Research Reports

Children's Relationship to Plants among Primary School Children in Finland: Comparisons by Location and Gender

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Summary. There is considerable evidence that children in modern society are losing their contact with nature and, more precisely, with green plants. Is this also the case in Finland, a northern country famous for its forests and wild nature? This study examines the relationship of 9- to 10-year-old Finnish schoolchildren with the green environment and plants. The data were gathered by a questionnaire comprising structured and open-ended questions. The focus of the research was on two comparisons: first, on the nature and child relationship in rural and urban neighborhoods and, second, among boys and girls. Participants in the study amounted to a total of 76 children, 42 in the Helsinki suburb area and 34 in Paltamo. The results suggested that the children in rural surroundings had closer contact with nature than their urban associates. For example, the children of Paltamo reported to know the trees better, and considered human beings to be part of nature more often (100% vs. 76% of the pupils in Helsinki, $P = 0{,}003$). Similarly, the results showed that girls in the study (N = 48) were more interested in plants than boys (N = 28). For the girls, the beauty and joy of plants was important, whereas the boys appreciated plants as the source of life. After the pre-questioning, the children of Helsinki participated in an in-class horticultural intervention and 10 days later, answered a similar questionnaire again. The results of the open-ended questions revealed that equally to children in other Western countries, Finnish children may also be in danger of losing their direct contact with the natural environment. It was common to pass free time in organized sports such as hockey or football (boys), or by just walking and talking with friends (girls). Rural children told that they still built huts, pick berries, and climb trees, whereas urban children played in parks and city groves. The results suggest that it is essential to research further the children's own experiences if we are to understand, and subsequently, to enhance, the crucial role of the green environment in their lives. Horticultural interventions can be effective starting points to add to children's knowledge, affection, and interest toward greenery, but it is highly recommended that they take place outdoors rather than indoors.

Urbanization and digitalization has led to changes in the ways people spend their free time. The role of direct contact with nature has appeared to decrease in modern society. In direct contact with nature, a child is exposed to the immense diversity and opportunities (in environmental psychology known as affordances) that only nature has to offer. Direct contact with nature in childhood has been increasingly replaced by more indirect and symbolic ways of becoming familiar with nature, such as television programs or visiting theme parks (Kellert, 2009). Nowadays, 8- to 12-year-old children participate in organized activities and have less spare time in Finland (Keskinen, 2001), as well as globally in Western societies (Louv, 2008). Growing vegetables, berries, or even green plants has become less common with each generation, especially in urban areas and with a modern life style. Physical activities outdoors in the green environment, however, have been proven to improve mental health and overall well-being among adults and elderly people suffering from depression, anxiety, or other mental health problems (Callaghan, 2004; Rappe, 2005; Ulrich, 1999). On the other hand, the need for activities in the natural environment may be even more vital for children. Not only physical, but also cognitive and affective development, which take place in natural settings in childhood, are claimed to be necessary for well being, as well as awareness and appreciation of nature (Kellert, 2009). Such activity has been said to be especially important around the primary school age (6–10 years), which is the most vital period for the development of inherent tendencies (Cobb, 1977; Kellert, 2009; Moore, 1986).

Several researchers recognize that natural environments relieve stress and have a restorative effect on people (Cooper Marcus and Barnes, 1995; Kaplan and Kaplan, 1989; Lewis, 1996; Ulrich, 1999). It has been reported in a number of studies that green spaces are beneficial, even crucial for a child's well being in cities (Kuo, 2001; Taylor et al., 1998; Taylor and Kuo, 2009). In Finland, Korpela et al. (2002) have studied urban children's environments and their favorite places in the city of Tampere. They found that over half of the children used their favorite places for cognitive restoration and one-third for emotion regulation. Urban greenery can thus be important to a child's well being. However, the children's freedom to explore nature by themselves is often restricted in Western urban societies (Kyttä, 2004; Prezza, 2007).

