror the options given in the last two games in the modified games testing tool, with ‘inside’ being broken up into “Playing indoors with non-electronic toys” and

“Spending time indoors on social media”. Such mirroring will allow for easy comparison between the number of hours the child spends in certain environments outside of the school environment, and how that may contribute to their CTN scores.

The second section is a Likert-scale questionnaire containing statements with which parents can give their accord, indicating their attitudes towards their child exploring in outdoor spaces, their own environmental values, and the safety and importance of the six aforementioned settings of potential play. These questions have been taken from Giusti, the creator of the original testing tool that was the basis of the modified testing tool used in this study, in their distributed parent survey (Giusti, 2014). Like the first section, this section will allow the researchers a better picture as to why a child may have responded the way they did in the last two games of the testing tool. As mentioned before in the review of literature, the time children spend outdoors can be mediated by the parents’ perception of safety in outdoor environments, as well as parents’ own enjoyment of nature. Upon comparison with the children’s CTN scores, patterns may be found to support or not support the literature regarding parental influence on children’s time spent outdoors.

The third section is the New Ecological Paradigm (NEP) scale, which is a series of 15 statements to be answered on a five-point Likert-scale, determining the level of environmental consciousness of the parent. The New Ecological Paradigm (NEP) Scale was developed in 1978, and subsequently revised, primarily by Riley Dunlap and Kent van Lier as a measuring tool of individuals’ environmental worldview or paradigm. Originally comprising of 12 statements, the revised and widely used version now contains 15 statements that have been positively tested as a reliable measuring tool (Dunlap, 2000). The developed questions are designed to contrast the

Dominant Social Paradigm (DSP) of the population, one that is more anthropocentric and believing in unlimited resources, to a New Ecological Paradigm, where greater environmental concern exists (Anderson, 2012). It has been found that the use of the NEP Scale positively reflects the pro-environmental attitudes of a sample population (Lawton, 2016).

The environmental consciousness of the parent is scored based on how they respond to specific statements in the NEP scale. Accordance with the eight odd numbers indicates a pro-ecological worldview while the seven even numbers indicate an anti-ecological worldview. Furthermore, the questions can be broken down into five themes of dimensionality for further categorical analysis and are as follows: reality to limits of growth (1,6, 11), anti-anthropocentrism (2, 7, 12), fragility of nature's balance (3, 8, 13), anti-exceptionalism (4, 9, 14), and possibility of an eco-crisis (5, 10, 15) (Table 1). Analysis of a parent/guardian's ecological worldview to their child's CTN scores can help determine if any correlation exists between parents/guardians' pro-environmental attitudes and the level of their children's CTN. Further breakdown into the five individual themes could offer more insight as to what factors may be influencing their children's scores.

It is important to mention that due to human error, the survey that we distributed contained only 14 out of 15 of the NEP tool's statements. The accidental omitted statement is number 3, found in Table 1. This was corrected in the methodology, by calculating NEP scores for individuals using a new total of 14, rather than 15.

Table 1. The New Ecological Paradigm Scale and associated themes.

| NEP Statement | Pro or Anti NEP | Theme |
|--|-----------------|-------------------------------|
| 1. We are approaching the limit of the number of people the earth can support | Pro | Reality to limits of growth |
| 2. Humans have the right to modify the natural environment to suit their needs | Anti | Anti-anthropocentrism |
| 3. When humans interfere with nature it often produces disastrous consequences | Pro | Fragility of nature's balance |
| 4. Human ingenuity will insure that we do NOT make the earth unlivable | Anti | Anti-exceptionalism |
| 5. Humans are severely abusing the environment | Pro | Possibility of an eco-crisis |
| 6. The earth has plenty of natural resources if we just learn how to develop them | Anti | Reality to limits of growth |
| 7. Plants and animals have as much right as humans to exist | Pro | Anti-anthropocentrism |
| 8. The balance of nature is strong enough to cope with the impacts of modern industrial nations | Anti | Fragility of nature's balance |
| 9. Despite our special abilities humans are still subject to the laws of nature | Pro | Anti-exceptionalism |
| 10. The so-called "ecological crisis" facing humankind has been greatly exaggerated | Anti | Possibility of an eco-crisis |
| 11. The earth is like a spaceship with very limited room and resources | Pro | Reality to limits of growth |
| 12. Humans were meant to rule over the rest of nature | Anti | Anti-anthropocentrism |
| 13. The balance of nature is very delicate and easily upset | Pro | Fragility of nature's balance |
| 14. Humans will eventually learn enough about how nature works to be able to control it | Anti | Anti-exceptionalism |
| 15. If things continue on their present course, we will soon experience a major ecological catastrophe | Pro | Possibility of an eco-crisis |

The fourth section is a series of eight questions asking various personal factors relating to socioeconomic status such as income and education level (Table 2). The questions are guided by the Material and Social Deprivation Index (MSDI) that was first created in the late 1990s to

measure social inequalities in health in Quebec and was later on expanded to be applicable in small-areas across Canada in the late 2000s (Pampalon, 2012). After the examination of four censuses, six socioeconomic factors were observed to indicate a level of social or material deprivation. Material component of deprivation include the level of education, employment status, and income level, where the lower the level of each indicates a worsening level of material deprivation (Pampalon, 2012). The social components of deprivation include the living arrangements of an individual (living alone or not), the marital status of an individual, and if they are a single-parent family, where the fewer people involved in each scenario would worsen the level of social deprivation (Pampalon, 2012). Studies who have used MSDI have found associations between high levels of deprivation and increased health issues such as mortality, diseases such as diabetes, as well as increased social issues such as child maltreatment (Pampalon, 2012).

Of the eight questions asked in section four, the first seven questions are directly related to the MSDI (Table 2). The last question posed is related to further research questions asked by MacKeen & Wright in the development of the modified tool, relating to the impact of attending environmental education-oriented schools versus more traditional learning-based schools (MacKeen & Wright, 2020).

Table 2. Specific and further explanation of the questions asked to parents/guardians in Section 4 of the survey.

| Question Asked in Section 4. | Explanation |
|--|--|
| 1. How many adults reside in your household? | MDSI Social Component: Relates to the number of parenting adults in the family. |

| | |
|---|--|
| <p>2. What percentage of time (on average) does your child reside in your household (i.e. if there is a child custody sharing with another parent how much time does your child stay with you)?</p> | <p>MDSI Social Component: Relates to the number of parenting adults in the family.</p> |
| <p>3. What is your total household income per year? (circle 1)</p> <ul style="list-style-type: none"> a. Under \$5000 b. \$5000-\$9999 c. \$10000-\$19999 d. \$20,000-\$29999 e. \$30000-\$39999 f. \$40000-\$49999 g. \$50000-\$59999 h. \$60000-\$69999 i. \$70000-\$79999 j. \$80000-\$89999 k. \$90000-\$99999 l. \$100000 and over | <p>MDSI Material Component: Relates to the level of income.</p> |
| <p>4. Over the past year, what best describes your employment situation:</p> <ul style="list-style-type: none"> a. Employed full time b. Employed part time c. Unemployed d. Not in the labour force | <p>MDSI Material Component: Relates to the level of income.</p> |
| <p>5. What is the highest certificate, diploma or degree that has been completed by individuals in your household:</p> <ul style="list-style-type: none"> a. Less than high school diploma or its equivalent b. High school diploma or a high school equivalency certificate c. Trade certificate or diploma d. College, CEGEP or other non-university certificate or diploma (other than trades certificates or diplomas) e. University certificate or diploma below the bachelor's level f. Bachelor's degree (e.g. B.A., B.Sc., LL.B.) g. University certificate, diploma or degree above the bachelor's level h. Master's degree i. Earned doctorate | <p>MDSI Material Component: Relates to the level of education.</p> |
| <p>6. What is your marital status?</p> <ul style="list-style-type: none"> a. Legally married b. Living Common law c. Never married d. Separated | <p>MDSI Social Component: Relates to the partnered status of an individual.</p> |

| | |
|--|--|
| e. Divorced f. Widowed | |
| 7. How many people (including you) currently reside in your household full time? a. 1 person b. 2 persons c. 3 persons d. 4 persons e. 5 or more people | MDSI Social Component: Relates to the living arrangements of an individual. |
| 8. Does your child attend a forest pre-school, or a pre-school that focuses their curriculum on environmental immersion? a. Yes b. No | Environmental education-oriented schools versus more traditional learning based schools. |

3.4 Study Procedure

Each testing session followed the same procedure to ensure consistency and ease of facilitation. Before testing began, each child and parent combination received a chronologically assigned participant number to keep track of data for later analysis.

An overview of the process is as follows:

- 1) Greet child(ren) and parent/guardian and review consent forms. Give the parent the survey to complete while the child is undergoing testing. Perform the Assent Script to give a final overview of the project to the child for verbal assent to the testing (Appendix IV).
- 2) Testing begins, with the primary researcher conducting the testing tool while the secondary researcher records the answers within a scoresheet document (Appendix II).

The testing will also be audio recorded (upon permission from the parent/guardian) as a supplement to written answers should any answers have been missed or

incomprehensible to record. The entire games testing tool procedure can be found in Appendix I.

- 3) Games testing is completed, taking around 15-20 minutes per session.
- 4) The survey is collected from the parent/guardian and is soon after recorded into an Excel spreadsheet. A certificate of completion will be given to the child and a \$25 gift card to Wozzles Children's Bookstore is given to the parent/guardian (Appendix VIII).

3.5 Analysis

Due to this study being completed within a greater research project, this research did not analyze the data from the modified testing tool itself, leaving that to other members of the research team. Once the data was collected and analyzed from the tool into individual scores, this study utilized the data to further analyze in comparison with the child's social environment using the data from the survey given to the parents.

All surveys were numbered to correspond with their child's documented answers and eventual scores, to be able to later compare results. All survey data were input into an Excel spreadsheet to be coded once data collection has been finished. Participants who had their children attend nature-based schools were highlighted to prepare for testing of variables between nature-based school parents and non-nature-based school parents.

The first section can be directly analyzed quantitatively to determine measures of central tendency in the locations of children's play. For the second and third sections, translating the Likert-Scale model used to equate to numbers, where 'Strongly disagree' equals 1 and 'Strongly agree' equals 5, we can quantitatively analyze the results using measures of

central tendency and dispersion. This allowed us to calculate central tendency of parents' attitudes towards where their children play and the associated safety and their environmental attitudes according to the NEP scores (with negative phrases to be reverse-coded). The final section, which uses multiple choice and numerical answers, was also able to be quantitatively analyzed using whatever given numbers or responded questions.

The first section was analyzed quantitatively to determine measures of central tendency in the locations of children's play by season and by year, by averaging the data from all four seasons. Isolating the outdoor locations of play, a one-way ANOVA was performed to compare the number of hours spent outdoors by season to test whether there are significant differences.

The second section was also measured quantitatively, after translating the Likert-Scale model used to equate to numbers, where 'Strongly disagree' equals 1 and 'Strongly agree' equals 5. This allowed us to calculate central tendency of parents' attitudes towards where their children play and the associated safety. The results of the two questions that ask parents' safety and importance preferences was analyzed by regression to see if there is any significant relationship between the two sentiments. With the first grouped question, "I am ok with my child having...", results were aggregated by participant to create a score that measures their accordancy with their child exploring in nature (Appendix VII). As there are five statements, the highest possible score of accordancy is 25, and the lowest possible score of accordancy is 5, due to the 5-point Likert-scale values available to the participants. This score was used when testing the significance of NEP score as a potential factor influencing connectedness to nature. Similarly, the second grouped question, "I am/feel...", results were aggregated by participant to

create a score that measures their own connectedness to nature, with the highest possible score being 15 and the lowest being 3 (Appendix VII). This score was also tested alongside the parents' NEP score to determine if there was any significant relationship between them.

Preparing the data for section 3 involved the conversion of Likert Scale answers to numerical values, where 1=Strongly Disagree, 3=Neither Agree Nor Disagree, and 5=Strongly Agree. The anti-NEP statements (see Table 1) were reverse coded. Five possible scores were then calculated by multiplying the number of total statements (14) by the appropriate Likert-Scale measurement (1-5). These summative scores give the ecological outlooks an associated range of scoring, which allows outlooks to be applied to individual participants scores depending on how they fall within the range (Table 3). Each score range covers 10 points, except for the 'Neither Pro nor Anti NEP' category which has 12. This was decided so as to account for ambivalence in responses rather than have them be categorized into a 'pro' or 'anti' category. Furthermore, measures of central tendency will be calculated according to the five sub-categories listed in Table 1.

