Internship Report

The impact of the environment on human health and behaviors

Two case studies on the human-nature relationship

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Under the supervision of Caroline Hägerhäll & Fredrika Mårtensson

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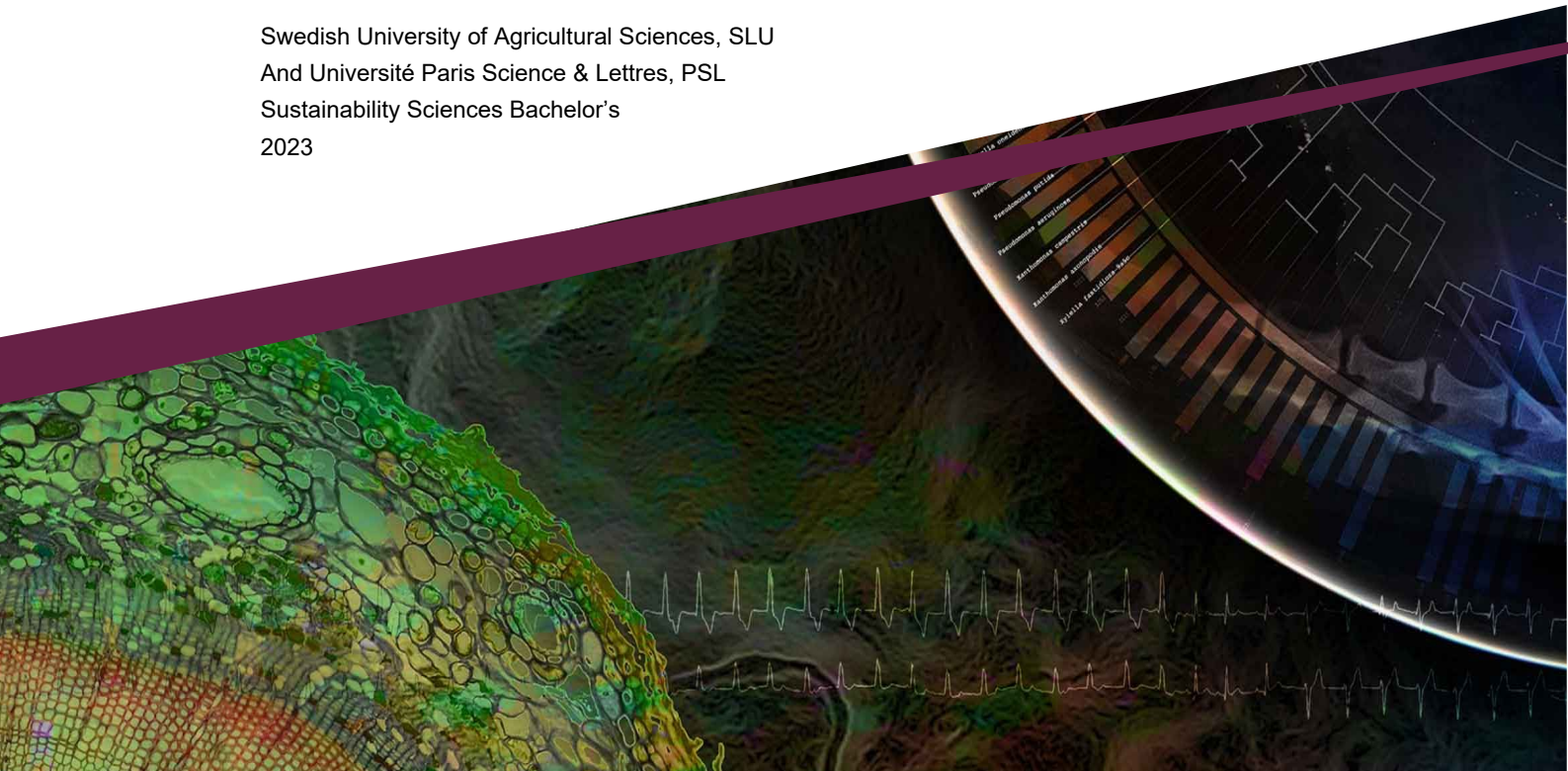

The impact of the environment on human health and behaviors. Two case studies on the human-nature relationship

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Table of Contents:

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I would like to thank my two supervisors, Caroline Hägerhäll and Fredrika Mårtensson for their benevolent guidance during my internship. they were both very supportive of my work here at SLU and always made me discover new things about Environmental psychology, Landscape architecture, and many other exciting topics. They've also both helped me feel at home in the Department of People and Society and were always eager to help me visit this part of Sweden. I am grateful for the opportunity of having them as my supervisors.

I also want to thank other members of the department, such as Amanda Gabriel, with whom I could always take a break from speaking English, and Elizabeth Marcheschi, who always had kind words for me and had the kindness to let me use her bike during my stay, Gunnar Cerwèn for his great explanations of his work, and all of those with whom I have had the pleasure to work during this and other related projects.

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General Introduction:

How we perceive nature is how we treat nature. Nature is generally viewed as something aside from human lives and constructions. It is looked at as a tool, a way to get new resources. The human-nature relationship has evolved in a way that our society and our lifestyle have become harmful to the very environment we live in, and that we need in order to survive. Human beings are part of nature, and nature is part of the human world. In this period of climate crisis, the relationship humans have with their environment needs to evolve to reach a balanced lifestyle that would preserve the biodiversity and the environment, for humans to have more connection to their environment. Studying the connection of human beings to their environment, and how it affects their health and behaviors is essential to achieve said balance. This field is called Environmental Psychology.

I have always been interested in the human-nature relationship, this is why I decided to do this internship and the Department of People and Society of SLU (Sveriges LantbruksUniversitet - Swedish University of Agricultural Sciences).

Presentation of the University

SLU is well-known for its education and research in life sciences and natural resources. Their main goal is to promote sustainable development and improve the well-being of people and animals. They tackle global challenges in fields like agriculture, forestry, environmental sciences, veterinary medicine, and landscape architecture. SLU was established back in 1977. SLU has campuses in Uppsala, Alnarp, Skara, and Umeå, making it a peculiar university, in which departments and researchers are scattered around Sweden. This particularity has inconvenient but also makes it so that each department can work with the adapted environment, for example studying great forests in the north of Sweden. The main fields of the university are agriculture, forestry, veterinary science, and landscape architecture. Research and innovation are dedicated to conducting impactful research that tackles real-world problems. Some research areas include sustainable food production, climate change adaptation, biodiversity conservation, and animal health.

Supervisors and Department

I worked as an intern in the People and Society Department, under the supervision of Caroline Hägerhäll and Fredrika Mårtensson. The Department research fields are environmental psychology and business management. The focus of the department is on the human environment as a place for work, economic activities, health, and well-being. The basic assumption is that health and well-being are major forces for the positive development of society, including business and management. Fredrika Mårtensson is an associate professor and senior lecturer at SLU, in the Department of People and Society. Her research focuses on environmental psychology and landscape architecture concerning children's play behavior. Caroline Hägerhäll is a professor and head of subject at SLU, in the Department of People and Society. Her research focuses on environmental psychology and landscape architecture concerning human health and sensitivity. She is also a member of the Sensola laboratory, also called SLU Multisensory Outdoor Laboratory.

The purpose of this lab is to develop methodology and conduct research on human-environment interaction, with a focus on wearable sensors in real environments. The development of sensors is fast and is aimed at the consumer market, where many people want to monitor their health with the help of heart rate monitors and smart rings that are not noticeable or hinder the wearer in daily activities. There is a potential in that many of these products are easy to carry and naturally used already by many people in society, which could be interesting for environmental monitoring. However, there are many questions about how this type of consumer-oriented product stands in terms of data quality and reliability, and how this type of data can best be visualized and combined with other data in both scientific and practical application.