Even though Finland is well known for its wild and relatively unspoiled nature, still not very much is known about our children's contact

with nature. In Finland, every citizen still has easy access to nature. Helsinki, the capital city, is surrounded by the sea, forests, and parks, and these are freely accessible to everyone. Small groves nearby are common in the suburbs. Nevertheless, concern about the lack of contact with the natural environment is current in Finland as well. An important study by Kyttä (2004) focused on the possibilities that 8- to 9-year-old children have to explore nature by themselves. The research was conducted in eight neighborhoods with varying levels of urbanization in Finland and in the Belarus region. The results showed that in the urban environment, children's spontaneous, participatory activities in nature have decreased, while the "glasshouse" type of non-interacting, looking outside at the environment without actually participating in it, has increased (Kyttä, 2004). A recent study on 9- to 13-year-old urban Helsinki dwellers showed that these children would rather spend their free time in shopping centers and public swimming pools, or inside homes in front of the television, at a computer, or using other modern media rather than spending leisure time out of doors (Stenvall, 2009).

Pre-school children are usually interested in the natural environment and explore natural elements during most of their time outdoors (Heerwagen and Orians, 2002). Small toddlers are found to spend more time exploring their physical environment than socializing with their parents (Heerwagen and Orians, 2002). Furthermore, according to Kellert (2002), children need various (direct, indirect, and vicarious) contacts with nature to develop their personality harmoniously. In his research, Kellert has brought up Wilson's (1984) concept of "biophilia," which means the human being's inherent tendency toward the appreciation of nature.

Urban societies may have changed children's direct contact with nature into one that is more abstract and virtual. The extinction of direct contact to nature may lead to a cycle of disaffection, which, among other things, may cause "environmental generational amnesia" (Kahn, 2002). This concept means that children become used to a poor and polluted environment to the degree that it becomes everyday life, a norm. Louv (2008) has developed the well-known concept of nature-deficit disorder, which is an argument that in the case that children do not spend enough time playing in a natural environment, the lack of nature experiences may lead to accumulated attention deficit hyperactivity disorder (ADHD) or other similar behavioral problems. The fact that the exposure of children with ADHD to nature can improve their behavior strengthens this view (Taylor et al., 2001; Taylor and Kuo, 2009).

The growing anxiety about children's lack of contact with the living environment has led to many types of action throughout the Western world. A wide range of interventions to get children out into natural surroundings have emerged, especially in school education (Blair, 2009). Meanwhile, teaching science and other subjects according to the curriculum in so-called non-formal learning environments—forest schools and school gardens—is to improve a child's missing or insufficient relationship to nature. For example, in Texas and California, the state departments of education encourage the schools to set up gardening programs (Blair, 2009). Although such activities have been initiated, research on the subject is still insufficient. Mainly, the focus of the current study has been on teachers' or parents' points of view considering learning or behavior. According to Blair (2009), the research on school gardening has mainly concentrated on the positive learning outcomes, while rigorous studies about children's prejudices, knowledge, and attitudes toward greenery and plants are scarce. To plan successful interventions, the first step is to study the present-day relationship between children and nature—and probably children are the best informants because they are the experts in the matter.

Present study

This article examines the role that greenery plays in the lives of 9- to 10-year-old Finnish school children. The motivation for this research emerged from the need to examine the general assumption that children are nowadays just sitting inside in front of the television or a computer screen instead playing outdoors. While expressing such assumptions, do we consider this something that children have chosen to do, or something they end up doing when there are no other options available? Through this research, we want to find out what the role of vegetation in the lives of urban and rural children is. Is it true that children are not interested in plants or playing outdoors? In the study, the concept of "nature" encompasses all places outdoors that includes vegetation.

The purpose of this study was to investigate how 9- to 10-year-old schoolchildren see the role of plants and natural environments in their lives. As a research subject, this age group is especially interesting because in the field of environmental education and psychology, it is said to be the age when children's environmental sensitiveness and awareness can still be affected, as well as affiliations by nature (Palmer, 1998). We focused on the present nature-child relationship among Finnish children from two different residential backgrounds. We wanted to find out if children in rural surroundings were in some way more familiar with the vegetation and nature than their counterparts living in urban neighborhood. Furthermore, we were interested whether there are differences in the present-day nature-child relationship between the genders. Gendered differences in behavior are self-evident in this age group, but we wanted to study whether boy's and girl's relations with vegetation differed equally. Even though ethnicity is also an interesting aspect, it was left out of this study design because we did not have enough immigrants in the focus groups.

In Finland, there is not much knowledge about how modern children regard nature in their own lives. Consequently, we wanted to study if an indoor classroom hands-on horticultural learning project had an effect on knowledge about plants, and if it had an impact on understanding in terms of the individual meanings attached to vegetation. Thus, a secondary aim was to study an indoor

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horticultural intervention in urban surroundings to assess the role of hands-on education in bringing children and greenery closer together.