Table 3. The breakdown of NEP scoring using reverse coding for the negative NEP statements (see Table 1).

| Ecological Outlook | Likert-Scale Equivalent | Score Basis (Likert-Scale Equivalent *14) | Score Range |
|--------------------------|-------------------------|---|-------------|
| Extremely Pro-NEP | 5 | 70 | 60-70 |
| Pro-NEP | 4 | 56 | 49-59 |
| Neither Pro nor Anti NEP | 3 | 42 | 36-48 |
| Anti-NEP | 2 | 28 | 25-35 |
| Extremely Anti-NEP | 1 | 14 | 14-24 |

For Section 4, the results were analyzed qualitatively and quantitatively. With much of the data, measures of central tendency helped to summarize the demographics of the sample study. Qualitative observations were made in reference to the literature and current census data. To test whether variables such as income, education, and nature-based schooling are significant factors on NEP score, and time spent outside, t-tests were run. Groups were created based on the variables being tested. For income, the two groups were divided based on higher and lower household income levels using Halifax's average income (\$65,824) as a baseline: where the higher income group is anything over \$60k and lower income and the lower income group is anything below (Statistics Canada, 2017). For education, the two groups were divided into higher education level and lower education level: where the higher education level is anything college educated and above and the lower education level is anything below college level. This is based on the MSDI that lists a high school education as the highest level of education achieved as an indicator of social deprivation (Pampalon, 2012). For nature-based schools, the groups were composed of participants whose children attended nature-based schools and those whose did not.

Once the children's test scores were collected from Lannigan, they were analyzed in three main categories which corresponded with each main game: environmental sensitivity (Game 1 A+B), environmental awareness, (Game 2 A+B), and environmental preferences (Game 3 A+B) (Appendix I). For the first two categories, scores could easily be calculated to summarize the child's total environmental sensitivity or awareness. These scores were used in a series of multiple regressions using the variables of household income, education level, and NEP score of the parents to determine the relationship between these chosen variables and their children's

levels of environmental sensitivity and awareness. While these tests were done for the dataset of the pilot study, they are done assuming assumptions are met, despite some violations in normality and heteroskedasticity existing. The results of these tests, particularly the multiple regression testing should be only understood in the context of this dataset. The data from Game 3 were analyzed qualitatively, noting which locations of play were preferred by parents and children.

3.6 Limitations and Delimitations

This study was limited by many factors including the sample population and its size, the age range of children received, and the global pandemic context of this study. The sample population, while attempting to recruit from a wide variety of backgrounds and geographic areas around the HRM, might have still resulted in a narrowed demographic of people. Successful snowball methodology based in a university setting could have resulted in a particular set of people who may be more educated and affluent than the average population, due to their proximity to the academy. This limitation is difficult to correct for with a small sample size of $n=30$, limiting potential variance found within a wider population.

The age range of child participants, which ranges from three- to five-years-old, also could serve as a potential limitation. While this age range is standardly used as the pre-school age, there are many developmental differences that a three-year-old is undergoing versus a five-year-old. For example, according to Stanford Children's Health, three and four-year-old children are just beginning to learn to express "ideas and feelings rather than just talking about the world around [them]," whereas as the child ages towards five-years-old, they are better

understanding of “complex questions” (Stanford Children’s Health, 2021). Some of the games within the modified tool ask the child to openly reflect upon some of their answers, which may not be as possible with younger participants. With a smaller sample size, outliers who may have difficulty answering these questions to the fullest extent may have a skewing effect on the overall data.

Furthermore, the extended lockdown periods experienced since the outbreak of the novel coronavirus may have affected patterns of early childhood development. For example, childhood activities were slowed as stay-at-home orders were imposed, leading to increased sedentary, indoor-centred lifestyles (Chambonniere, 2021). With lockdown orders, suddenly parents were tasked with taking care of their children for the entire day, despite perhaps having to coordinate working-from-home or trying to find work in the first place. An American study found that increased parental anxiety due to work stress increased their 12–36-month child’s screen exposure, as the parent would opt to use a screen as a mediator of the additional stress of caretaking (Farah, 2021). The same study highlighted how time spent with children, income, and employment levels (components of MDSI) were sent into flux during the COVID-19 lockdowns (Farah, 2021). One UK study found that if a child was able to continue attending early childhood education and care (ECEC) during the lockdown periods, their receptive vocabulary was more than those who had limited exposure to ECEC, especially if the child had lower socioeconomic status (Davies, 2021). Therefore, depending on the access to ECEC, or social and material components, a developing child’s life could have drastically changed from what it might have been pre-pandemic. Limited time spent outdoors, higher stress environments, and lack of material goods could have potential adverse effects on children’s

CTN. The long-term effects of the COVID-19 lockdowns will not be known for a long time, and its limitations can only be addressed as such.

Delimitations of this study surround the final section of the survey given to parents/guardians. As previously mentioned, the questions in the section are structured around MDSI components. However, other important factors that may play a part in influencing time spent outside, and pro-environmental attitudes and behaviours such as race, country of origin, gender, or being disabled are not accounted for in the survey. The delimitation of socioeconomic factors to only include those listed on MDSI allow for a familiar structure in the Canadian context that has been used for some time. While there has been work done on each of the listed examples sometimes in conjunction with one another, but mostly independently, there is not an obvious metric of containing all such factors to determine level of privilege. For future research on this topic, more intersectional indices of privilege and deprivation should be sought out to model a more robust questionnaire.

4. Results and Discussion

4.1 Section One of Survey: Time Spent by Location

Firstly, we analyzed the number of hours spent by location for measures of central tendency (Figure 1). It was found that, in hours per week, the participants' children spent the most time "Inside with Non-Electric Toys" (mean=14.57 hours, SD=8.86 hours) and in "Parks or Forests" (M = 11.95 hours, SD = 8.81 hours). The locations with the fewest hours spent per week were "Inside on Social Media" (M = 0.32 hours, SD = 1.27 hours) and in "Agricultural Areas" (M = 0.75 hours, SD = 4.41 hours).

With the highest mean number of hours spent inside, our results seem to support the trend of children spending more time inside rather than out (David Suzuki Foundation, 2012). Within the outdoor locations, "On the Street" has the lowest mean number of hours spent per week, compared to "Parks or Forests" or "Playgrounds" (Figure 1). These results also support findings, where parents were found to be more hesitant with certain outdoor locations of play based on safety concerns (Sandseter, 2020).

It is important to consider the potential impacts of the COVID-19 pandemic on how parents approached outdoor play during time at which data was collected. When asking safety preferences in Section 2, there was no reference to consider the pandemic environment while answering (Appendix VII). Therefore, there is no way to know if parents responded in a way that assumed a 'typical' environment or assumed a more locked-down environment during a COVID-19 wave spike—with the former assumed to spend more time outdoors and the latter predicating more time spent inside (Farah, 2021). Because we also asked for just the current

amount of time spent outside in different locations, there was no way to know if this was more or less than their typical time spent.

Finding that the location of “Inside on Social Media” is the location least frequented per week defies expectations that suggest that children are spending more time inside using technology, as found with Larson et al.’s study in 2018 (Larson, 2018). There are two things that may be factors to this discrepancy: the difference in age of the participants’ children in the two studies and the language of ‘social media’. In Larson et al.’s study, they surveyed children aged 11-13-years-old, whereas in this study we interviewed the parents of 3–5-years-old children (Larson, 2018). The older children, who may have their own personal devices or are given more independence to use technology around the house, may be more likely to spend more time inside on social media than outside. In contrast, younger children still rely upon their parents to access forms of entertainment, let alone technology, and therefore may be less likely to be left on their own playing on a communal technological piece inside their home.

The language of ‘social media’ could also be deterring parents from identifying with the technologically based activity. While parents did indicate a moderate amount of time spent inside watching TV or playing video games per week, there was an obvious decline when the technology was swapped out to social media. This may be because use of a social media like Facebook or Snapchat is something a young child would not have independent access to—versus an older child, like those in Larson’s study, who might. However, the language of social media may exclude any other time spent playing on smart device (iPads, tablets, smart phones, etc.) that is not purely social media based (such as educational games) that may not fall into the category of TV or video games.

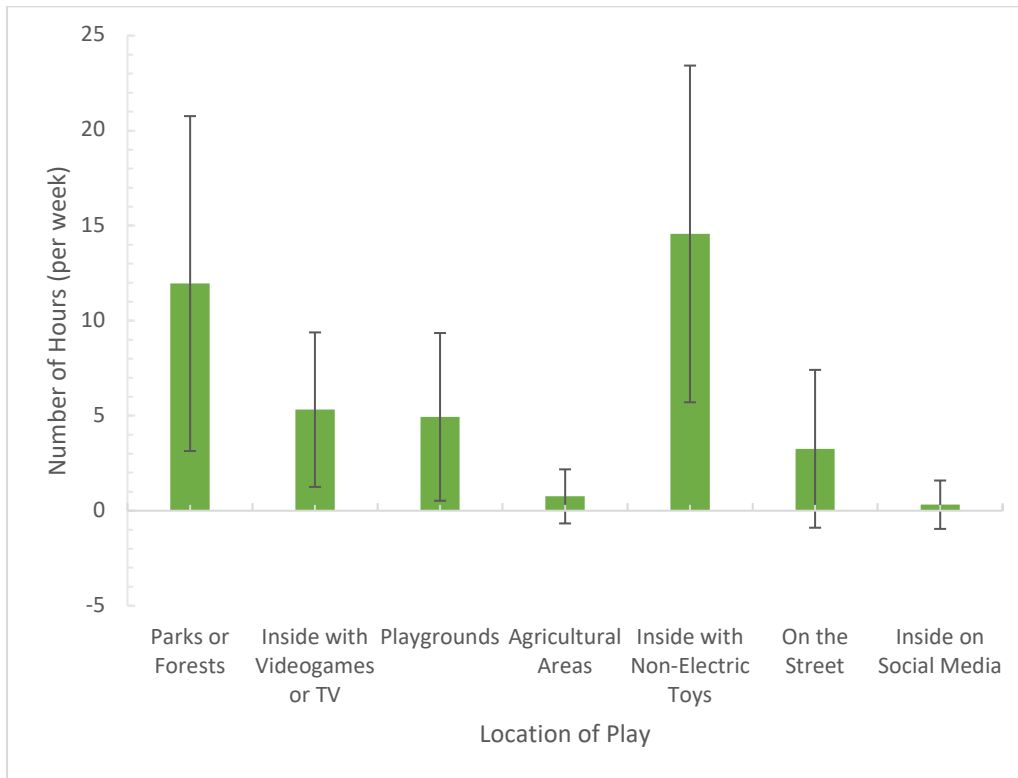


Figure 1. Mean Number of Hours Spent in Locations of Play (per week). Error bars are representative of standard errors.

This section also displayed patterns of play based on seasons. As expected in a winterized climate, such as the study area of Halifax, Nova Scotia, time spent outside is highest in the summer (M = 8.4 hours, SD = 3.95 hours) and lowest in the winter (M = 3.56 hours, SD = 2.05 hours) (Figure 2). Such results suggest more ease of accessing outdoor spaces in the summer months. It could also be consistent with findings from Keller, where participants' cognitive mood and openness to new information is increased in warmer temperatures and more time spent outside, allowing them to be more open to going to new outdoor locations of play (Keller, 2005).

A series of one-way analysis of variance were performed to analyze the effect of seasons on the time spent outside. The results of a one-way ANOVA showed that there was a significant

effect, $F(738.1, 21422.1) = 5.47$, $p = 0.001$, of the seasons on how much time was spent in the four outdoor locations (“Parks or Forests”, “Playgrounds”, “Agricultural Areas”, and “On the Street”). To see if seasonal effect was significant on the individual locations, four more one-way ANOVA were run. There was a significant effect of seasons on time spent in “Parks and Forests”, $F(953.2, 8287.8) = 4.44$, $p = 0.005$, and in “Playgrounds”, $F(247.1, 2071.7) = 4.61$, $p = 0.004$. However, the effect of seasons was no longer significant in “Agricultural Areas”, $F(13.1, 227.9) = 2.21$, $p = 0.09$, or On the Street, $F(25.4, 2027.6) = 0.48$, $p = 0.69$. These results reflect the mean number of hours spent in each location per week (annually), depicted in Figure 1, where time spent in “Parks or Forests” and “Playgrounds” seem to be more frequented than the time spent in “Agricultural Areas” or “On the Street”.

Time spent inside does not vary much between the seasons, with the number of hours spent inside ranging from about 6.33 to 7.37 hours a week across all seasons in various indoor locations (Figure 2). A one-way analysis of variance confirmed that the effect of seasons is not significant, $F(64.0, 23980.8) = 0.32$, $p = 0.81$, on the time spent in indoor locations, $F(64.0, 23980.8) = 0.32$, $p = 0.81$. Such consistency between seasons suggests that indoor activities are staples in people’s lifestyles and are less likely to change with the season.

These results correspond with a study on time activity of Canadians that found seasonality to be a significant predictor of time spent outdoors, but not time spent indoors (Matz, 2019). In both results, the time spent outdoors in the summer was twice as much as the time spent in the winter (Matz, 2019; Figure 2).

