Trees as affordances for connectedness to place– a framework to facilitate children's relationship with nature

Abstract.

This study, informed by phenomenology and ethnography, explores urban children's relationship with trees in a garden camp context: what are trees for urban children? Studying Finnish 7- to 12-year-old children, the research employed triangulation: participant and non-participant observation methods with mixed data collection over the course of three years. Engaging in grounded theory analysis after an intermission, the study unites the theoretical constructs of affordance and connectedness to place. Based on empirical observations, this study provides a theoretical framework to clarify the phased process of how urban children's connectedness to place is evolving. Exploitation of tree affordances during place-based play reflected connectedness to place; utilization of trees became more versatile over time. The results showed trees to be intriguing and multifaceted, satisfying many of the children's private and social needs. Trees provided the materials, space and often purpose and contents for the actual play that could not have thrived without them. In addition, children learned to manage possible tree-related risks mainly from experience and through scaffolding with peers. Recommendations for supporting beneficial nature contact emphasize allowing child-directed, place-based play time and planning biodiverse, low-maintenance spaces with a wide variety of trees that will invite children to use green spaces according to their needs.

Keywords: children's garden, grounded theory, insideness, place-based play, nature connection

Introduction

For urban children, connection to nature occurs in places that contain natural features; *trees*, grass, various plants and animals (Anderson et al., 2017; Chawla, 2015; Coe et al., 2014; Moore and Cooper Marcus, 2008). Nature connection is nurtured, if children are allowed to play outdoors in nature-rich places. Becoming familiar with nature requires direct contact that can usually be gained near home in parks, private and public gardens, vacant lots, waste lands, green school- or playgrounds and neighbourhoods. For instance, children's gardens are seen as one way to promote children's connection to nature, along with educational goals set by adults (Blair, 2009; Laaksoharju et al., 2012; Wake, 2008). In order to better understand the obstacles that might hinder children's nature time (Christian et al., 2015), an understanding of the preconditions and of how modern, urbanized children actually form their connection to nature's elements in green spaces is required. Information on the green space utilization of various age groups is equally vital for planning inviting and suitable green areas that meet children's needs and preferences (Jansson et al., 2016).

The elements that invite actions within places are called *affordances* in environmental psychology, a concept introduced by James Gibson (1979). An affordance refers to the functional properties of a place; affordances can be potential, perceived, utilized or shaped (Kyttä, 2002 p. 109; Sandseter, 2009). For example, in a children's garden, a tree can be a potential affordance for climbing or hut building, but

this will only be utilized or shaped if a connection is allowed and they are *available* for children to use. Thus, an affordance is always relational and varying, depending on situational and physical circumstances as well as individual urges and capabilities (Rietveld and Kiverstein, 2014). In understanding more of the ways in which children make meaningful connections to nature, learning from a specific affordance in a nature-rich place such as a garden can offer much insight.

In studies on children's connection to nature, trees are often mentioned among many elements of nature, but they have escaped the centre of interest. Studies of children and trees mainly follow two lines; one that emphasizes play and physical activity and the second, which finds that trees pose an injury risk or, in case of forests, risk of getting lost. Trees are often found to interest children; they want to climb them, build huts or make products out of wood (Laaksoharju et al., 2012; O'Brien and Murray, 2007; Pedersen and Rønning, 2016; Sobel, 2008). In a study from Sweden, for example, a tree that was suitable for climbing and other purposes turned out to be the main attraction in a playground, overcoming the built play equipment (Jansson et al., 2016). Children's play is found to be imaginative and creative with and around trees, since trees provide play props (Gurholt and Sanderud, 2016; Moore, 1986, 1989; Sobel, 2008). In treed spaces, children's physical activity levels and social interactions are found to increase (Christian et al., 2015; Coe et al., 2014; Niklasson and Sandberg, 2010).

Long-term interactions with plants during childhood can have a positive effect on appreciating trees and nature later as adults (Lohr and Pearson-Mims, 2005). Playing in a natural place (with trees) can be beneficial for child development and well-being in

the short -term, while continual contact can lead to a lifelong, personally meaningful sense of oneness with the natural world that is known as *connectedness to nature* (Beery and Wolf-Waltz, 2014; Chawla, 2007; 2015; Ernst and Theimer, 2011; Fjørtoft and Sageie, 2000; Korpela et al., 2002; Sobel, 2002; Tam, 2013). From our previous work with elementary school children in a Finnish garden camp context, we witnessed this attraction too; the trees were the most appealing natural features of the place (Laaksoharju et al., 2012; Laaksoharju et al., 2015).

On the other hand, trees are explicitly mentioned in several examples of risky play behaviours as well as identified as the single affordance fulfilling most of the risk categories. Tree-related risks included great heights, high speed, dangerous tools and elements, rough and tumble action or a risk of getting lost, while the major concern regarding trees is the risk of falling down when climbing (Brussoni et al., 2015; Sandseter, 2009). Commonly, children's opportunities for autonomous play are influenced by caretakers' increasing emphasis on safety, supervision and injury prevention, thereby diminishing children's overall independent mobility and unsupervised playtime in nature (Brussoni, 2015; Glenn et al., 2013; Kyttä et al., 2015; Sandseter, 2009, 2012; Skår and Krogh, 2009). In research about risky play, children's voices are seldom heard; almost no in-depth studies deal with how children handle possible hazardous natural elements such as trees by themselves.

Research using both qualitative and quantitative methodologies has substantiated that nature contact in general has multifaceted benefits for children (see reviews from e.g. Blair, 2009; Chawla, 2015; Gill, 2014). Although acknowledging the benefits and even children's need to challenge their boundaries as they make their connection to

nature, managing potential risks is a considerable factor when encouraging adults to organize nature activities for children (e.g. Moore, 2014, pp. 114-123). Regrettably, although concerns about the decrease are often manifested and new initiatives are being launched, the prolific understanding of the benefits involved in connection to nature, thus far, has not succeed in increasing children's nature contacts—quite the reverse (Clements, 2004; Christian et al., 2015; Kahn and Kellert, 2002; Moore, 1986; Skår et al., 2016; Skår and Krogh, 2009). The declining connection to nature makes our understanding of children's ways of interacting with specific natural elements or the impact of those interactions less certain. Evaluating the quality of children's nature connections may be helpful in assessing children's environments and organized nature programmes for children.