Materials and methods

Participants of the study. The data presented here were collected during 2006 in two locations in Finland: Mustakivi School, a primary school in Helsinki, and Kirkonkylä School in Paltamo. Paltamo is situated in the northeastern part of Finland (Kainuu region), 600 km north of Helsinki. Mustakivi School is situated in a typical suburban area with high buildings, a shopping mall, yet parks and the seashore are close to residents. On the other hand, Paltamo is a small rural town surrounded by forests and agricultural fields. All participants in the study were ≈10-year-old children going on to fourth grade. A total of 25% of the children in Helsinki were immigrants, whereas in Paltamo, none of the students were immigrants. In total, 76 children took part in the study: 42 children in Helsinki (26 girls and 16 boys) and 34 in Paltamo (22 girls and 12 boys).

A similar questionnaire was used in both places to collect the data. All questions are represented in Fig. 1. Each participant answered the questions (total 23) in the questionnaire simultaneously at the beginning of a normal school day. The questionnaire was designed to collect information on different aspects that may involve vegetation in a child's life. The questionnaire included structured "yes" or "no" questions (18) and four open-ended questions. The structured questions concerning the children's opinions and earlier experiences about plants were used to analyze the current child-plant relationship. By open-ended questions, data were gathered to understand children's relationship to nature: what they actually did outdoors and finally, how they spent this time playing in natural places. Additionally, there was a drawing task: "draw a tree or a flower." The assignment was added to analyze the capability of a 10-year-old child to draw a plant and represent its anatomy. The drawing task gave additional information about tree recognition: how well a drawing of a tree could be recognized as a certain species assessed by the first author.

Two groups of pupils in Helsinki took part in a horticultural intervention after the questionnaire (N = 42). The intervention called the "fruit bomb" consisted of four themed 2-h educational occasions inside a classroom. Each occasion included theoretical information about fruit plants and a hands-on session that began from sowing a chosen fruit seed and it ended when participants were allowed to take the plant home. The role of the intervention was assessed in the post-questionnaire among the urban participants. In post-questionnaire, the questions were similar to those on the first one, but the last four open-ended questions were different. In the non-structural questions, children had an opportunity to give feedback on the intervention: what they liked or disliked, and, in addition, one question about the meaning of the plants to the child ("What do plants mean to you?").

In analyzing the results, qualitative and quantitative methods were used (mixed methodology). Comparisons between girls and boys and rural and urban children were analyzed with SPSS (version 13; SPSS, Chicago), using paired cross tabulation

Please answer the following questions.

My age: _____ I'm a girl ____ I'm a boy____

Write down yes or no (x):	Yes	No
1. We have greenery in our home	( )	( )
2. I have a plant or plants in my room	( )	( )
3. I have watered flowers	( )	( )
4. I have sowed seeds	( )	( )
5. I have planted in a pot or in ground	( )	( )
6. Plants interest me	( )	( )
7. I want to learn how to grow plants	( )	( )
8. Plants are essential for human life	( )	( )
9. I like the woods	( )	( )
10. It is fun to play in the woods	( )	( )
11. Forest is scary	( )	( )
12. I know the trees in the forest by their names	( )	( )
13. I have collected mushrooms in the woods	( )	( )
14. I have picked berries	( )	( )
15. In summer we go to countryside	( )	( )
16. Our family has a summer cottage	( )	( )
17. My grandparents live in countryside	( )	( )
18. Human beings are part of nature	( )	( )

19. What does the plant need in order to grow well?

20. What do you think when you look at a beautiful scene?
21. My favorite place outdoors is:
22. What games do you play outdoors and how often?
23. Draw on the other side of the paper a tree or a flower.

20. Tell with your own words, what was nice in "fruit bomb"?
21. What did you not like?
22. What stuck in your mind especially?
23. Exercises were easy. yes ( ) no ( )
24. I want to keep on nurturing my plant home. yes ( ) no ( )
25. What was difficult?
26. What do plants mean to you?