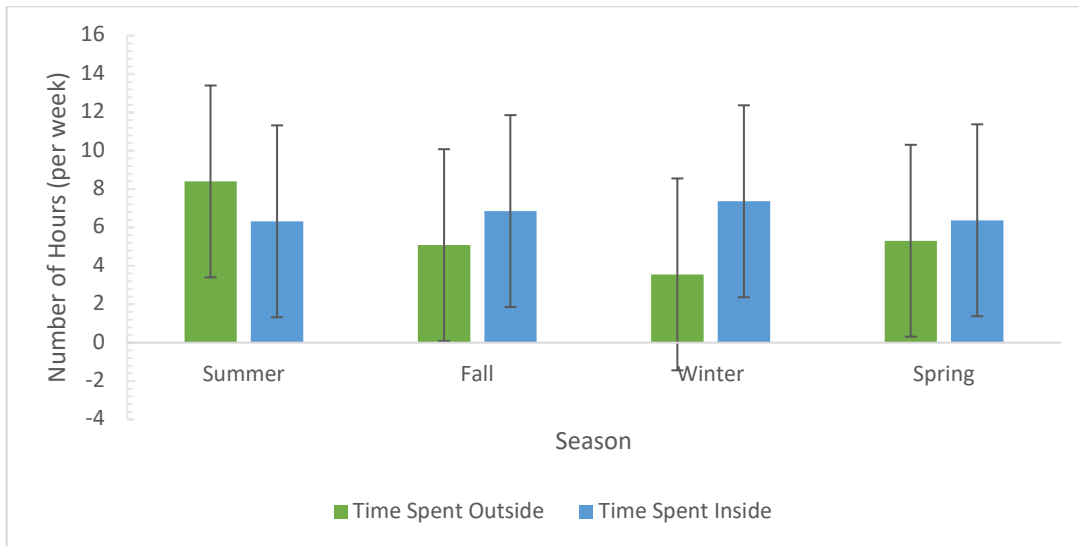


Figure 2. Mean Number of Hours Spent (per week) by Location and Season.

4.2 Section Two of Survey: Parents' Preferences of Location of Play

Reflecting further on the results of the previous section, we are given further insight with the results of Section 2 of the survey. The locations of play that were given the highest scoring of Safety and Importance Preference were “Parks or Forests” ($M = 1.67; 1.9$), “Playgrounds” ($M = 1.52; 1.33$), and “Indoor with Toys” ($M = 1.6; 1.37$), all falling within the *Agree* and *Strongly Agree* categories (Figure 3). The locations with the lowest scoring were most associated with technology, with “Videogames or Watching TV Inside” ($M = 0.2; -0.97$) and “Inside on Social Media” ($M = -1.37; -1.47$), both essentially falling between the *Disagree* and the *Strongly Disagree* for the Importance Preference (Figure 3). While “Inside on Social Media” is both ranked the worst on Safety and Importance Preference and has the lowest time recorded being spent in its location, “Videogames or Watching TV Inside” is different (Figure 2; Figure 3). While the Importance Preference for “Videogames or Watching TV Inside” is -0.97 (almost *Disagree*), the time spent in this location is almost parallel to that spent in

“Playgrounds”, which has an Importance Preference of 1.33 (*Agree*) (Figure 2, Figure 3). This highlights a potential discrepancy between parental opinions and actual time spent in such locations.

The level of Safety Preference of locations significantly explained the level of Importance Preference, $R^2 = 0.615$, $F(222.5, 139.1) = 332.6$, $p < 0.0001$. This was the result of a regression analysis between the two groups of indicated Safety Preference and Importance Preference by inputting all of the Likert-scale scoring the parents ($n=30$) gave to both categories based on the seven different locations of play, positing 210 scores of Safety Preference against 210 scores of Importance for all seven locations of play. Such a strong, positive relationship between the two variables demonstrate how parents perceive the concepts of safety and importance. In many of the different locations, the mean degree of preference of safety is less than that of importance (Figure 3). Only in the location of “Parks or Forests” and “On the Street” is the Importance Preference greater than the Safety Preference (Figure 3). In a study assessing parental risk perception and its effect on their children’s activities it was found that parents who had lived a “reasonably risk-free” life were more likely to be cautious and protective in their parenting, restricting age-appropriate risk-taking activities (Niehues, 2015). Risk involves both measures of safety and importance, and so a parent’s risk assessment of an activity would then consider both these factors. Those activities that are perceived riskier would rank lower on safety than importance, and therefore may cause hesitation before approving the activity.

For both locations of “Parks or Forests” and “On the Street,” parental perception of importance is unquestioned, but the safety of the two locations is less certain (Figure 3).

Comparing the parental perception with the actual number of hours spent in these two locations demonstrates how seriously the risk was taken, depending on if a location was frequented despite having safety concerns. With “Parks or Forests” it seems that the benefits were perceived to outweigh the risks as it remains to be one of the more frequented locations of play (Figure 1). However, with “On the Street” it seems that risk plays a larger factor in spending time within its location, being one of the lowest frequented of the locations of play and the lowest outdoor locations of play (Figure 1).

It is important to consider the findings of Soga when discussing time spent in these different locations, who notes that it is often opportunity, and not necessarily preference, that determines the frequency of attending different locations (Soga, 2019). A study done on evaluating the greenspaces within the Halifax peninsula found that the median score of the parks were 51.2 – a medium score according to the Quality of Public Open Space Tool (McNamee, 2012). This points to the built environment and circumstance, rather than parental preference, as potential explainers as to how time is spent in various locations.

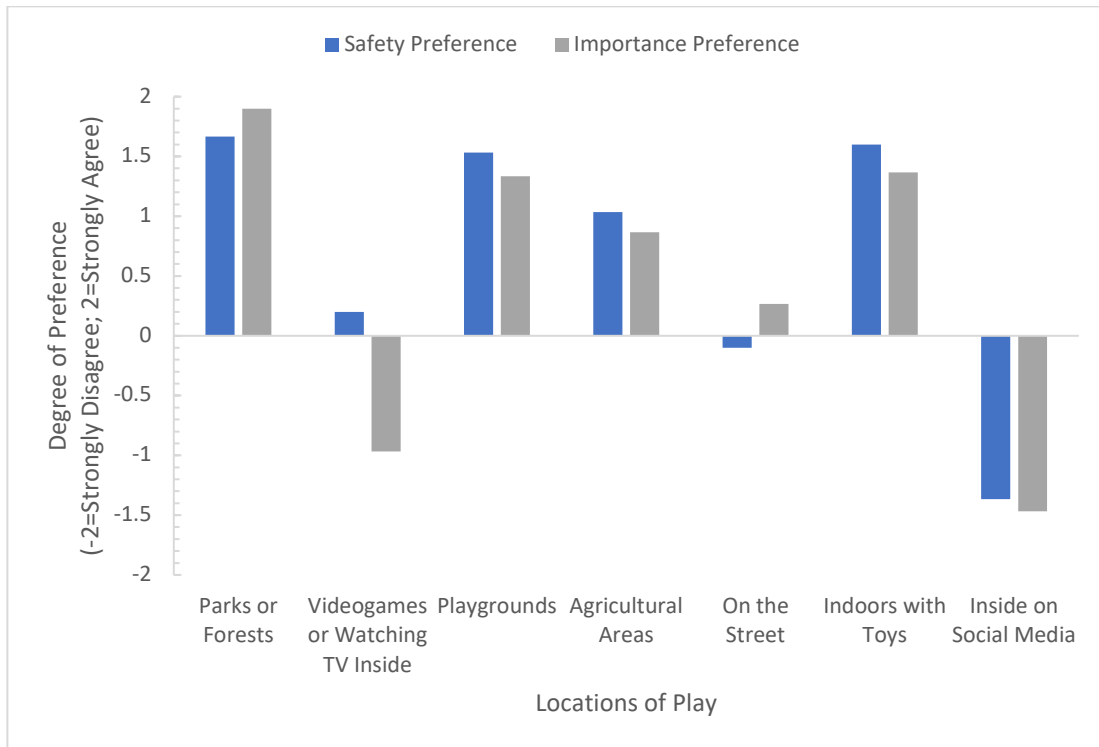


Figure 3. Preferred Locations of Play Based on Safety and Importance. Based on mean responses to the question, “Playing in [x location] is safe/important for my child,” using a 5-point Likert-scale.

4.3 Section Three of Survey: (Modified) New Ecological Paradigm Scale

Most of our participants leaned towards having a positive perspective on the New Ecological Paradigm, with none scoring a view that falls within either ‘anti’ category. Positive statements of the NEP that people seemed the most in accordance with ($M > 4.5$) included: “Humans are seriously abusing the environment” ($M = 4.7$, $SD = 0.66$), “Plants and animals have as much right as humans to exist” ($M = 4.6$, $SD = 0.56$), and “If things continue on their present course, we will soon experience a major ecological catastrophe” ($M = 4.5$, 0.57).

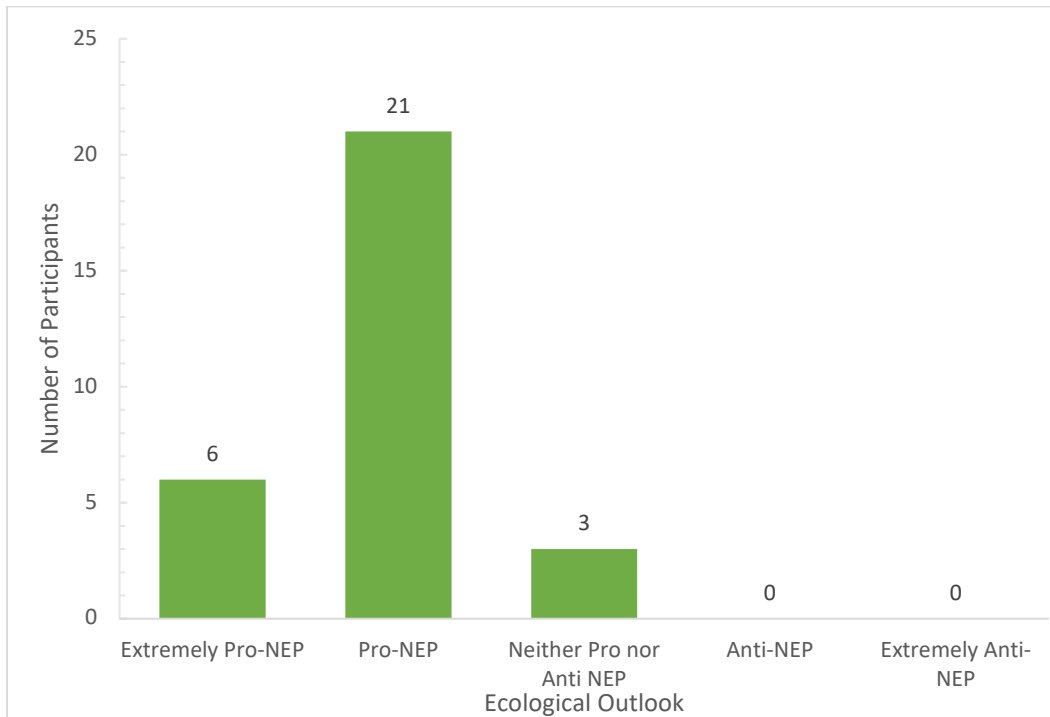


Figure 4. Participants' scoring on the (modified) New Ecological Paradigm Scale.

Negative statements of the NEP generally had more variance in the answers, with an average standard deviation of 0.85 compared to that of the positive statements being 0.69. However, negative statements like, “The balance of nature is strong enough to cope with the impacts of modern industrial nations” (M = 4.13, SD = 0.73), “The "ecological crisis" facing humankind has been greatly exaggerated” (M = 4.8, SD = 0.48), and “Humans were meant to rule over the rest of nature” (M = 4.43, SD = 0.68) were most disagreed with (means are reverse coded), indicating a favourable NEP outlook.

Participants seemed to engage most with the themes of Anti-Anthropocentrism and the Possibility of an Eco-Crisis (Figure 5). Many of the statements referenced above are associated with these two themes (Table 1). Interestingly, the two themes that are least agreed with are those related to the ‘Realities to the limits of growth’ and ‘Anti-exceptionalism’.

Overall, though, these results reflect the generally high levels of NEP present within the sample population. This differs from other uses of this scale. Compared to the results of Ntanos, a 2019 Greek application of the scale, our participants scored marginally higher than their study sample. Ntanos' study area was much larger than ours, studying citizens of the mountainous island of Evia, in Central Greece. This area's GDP in 2013 was 13,315 euros (~\$18,165 CAD) compared to Halifax's GDP which was about \$22.8 billion in 2018 (Ntanos, 2019; Nova Scotia, 2021). Ntanos also collected a representative sample size using an equation of simple random sampling to generate a confidence level of 95%, whereas our study was a pilot study focused on simply achieving a minimum of 30 participants (Ntanos, 2019).