Case Studies

I came here to see and experiment with the different ways to study and assess the human-nature relationship in Environmental Psychology. This is why I conducted two different studies related to this topic. In this report, the results of both studies will be addressed. The first study labeled “The ring study,” has been made with the equipment of the Sensola laboratory. It studies the stress level of participants in different nature areas to try to assess what kind of natural area is better in terms of stress reduction. Another goal of this study was to develop a methodology for the smart rings, which are relatively new equipment to the lab. The second study labelled “The school study,” is observation-based. The observations were at a school that was part of a green school ground project. The study aimed to analyze the different play behaviors of the children in relation to their environment and to compare the results with previous studies that have been made on the same school.

Part One: The Ring Study

Introduction:

In nowadays society, the possibilities for human contact with nature have been significantly diminished. Between the rapid pace of urbanization, the extensive exploitation of natural resources, and profound changes in lifestyle patterns, there have been many processes that led to a substantial reduction in the opportunities for individuals to have "nature experiences" (Hartig et al, 2014). There has also been a shift in human lifestyles that has brought a profound disconnection from nature, as individuals increasingly prioritize indoor activities, technology, and sedentary routines. Research from the past three decades has been focusing on the effect of nature on human health, and it is now very well established that exposure to nearby nature can have a significant benefit on human health, on both physical and mental health. There have been countless studies on how experiences of nature have been affecting human health and well-being (Ivarsson & Hagerhall, 2008), both in indoor situations (Beukeboom et al, 2012) and outdoor situations (Jiang et al, 2014; Ulrich et al, 1991). But almost all of the know studies have been using photographs, videos, or 3D models (Jiang et al, 2014; Ulrich et al, 1991) to get results, because the equipment necessary to collect the data stay generally indoors, due to how hard it is to implement it outside. This is why scientists have been developing less and less invasive portable devices so that the data collection could be in an actual nature environment, and not a model or a video of it. The benefit of really being in nature is it uses all the senses, and not just vision and hearing, but also touch, smell, and taste, hence helping researchers to understand what is going on when a participant is in real nature conditions. The development of these devices does not outdate the studies that use indoor equipment, as the development of unobtrusive equipment tends to be done at the expense of data quality.

It is in this context that the SLU Multisensory Outdoor Laboratory, Sensola, is developing. The lab has acquired a discrete portable device able to measure skin conductance: the Moodmetric® smart rings. There are many questions about how this type of consumer-oriented product stands in terms of data quality and reliability, and how this type of data can best be visualized and combined with other data in both scientific and practical applications. However, as mentioned before, the goal of Sensola is to develop a new methodology and conduct research on human-environment interaction, using wearable sensors in real environments, and these rings could be a very convenient way of collecting data. The main goal of this study is to learn how to use mood rings in a research environment. In fact, not only most of the studies has been done using simulations of nature, but it has been done in an urban versus nature environment. This study tries to fill the lack of stress reduction study between different kinds of nature areas, and to answer the following question: is there a difference between the types of "nature" in the reduction of stress levels? This study tries to tackle a particularly important question: what kind of nature should be evaluated? Because there is a different kind of nature one can experience. For example, parks and gardens are often described as a nature experience, as they appear natural, but they are usually designed and maintained. There is a significant difference between designed nature and wild nature. The question could be extended to all kinds of nature environments, because as soon as there is a path in a forest, it could be considered a human intervention, hence not a "natural" wild environment. But as interesting as this topic is, this isn't what this study is about.

Finding out what kind of nature is best for reducing stress can help community planning in general. Authorities and municipalities could use future research on this topic to not only add nature but add the best-fitted kind of nature to build an environment that benefits the most. This study will also

result in an example with advice on how data from consumer-type sensors could be handled and used to map environmental qualities that are important for activation level, stress, and emotional state in everyday life.

Methods:

Setup of the study

The emotional response to environmental stimuli is experienced along two dimensions: valence, varying along pleasantness and unpleasantness, and arousal, varying along deactivation and activation. An objective way to measure the activation of arousal is psychophysiological data, in this case, skin conductance, combine with self-reported data on mood and activities to measure the valence. Tying these data with geographic position, the creation of an "emotional map" is possible, knowing where arousal is activated, and knowing how the participant is feeling. This map would help to understand how the environment is perceived.

For this test study, the Moodmetric® smart rings (Figure 3) were used to measure the skin conductance of the participants. The Moodmetric® smart ring is a consumer product that helps people monitor and manage their stress in their daily life. The smart ring transfers measure skin conductance and transfer the data to the Moodmetric® app on the phone that the ring is connected to via Bluetooth®. Users can have a diary on the app, to register their activities during the day, and their mood, and add additional notes if necessary. The data can then be transferred to the Moodmetric® cloud if one has an account, where users can visualize their MM level (MoodMetric level).

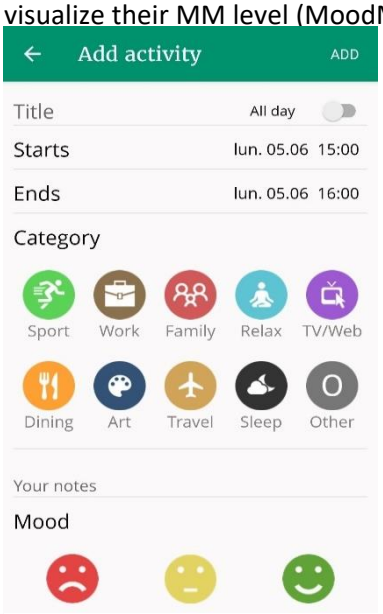

Figure 1: Diary interface of the Moodmetric® app
Source: screenshot of the Moodmetric® app

Figure 2: Map of the campus given to the participants.
Sources: SLU library Atlas

This level corresponds to their level of stress on a scale of one to a hundred. Each person has a different scale of MM Level, the ring is taking the highest and lowest score of skin conductance (resp. 100 and 0) in the twelve hours after calibration. Columbus™ P-10 Pro GPS loggers were used for the GPS location of the participants.

The area used for this test study was the Alnarp campus. The participants are either students, employees, or others, residing or not on campus. They were asked, during their stay on campus, to wear a Moodmetric® smart ring, and would have a Columbus™ P-10 Pro GPS logger activated on them for four to five days. The participants were to take a break every day, during which they would take a walk for thirty to sixty minutes in one of the predetermined areas. The map above (Figure 2) was given to the participants. After the walk, they were asked to create two new

entries in the diary on the Moodmetric® app, one for what they were doing before the walk, and one for during the walk. The diary (Figure 1) proposes options to have a title, a category of activity, a mood scale, and notes. Participants were asked to put the name of the area as a title and to write in the notes if they were alone or not during their walk if they felt a change of mood between before the walk and after, and if anything happened during the walk that they think is worth mentioning (animal encounter, person encounter, etc.). Participants also had the possibility to note a "Point of Interest" on the GPS logger to say where something particular happened during the walk. There was a total of seven participants in this study, from age 19 to 36 years old.

The Different Areas

Four different areas of the Alnarp campus were chosen to be test areas. As mentioned before, Alnarp's campus's particularity of having a lot of nature allows it to be a perfect test zone. As it is written on the map (Figure 1), the four zones selected were the Landscape Laboratory, the Fenced Garden, the Castle Park, and the Pond Area. These four zones were decided differently enough to potentially give different results in the study, as the four areas give a different atmosphere.

Figure 3: Photo of a smart ring
Source: Photo by Loïc Bascoul

The Landscape Laboratory (Figure 4) is an experimental forest made up of smaller stands of trees connected in diverse ways. The tree stands are in turn made up of distinct species mixtures where the number of species varies, giving the area an eerie and whimsical atmosphere. Walking through the forest feels like walking through various small environments. It is the most "wild-like" area on campus.