Present study

Research has proven that nature experiences in outdoor contexts can lead to connectedness to nature; this process can be captured in places with natural elements. Gardens, as nature-rich places, contain trees and other potential affordances for children; this may result in creative and long-lasting imaginary play, which may be the key for building beneficial, long-lasting connection to nature (Fjørtoft, 2001; Kyttä, 2002; Laaksoharju et al., 2012; Moore, 1986; Sobel, 2008). With this study, we focused on one particular affordance within the place of study, trees, in order to understand how such a natural element influences on how children's connection to nature develops.

Four core psychological needs are found to be essential for individual well-being: belonging, control, self-esteem and meaning (Scannell and Gifford, 2017). To

understand how a place can meet children's needs, our first interest was to explore the phenomenon 'garden environment for children.' With our first study in a garden day camp context we aimed to find out what children sought from their environment by studying how the children used the garden space and its affordances to learn and play (Laaksoharju et al., 2012). Due to the popularity of trees witnessed in the previous study, this time we set out to find the role and meaning of trees for children and whether the utilization of trees reflects children's actual psychological needs. By re-visiting the already (2008-09) gathered data and gathering new (2010), we asked whether an appealing affordance, like trees, has the potential to help children to connect with nature while fulfilling their developmental needs: acquiring new skills (self-esteem), forming friendships (belonging), satisfying curiosity (meaning) and manipulating the environment (control) (Blair, 2009; Scannell and Gifford, 2017).

It is not yet fully understood how the progression from a potential or perceived (tree) affordance to a fulfilling connectedness to place evolves. Therefore, the aspect of time in relation to the quality of the behaviour was among our considerations, noticing if and how the interplay with trees changed throughout the program. Since the trees involve an element of danger and are seen as a risk for children, safety issues were taken into consideration in the analysis.

Research settings

The research site, the Kumpula School Garden in the city of Helsinki, Finland, is a 4.3 hectare green space with trees of various kinds, ages and sizes. The garden was opened in 1929 for school children's summer recreation and educational purposes. It includes

an apple orchard of approximately 20 mature trees. Additionally, there is a relatively large, unattended ('wild') mixed forest featuring multiple tree species (Fig. 1).

The original garden plan includes northern tree species, mainly linden trees (*Tilia vulgaris),* birches (*Betula pendula*), apple trees (*Malus domesticus*), common spruce (*Picea abies*), rowans (*Sorbus aucuparia*) and aspens (*Populus tremula*). These wooded qualities made the garden an ideal place to study children's interactions with trees.

Figure 1 placed here.

Participants and observations

Middle childhood (~7-10-year-olds) is said to be the phase in life that is the most important in the experiential forming of one's relationship to nature (Kahn and Kellert, 2002; Sobel, 2002, 2008). In our study, the investigated children were 7- to 12-year-olds, living in Helsinki, with 9-years-olds forming the largest group (25%). Yearly, a total of roughly 130 children, divided into four groups by age and experience, participate in the gardening day camps.

This study, although long-lasting, was not longitudinal, because most of the children changed each year of the study. The camp period is exceptionally long, in total nine weeks, but it was common that many of the children were absent during their parents summer holiday. Some participants took part over multiple years, which allowed the formation of long relationships with some of the children. However, the children's behaviour in relation to trees was mostly captured by observing the novices with no previous experience of this garden space.

Each year, the parents were informed about the research project and asked for permission to include as well as to photograph their child in the study. The children

were also informed that their participation was voluntary, and they could withdraw from the study at any time. The attitude towards the research was helpful and only a handful of refusals occurred each year.

In this study, all observations, both participant and non-participant, were carried out by the primary researcher. The other author of this paper was a supervisor and a mentor throughout the research, giving valuable suggestions in conducting the research and interpreting the findings. Multiple observation strategies (a triangulation method in data generation) were implemented to gain a more holistic picture to elaborate the general phenomenon 'a garden environment for children' and, in this paper specifically, the role and meaning of trees.

The primary researcher spent three summers (2008-2010) at the research site, each year in a different role first as a camp principal, then as a group leader and, in the final year, without any official role, simply as an observer. During the first year (2008, 33 days) in a role of a principal, the primary researcher gained an insight into where the children liked to go and what they liked to do in the garden; she also acted as a substitute (for a period of 6 days) for one camp leader in a beginner's group. The second summer (2009, 31 days) her role as a camp leader throughout the entire camp period provided a thorough picture of children's garden affordance preferences. After two years in the field, it became clear that some specific natural elements of the place, trees in particular, were more favourable to the children than others. As a result, in 2010 (for 18 days), in order to focus on the tree-child relationship, the primary researcher's role was deliberately changed from participant to non-participant observer without a worker role, to avoid any interference with the children's actions. The observations

(carrying a camera, a book for field notes and a picnic chair) concentrated on child-directed situations wherever the children were being active, excluding most of the adult-led situations. (Table 1).

Methods

We implemented ethnographic fieldwork that allowed continuous encounters with the participants, to see and understand the causes and meanings behind the children's behaviours. To study trees as affordances for children, we used a hermeneutical-phenomenological approach with grounded theory (GT). The aim of GT is to generate theories through data without prior hypotheses, relating data to ideas, leading to the emergence of conceptual categories and, finally, theories (Denzin and Lincoln, 2000; Dey, 1999). As the analysis technique was inductive GT, the reasoning was based on learning from experience, starting with observations from various viewpoints. To explore the phenomenon in depth, the core idea of this study was triangulation: to frequently re-visit the field, participants and data by engaging in an interpretative dialogue with variables from multiple sources.