Examining Ntanos's results, their mean scoring was 3.46 (adjusted to the 5-point Likert Scale from the 7-point Likert Scale used) while our mean scoring was 4.00 (Ntanos, 2019). This difference is especially notable in the theme of Anti-Anthropocentrism. While Ntanos's population answered an average of around 3.16, almost a neutral stance, our sample answered an average of 4.12, a definitive accordance with the theme (Ntanos, 2019; Figure 5). Both studies have the highest means for the theme 'Possibility of an eco-crisis', with ours reaching a score of 4.66, a high level of accordance, and Ntanos's score being 3.94 (adjusted from the 7-point Likert Scale), almost of sure level of accordance. With both of our research taking place in the past 3 years, these results demonstrate a collective understanding of what risks lie ahead with the state of the environment. It represents that the participants in both studies are more willing to accept the threats of climate change than the lifestyle and ecological outlooks associated with its prolongation.

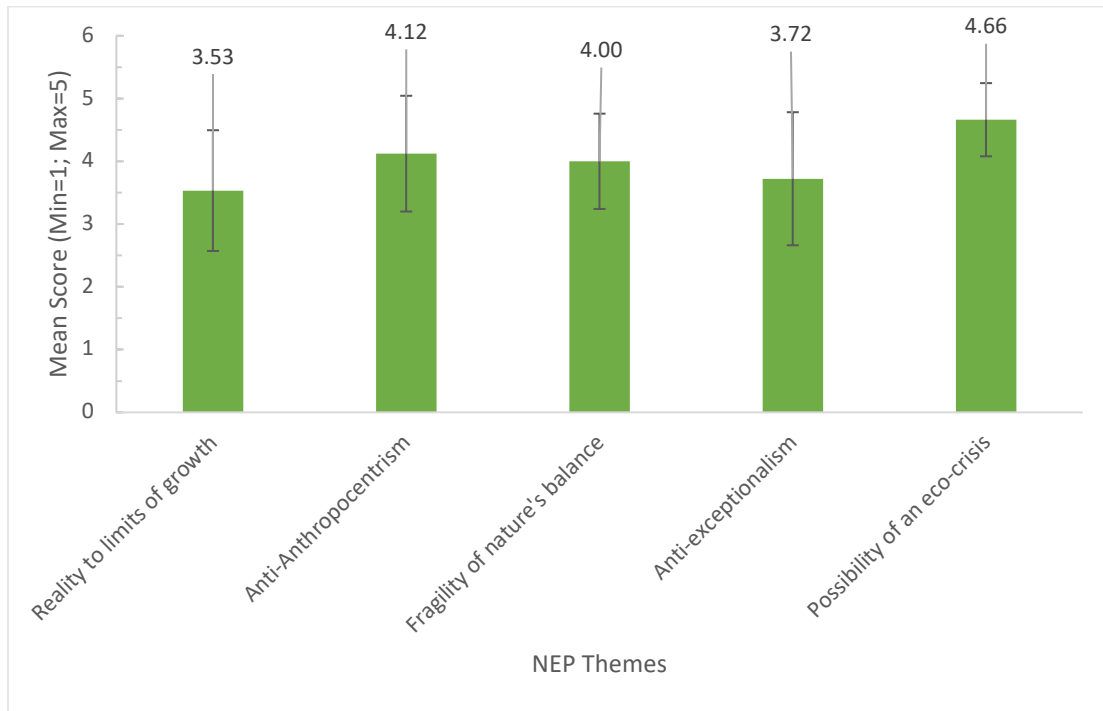


Figure 5. The five NEP Subscales and their associated means and standard deviations. Negative phrases were reverse coded.

4.4 Section Four of Survey: Material and Social Deprivation

Table 4. Sample demographics.

| Demographics | | Frequency | % Percent |
|--------------|---|-----------|-----------|
| Education | Less than High School | 0 | 0 |
| | High School Diploma | 2 | 6.67 |
| | Trade Certificate or Diploma | 1 | 3.33 |
| | College | 2 | 6.67 |
| | University Certificate | 0 | 0 |
| | Bachelor's Degree | 9 | 30.00 |
| | University Certificate Above Bachelor's Level | 4 | 13.33 |
| | Master's | 3 | 10.00 |
| | Earned Doctorate | 9 | 30.00 |
| Employment | Full Time | 18 | 60.00 |
| | Part Time | 5 | 16.67 |
| | Unemployed | 1 | 3.33 |

| | | | |
|-------------------------------|-------------------------|----|-------|
| | Not in Labour Force | 6 | 20.00 |
| Income | Under \$5000 | 0 | 0 |
| | \$5,000-\$9,999 | 1 | 3.33 |
| | \$10,000-\$19,999 | 0 | 0 |
| | \$20,000-\$29,999 | 0 | 0 |
| | \$30,000-\$39,999 | 0 | 0 |
| | \$40,000-\$49,999 | 1 | 3.33 |
| | \$50,000-\$59,999 | 0 | 0 |
| | \$60,000-\$69,999 | 2 | 6.67 |
| | \$70,000-\$79,999 | 3 | 10.00 |
| | \$80,000-\$89,999 | 3 | 10.00 |
| | \$90,000-\$99,999 | 2 | 6.67 |
| | \$100,000 and over | 18 | 60.00 |
| Single or Partnered Parents | Single | 1 | 3.33 |
| | Partnered | 29 | 96.67 |
| Partnered Status | Legally Married | 24 | 80.00 |
| | Living Common Law | 5 | 16.67 |
| | Never Married | 0 | 0 |
| | Separated | 1 | 3.33 |
| | Divorced | 0 | 0 |
| | Widowed | 0 | 0 |
| Number of People in Residence | 1 | 1 | 3.33 |
| | 2 | 0 | 0 |
| | 3 | 5 | 16.67 |
| | 4 | 17 | 56.67 |
| | 5 or more | 7 | 23.33 |
| Nature-Based School? | Nature-Based School | 9 | 30.00 |
| | Non-Nature-Based School | 21 | 70.00 |

Based on the Material and Social Deprivation Index model that posits factors such as high-school level education, single parents, and living alone as indicators of deprivation, most of the sample would not be understood as deprived. The majority of the sample are well

educated, with over 90% of the participants achieving at least a college or university level education (Table 4). In Halifax, around 21.8% of the population aged 25-64 list a high school diploma as their highest level of education (Statistics Canada, 2017). Of that same population, 1.4% have an earned doctorate (Statistics Canada, 2017). Compared to our sample population, where those with earned doctorates make up 30%, marking a 2042% increase, and indicating an unrepresentative sample. In terms of the other indicators of deprivation, only one participant (3.33%) was a single parent and lived alone, compared to the 18% and 32.2% of people in the Halifax population who are single parents and live alone, respectively (Table 4; Statistics Canada, 2017). Other indications of this sample's unrepresentative nature is the disproportionately high level of income of the participants' households. According to the 2016 Canadian Census, the median total income of households in the city's population centre in 2015 was \$65,824 (Statistics Canada, 2017). The households that earned \$100,000 and over make up 28.4% of Nova Scotian households (Statistics Canada, 2017). With our sample, 60% of participants made up that same high earning category—111% higher proportion (Table 4).

With such skewed data and small sample size, it was difficult to test factors of influence such as income, as the distribution between income brackets was not very even, therefore leaving blank or insufficient data categories. To account for the unequal variances and sample sizes between groups, we used Welch's (unpaired) t-tests. When testing whether the level of income was significant in impacting time spent outside, two groups were created: a higher income group composed of participants whose household income was >\$100k, and a lower income group whose household income was <\$100k. A results of a t-test demonstrated no significant difference in the time spent outside between the two groups ($t[28] = 0.469, p =$

0.321). However, this is recognizing that the assumptions of the t-test are not necessarily met due to the unrepresentative sample—leaving its results unreliable in presenting representative findings.

To test whether nature-based schools were a significant factor in time spent outside, a t-test was performed, testing the means of time spent outside between participants whose children attended nature-based schools and those whose children did not. There was no significant difference found between the time spent outside by the children who attend nature-based schools and non-nature-based schools ($t[28] = 0.847, p = 0.202$).

4.5 Further Analysis of Potential Affecting Factors

We identified three main variables of interest that we wanted to test for significance on other variables or sections of data. These included the participant’s NEP scale, whether they sent their child to a nature-based school or not, and their income level. For many of the questions asked, the results were insignificant. However, throughout this discussion of results, we will outline how our results compare to the literature and how they diverge.

Table 5. Multiple regression outputs testing the relationship between NEP scores of parents and various variable that pertain to connectedness to nature and childhood access to nature.

| Variable | Slope | Std. Error | t-Statistic | Probability |
|--------------------------------|--------------|-------------------|--------------------|--------------------|
| Time Spent Outside | -0.055 | 0.394 | -0.140 | 0.890 |
| Accordance with Their Children | | | | |
| Exploring in Nature | 0.099 | 0.219 | 0.451 | 0.656 |
| Personal Connection to Nature | 0.158 | 0.565 | 0.280 | 0.782 |
| R squared | 0.020 | F-statistic | 0.191 | |
| Adjusted R Squared | -0.090 | Prob(F-statistic) | 0.902 | |

The factor of a parent's ecological outlook, in the form of their NEP score, was tested against multiple variables to determine if there was any significant relationship between them. A multiple regression was performed, testing the parents' NEP scores as the independent variable against the dependent variables of time spent outside, their accordance with exploring in nature, and their own personal connection to nature. It was found that parents' NEP scores were not a significant predictor of any of the three variables, $R^2 = 0.02$, $p = 0.902$ (Table 5).

These results perhaps demonstrate the gap between parental pro-environmental attitudes and behaviours, discussed previously in the literature review. While it seems more logical to expect that NEP scores would have a positive relationship with pro-environmental behaviours, such as spending time outside and allowing their children to freely explore nature, studies done by Bamberg and Moser and Tam and Chan displayed a non-interdependence between pro-environmental attitudes and behaviours. The non-relationship between the two highlights potential barriers or factors of dissonance that prevent parental attitudes from being implemented into actionable behaviour.

Potential barriers have been previously named to be factors like income and education levels which both impact the amount of time and interest one may have to dispose to pro-environmental attitudes and behaviours. To test what may be impacting NEP scoring, and therefore potentially behaviours as well, further tests were done on the variables of income and education levels. It was found that those who had a high income did not have a significantly higher NEP ($t[1] = 0.189$, $p = 0.44$). This contrasts the results of Shen and Shaijo (2008) and Gifford and Nilsson (2014), who both found that high household income tended to result in

higher pro-environmental attitudes. However, of the lower income group being tested there only contained 2 participants who earned less than \$60k in their household. With such a small sample size, the results of the t-test are questionable in being able to accurately reflect the significance of the variable of income on NEP scores. When testing if there was a difference in means between levels of education, we run into similar issues. The number of participants within the lower education (below college) group are just three. It was found, however, that there was a significant difference in means between the two groups ($t[26] = -6.46, p < 0.0001$), with the lower education group having a significantly higher scoring NEP participants ($M = 19$) than those of the higher education group ($M = 13.5$). While this supports Uyeki and Holland's findings, that those who have lower education levels can be associated with high pro-environmental attitudes, the sample size of the test, and thus the results too, remain questionable in their validity (Uyeki & Holland, 2000).

There was also a significant difference in mean time spent outside between the high and low education levels ($t[4] = -2.46, p = 0.03$), with the low education level group spending more time outside. However, if we included those with college, but not university level of education in the lower education group, that difference in significance drops ($t[5] = -0.92, p = 0.20$). This further shows the unreliability in the data where the addition of two more participants' data can alter the results. Either way, these results do not align with the literature which finds that higher education levels tend to result in pro-environmental behaviours (Gifford & Nilsson, 2014).

Further independent t-tests were done using the variables of income, education level, and nature-based school attendance comparing the time spent outside. These variables were

chosen as potential factors of significance that impact the pro-environmental behaviour (spending time outside) of parents. There were no significant differences in the means of times spent outside between groups of high and low income households ($t[1] = -0.89, p = 0.27$), or between nature and non-nature based school attendance ($t[19] = 0.94, p = 0.18$). Similar to the last results, these results also contrast those found in the literature. Gifford and Nilsson comment out how income levels tend to result in pro-environmental behaviours as well as attitudes, in addition to Ametoghlu found higher income levels results in higher importance placed on playing outdoors (Ametoghlu, 2019; Gifford & Nilsson, 2014). Regarding the nature-based school results, perhaps the parents who send their children to nature-based schools assume that they will be spending enough time outdoors through their schooling and therefore feel that it is unnecessary for them to spend more time themselves.

Regarding the sample size of the study, and the statistical limitations related to it: this study was a pilot study and therefore had a more limited number of participants needed to complete it. However, should we have wanted to collect enough data to represent the Halifax population with a 95% confidence level and a margin of error of 5%, we would have needed to attain at least 384 people in our sample, based on current HRM population rates (Statistics Canada, 2017). At only 30 people, we only reached about 8% of the sample size which likely resulted in some skews and biases.

4.6. Comparison Between Parent Survey Results and Children's CTN Scores

We identified three variables that could be potential factors in affecting children's CTN scores which were household income, level of education, and ecological outlook/NEP score. We

analyzed the relationship between these three variables and two of the children’s CTN score categories—environmental sensitivity and awareness. Performing multiple regressions for each of the three parent variables testing against the environmental sensitivity and awareness of their children it was found that there was no significant relationships (Table 6).