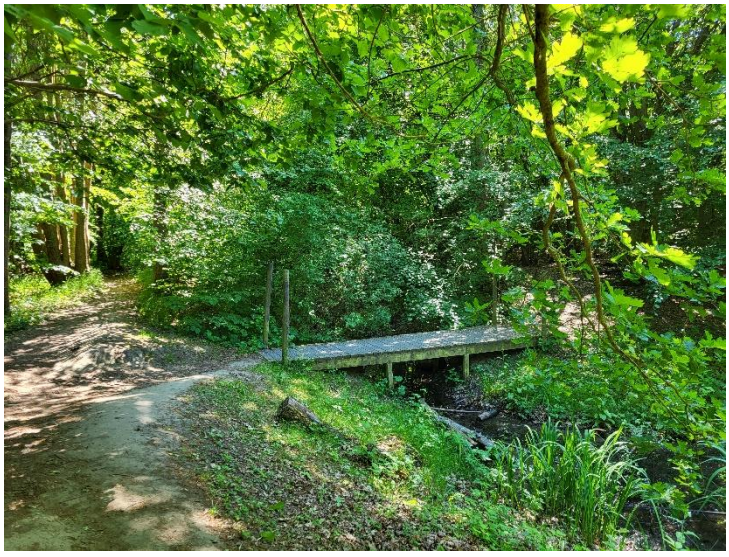

Figure 4: Photos of the Landscape Laboratory
Source: Photos by Loïc Bascoul

The Fenced Garden (Figure 5) is an area near the Alnarp's castle, with the vibes of an English garden, where a lot of different plant species are found. The place, unlike the landscape laboratory, feels very much like a garden organized by humans. All plants are classified and there are signs with the name

of the species for the students at the university. It is called "Fenced Garden" because there is a fence around it, but it is accessible to anyone.

Figure 5: Photos of the Fenced Garden

Source: Photos by Loïc Bascoul

The Castle Park (Figure 6) is a park-like area, with wide spaces of grass with lighter vegetation. A lot of people come here when there is mild weather to take a stroll near the castle. While there is a lot of vegetation and trees, it does not feel as organized as the Fenced Garden, nor as dense as the landscape laboratory.

Figure 6: Photos of the Castle Park

Source: Photos by Loïc Bascoul

The Pond Area (Figure 7) is the area that has the least amount of vegetation. It is a pond with some trees around it, but a lot of the place is surrounded by the university's buildings (which are old farmer's barns). There is still enough nature for it to be considered a "natural" area.

Figure 7: Photos of the Pond Area

Source: Photos by Loïc Bascoul

The fact that there are four areas was also more flexible for participants, as they had five days to do the study.

Data transformation

The data was retrieved from the Moodmetric® cloud for each participant as an Excel file with different data on it, including time or MM levels. The GPS data was extracted from the logger as CSV files.

To create the maps, the open-source software QGIS was used. The data from the GPS logger were transferred to the software, where they were fused with the Excel files so that the GPS data would match the MM levels data based on the time and date they were happening. Note that the MM level is measured as a mean over one minute, and the GPS logger tracks a point every second. Different layers were then made for each participant. The data has then been customized in a way that the stronger the color appears, the higher the MM level is. Excel was then used to calculate the mean MM level for each zone, the mean MM level two hours the walk for each zone, and the mean change of MM level for each zone. Using the data collected on the diary of the app, each walk was attributed a mood: Happy if the participant felt a positive change of mood, neutral if they felt no change of mood, and unhappy if they felt a negative change of mood.

Problems encountered

Since it was the first time the lab used mood rings for a study, there were a lot of things to figure out, so some mistakes and struggles happened during the study. This part will explain why they were encountered, and how they were solved if they were.

First of all, getting participants was one of the main problems. The study was conducted in May, which is the end of the semester for most students, and a generally busy month. This, plus the fact that only four rings were available at the same time, explains why only seven people were willing to wear a smart ring for a week (four the second week of May 3rd the 4th week of May). The participants were mostly students that were living on campus, but two people worked on campus. This small number of participants affects the significance of the study. Another issue was to get participants to do what they were supposed to do. Some participants did not go to all areas, and some participants forgot to take their GPS logger with them on their walk. This caused part of the GPS data to be unusable. Perhaps the instructions were not entirely clear to them.

Secondly, there were some issues while working with the Moodmetric® app. The first issue was the accounts for the cloud. Because an account cannot be connected at the same time on two different phones, each participant had to have their account for the data collection to happen smoothly. As a result, seven different accounts were created with seven different email addresses, which was difficult to manage.
But there was also a major issue. On the Thursday of the first week of the study, an email was sent by the Moodmetric assistant stating that they had a breach in security, and for that reason, they updated the app. Without the update, the app was still able to receive data from the ring and store it but was unable to send it to the cloud. But with the update, the app was simply unable to open, stuck as a blank screen with an error message. It seemed that the problem was only affecting Android phones. After a quick chat with the Moodmetric support team, they were notified of the issue, and the problem was solved the day after. Fortunately, none of the data was lost during this incident.

In addition, there were also some issues with the GPS loggers. The first issue is more of an error made at the beginning of the study. The GPS logger was set by default to store the data in a CSV file, instead of GPX or NMEA. CSV file was the only type of file that was able to receive the information of the “Points of Interest.” However, CSV files are not readable by QGIS, but GPX files were. As the CSV files were converted into GPX files, which was a challenge of its own, the “Point of Interest” information was lost as it was not supported by GPX files. The second problem with the GPS loggers is that on one random Monday, the GPS loggers that were used in the study all stopped working because they were unable to connect to the satellite. After testing all the other GPS loggers from the lab, all but one were not able to connect to the satellite. Oddly, one succeeded, but not the others. The website of the company, Columbus™, said there was an update available. But even after updating, the GPS loggers were not working. The problemed resolved itself a few days after, but from that day, there is still no explanation as to why all, but one GPS logger stopped working at the same time. This incident has made some of the data unusable, as one of the participants still had a GPS logger to this day. Finally, there was some other problem, such as the compatibility of the time between the rings and the GPS loggers. Moodmetric® being a Finnish company, there was a one-hour time delay from the actual time the data was collected. And as mentioned above, the GPS loggers are tracking a point every second, while the rings were doing a mean of the MM level every minute. This led to an awfully long session of erasure of the seconds behind the minutes in the GPX files on QGIS. If there was a faster way, this way remains uncovered to this day.

Results:

The idea to turn the walks of the participants into maps was to be able to visualize where the participants' arousal was the highest and to see if there was any common point between the different participants. Each map has a different number of walks, because of some GPS data missing, or number limitations to not completely obstruct the view. Each color represents a participant, and the stronger the color is, the higher the stress level (MM level) of the participant is high.

- Pond area:

The emotional map of the Pond area is the one with the least number of tracks. One participant did not go into this zone, and three GPS data were unusable. The presence of a lot of buildings is suspected to have affected the precision of the GPS loggers because they tend to bug a lot inside buildings.

One thing to notice is that all the participants had a similar path, going around the pond, and in the patch of grass in front of a building that is an accommodation for students. But it is important to notice that while two of them stayed around the pond, one decided to go and visit the little garden and the basin with fishes in the south (Red in Figure 8). Going back to Figure 1, the garden was indeed in the area defined, and the overall area has not been used in many different ways.

Figure 8: Pond Area Emotional Map

Source: QGIS

As for the stress level in this area, the colors stay in pastel tones. The average MM level for the participants before the walk (two hours before the break is taken) is 50.6, and the mean MM level during the walk is 49.2. This means the average drop in stress level is 1.4 MM level. In the diary of the app, half of the participants declared feeling significantly better during and after the walk, and the rest declared having a neutral experience, not feeling particularly happy or anything.

- Castle Park:

The emotional map of the Castle Park is the one with the strongest colors. One hypothesis is that this area is the most social one, where the are the most people. It induces arousal, whether positive or negative because it is normal to react while crossing someone else's path. Just like for the Pond Area, the participants decided to take quite different paths in the park. While some of them decided to take a stroll around the whole park (Blue, green, and red in Figure 9), seemingly staying on the paths, some others decided to stay very close to the castle, focusing on the vegetation that was around (gray and orange on Figure 9). There weren't any instructions to go all around the area, and it is interesting to notice this difference in choices.