Fig. 1. Questionnaire used in the study. Questions that are in bold are represented in the results. Pre-questioning was exactly the same in rural Finland (Paltamo) and in Helsinki (questions 1–23). In Helsinki, questions 20 through 23 were replaced after the horticultural intervention "fruit bomb" to questions 20 through 26. Questions 1 through 5 and 13 through 17 gave background information about child's experiences and contacts with vegetation. The answers to questions 6 through 8, 12, and 18 were statistically tested (chi-square test) and are represented in Tables 1 and 3. The frequencies of the answers to questions 21 and 22 are represented in Table 2. Question 26 answers were classified into categories, the examples of the typical answers in Table 4.

and a chi-square test. Tests were used to measure the significance of differences among the groups. The qualitative data analyses of the open-ended answers were classified into themes and categories that emerged from the responses.

Results

Results are presented in three sections. First, the differences between the two compared groups, urban and rural, and second, the contrast in voices between girls and boys. Finally, the findings about the children of Helsinki after the horticultural intervention are represented and discussed.

DIFFERENCES AMONG RURAL AND URBAN CHILDREN. The results indicate that the relationship with nature and green plants is considerably different between rural and urban children. According to their own assessment, the participants in rural surroundings (Paltamo, Kainuu, in the middle part of Finland) knew trees by name better than their urban associates in Helsinki. The result was confirmed in statistical analysis and in the drawings, as shown in Fig. 2. Rural children agreed to the claim "I know the trees of the forest by their names" with the answer of "yes" more often than their urban counterparts (Table 1). From the Paltamo drawings, it was also easy to recognize such common trees in Finland as pine (*Pinus* spp.), birch (*Betula* spp.), spruce (*Picea* spp.), apple (*Malus* spp.), and winter-garbed, broad-leaved trees. On the other hand, drawings made by the Helsinki children represented only two recognizable species: a spruce and an apple tree (Fig. 2). The children from the rural environment also included the human being as part of nature more often than their counterparts in the Helsinki suburban area (Table 1).

Answers to open-ended question about favorite places and activities outdoors clarified the role of nature in everyday life of the children in Finland. The natural environment had a larger role in favorite games in Paltamo than in Helsinki (Table 2). The notions of visiting berry bushes and building huts in the woods came up only in the rural children's answers. In addition, the rural children described the natural environments in a more illustrative manner than the pupils in Helsinki: "my favorite place is warm, near the flowers and beautiful places"; "on the top of the rock and beside there is a bush and nature." Parks as favorite places were mentioned only in Helsinki, but then again, forests were popular in both groups. Interestingly, urban children answered that their favorite place is a forest more often than did children in rural environment (40.4% urban, 17.6% rural).

Surprisingly a total of nine pupils of 76 (12%) reported that they do not play outdoors at all. From the rural surroundings, three boys and one girl answered that they do not play: "I do not play, but I stay outdoors." Of the urban, four girls and one boy shared the situation. On the other hand, hanging out with friends was a typical answer, especially among city girls.

DIFFERENCES BETWEEN GENDERS. Boys and girls were also significantly different in terms of their experience and interest in green plants. Girls were more interested in plants in general (Table 3), and they were also more eager to learn about plants than boys. Boys saw themselves as more independent of nature; over 30% thought that they could live without vegetation.

The meaning of plants to children varied from pure pleasure (in many of the girls' answers) to appreciation of the fact that plants actually provide for human life and well being on the planet. The evident difference between girls and boys came up likewise in the open-ended question "What do plants mean to you?" (Table 4). This question was asked only in Helsinki and after a horticultural intervention (growing a fruit plant from seed), so the total number of responses was only 42. In their answers, boys explained that plants are meaningful mainly for nutrition and general living conditions, whereas girls appreciated the beauty of flowers and plants as a whole. The most common answer, independent of gender, was that: "they matter to me a lot" or that: "plants are important to me," in a total of 13 of 42 (30.9%). Some improved understanding about the meaning of vegetation could be due to the effect of the horticultural intervention. For example, before the intervention, 24% of the urban children considered that human beings are not part of nature, and afterward, only 7% thought so. Also some improvement was seen in the general knowledge of plants. Before the intervention, girls mentioned, on average, 2.6 facts that are essential to plant growth (such as light, water, soil, and nutrition), and afterward, they mentioned 2.8 facts (boys were similar, with a before average of 2.0 and after 2.3).