Table 6. Multiple regression outputs testing the relationships between various parental variables and their children’s environmental sensitivity and awareness.

| Household Income | | | | | |
|---------------------------|--------|-------------------|-------------|-------------|--|
| Variable | Slope | Std. Error | t-statistic | Probability | |
| Sensitivity | -0.011 | 0.082 | -0.140 | 0.890 | |
| Awareness | 0.009 | 0.057 | 0.156 | 0.877 | |
| R-squared | 0.001 | F-statistic | 0.016 | | |
| Adjusted R-Squared | -0.072 | Prob(F-statistic) | 0.984 | | |
| Level of Education | | | | | |
| Variable | Slope | Std. Error | t-statistic | Probability | |
| Sensitivity | -0.041 | 0.074 | -0.555 | 0.583 | |
| Awareness | 0.029 | 0.052 | 0.547 | 0.589 | |
| R-squared | 0.016 | F-statistic | 0.226 | | |
| Adjusted R-Squared | -0.056 | Prob(F-statistic) | 0.799 | | |
| NEP Score | | | | | |
| Variable | Slope | Std. Error | t-statistic | Probability | |
| Sensitivity | 0.181 | 0.149 | 1.210 | 0.237 | |
| Awareness | -0.200 | 0.104 | -1.920 | 0.066 | |
| R-squared | 0.130 | F-statistic | 2.018 | | |
| Adjusted R-Squared | 0.065 | Prob(F-statistic) | 0.152 | | |

These results contrast much of the literature surrounding parental effects on their children’s CTN. However, the data being tested is not as robust as those present in some of the literature, making comparisons difficult. For example, Ametoghlu found a strong relationship

between parental educational background and their children’s CTN, where children whose parents only attained a high school degree or less scored lower (Ametoghlu, 2019). Our sample only contained two participants whose highest level of education was high school, and therefore cannot be easily compared to a Ametoghlu’s results whose study sample had much more breadth. While the studies did not collect information about communication methods, it can be assumed that a higher level of NEP would potentially lead to a greater number of environmentally related interactions between a parent and their child. Using this logic allowed us to test parental NEP scores with their children’s environmental sensitivity and awareness, to which the results were insignificant (Table 6). This contrasts Soga et al.’s findings that demonstrate a positive relationship between parental pro-environmental attitudes and their children’s (Soga, 2016).

Table 7. Most common responses from parents and children to questions in Games 3a and 3b (Appendix I). Parents’ responses are related to Sections 1 and 2 of the parent survey that correspond with the questions from the testing game and can be found in Figures 1 and 3.

| Questions from Games 3a and 3b | Children's Response | Percent | Parent Response |
|---|---------------------|---------|--|
| Where do you play the most? | Playground | 62.00% | Inside with Toys |
| Where do you like to play the most? | Inside | 30.00% | Parks or forests |
| Where do you feel safest to play? | Inside | 39.00% | Parks or forests Agricultural Settings |
| Where do you not like to play? | On the Street | 38.00% | On the Street |
| Where do you not like to play the most? | On the Street | 40.00% | On the Street |
| Where do you not feel safe to play? | On the Street | 40.60% | On the Street |

To compare the children’s environmental preferences with parental preferences for locations of play we first examined the modes of children’s preferences (Table 7). It is

important to note that the photograph for “Inside” showed a photo with non-electronic toys, thus making the parental preferences regarding playing inside with electronic toys (video games, TV, social media) not relevant in this comparison (Appendix I). According to the results, children indicated their preference (safety and overall) for inside locations (Table 7). While this contrasted with their parents’ preferences, it reflected the location that parents recorded to be most frequented in Section 1 (Figure 1). It also perhaps reflects upon the general less frequenting of public outdoor environments during the COVID-19 pandemic, where playgrounds and parks were shut for long periods of time (April, 2020).

In terms of the locations that were least preferred, “On the Street” was the most common (Table 7). This reflects the parents’ low safety and importance preference for the location of play, implying an internalized understanding of their parents’ distaste. Such adoption of parental views recalls the study by Grønhøj & Thøgersen, which demonstrated how children can be influenced by the perceptions of their parents’ actions—where in this case relates to children potentially being influenced by their parents unwillingness to supervise them playing on the street (Grønhøj & Thøgersen, 2012).

The results of this comparison between the parent survey and the children’s CTN scores derived from the modified testing tool further indicate potential problems with the study sample. With high variation in the children’s scoring between games, it suggests potential misunderstanding of certain games and therefore affecting results. While this is to be expected to a degree, as children are varied in their development and comprehension, the low sample number is vulnerable to outliers skewing the results.

5. Conclusion and Further Recommendations

5.1. Conclusions

This study was developed as an extension to testing the reliability and validity of the Modified Games Testing Tool, developed by Jessica MacKeen. As this study was to go beyond sampling nature-based school children, the study team was interested in better understanding the parents of the children being tested to potentially illuminate factors behind the scoring of the children. As such, this thesis sought to answer the following research questions:

1. To what extent does a parent's socioeconomic characteristics (household income, level of education) effect their child's CTN?;
2. To what extent does a parent's ecological outlook effect their child's CTN?;
3. What factors may affect the time a child spends playing outdoors in nature (parent's socioeconomic characteristics, ecological outlook, seasonal differences)?
4. In what locations of play is time most spent?

To answer these questions, an extensive literature review, a pilot test, and a distributed survey were conducted. Overall, it was found that there were insignificant relationships between socioeconomic characteristics such as income and level of education of a parent as well as their ecological outlook (NEP) and their child's CTN. Through further testing of parental variables, insignificant relationships were also found between the household income and level of education and a parent's ecological outlook (NEP). There was also an insignificant impact of parental environmental attitudes, socioeconomic status, and whether they enrolled their child into a nature-based school on the amount of time their child plays outside in nature.

Regarding the breakdown of locations of play, it was found that seasons did have a significant effect on the time spent in outdoor locations but did not for indoor locations. Parental safety and importance preferences were also found to have a positive relationship, indicating the level of consideration of both when choosing locations of play for their child.

While these results describe the sample population for this particular study, they do not necessarily apply to the larger population due to the potentially biased, unrepresentative sample. Most likely this was due to using snowball sampling within a university environment, where it is more probable to find parents who are highly educated and high earners. While this study was done in the hope of going beyond potentially biased study populations (those who would be predisposed to environmental concerns as demonstrated by their decision to send their children to nature-based schools), it seems that we still collected a reasonably skewed sample. This highlights the importance of intentional sampling efforts that better represent the overall study population.

This study provides a demonstration of what information can be collected and analyzed through a parent survey given alongside a CTN testing tool. Researchers and practitioners should be mindful of their sampling techniques when conducting similar research. Depending on what kind of CTN tool is used, this study displays the utility of mirroring the parent survey to the kinds of games used within the tool to be able to easily compare results. It also offers widely used measures of ecological outlook (NEP scale) and of socioeconomic factors (MSDI) as guidelines to use for the rest of the analysis. It should be noted that in future uses of this survey, the NEP scale should be replicated in full (15 questions), not in its modified form shown in this study.

5.2. Recommendations

Should this survey be used in the future, there are several changes and improvements to consider ensuring a more accurate and robust picture of the tested children's parents. First, adding more components to Section Four of the survey, which currently focuses on factors relating to MSDI, would bring in more potential factors of interest that could be analyzed for significance in their effects on CTN. These components could ask the race, country of origin/cultural background, gender, or disability status of the participants. This would align more with the literature provided, as well as provide more intersectional answers to potential gaps in data collection. It would also allow the survey to be more representative of its population if race and cultural factors were able to be discussed.

Second, adding qualitative questions to Section Two would allow more explanation as to why the locations of play are rated as they are, and why they feel more or less comfortable with their child exploring in nature. Qualitative analysis would allow for more nuance in the discussion of results. It would also allow comparison between the parent and the child's anecdotal answers which could reveal differences in perception between the two family members on locations of play or environmental attitudes.

Third, adding a question or two that asks about the environmental-related interactions between the parent and child would allow further insight on how pro-environmental attitudes and behaviours are passed down. These potential questions could be relating to the frequency of conversations about the environment, watching nature documentaries together, reading

environment-specific books together, etc. and the frequency of environment-based activities such as recycling together, picking up litter, gardening, etc.

Fourth, care should be taken to collecting as representative of a sample as possible. This looks like having a bigger sample and using more purposive sampling techniques that may target populations in a more geographic way to ensure a wide distribution of participants.

Lastly, specific ideas for further research could involve branching off this study to further compare data between the parent survey and the children's CTN scores. This could look like more of a focus on the specific age of the children: is there more of a relationship between parents and the 3-year-olds than the 5-year-olds? It could also involve more testing between added potential factors, mentioned in above recommendations, and the children's scores, not limited to the effects of race, cultural background, gender, disability status, and geographic location of residence.

Understanding how the COVID-19 pandemic has affected the time children have spent outside in the first three to five years of life is also important to know to be able to account for in the CTN scoring. Adding a component in the parent study, asking how the pandemic affected their daily/weekly routines and activities, and what their level of comfort going outside was during the pandemic, could provide insight to the results.

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Appendices

Appendix I: Research Tool (modified games testing for Emotional, Cognitive and Attitudinal Affinity with the Biosphere, Giusti et al., 2014)

Measuring Environmental Knowledge and Connection to Nature; A Games Testing Tool for Preschoolers (3-5-year-olds)

Overarching Recommendations

1. If possible, bring an assistant to help with recording the results;
2. It is advised that each session be audio-recorded upon consent from the parent(s)/guardian(s) of each participant;
3. Enlarge the suggested tables to poster size to establish a game board;
4. Enlarge the loose pictures to an appropriate size to use as game pieces;
5. Play one game at a time to allow for clarity for the participants;
6. Shuffle the loose cards in between participants for games 1A and 2A;
7. Finally, have a dance party, tell some knock-knock jokes, and/or have a puppet on hand to facilitate breaks in between games if the participant is losing interest or at the end of the session for some additional fun (not necessary if the participant is engaged).

Before Starting the Games Testing

The opening exercise will have the child draw a picture of themselves on a blank square piece of paper (this piece of paper should be the same size as the cut outs for game 1A). This is a great ice breaker, and the picture will be used later in game 2B.

- Begin by explaining the task to the child:
 - o Example: "Before we start, I would like you to draw a picture of yourself on this piece of paper".
- Set this picture aside, so it can be used later in game 2B.

It is essential to go over the concepts of dirty water (water pollution), dirty/smoky air (air pollution), and dirty ground (ground pollution) briefly without iterating the environmental issues and consequences associated with each one. This will allow the children to have some understanding, without creating bias in the answers received from each participant. Examples are as follows:

- Example of explanation: "Before starting the games, I am going to go over some ideas that you will see today";
- Example for dirty water: "Dirty water can happen when trash and chemicals get in the water";
- Example for dirty/smoky air: "Dirty or smoky air can happen when too many harmful gases and smoke are in the air";
- Example for dirty ground: "Dirty ground can happen when garbage gets into the environment".

These phrases can be referred to upon conducting the games that involve these challenging concepts (Game 1B and Game 2B). Thus, giving the child some understanding without saying it in a way that will influence their responses.

Section 1: Environmental Sensitivity




Game 1A






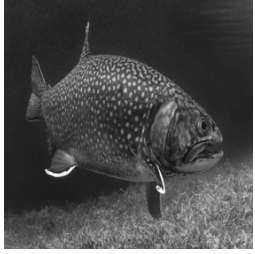
Recommendations:

It is advised that the researcher enlarges, prints, and laminates the pictures found in the table below. Additionally, it is advised that the researcher bring two separate containers to make yes and no bins, to facilitate sorting (may be beneficial to use a green coloured checkmark and a red coloured 'x' alongside the "yes" and "no" signs, as some children respond best to visual cues). Finally, another option to keep the child engaged is to place the bins on opposite sides of the testing area, allowing the game to have a task and movement. If this is the case, then it is advised that the researcher explains the bins to each participant before beginning the game.

Instructions:

1. Begin by explaining the exercise to the child:
 - a. Example: "In this first game, I will hand you a picture and ask if the thing in the picture can feel an owie or get hurt, and then you will sort them into the yes or no bins (demonstrate while explaining)";
2. Show the child one picture after the other from the table below (laminated cut-out versions of the pictures). For every picture, ask they/them:
 - a. Example: "Can (ex. a tree) go owie? Can (this picture) get hurt?";
3. For each picture, ask the child to sort their answer either in the yes bin or the no bin, allowing the child to partake in a sorting exercise;
4. Therefore, the game result will be a simple list of "yes" and "no" matching each picture in the table below;
5. Record the results on the scoresheet as "yes" or "no";
6. Note: It is important to shuffle the loose cards in between participants.

| | | |
|--|---|--|
| Tree  | Chicken  | Bike  |
|--|---|--|

| | | |
|---|--|--|
| <p>Bird</p>  | <p>Reindeer</p>  | <p>Airplane</p>  |
| <p>Cut Down Tree</p>  | <p>Car</p>  | <p>Fish</p>  |

Game 1B

Recommendations:





It is advised that the researcher prints and laminates an enlarged version of the table. Additionally, it is recommended that nine of each of the happy and sad smiley faces are enlarged, printed, and laminated so the children can place them on top of the pictures.