The first year gave an overall impression of the phenomenon of a garden for children; the next year, after analysis and re-framing the focus, elucidated the children's garden affordance preferences; the final year clarified how children's connectedness to place showed in the relationship between children and trees. In 2017, after a long pause in the research, all data was re-visited a final time; this pause was helpful in achieving a more objective interpretation. The meaning-making also followed triangulation protocol, that is, comparing various sources of data: camp leaders' day-to-day field

reports and photos, documents (such as camp rules and registers), children's drawings, poems and photos, and the primary researcher's daily field notes, audio and video recordings and photographs.

To unravel the factors hindering and facilitating nature contact, camp leaders from all four camping groups were asked to write in their field reports observations of the children's nature contact. Whenever the children took initiative with the garden affordances, audio material was recorded in these naturally occurring situations; the researcher repeatedly asked the children about their actions and feelings. Children were asked for photography permission in each situation and they were also encouraged to take photos of their favourite places in the garden. In the drawing assignment, they were asked to draw their personal view of the garden. Together with the shifting observer's role, this contributed to alternative perspectives in the data, thus strengthening the interpretation of how the children's process of perceived, potential affordances transformed into varied actions according to their situational needs. (Table 1).

Table 1 here

Analysis

The whole research process formed a dialectic circle of the participants, interpretations and data. The interpretation emerged through a chain of repeated encounters with the children until data saturation was accomplished. Theories in relation to the chosen concepts were formed towards the end of the research process as a result of reflective, data-driven analysis, which is why the applicable concepts are presented *after* the results (Angrosino and Mays de Pérez, 2000; Silverman, 2006; Tedlock, 2000).

The findings are based on scrutinized data of field observations, including the primary researcher's and other camp leaders' field notes, 564 photographs (taken by the primary researcher, children or other camp leaders) of which 143 were of children and trees, 62 children's drawings with trees, and audio recordings that were related to trees. The inductive coding of data began already in transcription, for the core words, thoughts, ideas and open questions were written down simultaneously and events of interest relative to affordances were color-coded. After marking interesting episodes and behaviours (open coding), we looked through events to determine the general customs and/or patterns of behaviour from a variety of individual situations by making categories and connections (axial coding). These patterns of behaviour were noted in the data and reflexively checked against other data units.

When focusing on children's relationships with trees, the themes and categories started to take shape (selective coding) whereupon the primary researcher – for the last time– re-arranged and, with an open mind after an intermission, re-analysed all tree-related data, whether in the form of a photograph (taken by a researcher or a child), field note (by a researcher or another camp leader), recording or drawing. The theoretical analysis continued after presenting the results (trees as affordances) regarding connectedness to place, by comparing and discussing suitable concepts from the existing literature with the findings. Interpretations were brought together with the existing theoretical concepts by building a combined, applicable framework. The provided conceptual framework, 'Trees as affordances for connectedness to place', is a conclusive GT output of the entire research process.

Results

In this paper, we show what trees provide to children in a garden camp context, where trees are an available affordance for use. First, we demonstrate how the children took advantage of trees providing *material* in their self-initiated place-based play activities. Then, we present the type of play *spaces* that trees provided both privately and socially, and relate play behaviours to children's needs. In addition, we show how the *passage of time* spent in the garden affected connectedness to place, how the utilization of trees transformed throughout the camp period. We also reveal the favourite *activities* around and with trees. Finally, we highlight the common concern of *safety*, providing illustrative examples of how the children themselves address the risks of injury.

Trees provided material and space, yielding connectedness to place

The *materials* that trees provided for children's creative play were diverse and every part of the tree could be utilized in multiple manners. For example, fresh, green *leaves* were used as play food (usually salad), a plate, a ceiling or roof in a hut, decorations or a package for covering other objects. Accordingly, *branches* could be all-round tools, such as hammers, weapons, walking sticks or magic wands, as well as building materials for construction. *Cones* and *twigs* were used creatively, sometimes as decorations or toys (for example, cone animals or puppets). *Bark* could be transformed into a plate, a floating boat or a piece of meat in a play serving of food. Occasionally, the collection of the materials seemed to be the main objective, implying that the process of collecting per se was pleasurable enough. For example, a group of girls who were collecting the *seeds* of a linden tree (*Tilia cordata)* focused on the activity for a

long time (~ half hour on 21 June 2010), explaining that they collect because they like it, and that the rule was 'just to collect the unbroken ones'. In order for children to make use of tree materials, they needed time to start utilizing trees without being forbidden from doing so. The children's range of tree material use is represented in Table 2.

During the first days in the camp, before the groups were assembled, the children sought privacy and comfort around the trees, where they could securely observe others. When the situation was new and the children still felt insecure in the setting, they typically tinkered with leaves, bark, or needles taken from the trees. We named the first stage of connecting with the place *outsiders*. A field note highlights this behavioural pattern:

> I notice that somebody has put a hewed spruce nut on my chair. Children tend to chop natural materials in their hands when they are nervous: leaves, sticks, flowers, grass, and branches.
>
> (Field note, June 7 2010, the first day of camp)

Table 2 here

The children used trees as a *space* according to their individual needs: for showing or improving their competence in a group with peers, to relax and rest, to follow situational impulses by creating play worlds around trees. It is noteworthy that play spaces with trees increased opportunities both for the individual and private (being and doing alone) and the social (being and doing with peers) utilization. The trees played a significant role in the phase of getting to know others and the place. During the first

week in camp, while the children became acquainted with each other, they often gathered around the big trees to socialize and show off or pass on their skills. This stage of connecting included constant exploration of the space and all of its affordances, and we accordingly named this phase *searchers*.

As the connectedness with this place was established after a few weeks, the children's initiative and the use of the tree affordances increased notably, especially in the mixed forest, as they discovered the trees provided loose parts with which ideas could be executed. Equally, play behaviours became more diversified; certain full-grown trees became established sites for creations. By the end of summer, many children played long-lasting, imaginary and adventurous make-believe games, such as Indian tribes role-play, and even continued with the same play the next summer. This kind of place-based make-believe play was typical in the final stage of forming connectedness to place, and we therefore named this phase *insiders*. Several make-believe play sessions with various groups of children could take place simultaneously in the mixed forest. Here is an example of insiders' behaviour:

> 'The group does not play on the playground much anymore, but they spend their time in the grove picking berries and playing. The new camp group, on the other hand, is tightly attached to the playground. The boys shout "Indian" cries in the bushes while picking raspberries. Note to self: the free-time Indian play has lasted for many weeks now! A boy: "Let's go to our hut soon." "Hey, I want to go to the hut, too!"'
>
> (Field note, 26 July 2010, seven weeks into the camp)

The possible play spaces trees provided for the child or group of children as well as the child's need that triggered the usage of space are shown in Table 3.