Figure 9: Castle Garden Emotional Map
Source: QGIS

As for the stress level in that area, the colors are in stronger tones. The average MM level before the walk is 58, while the mean level during the walk is 56.2. This is the highest mean MM level during a walk out of the four zones. These data make the mean drop of stress 2.8 MM level. In the diary of the app, three out of seven participants said they did not feel a change of mood, and four of the seven participants declared feeling happier after the walk.

- Landscape Laboratory

The emotional map of the Landscape Laboratory is the one with the most similar paths among the participants. The shape of the area is surely connected to that observation.

The participants all decided to take a loop down in the area, only changing how deep they went into the experimental forest. Only one of the participants decided to visit the northern part of the zone (green in Figure 5).

As for the stress level in this area, the colors are strong, but not as much as in Castle Park. The average MM level before the walk is 58.6, while the average MM level after the walk is 53.4, making the mean drop of stress 5.2 MM levels. Out of the seven participants, five reported having a positive change of mood during and after taking a walk in the area, while only two reported having a neutral experience.

Figure 10: Landscape Laboratory Emotional Map
Source: QGIS

- Fenced Garden

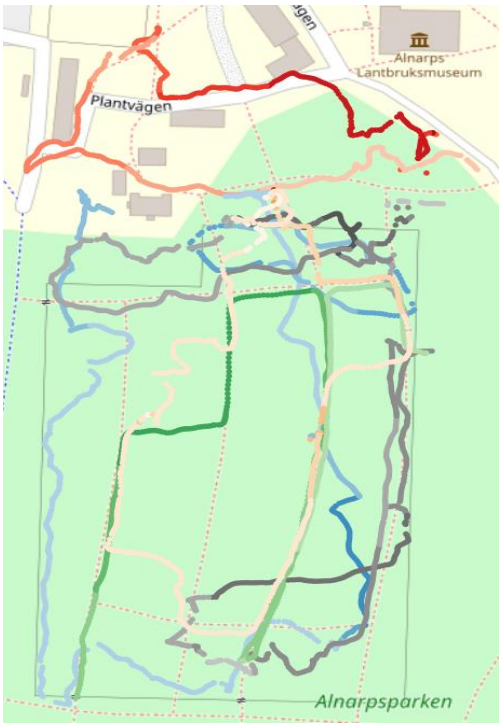

Figure 11: Fenced Garden Emotional Map
Source: QGIS

The emotional map of the Fenced Garden is the one with the softest colors. This area appears to be the most calming one. While this area is also popular, the vegetation there is denser and more diverse, which could be an explanation.

As well as in the previous zones, the participants decided to take quite different paths, some staying on the paths, and others wandering around. One of the participants did not quite go to the actual fenced garden but instead stayed in the area in the north, where there is a generally a lot of people sitting there, which also explains why the color is much stronger than the other participants (Red in Figure 6).

As for the stress level in this area, as said before, the colors are soft, very pastel. The average MM level before the walks is 56.4, while the average during the walk is 44.8 MM level. This makes the drop in stress level 11.6 MM level. This is the biggest drop observed, as well as the lowest average MM level observed.

Six out of the seven participants have reported feeling better during the walk than before, and only one reported having a neutral experience. However, one participant reported feeling worse after the walk than before and during because of an injury that occurred during the walk.

Discussion

Is there a difference between the types of "nature" in the reduction of stress levels?

Before talking about differences, let's introduce the similarities of the four zones. This study's results have found that all four zones have a positive effect on the mood of the participants, seemingly reducing their stress. In all four areas, none of the participants declared being in a worse mood after the walk rather than before, meaning that the valence of our participants is on the pleasant side rather than on the unpleasant side. The majority of participants felt a positive mood change during the walks. On top of that, all four areas showed a more or less important drop in MM levels, meaning that according to both psychophysiological data and self-reporting data, the participants felt less stressed thanks to the walks.

Now focusing on what is different between the areas, the maps help to realize a first difference: the Fenced Garden paths have softer colors compared to the other, and the Castle Garden has the strongest one. However, it doesn't seem like there is a pattern or place where the stress level is lower than somewhere else in the same area. It looks like it depends very much on the person and their experience rather than a specific point on the map. This is the major finding of this study, that there are too many unknown variables affecting the stress of one person that it makes it hard to find a specific structure that would reduce the stress level. This opens questions for a potential future study, on how to find such structures. Using the same method, a lot more participants would be required, but the exact number is unknown. Another solution could be to focus more on the qualitative data collected through the diary, or even interviews, which would help to understand better the experience of the participants.

But there is a difference in stress levels comparing the different areas. What is important to compare isn't mean during the walk between the areas, because the day of the person, how sensitive they are, and a lot of other factors can influence the mood, but comparing the drop of stress is important because it expresses how much an area impacted the stress of the participants. The psychophysiological data shows that the Fenced Garden has a bigger impact in reducing arousal (11.6 MM levels), followed by the Landscape laboratory (5.2 MM levels), the Castle Garden (2.8 MM levels), and finally the Pond Area (1.4 MM levels). Put in relation to the valence of the participants, this means that the drop in arousal can be interpreted as a relaxation of the participants since the walks were pleasant. If the walks were unpleasant, the drop in arousal could have been interpreted as boredom instead.

Some of the drops in stress levels could be deemed insignificant considering how small they are, especially for the Pond Area and the Castle Garden. But the arousal data always need to be put in relation to the valence data. The small drop in stress levels in these areas can be explained by the fact that the arousal can be both positive and negative. While going into nature, stress, the negative arousal, can diminish, but the attention toward nature grows, making the arousal go up, but this time in a positive experience. This means that the zones with smaller stress level drop trigger positive arousal. This effect has already been talked about in previous studies with the term fascination for nature (Ulrich et al, 1991). But instead of a fascination for nature, it is more likely that these two zones were triggering more positive arousal because of higher social interactions, as the Pond Area and the Castle Garden are places that are more active socially.

At the end of the study, participants were asked to answer a questionnaire about being a participant in the study, in order to improve the method of the study. Questions like "How invasive was wearing the ring invasive in your daily life?" or "How invasive was having the GPS in your daily life?" were asked, with the answer being 5 points Likert scale. Six out of seven participants answered the questionnaire. As a result, one participant found the smart ring "Not at all invasive," three found it "Not very invasive," and two found it "Neutrally invasive." The GPS logger was found "Not all invasive" by five participants, and "Not very invasive" by one. The participants were also given the chance to write a free comment. The three comments are "The ring was a bit annoying because it would not always fit well", "Wearing the ring was sometimes awkward as I am not used to wearing one", and a participant that kept on forgetting his ring in the bathroom after removing it because the ring is not waterproof. These comments are helpful to understand the experience of the participants as the subjects of a study. It indicates that more sizes of the ring would be great to obtain and that a waterproof version would be easier to be even less invasive in the daily life of the participants. The company making the ring is currently developing smaller rings that are waterproof.

Limits

The results of this study aren't to be taken as a generality, as it faces many limits. Having only seven participants makes the interpretation of the results difficult, as the experience of nature and the mood of the participants are their very own, hence can vary a lot from one person to another. A lot of factors can influence the mood, making it hard for one specific place in an area to have a significant impact. This is why the maps only help us to visualize the data obtained through the ring rather than helping to find out more specific feature in these areas that affects stress. Perhaps if the study was done at a much bigger scale, patterns could have emerged.

Another limitation to consider is that the data used for the stress level is on a scale of 0 to 100, made from the lowest and highest raw skin conductance level of the person wearing the ring during the first twelve hours. The study could gain precision to use the raw skin conductance data rather than MM levels, but that would also make the interpretation harder, as each person has a different base skin conductance, some people are more sensitive than others. Finally, one of the key issues with the study has been the technological difficulties. With updates and bugs happening randomly, this can endanger the well-being of a study in the future.