Instructions:

1. Begin by explaining the exercise to the child:
 - a. Example: "We are going to play a game of happy and sad faces, and I would like you to put a happy smile or sad face on each photo you see here (demonstrate while explaining)";
2. Then for each picture, have a smiley and sad face in your hands providing the child with the option to pick and place one or the other on top of each picture (there will be a total of 18 happy and sad face cut outs);
3. Ask the child to place a happy or sad face image on top of each of the pictures in the table below one after the other (you could use your finger to point to each picture);
 - a. Example: "We'll start with dirty water, which smiley would you like to place there (the researcher should have both a happy and sad face in their hand)?"
 - b. The researcher must ensure that they do NOT ask any questions to the child and do NOT explain what the picture means;
4. Record results on the scoresheet as "happy" or "sad" smile.

"Happy smile" and "sad smile"



| | | |
|---|--|--|
| <p>Dirty Water</p>  | <p>Dirty or Smoky Air</p>  | <p>Watering Plants</p>  |
| <p>Dirty Ground</p>  | <p>Cleaning up</p>  | <p>Cutting Down Trees</p>  |
| <p>Dirty or Smoky Air</p>  | <p>Planting a Tree</p>  | <p>Plastic on the Ground</p>  |

Section 2: Environmental Awareness

Game 2A










Recommendations:




It is advised that the researcher enlarges, prints, laminates, and cut out *List 1* found below (cut outs similar to Game 1A). Then, similar to the previous game (1B), enlarge, print, and laminate the pictures in *List 2*. This exercise is a matching game.







Instructions:

1. Place the table with the pictures from *List 2* in front of the child and pile the pictures from *List 1*. Then begin by explaining the exercise:
 - a. Example: "In this game, I am asking you to match a picture from *List 1* with a picture from *List 2* (demonstrate while explaining)";
2. Show the child one picture at a time from *List 1* and ask they/them to find a picture among the ones already placed in front of they/them (*List 2*) and ask they/them to answer:
 - a. "What do you need to have (this picture)?", then ask "why did you match those two pictures";
 - b. Example: "What do you need to make a picnic table?", and then ask, "why did you match those two pictures?";
3. What the picture represents must be clearly stated to make the child understand:

- a. Example: the image is a “WOODEN table” or that the image represents “BLUEBERRIES” and not every kind of berry;
4. Continue this process for every image in *List 1*;
5. Record which item from *List 1* was paired with in *List 2*. To the question “Why?” the child does not have to select any picture, but reply in words, this implies that researchers must synthesize it and write down children’s answers in the scoresheet;
6. Note: It is important to shuffle the loose cards in between participants.

| List 1 | | |
|--|--|--|
| Picnic Table  | Eggs  | Tuna can  |
| Carrots  | Glass of milk  | Tap water  |
| Wool hat  | Paper  | Blueberries  |

| List 2 | | |
|--|--|--|
| Wood  | Fish  | Cow  |
| Chicken | Garden | Money |

| | | |
|---|---|--|
|  |  |  |
| River  | Truck  | Sheep  |

Game 2B

Recommendations:

It is advised that the researcher enlarges, prints, and laminates the pictures found in the table below, *List 1* (cut outs similar to Game 1A). Comparable to the previous Game 1B, it is recommended that the researcher organizes the pictures from *List 2* into a table, as well as to enlarge, print, and laminate the table. *The picture that the child drew of themselves at the beginning of the testing should be placed under the “you” category in *List 2* along with three other cards that have the word “YOU” written on them.

Additionally, bring enlarged, printed, and laminated versions of each individual (3 of each) picture in *List 2*. Finally, utilize the bins from Game 1A to facilitate the sorting of the “yes” and “no” segment (may be beneficial to use a checkmark and an ‘x’ alongside the “yes” and “no” signs, as some children respond best to visual cues).

Instructions:

1. Begin by explaining the exercise to the child:
 - a. Example: “In this game, I will first ask you to explain what you see, and then I will ask you if the picture I show you (from *List 1*) can hurt each of the pictures in *List 2* by getting you to sort them into the yes or no bins again (demonstrate while explaining)”;

Part 1:





2. Show the child one picture from *List 1* (representing different kinds of pollution) and place it visibly in front of they/them. The picture should NOT be explained again at this time;
3. Ask the child what the environmental issue (from *List 1*) means and record their answer:
 - a. Example: “What is air pollution/dirty air?”;
4. For this question the child does not have to select any picture, but reply in words, this implies that researchers must synthesize it and write down children’s answers in the scoresheet.
5. After the first step is complete, place the pictures (*List 1*) and table (*List 2*) in front of the child;

Part 2:

6. Then show the child by pointing, one after another, at the images in *List 2* and ask they/them for every set of pictures the following and record their answer:

- a. "Can (the first picture) hurt (the second picture)/make (the second picture) go owie?";
 - b. Example: "Can (ex. dirty or smoky air) hurt (ex. an animal)/make (ex. an animal) go owie?";
 - c. If the child says "yes", encourage them to place it in the "yes" bin and vice versa;
 - d. Then move onto the next photo from *List 1* and go through each item in *List 2*:
7. The game will result in a simple list of "yes" and "no" for each picture in *List 1* corresponding to each set of pictures in *List 2*. Record the results on the scoresheet.

| List 1 | | | |
|--|--|--|--|
| Dirty or Smoky Air  | Dirty Ground  | Dirty Water  | Cutting Down Trees  |

| List 2 | | | | |
|---------------|---|--|--|---|
| You | Animal  | Car  | People  | Forest  |

Section 3: Environmental Preferences Game 3A

Recommendations:

It is advised that the researcher prints and laminates an enlarged version of the table. It is important to note that the participants are allowed to pick as many options as they would like for each question provided below.

Instructions:

1. Begin by explaining the exercise and saying what each of the pictures in the table are:
 - a. Example: "I am going to show a table of pictures and ask you some questions that will require you to pick a photo (demonstrate while explaining)";
 - b. Then go through the table and say what each picture is:
 - i. Example: "This is a picture of children playing in a backyard, this is a picture of a playground, etc.";
 - c. Example: "Then I will ask you questions, such as where do you usually play the most? And I would like you to pick a picture from this table."

2. Place the table of pictures in front of the child and ask they/them to select from the pictures to answer the following questions:
 - a. Question 1: “Where do you play the most?” and “Why?”
 - b. Question 2: “Where do you like to play the most?” and “Why?”
 - c. Question 3: “Where do you feel the most safe to play?” and “Why?”
3. First record where they play on the scoresheet. To the question “Why?” the child does not have to select any picture, but reply in words, this implies that researchers must synthesize it and write down children’s answers in the scoresheet.



Game 3B

Recommendations:

It is advised that the researcher uses the same table of pictures from Game 3A. It is important to note that the participants are allowed to pick as many options as they would like for each question provided below.

Instructions:

1. Begin by explaining the exercise to the child:
 - a. Example: “This game will be similar to the last one (Game 3A), where I will ask you questions, and you will point to a photo in the table (demonstrate while explaining)”;
2. Place the table of pictures in front of the child (from Game 3A) and ask they/them to select from the pictures to answer the following questions:
 - a. Question 1: “Where DO you NOT like to play?” and “Why?”
 - b. Question 2: “Where DO you NOT like to play the most?” and “Why?”
 - c. Question 3: “Where DO you NOT feel safe to play?” and “Why?”
3. First record where they play on the scoresheet. To the question “Why?” the child does not have to select any picture, but reply in words, this implies that researchers must synthesize it and write down children’s answers in the scoresheet.

Debrief

After completing the games testing with the participant, it is recommended that the researcher debriefs the child by explaining pollution in simple terms. It may be beneficial to bring materials along with you, such as a jar showing clean water and a jar showing dirty water.

- Go over dirty water (water pollution), dirty ground (ground/soil pollution), and dirty or smoky air (air pollution);
 - o Example: “Today we have been talking about different kinds of pollution. I will now go over these ideas with you. If you have any questions, please ask”;
 - o Example of water pollution: Water pollution can happen when waste and chemicals are found in a body of water (e.g., the ocean or river). The waste and chemicals can make the water not safe for fish and other animals to live in;
 - o Example of ground pollution: Ground pollution can happen when garbage is found in the environment (e.g., on the side of the road or on the ground). When garbage gets into the environment it can cause health problems for animals and humans;
 - o Example of air pollution: Air pollution can happen when too many chemicals and harmful gases are in the air. This can cause the air to become smoggy or have a smoky look to it and can cause health problems for animals and humans (e.g., makes it hard to breathe).
 - o Example of cutting down trees: Deforestation can happen when humans take too many trees from the forest. This can have a negative impact on the wildlife and ecosystems in the forest.
- Finally, ensure to ask the participant again if they have any questions.

Appendix II: Researcher Design Sheets

Scoresheet

Date _____

Participant _____

Please send a copy of the scoresheet to the Lead Researcher/Research Assistant after each session is complete

Game 1A: Emphatic Behavior Instructions

*Record the results as “yes” or “no”.

| | | |
|---------------|----------|-------|
| Tree | Chicken | Bike |
| Bird | Reindeer | Plane |
| Cut Down Tree | Car | Fish |

Game 1B: Concern & Sensitivity Instructions

*Record results on the scoresheet as “happy” or “sad” smile.

| | | |
|-------------|--------------------|-----------------|
| Dirty Water | Dirty or Smoky Air | Watering Plants |
|-------------|--------------------|-----------------|

| | | |
|---------------------------|------------------------|------------------------------|
| Dirty Ground | Cleaning up | Cutting Down Trees |
| Dirty or Smoky Air | Planting a Tree | Plastic on the Ground |

Game 2A: Provision of Ecosystem Services Instructions

*Part 1: Record which item from *List 1* was paired with in *List 2*.

*Part 2: To the question “Why?” the child does not have to select any picture, but reply in words, this implies that researchers have to synthesize it and write down children’s answers.

| | | |
|------------------------------|-------------------------------|-----------------------------|
| Picnic Table Item: | Eggs Item: | Tuna can Item: |
| Why: | Why: | Why: |
| Carrots Item: | Glass of milk Item: | Tap water Item: |
| Why: | Why: | Why: |
| Wool hat Item: | Paper Item: | Blueberries Item: |
| Why: | Why: | Why: |

Game 2B: Pollution Awareness Instructions

*Part 1: For this question the child does not have to select any picture, but reply in words, this implies that researchers have to synthesize it and write down children’s answers.

| | |
|--|--|
| Air Pollution/Dirty or Smokey Air | |
| Ground Pollution/Dirty Ground | |
| Water Pollution/Dirty Water | |
| Cutting Down Trees | |

*Part 2: *Record the results as “yes” or “no”.

| | | | | |
|--|---------------|------------|---------------|---------------|
| Air Pollution/Dirty or Smokey Air | | | | |
| You | Animal | Car | People | Forest |
| | | | | |
| Ground Pollution/Dirty Ground | | | | |
| You | Animal | Car | People | Forest |
| | | | | |

| | | | | |
|------------------------------------|---------------|------------|---------------|---------------|
| Water Pollution/Dirty Water | | | | |
| You | Animal | Car | People | Forest |
| Cutting Down Trees | | | | |
| You | Animal | Car | People | Forest |

Game 3A: Favorite Environmental Quality Instructions

*First record where they play on the scoresheet. To the question “Why?” the child does not have to select any picture, but reply in words, this implies that researchers have to synthesize it and write down children’s answers in the scoresheet.

| | | |
|--|--------------|------------|
| “Where do you play the most?” and “Why?” | Where | Why |
| “Where do you feel the most free to play?” and “Why?” | Where | Why |
| “Where do you feel the most safe to play?” and “Why?” | Where | Why |

Game 3B: Disfavored Environmental Quality Instructions

*First record where they play on the scoresheet. To the question “Why?” the child does not have to select any picture, but reply in words, this implies that researchers have to synthesize it and write down children’s answers in the scoresheet.

| | | |
|---|--------------|------------|
| “Where DO you NOT like to play?” and “Why?” | Where | Why |
| “Where DO you NOT feel free to play?” and “Why?” | Where | Why |
| “Where DO you NOT feel safe to play?” and “Why?” | Where | Why |

Appendix III:

Initial Recruitment E-Mail to be Sent to the Preschool Directors and Preschool Teachers

Warmest Greetings!

My name is Dr. Tarah Wright. I am a Full-time Professor in the Earth and Environmental Sciences Department at Dalhousie University and the Director of the Education for Sustainability Research Group. Currently, I am also a lead researcher working on a project that is looking at assessing a bioaffinity (one's love of/for or connection to nature) test with 3-5-year-old children.