Table 3 here

The spaces populated with trees produced diverse play behaviours due to the extension of perceived affordances for various activities. The apple orchard was a many-sided semi-open space that enabled running games (such as playing tag or hide-and-seek), climbing trees for privacy, as well as making decorations or just talking with a friend. The untended mixed forest with trees of different sizes, ages and species, as well as dead trunks, offered the most affordances for versatile behaviours, notably the possibility of long-lasting, creative, inquisitive and adventurous play sessions including, for example, hiding, constructing and, building huts. (Fig. 2).

The children were not in any way encouraged to use the mixed forest, since the group leaders only supervised the playground area. Each year, it was "discovered" by the children as they learned it was available, either by exploring the garden themselves or after being introduced to it by the more experienced children. The space was large enough (approximately six hundred square meters) for the children to build their own semi-secret play worlds, and it contained endless loose materials for play props, which increased the possibility of varied play scenes. The (bio)diversity of the garden seemed to help in satisfying many of the children's social, as well as individual needs. Notably, the children with previous experience, who were attending the camp for the second or third time, could continue their games and play straight away as they were already connected with the garden.

Activities with trees

Climbing trees was important for the children and was observed to be among their most self-initiated activity around trees. In the photographs from the field (N = 564), 41 showed children in or climbing up a tree. Because the skill of climbing was highly appreciated among children, in order to master the skill, most of the children climbed trees at some point during the camp. It seemed important for the children that they could show off their abilities and get appreciation for their mastery (also from the adults): 'Look how high I am!' Children also helped one another to climb better; this example below describes the pattern of teaching and learning new skills from peers.

> 'Two girls climb the tree. One girl shows good climbing trees and gives advice to the other. "Isn't this nice? Go on, try to go there. This is kind of... Take hold of that branch, and with your other hand… Look, I'll show you! See?" Two other girls join in." Can I?" "It's hard to get there." The girls try to climb. Five girls are climbing and spurring each other on. One is swinging on a limb.'
>
> (Field note, 22 June 2010, two weeks into the camp, situation in Figs 3 and 4)

Building huts in the forest was a popular social task, which required skills to negotiate and settle rules. It was also physically challenging. As a holistic activity much like climbing, it met many of the children's intrinsic situational needs, which varied from child to child: competence in a group and sense of belonging, the need for social

368 standing and for order and structure, physical activity and ability, achieving goals, and
369 curiosity about how 'things' work. The children initiated hut building activities in the
370 mixed forest after the place had become familiar (as insiders), usually after around three
371 weeks in the camp (Fig. 2).

372 There were individual differences in the motivations the children grasped in the
373 hut-building affordance. The situational needs of boys versus girls seemed profoundly
374 dissimilar, which affected the differing behaviour between the genders. Although we
375 want to emphasize that all children are individuals, it was common among the boys that
376 building huts involved scenarios of conquering lands or defending a fortress, whereas
377 the girls usually played home, made 'food' and concentrated more on the details and
378 decorations of their hut. Below, a camp leader puzzles over this difference in
379 behavioural patterns:

380 'Could someone tell me what is going on when the boys in particular play
381 these kinds of aggressive power games and the girls are busy doing flower
382 huts? We haven't seen [in our group] even a hint of the girl's death squads
383 – nor the boy's floral decorations.'
384 (Camp leader's field note (male), 13 June 2008, two weeks into the camp)

385 Figure 2 place here.
386

387 *Relaxation.* Often, especially during the first days of the camp children (as outsiders)
388 privately found their way to the nearby trees in search of privacy. When the children
389 became more accustomed to the place and had already formed friendships, they often
390 gathered under the mature apple trees, talking and relaxing together. In their drawings

of a garden, the children pictured the trees, often referring to relaxation; in drawings from 2010, 49% included trees (in 62 out of 126) with a human figure drawn beside the tree/trees 21 times, and often also featured a swing, bench or a hammock. An eight-year-old girl wrote a short poem about relaxing under trees, which also tells the story of a moment of connecting with nature:

'The sun is shining,
Birds are singing.
Flowers blossom.
It is nice to sit under the apple tree.'
(Eight-year-old Rebekka, 2008)

Interestingly, it was especially important for some of the restless ('wild') children to climb trees in solitude or close to a group of others in order to calm themselves down for a moment of *self-reflection*. After the retreat, the child could came back and join the others without any further problem. Below is an example of a transcribed excerpt from an audio recording in which the children discuss this theme. The child under discussion appeared in four photographs up in a tree.

Researcher: *What would you say if climbing trees were forbidden due to safety reasons?*
Child 1: [Loud growl].
Child 2: *Clara would be upset*. [Refers to a child who constantly climbs trees after an argument or getting into trouble]
Researcher: *Yes, Clara wants to climb very often. She is eager to climb.*

> Child 1: *Yeah, she is so childish. More childish…* [Refers to the girl's tendency towards wild behaviour]
>
> (Recorded discussion from 21 July 2010, six weeks into the camp)

Dealing with risks

The children's free play, especially tree-climbing and play in the mixed forest, where the children were out of sight, caused anxiety among camp leaders. Even though the children participated in the making of camp rules, the adults considered forbidding the autonomous free play in the mixed forest since it could not be controlled. Accordingly, some leaders did forbid climbing trees in their group appealing to safety. In 2008, the camp policies considering the rules of free play had not yet been established, which caused variation in the line of action, as one camp leader ponders in the following field note. This example also describes the children's searcher phase of connecting with the place.