Part Two: The School Observation

Introduction

Children's play is a vital component of their physical, cognitive, and social development. The school playground serves as a crucial environment where children engage in unstructured play, fostering creativity, imagination, and social interactions. In recent years, there has been growing recognition of the role of greenery within school grounds and its potential impact on children's play experiences (O'Brien et al, 2007). Greenery, including trees, plants, and natural elements, has the power to transform a school playground into a dynamic space. It offers numerous benefits that extend beyond aesthetics, providing children with opportunities for exploration, sensory stimulation, and connection with the natural world. The presence of greenery is associated with improved cognitive functioning, reduced stress levels, and increased attention spans among children (Faber et al, 2011), as well as increasing their health by promoting physical activity (Dyment & Bell, 2008).

IIn this context, the city of Malmö launched the Green School Ground Initiative in 2010, which consisted of the greening of two schools in the city, involving researchers from SLU. Thanks to this project, the researchers were able to do a comparative study about the role of greenery in children's play behaviors and physical activity. Two scientific articles were published (Jansson & Mårtensson, 2012; Mårtensson et al, 2014), as well as an internal SLU report (Mårtensson & Wales, 2019). These papers will be used as a reference for the present study.

This study was carried out at Videdalsskolan, a school in the city of Malmö. This school was part of the greening school project implemented by the city office 13 years ago and has been greened in 2012 (Mårtensson et al, 2014). The school was referred to as the "Grey school" in this previous study, as it was dominated by pavement and concrete before the intervention of the city. There is now a big natural area in the middle of the school ground, as well as the previous bushes and trees that are more typical for school grounds. The results of this study will be used as a way to compare the play behaviors of the children eleven years after the first study was made. This study will make up an important baseline for any further efforts to evaluate the long-term effects of greening a site since these effects tend to transgress the time span of any ordinary research project.

There is an expectation that the play patterns of the children will change, becoming more adapted to the natural environment on the school ground. This expectation arises from the fact that some of the observed children were part of the observation both before and after the greening initiative took place. These children were originally observed as fourth graders, before the greening in 2010, and then as sixth graders, after the greening in 2012 (Mårtensson et al, 2014; Mårtensson & Wales, 2019). The transformation of their playground environment, from one with limited natural elements to one with a central natural area, undoubtedly influenced their play behaviors. However, in 2023, the whole current school's student population has only known the school grounds with natural space at its core. Therefore, their play practices must have adapted to the green spaces.

This study aims to analyze children's play in a natural environment, to understand how they use their environment, and to compare the functioning of Swedish schools compared to French schools.

Methods:

Setup of the study

Has the school been referred to as the “Gray School” in previous studies, the term is not at all accurate anymore. The school is now dominated by a central natural area that covers a large part of the playground (Figure 12). This central area includes many trees, different species of bushes, and grassy and sandy areas. The place was also arranged to have variations in elevation with small hills and different paths (Figure 13). A circle of trees with some benches and rocks was also added.

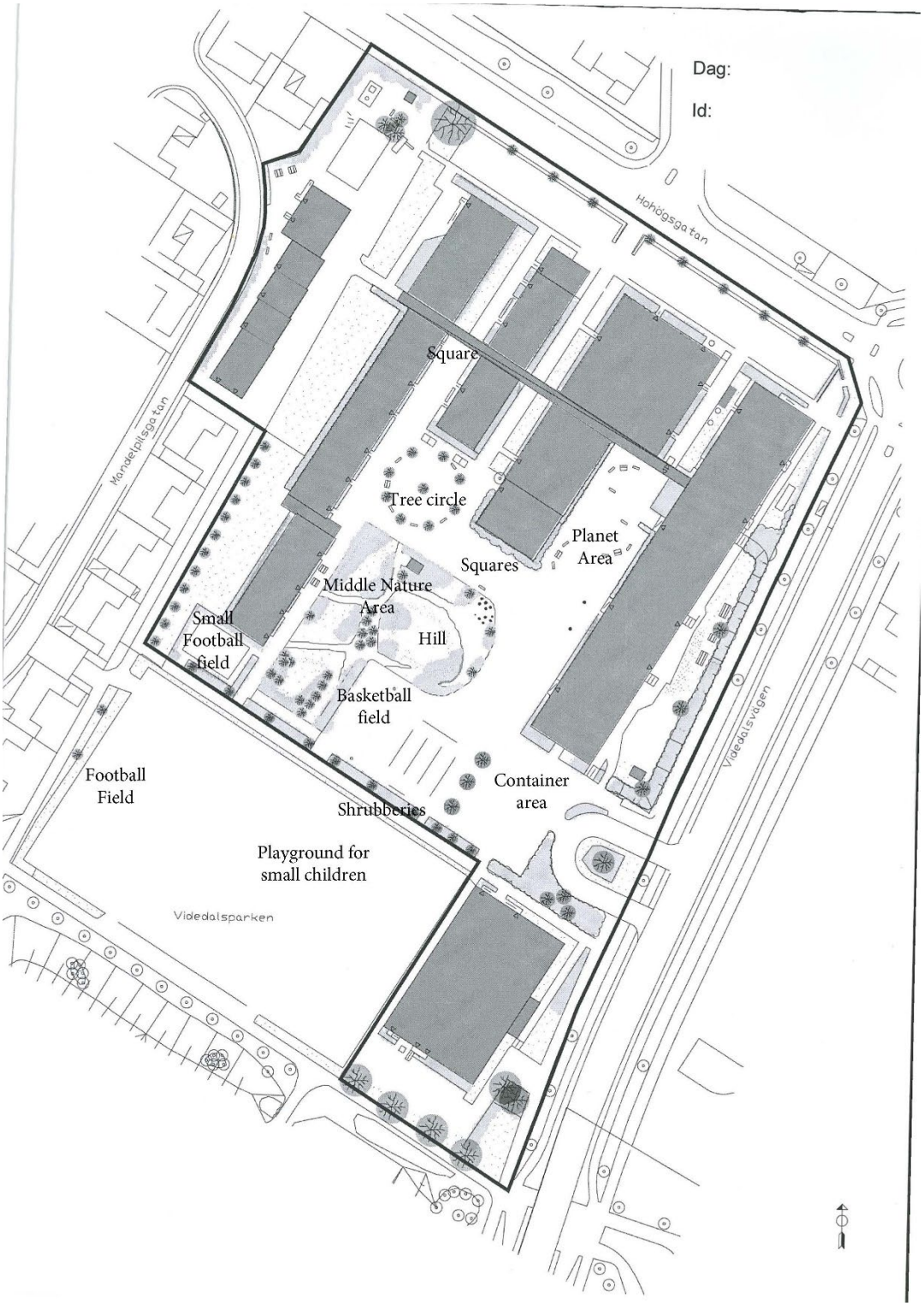

Figure 12: Scan of the Videdalsskolan map used to take the field notes.
Source: Mårtensson et al, 2014

Figure 13: Nature area in the schoolground
Source: Photos by Loïc Bascoul

The school has also kept some of the nature that was already there before the intervention, for example, the shrubberies right next to the playground for small children. Although the green intervention the school did not have the intent of making this part of nature play-oriented, the way bushes and small trees are in this area creates canopy tunnels under the bushes for small children to go play in, and branches are easy to climb to (Figure 14).

Figure 14: On the left: Shrubberies and trees where small children can play.
On the right: Playground for small children
Source: Photos by Loïc Bascoul

The area also has a wall for ball games, table-tennis tables, and fields for foursquare games, basketball, and soccer. A lot of equipment was also made available by the school such as frisbees, balls, hockey crosses, etc.