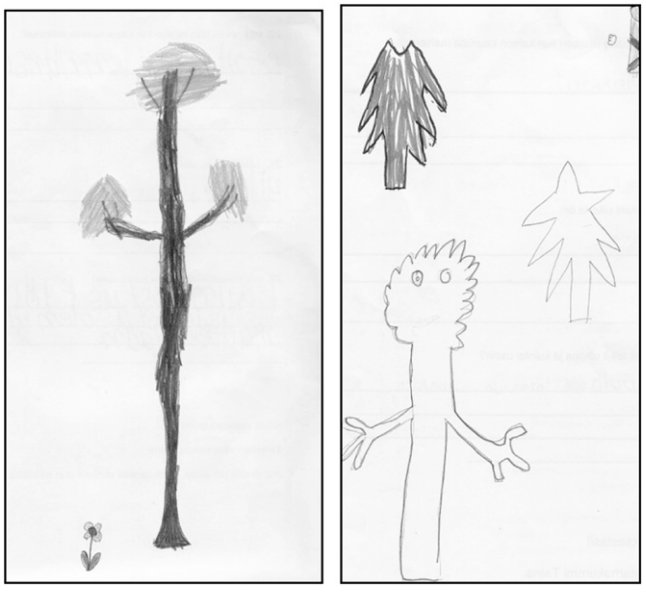

Fig. 2. The 9- to 10-year-old participants of the study were asked to draw a tree or a flower. These are two examples of the most similar to real tree drawings. On the left, a rural boy's drawing of a common pine tree. On the right, his urban counterpart representing spruce and, presumably, a deciduous tree.

Table 1. Group differences in self-estimated tree identification and opinion of considering human as part of nature in comparison between rural and urban 9- to 10- year-old children in Finland (total = 76 children).

	Total agreed			Total agreed			
	Rural children (n = 34)			Urban children (n = 42)			
	Frequency		Missing answers	Frequency		Missing answers	
Question/claim	(%)	(no.)	(no.)	(%)	(no.)	(no.)	P^y
I know the trees in the forest by their names	88	29	1	55	21	4	0.003
Human beings are part of nature	100	32	2	76	31	1	0.003

[z]Statistically significant if $P \leq 0.05$; chi-square test was used to test the differences between rural and urban children.

Table 2. Favorite places and outdoors activities among primary school children in rural Paltamo and in urban Helsinki, Finland (total children = 76).

	Rural (n = 34) (%)[z]	Urban (n = 42) (%)
Favorite outdoor places		
• Forest	17.6	40.4
• Yard	29.4	23.8
• Park	0	14.2
• Beach	17.6	14.2
• Huts in the woods	11.6	0
Favorite activities outdoors		
• Organized games (hide-and-seek, tag, etc.)	11.6	33.3
• Imaginary games	23.5	21.4
• Sports	32.3	9.5
• Walking and talking with a friend	0	11.9
• Building huts, picking berries, climbing trees	29.4	0
• "I don't play at all"	11.7	11.9

[z]Frequency of the most common answers. Statistical tests to measure differences between the groups were not performed.

Table 3. Opinions about plants among 9- to 10-year-old school children in Finland. Frequency percentage and amount of the participants who agreed on a claim asked in a questionnaire. Comparisons between girls and boys with answer "yes."

	Total (n = 48)		Total (n = 28)		
	Girl agree		Boy agree		
Claim	(%)	(no.)	(%)	(no.)	P^z
"Plants interest me"	89.4[y]	42	39.3	11	0.000
"I want to learn how to grow plants"	87.5	42	46.4	13	0.000
"Plants are essential for human life"	85.4	41	64.2	18	0.032

[z]Statistically significant if $P \leq 0.05$; chi-square test was used to test the differences between girls and boys.
[y]One missing answer.

Discussion

These findings are consistent with the existing research about children and nature. Environment plays an important role for a child to receive direct nature experiences (Korpela et al., 2002; Kyttä, 2004). In rural Paltamo, it is clearly easier for a child to develop close connections with nature; doubtless, the opportunities are more varied than in the suburbs. In the suburbs, the children cannot build huts and pick berries partly because the urban forests are usually small and heavy used. Nevertheless, urban woods are still important for city children according to the results. Boys play games and girls talk with friends and play imaginary games in the woods. Parks are being used in the same way. This research shows that rural areas in Finland offer a wide range of different play settings for children to form their relationship to plants and scenery. The results indicate that the relationship to nature seems stronger in rural surroundings. To the contrary, especially urban boys did not necessarily consider themselves to either be part of nature nor did they see any meaning for them in the vegetation.