> 'Some of the children are very courageous in getting to know their environment and I feel conflicted about maintaining order/safety on one hand and, on the other hand, remaining open to children's explorations of nature. For example, forbidding the climbing of trees is from an environmental educator's point of view regrettable, but if one cannot supervise it all the time, it cannot be allowed.'
>
> (Camp leader's field note, 6 June 2008, one week into the camp)

436 Camp leaders rarely took into account the children's own ability to estimate risks by
437 exploring and utilizing natural elements with a sense of curiosity, learning to avoid
438 danger through experience. Nor did they notice the children's tendency to eagerly pass
439 on the safety information to other children through *scaffolding*: warning and teaching
440 each other about the risks. Many children took 'the law into their own hands' by
441 resisting the prohibition, for example on 8 August, 2010 the boys laughed that ' while
442 the teacher is not around, you can do whatever you like' and, started climbing trees.
443 The children learned risk management by themselves on various occasions (see
444 also an example in bold in Table 2 about not fighting too hard with sticks). In one
445 example from a discussion witnessed on 5 August 2010, a girl says: 'This is my
446 favourite tree' and starts climbing. A boy replies: 'I haven't climbed there, and I
447 won't.' Then, they estimate together how high it is safe to climb and how high the girl
448 can climb. The boy gives advice while the girl is climbing. The girl says: 'For some
449 reason, I cannot climb higher. I don't dare.' Afterwards, in a group interaction
450 underneath a large linden, which was documented in a photograph and a field note, the
451 researcher witnessed the same girl giving advice to her peers on how to avoid the
452 danger of falling (Fig. 3 and 4). After several such episodes, the primary researcher
453 understood that the children learned to avoid risks through shared experiences. In
454 addition, settling the democratic voting-implementation procedure of camp rules
455 improved the inclusion of children's voices. The children's camp rules (2010) often
456 emphasized the protection of natural elements ('Do not hurt nature') and their rights to
457 enjoy nature ('Have fun', 'You are allowed to climb trees/play in the forest').
458 Figure 3 and 4 place here

Discussion

The utilization of trees increased in phases and became ever varied as time passed. The trees facilitated and framed interpersonal relationships, social formation, and behaviour. Trees differ from other natural elements in their versatility, which made possible the simultaneous creation of a play space and the utilization of materials, making the trees 'super-affordances' in the children's eyes. The possibility of utilizing trees as play props according situational preferences motivated actions that increased creativity; a single branch could be transformed into the wall of a hut, walking stick, magic wand or weapon of choice (also Moore, 1989, 2014; Sobel, 2002). By exposing the significance of trees, in particular, our results strengthen previous research findings that natural places with trees were found to boost children's use of senses and imagination, resulting in diverse and long-lasting play (Fjørtoft and Sageie, 2000; Fjørtoft, 2001; Pedersen and Rønning, 2016; Skår et al., 2016; Sandseter, 2009; Sobel, 2002, 2008). Furthermore, our results also reveal children's own ability to handle possible tree-related risks.

In the following discussion, which complies with the grounded theory protocol, we present relative theoretical concepts and their influence on shaping our framework of trees as affordances.

Affordances can facilitate connectedness to place and insideness

Clearly, the more connected a person is with a particular place, the more autonomous connections with its affordances occur (also Beery and Waltz, 2014; Fjørtoft and

Sageie, 2000). Children's intrinsic motivations for action were minor as *outsiders* in the first days of camp, when the children mostly explored their immediate surroundings; this is probably due to a feeling of uncertainty in a new situation, with new people and environment. In the second, *searcher* phase, exploration and getting to know the place/people were priorities whereas finally the holistic, creative use of affordances typified the last phase, *insiders*.

During their autonomous free play sessions as insiders, the affordances 'spoke' to the children with situational sensitivity, focusing one's attention to the moment through the senses, which led to the exploitation of a whole set of 'treeful' play spaces. This presence in the moment allowed children to *feel* their core needs of belonging, meaning, control and self-esteem and act upon them (Scannell and Gifford, 2017). The role of senses arose also in Jansson and colleagues' study (2016), in which the researchers discovered the children's tendency to pay attention to the smells, taste, sounds and feel of natural elements. Once the connectedness to place had developed, the mixed forest as an unmanaged, mouldable place offered sufficient opportunities to act on the incentives of the affordance, thus fulfilling situational needs.

Adding the aspect of time to this study, we apply Edward Relph's (1986, originally 1976) concept of behavioural *insideness*, which delineates the level of connectedness to place over time. Presumably, the level of insideness increases a person's connectedness to place proportionately to the amount of time spent there. The concept of insideness emphasizes the *quality* of connecting with a place that is affected by the specific affordances with which individuals can interact and connect (Beery et al., 2014; Niklasson and Sandberg, 2010; Sandseter, 2009). The use of affordances

505 deepens and becomes multifaceted after getting to know a place, but the quality of the
506 available affordances certainly has a significant effect on the process. Our findings add
507 actual phases (outsider, searcher, and insider) to the concept of behavioural insideness.
508 The particular phase of behavioural insideness is manifested through the quality of
509 children's actions, i.e. how they use affordances at different stages of connecting with
510 the place to satisfy their needs. Obviously, with the versatility that trees provide, they
511 can help children to become more connected with a place – finally becoming insiders,
512 who are totally immersed in the moment and nature; this final phase may actually help
513 children become more connected to nature as a whole.
514
515 *Risky place-based play?*
516 With an adequate amount of data, we uncovered how children addressed the major risks
517 of falling or getting hurt (see also Brussoni et al., 2015; Sandseter, 2009). We learned
518 that, once exposed to actual danger, a child managed to better estimate his or her
519 personal capabilities and to determine an appropriate level of risk-taking. In addition,
520 this experience-based knowledge was eagerly shared with others with guidance and
521 warnings. Scaffolding was common in several favourite activities within this garden,
522 including hut building, climbing and, manufacturing or using tools. Our examples
523 illustrate how experiences with nature, mediated directly or indirectly by more
524 knowledgeable others, can be a transformative motive to absorb risk managing
525 behavioural patterns among children. Learning to climb in a tree from an older
526 'climbing expert' is a representative example of scaffolding that led to cautious, yet
527 sufficiently challenging play (originally Vygotsky, 1978).