Data collection

Fieldwork was conducted for three days (Tuesday, Wednesday, and Monday) in May 2023. Each day, two recesses happened, one starting around 9:30 am, and one for lunch, starting around 11:20 am to 1 pm. Most of the children were expected to be outside during recess, however, the weather had an impact on how prone children were to go outside. The weather between the three days was quite different. On Tuesday, the weather was cloudy, without much wind or rain, with the temperature sitting at around 16°C. On Wednesday however, the weather got worse, with a lot more

wind and occasional rain, and the temperature being around 13°C. On Monday, the weather was the opposite, with a strong sun, and clear blue sky, and a temperature of 22°C.

The method for data collection consisted of both systematic trackings inspired by the method used in Mårtensson & Wales, 2019, and open field notes inspired by Participant Observation: A Guide for Fieldworkers (Musante & DeWalt, 2010). The first one was to capture situated play episodes and types in different settings and the overall school ground. In order to do that, observation started around 5 minutes after the children were outside, to ensure that the play had begun, and avoid the observer's effect. On a sheet of paper with the map of the school ground, the observer would map the children according to observable gender in the area of the school ground they are. Then, the observer would write a few notes to describe the type of the play episode. The observer would move slowly around the school ground (see Figure 12) and map and note every type of play observed until the map is full (no more place to write of track position) or a lap is completed. The mean duration time of a lap was fifteen to twenty minutes. After a lap is over, a new sheet would be taken, and a new lap would begin. This goes on until there are no more children in the playground. An average of five maps were used per recess.

Along with the systematic tracking, open field notes, or ethnographic notes, were taken. This aimed to describe the everyday life of the schoolyard and its surroundings. Looking around the whole area, the observer would write down the conditions of the day, as well as repeating patterns, or things that stand out. More or less precise descriptions of what was happening were written, along with some conclusions and personal reactions.

After a session, the observer would elaborate more on the short description note on the field. All the notes taken from the systematic tracking were then brought together in one Word document and classified into different play categories (See Annex 1), for it to be analyzed further. The play categories used for the tracking are the same as in Jansson & Mårtensson 2012 (Table 1).

Table 1: Play category definition

Source: Jansson & Mårtensson, 2012

Play Category	Definition	Notes from Observations - Examples
Ball game	Ball games with rules or playing with balls	Ball against wall, bouncing ball while walking, foursquare games, Soccer-ping-pong
Green exploration	Moving around, using and exploring green areas or natural elements – ***when not part of other play category***	Standing in the bushes, sitting on stones and manipulating things
Locomotor play	All movement at a higher intensity than walking – ***when not part of any other play category or transport e.g. to class or canteen***	Balancing on a bar (by the stairs), crawling along the wall, hanging in the soccer goal; running over the rocks
Equipment play	Locomotor activity by play structure - ***when not part of pretend play***	Swinging, climbing in slide, climbing and talking, swinging and jumping
Pretend play	The children express verbatim or by posture that they are pretending or imagining things	Playing horse, school, family, war, swings in the tree and fantasize, playing at the train
Rough and tumble play	Play fighting and other types of play that involve intimate bodily and social interaction	Wrestle, fighting for the ball, get each other down from play equipment, two girls carrying a third
Chasing game	Different games in which children run round, e.g. hide and seek and tag	Tag, hide and seek, chasing in groups (in Swedish: Dunkgömme, Femton, Princess)
Sport	Sports organized into competing teams and following rules	Basket ball, soccer, fetching the ball, watching soccer

Results:

The result of this year's tracking will be compared to the tracking that has been done at the same school in 2012, after the intervention of the greening project of school grounds in Malmö. There are some differences in the method of tracking, especially in the categorization of play behaviors that could have been done differently depending on the interpretation of the definition of Table 1.

A total of 201 observations were displayed in different play categories in Table 1. The weighting of the different play behaviors observed was forged into Table 2. The data from Table 3 was taken from a report of a study (Mårtensson & Wales, 2019), for the purpose of comparison. The "Other" play type category was removed from Table 2 result table because of its absence in Table 3.

	Girls	Boys	Mixed	All
All Ativities	42 (23%)	76 (42%)	64 (35%)	182
Ball Game	3	28	20	51 (28%)
Green Exploration	19	12	7	38 (21.1%)
Locomotor Play	4	2	1	7 (3.8%)
Equipement Play	2	5	6	13 (7.1%)
Pretend Play	5	10	2	17 (9.3%)
Rough and tumble play	0	2	2	4 (2.1%)
Chasing Game	5	6	15	26 (14.3%)
Sport	4	11	11	26 (14.3%)

Table 2: Play types at the school in 2023.

	Girls	Boys	Mixed	Not categorized by gender	Total
All Ativities	31 (19.3%)	85 (52.8%)	27 (16.8%)	18 (11.2%)	161
Ball Game	6	36	9	6	57 (35.4%)
Green Exploration	0	3	0	0	3 (1.9%)
Locomotor Play	6	6	0	5	17 (10.6%)
Equipement Play	2	0	2	0	4 (2.5%)
Pretend Play	4	2	2	0	8 (5%)
Rough and tumble play	2	2	3	1	8 (5%)
Chasing Game	11	11	9	3	34 (21.1%)
Sport	0	25	2	3	30 (18.6%)

Table 3: Play types at the school in 2012.
Source: Mårtensson & Wales, 2019

In order to better visualize the differences between the two studies, Figure 15 was created.

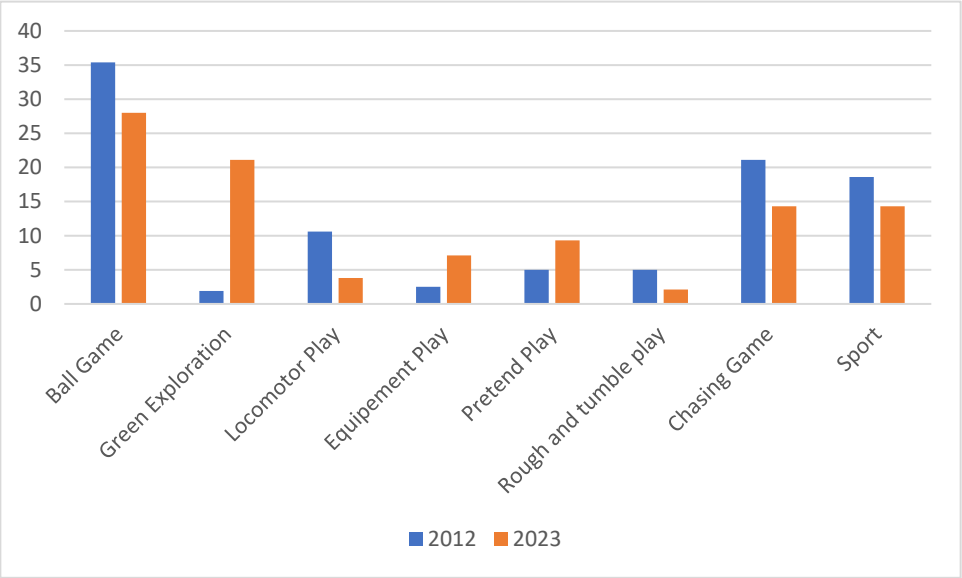

Figure 15: Play types in percentage at Videdalsskolan 2012 vs 2023.

Eleven years after the remodeling of the school, the green area that was brand new to children in 2012 has become the normal state of this school playground. The percentage of Ball games, which already faced a reduction after the intervention in 2012, faces again a reduction (-7.4%), although it stays the predominant play type. Sports, Chasing Games, Rough and tumble play, and locomotor play all faced a decrease too. All of these play behaviors are “physical” play behaviors that induce physical activity. This correlates with the results obtained in the 2012 field study (Mårtensson et al, 2014; Mårtensson & Wales 2019), where adding greenery to the school playground had a negative impact on the children's physical activity. Despite this negative impact, “physical” play behaviors are still dominant compared to other types. It is somewhat normal to observe this decrease. As children don’t have more time during breaks, the addition of green areas on school grounds makes new possibilities for play behaviors. But due to the limitation of time, if they chose to play in this new environment, they will play less of another play category. Sports and ball games are the most affected types of play because they are also the most popular, so statistically more children would stop doing that to go play in greeneries.