In the urban region, adults play a significant role in controlling children's access to nature in their everyday lives. In larger cities, there are various factors that hinder children's unattended play outdoors. Parents may be scared for their children because of traffic or crime (Louv, 2008); however, this is not yet a common situation in Finland. An even more apparent reason appears to be the lack of time, as well as the new activities in which the children are spending their time with electronic media such as computers and video games (Stenvall, 2009). In particular, children in urban areas are in danger of replacing their nature connections with organized hobbies and computer games. This situation leads to a question: If the connection to nature decreases, what are the consequences to a child's normal growth and well being?

When teachers or parents are asked why growing plants is necessary, they will probably answer that learning about plants and growing food, and as well as socializing and relaxing in a safe environment with peers, are important (Waliczek et al., 2000). Previous studies have shown that gardening at a young age has led to an appreciation of cultivation and nature (Matsuo, 1995). Matsuo (2008) has pointed out the power of horticultural experiences in child development according to Huizinga's play theory and Maslow's well-known hierarchy of human needs. Likewise, children's cognitive functioning has improved in greener surroundings as

Table 4. The meanings of plants to fourth grade urban schoolchildren after a horticultural intervention. Percentage value of the most common answers to the question "what do plants mean to you?" was classified into categories. Only children from Helsinki took part in the horticultural intervention (total children = 42).

Category	Frequency (%)	Example of a typical answer[z]
Undefined necessity	30.9	"Plants are important" (girl) "They mean a lot to me" (girl)
Living condition	14.2	"Plants are important to me because I could not live without them." (boy)
Aesthetics	11.9	"I like a lot of plants and those fine colors. I wouldn't want an apartment where there are not any plants." (girl)
Joy	11.9	"Those (plants) are like a nice little home hobby to me." (girl)
Friendship	4.7	"A friend that I can talk to and tell secrets." (girl)
Nothing	4.7	"Nothing" (boy)

[z]Statistical tests were not performed; the answers were analyzed and classified into categories qualitatively.

a result in numerous other studies (e.g., Kuo, 2001; Taylor et al., 1998; Wells, 2000). As children told in this study, natural areas are important arenas for children's free play and socializing. In the suburbs, closer connections to nature, such as picking berries or growing vegetables, are rare and thus interventions in schools, especially outdoor horticultural ones, can help children to build their relationship to vegetation.

While planning such interventions, the difference between genders needs to be taken into account. In the horticultural intervention in this study, the 9- to 10-year-old boys especially did not care for the theoretical lecture, but instead enjoyed doing the work. It seemed obvious that learning by doing in an informal learning environment suits the kinesthetic boys better than sitting at a desk listening to a teacher. A horticultural intervention or bringing classes outdoors may well be a starting point for a life-long appreciation of the green environment (Matsuo, 1995). The improvement in attitudes and in general knowledge of plants in this study could have been more significant if the horticultural intervention had happened outdoors. It was obvious that learning by doing was enjoyable and fruitful for children.

The scope of this study was to give voice to the children and to find out their own thoughts about the green environment. The results indicated that the children who responded to the questionnaire were interested in plants, girls more than boys, and were also eager to learn to take care of and learn more about them. However, the open-ended questions did not offer detailed information about the ways children spent their time. Participatory observation, interviews, and other qualitative methods would be more suitable to understand better about the phenomena of modern children and nature. The scholar needs to form a confidential relationship with children first, to achieve reliable answers that turn into reliable results or conclusions. More studies should be conducted observing children during their everyday life and thus finding out how they act and what they really do. The number of participants in the research was small (N = 76) and it is possible that children did not, in all cases, take answering the questionnaire very seriously; therefore, no certainty can be directly captured nor generalized. One possible reason for the findings that urban children had a more noticeable disconnection from nature may be because 25% of the pupils in Helsinki were immigrants and thus still had some difficulty with the Finnish language. Nevertheless, the results definitely show some indications of the tendency toward a lack of relationship to nature. A suggestion for the future would be more qualitative, in-depth research on how children build up their personal nature relationship and how important this relationship is to child's development.

This study has shown differences in the child-nature relationship between boys and girls, as well as between rural and urban children. Finnish people have a reputation of being "forest people" because 72% of the country is covered with forests (Ministry of Agriculture and Forestry, 2009). Yet the way Finnish children are connected to nature may be rapidly changing. Children in the urban environment often no longer know the trees by their names; more alarmingly, they do not even consider themselves to be part of nature. In conclusion, we might ask if adults accept that the future generations will grow up without fully understanding the origin of life itself: vegetation.

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