Natural playgrounds are found to provide a challenge that children find intriguing (Coe et al., 2014; Fjørtoft, 2001; Sandseter, 2009). Other individuals can offer inspiration or encouragement to actualize new affordances, but also, on the other hand, set boundaries in the form of rules or restrictions to children's actual opportunities to utilize them (Gibson, 1979; Kyttä, 2002).There has been a long debate regarding the advantages of risk involving nature play for children's development, versus the actual risks of injury, and the findings of a review by Brussoni et al. (2015) ultimately concluded that environments that support risky play can promote increased play time, social interaction, creativity and resilience. According to our observations and conclusions from others, it would seem useful to estimate the level of surveillance and regulation that least hinders contact with nature *and* allows children to participate in risk assessment and rule-making (Glenn et al., 2013; Sandseter, 2009; Skår et al., 2016; Skår and Krogh, 2009). When children take part in rule-making, they take safety into account and are more willing to obey rules, as was the case in Kumpula. For adults who organize children's nature activities, Allen Cooper has, in fact, provided a thorough, applicable risk management protocol that also respects children's initiative and need for challenge (Moore, 2014, pp. 98-106).

Embracing the concept of *place-based play* the focus is not on risks, but on the possibilities and advantages, likewise identified by Brussoni (2015), Glenn et al. (2013) and Sandseter (2009, 2012). The necessity of self-initiated exploration of place should be acknowledged by the organizers of nature programs (Beery and Wolf-Waltz, 2014; Moore, 1986; Scannell and Gifford, 2016; Skår et al., 2016). Although the adults at our research site discussed safety issues at length, the children were usually permitted to

551 climb and use trees and, ultimately, the camp leaders allowed the children's individual
552 free play in the mixed forest without any adult agenda or interference.
553
554 *Trees as affordances for connectedness to place*
555 Grounded on our core findings, we present the framework 'Trees as affordances for
556 connectedness to place', which is linked with the aforementioned concept of insideness
557 (Fig. 5). The preconditions were the necessary terms for the children to start utilizing
558 tree affordances through their own initiative; external preconditions came from outward
559 circumstances, whereas the internal were personal to each child. The three-phased
560 process of forming behavioural insideness that the children underwent when connecting
561 with the place, developing from outsiders to insiders, was visible in the ways that they
562 used tree affordances. The increasing versatility of taking advantage of tree affordances
563 is highlighted with arrows of different widths, showing how the use of an affordance
564 reflected the level of insideness. In addition, we included a description of how
565 behavioural insideness yielded connectedness to place by presenting how it manifested
566 in children's behaviours as insiders: immersion in a moment, scaffolding, taking
567 initiative and managing risks and long-lasting and creative play.
568 Figure 5 place here
569
570 We fully acknowledge that this empirical case study is unique and the findings reflect
571 the children's preferences for autonomous action in relation with tree affordances
572 specific to this place. Improved reliability was acquired with the consistency of the
573 same observer in different roles over an extended period of time, with a relatively high

number of participants per year and, with data that provided a comprehensive, yet detailed view of the phenomenon. GT usually leaves the formulated theories for others to test and verify, and we have followed this example (Dey, 1999; Strauss and Corbin, 1997).

We suggest future research to look further into children's relationship with trees, perhaps using the provided theoretical framework. For example, how children's connectedness to nature is formed in different types of green spaces, such as parks or gardens, or how much 'nature' in terms of scale and biodiversity is necessary to gain a meaningful affordance-based connection. We also urge the integration of multiple child-centred methods to further explore children's perspectives on how they manage risks during nature play.

Conclusions

A tree is a tree, but for children, trees are a resource. With the versatility they provide, trees increase children's openness to affordances towards self-actualization. The ways children utilize tree affordances reflect their connectedness to place. Given the time and opportunity, in the circumstances of the kind presented in this study, it is possible to start increasing children's access to nearby nature by tolerating and encouraging child-directed, place-based play. With the information about children's preferences regarding trees, landscape architects and planners can aid children's interest in nature by adding tree species variation to green spaces. The most intriguing affordances that yield immersed play behaviours are found in less maintained areas with diverse vegetation.

According to our findings, place-based play is an entity where the perceived, available affordances of the environment and the social interplay with peers support each other. This study underlined that the concept of connectedness to place is bound to sensual experiences intertwined with the children's core needs, along with situational circumstances that vary over time and moment. In place-based play, the affordances of a given place correspond with children's needs, and this ultimately leads to connectedness to place, which is seen in the level of behavioural insideness. Over time, repeated connections with natural features such as trees can lead to a lifelong connectedness to nature.

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Note. The names of the quoted children have been changed.

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735 processes. (Ed. M. Cole). Harvard University Press, Cambridge, MA. pp.
736 79- 91.

737 Figure1. Research site: the Kumpula School Garden in Helsinki. This 4.3 ha. garden
738 provides a recreational camping site for approximately 130 children each summer. Map:
739 Google maps (20 meters =1 cm).