The tool that we want to pilot test aims to examine the influence of different outdoor and indoor natural exposures in a preschool's curriculum on children's affinity with the biosphere, by using a questionnaire which is called "Modified Research Instrument: Games Testing for Emotional, Cognitive and Attitudinal Affinity with the Biosphere". In a previous study, we successfully modified the tool to become more appropriate for Canadian 3-5-year-olds. Working with Jessica MacKeen, a master's student at Dalhousie University, and Hope Moon and Honours student in Environmental Science, we are determining the validity (ensuring that the tool does what it intends to do) and reliability (ensure that the test gets the same outcome after repeated trials) of the modified tool and pilot test the new tool to test for validity and reliability. In order to test validity and reliability of the refined tool, we are looking to test it a cohort of 3-5-year-old preschoolers (30 children in total). By completing this study, we hope to further determine the appropriateness of the measure for younger children and prepare the tool for future use by confirming whether the tool can produce trustworthy and generalizable data. Further, once the reliability and validity testing are established, we will analyze the bioaffinity results of the Halifax participants to determine their emotional, cognitive and attitudinal affinity with the biosphere. In addition, a survey of the parents of the children enrolled in the study will be conducted to determine whether outside influences like time spent in nature outside of school has an impact on the children's overall bioaffinity.

With this in mind, we would like to request permission to send an invitation email to the parent(s)/guardian(s) of the preschool children attending your school for voluntary participation of their children and themselves as a pair in the study. If permission is granted, we would like to ask that the invitation comes directly from you and/or the teacher who leads the preprimary class(es). Please let me know if you have any questions or concerns. Thank you for your consideration in advance. You may contact me by responding to this e-mail or by calling me at 902-497-1831.

Respectfully yours,

Tarah Wright, Ph.D.
Dalhousie University
Environmental Science
1355 Oxford St.
PO BOX 15000
Halifax, NS B3H 4R2

Appendix IV:

Initial Recruitment E-Mail to be Sent to the Parent(s)/Guardian(s) of the Preschool Children

Dear parents,

This email is to invite you to consider you and your child's participation together in a research study called "Determining the Validity and Reliability of a Modified Games Testing Tool to Evaluate the Bioaffinity of Preschoolers". This study is being conducted by myself, Dr. Tarah Wright, and my research assistant Jessica MacKeen who is a master's student at Dalhousie University. In addition, Hope Moon, an undergraduate research assistant, will be completing their Honours degree at Dalhousie and will be supporting the project.

If you and your child agree to participate in the study, your child will be asked to complete a set of games. While your child is playing the games, you will be asked to fill out a survey about your family's activities and demographic information. Taking part in the study is up to both of you; it is entirely your choice. You and your child's participation is voluntary and remains voluntary throughout the entirety of the study. The testing with your child will be held at an outdoor location on Dalhousie University campus to allow for physical distancing, and the testing material will be laminated to allow for sanitization in between each participant. You can choose to fill out the survey in whatever location is most comfortable for you while your child is being tested (i.e. you should feel free to take the survey away to a coffee shop, or anywhere else that works for your situation).

You and your child's participation will be required for roughly 15-35 minutes. Upon completion of the games testing, your child will receive a Certificate of Achievement, and we will offer you one \$25.00 gift card to Wozzles children's store for your collective participation in the study.

It is important to note that you and your child's participation is completely voluntary. This research is not being done nor is endorsed by the Director or the teachers sending this email. The research will be conducted by the Research Assistant, Jessica MacKeen, who is master's student attending Dalhousie University and Ms. Hope Moon under the direction of Dr. Tarah Wright.

For further explanation, we ask you to read the information bulletin attached to this email. We have also provided a brief biography about the research assistant, Jessica MacKeen, in hope that you gain familiarity with who will help facilitate the testing with your child. If you have any questions about the study, and/or are interested in your child participating in the study, you may contact Tarah Wright, the lead researcher, via responding to this email (tarah.wright@dal.ca) or telephone (902-497-1831). Thank you for considering this request.

Respectfully yours,
Tarah Wright, Ph.D.
Dalhousie University
Environmental Science
1355 Oxford St.
PO BOX 15000
Halifax, NS B3H 4R2

Appendix V:
Information Bulletin to be Sent to the Experts and the Parent(s)/Guardian(s) of the
Preschool Children

Hello,

My name is Dr. Tarah Wright, I am a Director of the Education for Sustainability Research Group and Full Professor in the Faculty of Science at Dalhousie University.

I am writing you today to see if you will consent to your child being part of a pilot study in which we are testing a tool that aims to measure children's emotional, cognitive and attitudinal affinity with nature (also known as bioaffinity or one's love of nature). The intention is to pilot test our tool to make sure that it is both valid and reliable, and then use the tool for a larger study that will look at whether increase in nature experience in curriculum creates a greater bioaffinity in children.

This is where you and your child come in. We need to pilot test our tool with 3-5-year-old preschoolers and one of their parents/guardians. If you and your child agree to participate in the study, the child will be asked to complete a set of games. These games are comprised of picture matching, yes/no and short answer questions to which your child can respond by pointing to a picture of a happy or sad face or other images that will be provided. Your child's participation would be required for roughly 15-35 minutes. It is intended for the games to be played at an outdoor location on the Dalhousie University campus to allow for physical distancing, and the testing material will be laminated to allow for sanitization in between each participant.

As for you as a parent, your contribution to the study will involve filling out a single survey. You can choose to fill out the survey in whatever location is most comfortable for you while your child is being tested (i.e. you should feel free to take the survey away to a coffee shop, or anywhere else that works for your situation).

As mentioned in the invitation email, each parent/child group who partake in the games testing will receive a Certificate of Achievement (for your child) and a single \$25.00 gift card to Woozle's Children's store. It is important to note, even if you decide to remove yourself and your child from the study after the testing is complete, you and your child will still be compensated.

Throughout the entire research process you and your child's name and any other information pertaining to their identity will be kept confidential. If you are interested in you and your child participating, we will gladly send you a consent form and my contact information should you have any questions. After signing the consent form you do have the opportunity to withdraw from the study at any point without

repercussions. During the testing, if your child decides they do not want to continue participating or becomes uncomfortable during the interview process they are encouraged to tell the researchers and they will be removed from the research setting. Please see the attached consent form for more details on the ethical considerations associated with this study.

A previous study by MacKeen and Wright (in press) used the modified games testing tool that is being asked for your child to be tested with, and studies by Omidvar (2018) and Omidvar et al. (2019) studies used the original testing tool did not have any instances of uncomfortableness occur. However, if your child is fidgeting, cowering away from the testing (looking away, standing by the door wanting to leave, or showing increased signs of uncomfortableness, such as crossing their arms), the researcher will stop and ask the child if they are okay. If the child indicates they merely uncomfortable due to needing to use the washroom, then the Research Assistant and Lead Researcher/Volunteer will handle this accordingly. If the child is unwilling to voice their feelings, then that will be the determinant of stopping the study. To expand on this, if the child becomes increasingly unwilling to participate in the games testing (not responding or looking away), this will facilitate a reason to stop and ask the child if they are okay. Furthermore, if the child does not respond, that will be taken as the child is too uncomfortable to continue the testing, therefore, the child would be returned to the class or to their parent/guardian depending on the chosen study location. Finally, if this was to occur, which it should not as the testing was completed in three separate schools with 20 children in the Omidvar (2018) and Omidvar et al. (2019) and with 9 children in the MacKeen and Wright (in press) study, and this did not happen, the Research Assistant and Lead Researcher/Volunteer would follow up with the parent to ensure the child went back their normal level of comfort upon ending the testing.

If you have any questions or concerns regarding the research process and/or ethical issues, please contact Tarah Wright (at 902-497-1831, tarah.wright@dal.ca) at any time. I will also inform if any new information comes up that could affect your decision to participate.

If you wish for your child to participate in the study, please RSVP to this email. Thanks again for your consideration.

Thank you for your interest,

Respectfully yours,
Tarah Wright, Ph.D.
Dalhousie University
Environmental Science
1355 Oxford St.
PO BOX 15000
Halifax, NS B3H 4R2

Appendix VI: Consent Form

Project Title: Determining the Validity and Reliability of a Modified Games Testing Tool to Evaluate the Bioaffinity of Preschoolers

Dear Parent(s)/Guardian(s),

We invite your child to take part in a research study being conducted by Dr. Tarah Wright and research assistants Jessica MacKeen and Hope Moon. Taking part in the research is up to you and your child; it is entirely your choice. Even if you consent to participate, your child will not participate if they do not want to. Both you and your child may leave the study at any time for any reason. It is important to note, even if you decide to remove yourself and your child from the study after the testing is complete, you and your child will still be compensated. The information below tells you about what is involved in the research, what your child will be asked to do and about any benefit, risk, inconvenience or discomfort that your child might experience. Please ask as many questions as you like. If you or your child have any questions later, please contact the lead researcher.

Who is Conducting the Research Study

Principal Investigator:

Dr. Tarah Wright, Full Professor, Dalhousie University, Environmental Science,

tarah.wright@dal.ca

Other researchers:

Jessica MacKeen, Master's Student, Dalhousie University, School for Resource and Environmental Studies,

jmackeen@dal.ca

Hope Moon is an undergraduate research assistant who is completing their Honours degree at Dalhousie and will be supporting the project as a research assistant.

Hope.moon@dal.ca

Purpose and Outline of the Research Study

This pilot study aims to evaluate the validity and reliability an existing modified psychological games testing tool that has been previously utilized to assess young children and their love of nature (bioaffinity with nature). The games testing tool is called "Modified Research Instrument: Games Testing for Emotional, Cognitive, and Attitudinal Affinity with the Biosphere". The intention is to pilot test our tool to make sure that it is both valid and reliable, and then use the tool for a larger study that will look at whether an increase in nature experience in curriculum creates a greater bioaffinity in children/increased positive relationship with nature. In other words, this project focuses on determining the validity and reliability of the games testing tool and proving it can generate trustworthy,

generalizable results and its appropriateness (usability) for testing Canadian preschoolers (3-5-year-old's). In order to prove that the tool is appropriate for future use, psychological measures validity and reliability will be used; validity is whether or not the tool does what it's supposed to do, and reliability is whether or not the results of the tool stay consistent. Furthermore, this study will test the reliability of the modified emotional, cognitive, and attitudinal Games Testing tool with the collected data from this pilot test. In order to test the validity and reliability of the modified tool, we are looking to test it with a cohort (group) of 3–5-year-old preschoolers. By completing this study, we hope to accomplish (a) assess the modified tool's face and content validity by sending a questionnaire and conducting semi-structured interviews with Bioaffinity, Early Childhood Education and Psychological Testing Tool Experts (b) further refine the modified tool through consultation with Bioaffinity, Early Childhood Education and Psychological Testing Tool experts, and (c) determine the modified tool's internal consistency reliability through pilot testing with preschoolers. By meeting these three objectives we will determine the appropriateness of the measure for younger children, and whether refining the tool accordingly will produce trustworthy and generalizable data resulting in the confirmation that tool is ready for future use. In addition, we will analyze the test data collected in games testing with the children to examine their affinity to nature. Finally, we will be using a parent survey to determine whether outside influences (i.e. time spent in nature outside of school), has an impact on the children's overall bioaffinity scores.

Who Can Participate in the Research Study

Participation must occur in adult/child pairs. A pair involves (1) Any junior and senior preschooler, between the ages of 3-5 year, and (2) one parent/guardian of the aforementioned child. Given the age of your child, consent needs to be given by you as their parent/guardian (please see below). Although you are providing consent for participation in this study, please review this document with your child to ensure they also agree to participate.

What Your Child Will Be Asked to Do

To help us determine the appropriateness of the measure for younger children via validity and reliability of the games testing tool, we will ask your child to complete six games which are related to children's cognitive, emotional and attitudinal bioaffinity. These games will comprise of picture matching games, yes/no and short answer questions that your child can reply with using the picture of happy/sad faces or the images that will be provided. The games will be conducted at an outdoor location on Dalhousie University campus to allow for social distancing, and the total amount of time needed to perform a complete set of games is ~15-35 minutes. To obtain an accurate and complete report of your child's responses, it is asked that the session be audio-recorded upon permission.

Upon the day of the testing, your child will be asked if they would like to play a game with the researcher. If they agree, the game testing will begin. If not, the researcher will wait awhile and ask the child again. If they still do not want to 'play' with the researcher, then they will not be tested. You are welcome to see a copy of the Games Testing questionnaire and images prior to deciding of signing the consent form. We are aiming to conduct the testing anywhere between June 2021 through September 2021, pending REB approval. Therefore, after consenting to your child's participation specific dates and times can be discussed based on your availability and at your convenience.

What Your Will Be Asked to Do

While your child undergoes the games testing portion of the study (as described in your child's consent

form), we will be asking you to fill out a survey (approximately 20-25 minutes) that tries to determine factors outside of school that may influence your child's degree of connectedness with nature. The survey will ask you to describe your child's exposure to natural experiences outside of school time, answer general demographic questions, and will have you rate 16 statements related to your connection with nature.