Adding greenery to school grounds made the play behaviors more diverse (Mårtensson & Wales 2019). This trend seems to still be going on in 2023. Observations show that there is an increase in pretend play and equipment play, which both enhance the children's imagination and fantasies. The biggest change in play behaviors between the two studies is Green Exploration. It went from the less observed type of play in 2012 to the second most in 2023, with an increase of 19.8%. This change means that the children have adapted their play to their environment. Therefore, in the continuity of what was found eleven years ago, the play behaviors of children are more varied than it was before. The children are playing more with nature itself, whether it is simple observation of nature, or play with rocks, plants, or dirt. An important factor of this evolution can be the growth of the vegetation. As mentioned before and in a previous report of the study, the vegetation in 2012 was brand new, and not as developed as it is now. This growth has made the place more attractive, making the children play in it more. However, it would be interesting to compare this observation with an observation during winter, when the vegetation would be much less attractive because the nature area is not made with evergreen species, but with deciduous species.

Another change that is interesting to note is the evolution of the groups that are involved in certain play behavior. In 2023, more of the play observations overall were mixed play. The most important changes are in Chasing Games, Sports, and Ball Games. While this change could be attributed to a change in societal norms, observations back in 2012 indicated that adding greenery to school playgrounds benefitted social interaction and induced a greater gender mix in play behaviors, whether it happened related to nature or not.

One of the goals of this study was to describe how children play and interact with their environment. More than one-fifth (21.1%) of the play behaviors observed were in direct connection with nature, labeled as Green Exploration. But it is interesting to know how the environment was put to use, even when nature was not at the center of the play behavior. Out of 201 observations, 74 play behaviors were nature-based play, meaning that it happened in nature, or nature was the center of the play. This translates into 36.8% of all play behaviors being directly connected to nature, almost double what happened. But this nature-play related to nature can be divided into two different categories: play behaviors that happened in the nature area in the middle of the school ground and play behaviors occurring near or in the greenery in the fringes, and in a greyer zone with some nature, like the circle of trees, which is more traditional of what is seen in playgrounds.

Out of the 74 observations that were nature-based play behaviors, 45 happened in the nature area in the middle of the school, and 29 happened with other greeneries. A lot of what happened in the nature area was green exploration, but the area was also used as a playfield for many different games such as Hide & Seek, Tag, Prisoners, Boys vs Girls, or the Floor is lava, and also used for a lot of pretend play. The other type of greeneries was also used to play group games, but different types of games like a red light green light, off-ground tag, or simple chase games were played. It is also important to note that the smaller children did not go into the big nature area but instead used the bushes and trees near the small school to play in nature. It is not known if they were forbidden to go there, or if they did not go there due to the big nature area being the territory of older kids. One last thing to note is that the area the furthest from nature, like around the globe, was barely used, despite the area having some trees, tables and benches, and enough place to play ball games. Kids instead play ball games right next to the nature area, but never inside of it. The two different types of greenery were used differently, and the presence of both induced more variety of play related to nature.

Discussion:

In this part, the observations described are the observers' reflections on what they observed during the study. Repeating patterns and events that stood out along with the personal thoughts of the observers will be addressed, comparing the observations to his experience of primary school in France. It is important to remind the reader that the observations were made at one school only, meaning that none of the observations should be taken as a generality, but rather as an example at one time, in one place.

Games

During the observation, it was evident that the Foursquares game was immensely popular among the children. Some children were only playing this game for the full recess, and many children engaged in this game consistently during different recess periods, not playing any other game than this. The game was played in the squares (Figure 12), and there wasn't any interaction between the children

and nature, except when the ball would be sent to the area. This game is not very common in France, but it seems to be a classic in Sweden. Another game that stood out and was particularly repeated was basketball ping pong. A significant number of children were playing ping pong but using their palms as rackets and a basketball instead of a ping pong ball. An obvious explanation for the development of this game would be the lack of actual ping pong equipment, but it was not the case, as some children took the appropriate equipment from the cabin where the equipment was stored. Basketball ping pong is an example of how children use the infrastructure they have at disposition in a much different way than how it was intended.

There was a lot of play equipment available to the children, such as balls, hoops, ping pong rackets, hockey crosses, crayons, jumping ropes, and bicycles, offering them a wide range of choices for play. Music was also played by speakers by supervisory staff. When music was played during recess, the children became more active and regrouped to dance. Additionally, despite the prevalence of smartphones among children in general, only a small number of them were observed using their phones during recess. It could be that the usage of smartphones was prohibited during recess periods.

Behavior

During the observation, a lot of different behaviors were observed, and they are interesting to note. The first thing to mention is the behavior of children towards the observer. For some reason, kids did not notice the observer during the first two days, or if they did, they did not engage in any discussion. However, on the last day, Monday, whole groups of children came to ask questions about the reason for his presence there. It became quite an attraction. The level of English of the children was good enough for them to be able to handle a discussion. Another observation was that sometimes, the children would notice the presence of the observer. In such cases, they tended to migrate toward another area or stop what they were doing. This is a natural reaction when a child sees an adult looking at them and taking notes, but it must have affected the children's behavior, hence the result of the study.

Additionally, the number of children observed during recess was much lower on Wednesday was much lower than the rest, resulting in fewer observations. This decrease could be attributed to the combination of unfavorable weather conditions and the upcoming weekend of 4 days due to a holiday. Moreover, the children who did venture outside during recess tended to stay near the classroom entrance, seeking shelter from the cold and potentially displaying a preference for indoor activities on such days, as they had the possibility to stay indoors during breaks. This proves that the weather plays an important role in the children's play. Another observation on this phenomenon was that equipment like ropes, hoops, and hockey crosses were used less frequently on sunny days, while static games like "The Floor is Lava" and sitting on benches became more prevalent.

The most striking cultural contrast between the observed school and French schools was the liberty and autonomy afforded to the children. The school was an open space accessible to anyone, which is a normal thing in Sweden, and the children had the freedom to leave the school perimeter. Adjacent to the school, there was a park with various recreational facilities, including a skatepark, tennis courts, a large lawn, and playgrounds. The children would independently venture into this park, running, playing, and exploring without constant adult supervision, returning to the school grounds when recess was over, without the teacher having to specifically search for them. While this does not apply to all schools in Sweden, it is still done in a lot of schools, but this would be unimaginable in France. Different classes seemed to have different schedules, and not all classes were outside at the same time. This is a huge difference in the level of autonomy granted to children compared to the French schools, where everything is stricter, for example, there are precise times for breaks or interdiction of leaving the school ground outside of the schedule.

Relation to nature

While nature appeared to be a popular destination for children, it was observed that there were limited seating areas for children in the natural environment. The natural areas of the school grounds seemed to function more as a place to run rather than spaces where children would sit and play. The circle of trees with benches and rocks proved to be a popular spot where children would sit and chat, implementing sitting options in the nature area could also favor children's interaction with nature.

The nature area seemed to serve as a refuge for some children. Two instances were observed where children went into nature to isolate themselves from the rest of the children. One girl climbed a tree behind the cabin to isolate herself, indicating that nature provided her with a space to find emotional comfort. Another child was found sitting alone in the bushes, seemingly sad and avoiding contact. These instances suggest that nature serves as a place where children can hide and seek comfort, separating themselves from the larger group.

Among all the activities that children were observed doing in nature, one recurring behavior was unexpected. A lot of children were observed picking and eating the leaves of some trees in the natural area. This behavior raises curiosity regarding their motivations. One possible explanation could be that they have learned that certain leaves are edible. It is also possible that this behavior was part of a recurring pretend play.

Finally, one interesting observation was harmful behaviors towards nature. It is often an argument that some biologists and ecologists have over the greening of the school ground. Children are considered not responsible and can have feral behaviors that would harm the vegetation on the school ground.
There was an incident involving a group of boys who destructed small trees (Figure 16) and other observations where kids destroyed a bush, tearing the branches apart. However, teachers and supervisors intervened, putting an end to the destructive behavior, and engaging in a discussion with the children. Despite this kind of behavior concerning a minority of children, it is still a concern for ecologists and planners. It is important to address and educate children about the importance of preserving and respecting nature.