740

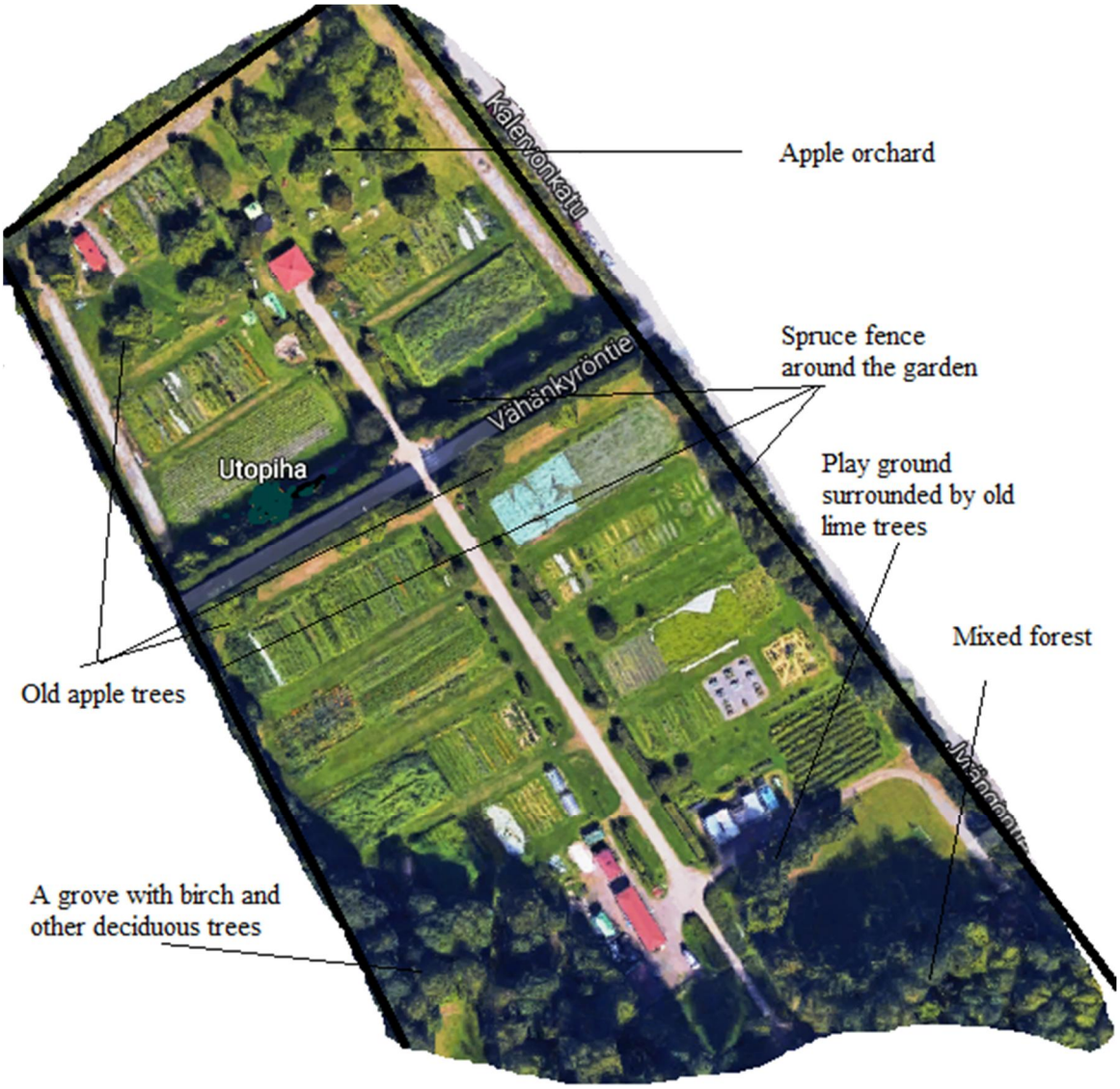

Figure 2. An example of a child-made, tepee-style hut made from loose tree material, sticks and branches. Photograph by Taina Laaksoharju, taken 3 August 2009, eight weeks into the camp.

Figures 3 and 4. A group of children are practicing climbing a mature linden tree. One girl with experience is giving advice to the others. Photographs taken 5 August 2010 by Taina Laaksoharju.

780 Figure 5. A framework of our main findings: 'Trees as affordances for connectedness to
781 place'; a final output of grounded theory analysis procedure.
782
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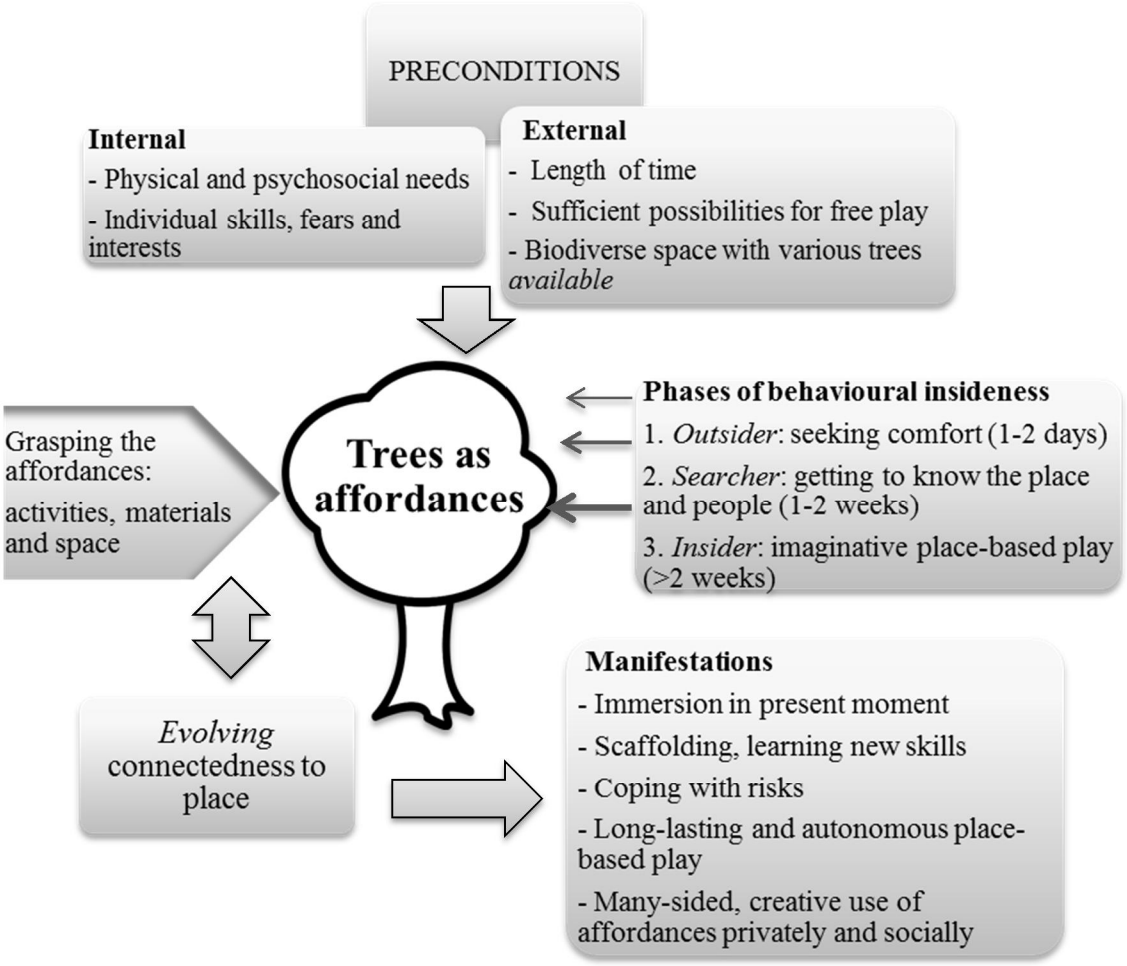