Possible Benefits, Risks and Discomforts

Parents and children who participate will indirectly contribute to knowledge in the field of formal and non-formal environmental education.

Given the nature of this study, the perceived risks and/or discomforts for participants are minimal. Potential discomforts that may be felt by participants include: inability to understand what an interview question is asking them, and/or feeling upset about the pictures related to negative environmental behaviors. For example, children will be asked to answer, "Is this picture (without mentioning air pollution) harmful to animals?". The child will be shown photos of a type of pollution and asked to think about if it would harm an animal, which may result in some children feeling uncomfortable having to think of an animal being harmed by pollution.

In order to address any potential discomfort, the lead researcher will be available to answer any questions the participants may have before, during, and after data collection. In addition, if your child feels uncomfortable, they may leave the study room with no penalty by verbally informing the primary investigator that they would no longer like to play. It should be noted that none of the pictures used in the set of games contain any example of violence, gore, crime or depressive component. Since the games are full of different entertaining features, it is anticipated that feelings of boredom and fatigue will not be a problem. However, due to the time commitment, if feelings of boredom and fatigue are noticeable, we will employ the use of puppets or a dance break in hopes to make the games more interactive and enjoyable. If your child decides to discontinue the Games Testing, their data will be destroyed, because a fully completed test is required for the analysis.

Compensation / Reimbursement

Alongside a Certificate of Achievement for your child, the pair of you will be offered one \$25.00 gift card to Wozzles children's store.

Privacy and Confidentiality

In order to keep personal information confidential, you and your child will only be identified by a participant code. These codes will be alphanumeric codes (e.g., A1, A2, B2). Any identifying information, including names of preschoolers, age and sex, will be kept separately from other data on a password-protected computer within an encrypted file. The final results of the research are to be shared in (a) a thesis format, (b) scholarly publications, (c) a report format, and (d) conference presentations. Any identifying information will not be present in any of these final documents, ensuring that you and your child's identity will always remain private.

In specific instances, a direct quote that you or your child made in the game's process may be used in these final formats. By signing this consent form, you agree that your child's direct quotes may be used within the thesis, publications, report, and/or conference presentations. To reiterate, no identifying information will connect you or your child to these quotes; only the assigned code will be used.

Once all relevant data has been gathered, it will be put into electronic documents and compiled into a computer program called SPSS. This program is popular in social science research as it provides a researcher with the tools necessary to organize, compile, analyze and make connections between different types of data. Games responses will remain in SPSS, on a password-protected computer in a locked research lab on Dalhousie campus to ensure that only the research team has access to this data. Back-up copies of the electronic data will be put on an encrypted external hard-drive that will remain in the locked lab throughout the research process. The hard copies of the games will be stored in a locked filing cabinet on Dalhousie campus.

For the parent survey, once all relevant data has been gathered, it will be put into electronic documents and compiled into an Excel spreadsheet. Survey responses will remain on a password-protected computer in a locked research lab on Dalhousie campus to ensure that only the research team has access to this data. Back-up copies of the electronic data will be put on an encrypted external hard-drive that will remain in the locked lab throughout the research process. The hard copies of the surveys will be stored in a locked filing cabinet on Dalhousie campus.

Upon completion of the study, all data will be cleaned (de-identified) and retained until September of 2022 as encrypted, password-protected data on a secure digital storage, managed and maintained by Dalhousie University. It is retained until September of 2022 in order to properly analyze the data and illustrate results of the study, after which the data will be destroyed. All paper copies of the answer sheets will be scanned and stored as digital files along with the other data, and the hard copies will be destroyed (shredded and recycled). Audio-recorded data will only be used to supplement the written answers in the score sheet if they are missing or not comprehensible. Transcribed audio will also be retained until September of 2022 as encrypted, password-protected data on a digital storage, managed and maintained by Dalhousie University.

In extreme cases, confidentiality may need to be broken. In particular, with this type of study it must be clear that it is the researcher's legal responsibility to report any information that may indicate a participant has been subjected to abuse or harm to the proper authorities.

Additional information:

You or your child are free to leave the study at any time. If you or your child decides to withdraw from the study after testing is completed, data collected from the testing will be excluded from the study. You can also decide for up to two (2) months if you want us to remove their data. After that time, it will become impossible for us to remove it because it will already be analyzed and published in various academic writings.

We are happy to talk with you about any questions or concerns you may have about your child's participation in this research study. Please contact Dr. Tarah Wright (at 902 497-1831, tarah.wright@dal.ca) at any time with questions, comments, or concerns about the research study (if you are calling long distance, please call collect). We will also tell you if any new information comes up that could affect your decision to participate.

If you have any ethical concerns about your child's participation in this research, you may also contact the Catherine Connors, Director, Research Ethics, Dalhousie University at (902-494-1462), or email: ethics@dal.ca

Finally, we are also recruiting students and parents via snow-ball sampling, which relies on chain referral. If you feel comfortable and know of someone who may be interested in their child participating in this study, please reply back to this email with their information (name and email).

Reference

Giusti, M., Barthel, S., & Marcus, L. (2014). Nature routines and affinity with the biosphere: A case study of preschool children in Stockholm. *Children, Youth and Environments*, 24(3), 16-42.

Signed Consent

Project Title: Determining the Validity and Reliability of a Modified Games Testing Tool to Evaluate the Bioaffinity of Preschoolers

Lead Researcher: Dr. Tarah Wright, Dalhousie University, 902 497-1831, tarah.wright@dal.ca

Please read the following statement before signing the consent form:

I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered. I agree that my child and I will take part in this study. My child and I understand that participation is voluntary and that we are free to leave the study at any time. I understand that direct quotes from the study may be used in the final report. If used, direct quotes will be referenced using participant codes and will not contain any personal or identifying information.

I agree to have my child’s games testing session audio recorded.

Please check this box if you like to receive an emailed copy of the study’s results. If so, results should be expected in August 2022. We ask that you leave you phone number and email address below in order to receive these results.

Participant’s Name (Child)

Phone #: (____) - ____ - _____

Participant’s Parent/Guardian Name

Email Address: _____

Parent/Guardian Signature

Appendix IV: Assent Script

Project Title: Determining the Validity and Reliability of a Modified Games Testing Tool to Measure Preschoolers Bioaffinity

Lead Researcher: Tarah Wright

Research Assistant: Jessica MacKeen and Undergraduate Research Assistant: Hope Moon

Hi my name is _____ (Jessica or Tarah) and this is _____ who will be helping me today. We are going to go play some games and then bring you right back to your parent/guardian. If you have any questions about what I am telling you or what we are doing, you can ask me at any time.

Today we are going to play 6 games in total. We will play them with game boards and game pieces. And by playing these games you will help us figure out if the games works.

If you have to go to the bathroom, feel uncomfortable or upset, too tired, or for any reason want to stop, just tell me and we will stop and I will take you back your parent/guardian. Playing these games is totally up to you and no one will be mad at you if you change your mind about playing the games, it is okay to ask to stop.

Your parent/guardian have said its okay for you to play these games.

Are you still okay with playing the games?

End of verbal script. To be completed by person obtaining verbal assent from the participant:

Child's/Participant's response: Yes [] No []

Check which applies below:

[] The child/participant is capable of understanding the study.

[] The child/participant is not capable of understanding the study.

Child's/Participant's Name (printed by lead researcher/research assistant)

Name (printed) and Signature of Person Obtaining Consent

Date

Appendix VII: Survey for Parent/Guardian

Section 1

On average, how many hours does your child spend in the following places outside of school time (i.e. on weekends and after school)?

| Area | ~hours/week in summer | ~hours/week in fall | ~hours/week in winter | ~hours/week in spring |
|---|-----------------------|---------------------|-----------------------|-----------------------|
| Playing in outdoor parks or forests | | | | |
| Indoors playing videogames or watching TV | | | | |
| Playing in playgrounds | | | | |
| Playing in agricultural areas | | | | |
| Playing indoors with non-electronic toys | | | | |
| Playing on the street near my our home | | | | |
| Spending time indoors on social media | | | | |

Section 2

Please list the degree to which you agree with the following statements (check one box for each statement):

| Statement | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly Agree |
|--|-------------------|----------|----------------------------|-------|----------------|
| I am ok with my child having scratches on his/her/their knees and arms | | | | | |
| I am ok with my child having very muddy clothes or shoes | | | | | |
| I am ok with my child walking barefoot outdoors | | | | | |
| I am ok with my child collecting objects from the ground | | | | | |

| | | | | | |
|--|--|--|--|--|--|
| I am ok with my child putting objects from the ground into his/her/their mouth | | | | | |
| I am involved in protecting the environment my family lives in | | | | | |
| I am fascinated by the beauty of natural elements | | | | | |
| I feel more pleasure spending time in nature than in urban environments | | | | | |
| Playing in parks or forests is <u>safe</u> for my child | | | | | |
| Playing videogames or watching TV indoors is <u>safe</u> for my child | | | | | |
| Playing in playgrounds is <u>safe</u> for my child | | | | | |
| Playing in agricultural settings is <u>safe</u> for my child | | | | | |
| Playing on the street near my home is <u>safe</u> for my child | | | | | |
| Playing indoors with toys is <u>safe</u> for my child | | | | | |
| Spending time on social media is <u>safe</u> for my child | | | | | |
| Playing in parks or forests is <u>important</u> for my child | | | | | |
| Playing videogames or watching TV indoors is <u>important</u> for my child | | | | | |
| Playing in playgrounds is <u>important</u> for my child | | | | | |
| Playing in agricultural settings is <u>important</u> for my child | | | | | |
| Playing on the street near my home is <u>important</u> for my child | | | | | |
| Playing indoors with toys is <u>important</u> for my child | | | | | |
| Spending time on social media is <u>important</u> for my child | | | | | |

Section 3

Please list the degree to which you agree with the following statements (check one box for each statement):

| Statement | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly Agree |
|---|--------------------------|-----------------|-----------------------------------|--------------|-----------------------|
| We are approaching the limit of the number of people the Earth can support. | | | | | |

| | | | | | |
|--|--|--|--|--|--|
| Humans have the right to modify the natural environment to suit their needs. | | | | | |
| Human ingenuity will ensure that we do not make the Earth unlivable. | | | | | |
| Humans are seriously abusing the environment. | | | | | |
| The Earth has plenty of natural resources if we just learn how to develop them. | | | | | |
| Plants and animals have as much right as humans to exist. | | | | | |
| The balance of nature is strong enough to cope with the impacts of modern industrial nations. | | | | | |
| Despite our special abilities, humans are still subject to the laws of nature. | | | | | |
| The "ecological crisis" facing humankind has been greatly exaggerated | | | | | |
| The Earth is like a spaceship with very limited room and resources. | | | | | |
| Humans were meant to rule over the rest of nature. | | | | | |
| The balance of nature is very delicate and easily upset. | | | | | |
| Humans will eventually learn enough about how nature works to be able to control it. | | | | | |
| If things continue on their present course, we will soon experience a major ecological catastrophe | | | | | |

Section 4

Please answer the following questions to the best of your ability:

1. How many adults reside in your household?

2. What percentage of time (on average) does your child reside in your household (i.e. if there is a child custody sharing with another parent how much time does your child stay with you)? _____%

3. What is your total household income per year? (circle 1)
 - a. Under \$5000
 - b. \$5000-\$9999
 - c. \$10000-\$19999
 - d. \$20,000-\$29999
 - e. \$30000-\$39999
 - f. \$40000-\$49999
 - g. \$50000-\$59999
 - h. \$60000-\$69999

- i. \$70000-\$79999
 - j. \$80000-\$89999
 - k. \$90000-\$99999
 - l. \$100000 and over
4. Over the past year, what best describes your employment situation:
- a. Employed full time
 - b. Employed part time
 - c. Unemployed
 - d. Not in the labour force
5. What is the highest certificate, diploma or degree that has been completed by individuals in your household:
- a. Less than high school diploma or its equivalent
 - b. High school diploma or a high school equivalency certificate
 - c. Trade certificate or diploma
 - d. College, CEGEP or other non-university certificate or diploma (other than trades certificates or diplomas)
 - e. University certificate or diploma below the bachelor's level
 - f. Bachelor's degree (e.g. B.A., B.Sc., LL.B.)
 - g. University certificate, diploma or degree above the bachelor's level
 - h. Master's degree
 - i. Earned doctorate
6. What is your marital status
- a. Legally married
 - b. Living Common law
 - c. Never married
 - d. Separated
 - e. Divorced
 - f. Widowed
7. How many people (including you) currently reside in your household full time
- a. 1 person
 - b. 2 persons
 - c. 3 persons
 - d. 4 persons
 - e. 5 or more people
8. Does your child attend a forest pre-school, or a pre-school that focuses their curriculum on environmental immersion?
- a. Yes
 - b. No

THANK YOU FOR YOUR TIME

Appendix VIII: Certificate of Achievement Template