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Year, focus of the study	The primary researcher's role, time spent with the participants, average number of observed children	Data
2008-2009 Garden affordances for the children	**Participant observer** - 33 + 31 days in the field - groups of children observed varied between 1 to 40 per occasion, on average ≈ 20 (more general impressions about the garden)	· recordings from interactions · photographs · other camp leaders' reports · field notes · children's stories and pictures
2010 Tree affordances and place-based play	**Complete observer** - 18 days - groups of children observed varied between 1 to 20 per occasion, on average < 10 (more specific/intimate encounters with trees)	· photographs · field notes · recordings · informal interviews · children's drawings

787

788 Table 1. The hermeneutic process changed the researcher's position in the field during
789 the three years of observation (2008-2010). The number of observed children varied
790 depending on the situation. Additional data was gathered according to the reassessed
791 focus. 2010 was the primary year of this study's findings, but the years before were
792 equally important for interpretation.

Children´s use of tree materials	**Parts in use**	**Verifying data, examples**
Building material 1. *Construction:* walls, floors and roof for huts and nests 2. *Furnishing:* chairs, benches, tables 3. *Demarcation* of an area, flagpoles, borders	- Young branches and small trees, loose sticks - Whole trees with a large trunk - Trunk of a tree, large and thick branches	Number of photographs of child-made constructions: 11 (2008), 10 (2009), 13 (2010) *Children show their hut construction in a tree. They negotiate how to tie a rope into the tree. Children use play equipment on their own terms creatively.* (Field note 5 August 2010)
Play props 4. *Play food:* pretend salads, soups, cakes, desserts, spices 5. *Tools:* hammer, walking stick 6. *Weapons:* guns, swords 7. *Toys:* play animals or pets, puppets, magic wound	- Leaves, bark, seeds, needles, cones, fruits/berries - Branches and sticks, round billets and clubs	Photographs of play foods: 2 (2009), 5 (2010) *The portions on the leaf plates were truly fine and looked beautiful. The children's enthusiasm and creativity were delightful.* (Field note 8 June 2009) Photographs of tools: 8 (2009), 10 (2010) *The boys, having once again found sticks in their hands, are knocking and play fighting. A boy: '**Let's fight, but not too rough.'*** (Field note 23 June 2010)
Decoration 8. *Beautifying*: wreaths and garlands, arrangements, bouquets 9. *Clothing*: hats, jewellery, skirts	- Fallen branches and willow twigs, conifer cones, decorative sprays - Branches and sticks - Sticks and cones - Twigs with green leaves	Photographs of creative use: 12 (2009), 18 (2010) *All right, once again, like in 2009, an apple tree is home to the girls' secret world. There are spruce twigs hanging.* (Field note 17 June 2010) *Three girls are decorating me with branches and leaves and talk a while about birds, good climbing trees etc. saying:'You'll have a fine disguise and the birds can make a nest on your head.'* (Field note 12 July 2010)

793 Table 2. The use of tree materials in children's play based on observations from 2008-
794 2010 in a children's garden.

795

Trees as a space	The use of treed spaces	Underlying needs as triggers
Single tree Broadleaved tree or a conifer (e.g. linden, apple tree, birch, spruce) Small, young tree Mature broadleaved tree	**Private, utilized by one child** 1. A place for privacy, self-reflection or to calm down 2. Hiding place for spying or eavesdropping 3. As a landmark, viewpoint or a home base 4. As a place to practice climbing 5. Nature observation 6. Manipulation and utilization; making tools, constructions and decorations **Social, utilized by more than one child** 1. As a spot to gather together to talk and relax 2. Climbing together 3. A site for make-believe play	1. Self-knowledge and self-regulation 2. Excitement, adventure 3. Safety, building self-confidence 4. Acquiring motor skills, building strength and coordination, to challenge oneself and to learn to estimate risks 5. Connection with nature, sense of wonder, affection 6. Creativity and curiosity, the use of imagination, a child's need to know 1. Building friendships, bonding with peers, a need for shelter and shadow 2. Competence and belonging in a group; scaffolding; learning new skills from peers 3. Creativity, the use of imagination, practicing negotiation skills
Group of trees Grove Orchard Mixed forest Orchard Mixed forest	**Private** 1. Strolling around, seeking materials for manipulation 2. Foraging for edible berries and fruits 3. Seeking privacy 4. Hiding from the others **Social** 1. Games with rules; playing tag or using trees as a haven 2. Make-believe play, long-lasting play sessions that continue weeks, even years 3. Building huts and spaces using surrounding trees	1. A need to be creative and resourceful 2. Sensual experiences, taste, touch, smell 3. A need for independence and self-control 4. Excitement, adventure 1. A need for fun and excitement in a group, physical needs 2. A need to immerse oneself in imaginary play world **combining various needs** 3. Needs to practice skills and to create

796 Table 3. The types of spaces with trees the children used during the garden camp and the
797 correspondent stimulating need to which the space responded.
798