Figure 16: Severed tree after destruction by a group of boys

Source: Photo by Loïc Bascoul

General Conclusion:

My experience as an intern at SLU has been rich in experiences. In addition to conducting the two studies addressed in this report, being an intern at SLU has allowed me to experience many other aspects of being part of a lab at a university. The work atmosphere was always a delight, not at all stressful. During the first month of my internship, my main goal was to discover how was campus life. I discovered the tradition of literally nailing to the wall the thesis of Ph.D. students two weeks before their defense, which I think is a great way to celebrate the end of a doctorate.

I also took part in another study in the Sensola lab, using eye-tracking technology. The study was trying to evaluate what kind of green roofs were more attractive to people by showing images of green roofs to the participant, and analyzing how many focal points there were for each picture. This was another great example of how technology can help the development of nature architecture.

Another notable thing that I did was attend the REGREEN seminar. There, I learned that the REGREEN European project is a collaborative initiative aimed at promoting and implementing nature-based solutions in urban areas. Researchers from all over Europe focus on enhancing the quality and sustainability of urban environments by integrating green infrastructure, such as parks, gardens, and green spaces, into the urban fabric. REGREEN brings together researchers, policymakers, practitioners, and stakeholders from various disciplines and sectors to work towards a common goal of creating more resilient, healthy, and livable cities. The project also adopts a multidisciplinary approach, which I am very familiar with, drawing on expertise from fields such as environmental science, urban planning, landscape architecture, and social sciences. One of the goals of the REGREEN project is to develop innovative strategies and tools for the design, implementation, and management of green infrastructure in urban contexts while trying to involve all stakeholders concerned, like local communities and policymakers. The project was tightly connected to my studies, as it seeks to raise awareness and provide guidance on the benefits of green infrastructure.

To conclude, I'd like to say that the goal of this internship, which was to experience environmental psychology and study the human-nature relationship, has been reached. These studies open the way to further analyses of stress levels in nature and children's play behavior on green school grounds, which makes me want to study more about these topics.

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Annexes:

Annex 1: School Observations.

Tuesday : Cloudy, but fine, not too much wind, not too hot. Kids were wearing sweatshirt in general

Wednesday : still cloudy, but much more wind, hence much colder, some kids had coats. Some rain.

Monday : Extremely sunny and hot, kids were wearing t-shirts and shorts.

201 observations of play behaviors.

Yellow: Other greeneries Green: Nature area

Ball game

1 Ball game on basketball terrain (but not actual basketball, just passing the ball) M
2 Ball pass in the corner near the circle tree B
3 Foursquare games were very popular, there was always someone there M
4 Foursquare game M
5 Bouncing ball against the wall B
6 Foursquare game M
7 Playing ping-pong but with basketball B
8 Ball pass in the corner near the circle tree B (a ball hit a boy in the nose, interrupted)
9 Passing ball inside the tree circle B, (interrupting play of some girls)
10 Foursquare game M
11 Basketball ping pong game w/ basketball G
12 Football freestyle B
13 Foursquare m
14 Chase after ball, kicking M
15 Foursquare game M
16 Kids playing Bull with a ball B
17 Foursquare game M
18 5 boys playing ping pong basket B
19 Foursquare game but this time only girls G
20 Another game the foursquare game is played in the same area, dodgeball M
21 Girls bouncing a ball to one another while chatting. G
22 Group playing Steal the Bacon with a ball. M
23 Foursquare game M
24 Boys playing a mix of baseball and hockey in nature B
25 Foursquare game is still on, generally the same players also. M
26 Some boys are playing with a ball, shooting it against a wall aiming for targets on the wall B
27 Foursquare game is as popular as ever. M
28 Football freestyle near the square B
29 Foursquare is the main attraction, mainly girls M
30 Boys bouncing balls on the ground and walls B
31 2 boys playing ping pong basket B
32 A ball play is organized near the rock and the squares B
33 Foursquare game M
34 Boys playing with a ball near the circle tree B
35 Boys playing turning ping pong basketball B

36 Hockey basketball match girls vs boys M
37 Foursquare game M
38 Kids playing in circle tree, putting ball in hoop hold in the air. M
39 Foursquare game M
40 Foursquare game, ball went on the roof M
41 Groups do some kind of ball play with unknown rules. M
42 Basket ping pong tournament M
43 Foursquare game M
44 Foursquare game M
45 2 boys passing ball in the rock area B
46 Foursquare game M
47 Ball play in the tree circle M
48 Foursquare game M
49 Foursquare game M
50 Ping pong basketball tournament. M
51 Bouncing ball near the circle tree, passing and bouncing. B

Green Exploration

1 Sitting on the ground near the bushes G
2 Crawling under the bushes M
3 Some girls walking around nature, pointing, picking and eating some leaves G
4 Two girls gathering leaves and petal in a bucket G
5 4 girls moving around in the nature area chatting and observing nature G
6 Near the gardeners, two girls eating some leaves/herbs, trying petals too (left when the noticed me watching them) G
7 Chatting sitting on branches in a tree (not so high) G
8 Climbing, chatting in a tree B
9 Walking in circle on top of the hill G
10 Three girls walking around on the paths between trees chatting G
11 Climbing trees in the circle of trees B
12 Girls climbing in tree to chat near bushes G
13 Some children are climbing in the “climbing tree”, very liked by some kids M
14 Two kids eating leaves and chatting in nature. B
15 2 girls sitting on top a the hill, chatting and playing with dirt G
16 Girls uses one tree as a reunion spot, chat and draws on it with crayons G
17 Some kids uses the rocks near the pole as a sunbath spot, just lying on them M
18 A girl alone in a tree, as a refuge probably, counting petals and leaves of the tree. G
19 2 girls sitting on the ground in the middle of a path G
20 2 boys digging the ground near the bushes B
21 Boys playing with rocks near the bushes, using them as marbles/boules. B
22 Girls middling with rocks, trading and organizing them in the bushes G
23 Girl alone climbing and hugging tree. G
24 2 boys talking and walking in the nature area. B
25 Kids comparing and measuring the different branches they find M
26 2 boys playing in the bushes, crawling in the ways that has been cut inside of them B
27 A boy and a girl chatting while climbing rocks in the circle tree. M
28 Two boy sit in the grass after running. B
29 Boy Playing with branches, seems disgusted by what he touches B

30 Boy digging the soil of a garden pot, hands very dirty. B
31 Girls sitting in the shadow of the tree, avoiding sun? G
32 Boys sitting in the shadow too B
33 2 boys sitting on rocks in the shadow, talking about something explosive (explosive sounds) B
34 2 girls walking in the nature area, chatting and enjoying the shadows of the trees G
35 Girl alone interacting with nature, sitting on the ground under low branches, digging soil with branch G
36 Girls collecting leaves, tasting some of them G
37 A group of kids climbing trees alternatively, who goes the highest. M
38 "Cochon pendu" in trees. M

Locomotor Play

1 A group of girls rope jumping near the bikes B
2 A group of girls dancing to the music that was just turned in G
3 Dancing on the basketball field G
4 Dancing near the foursquare M
5 Boys running around the nature seemingly without purpose B
6 Girls doing handstand near the wall of the small school G
7 Boys doing handstands next to a wall B

Equipment play

1 Small kids majorly played in the designated playground with swings and slides. M
2 Small kids majorly played in the designated playground with swings and slides, mainly girls. G
3 Small kids majorly played in the designated playground with swings and slides M
4 Kid playing near the square game with a hoop B
5 Actually a lot of equipment were provided by the school, but they were not so much used (most used were balls). M
6 Small kids majorly played in the designated playground with swings and slides M
7 Kids again playing in the playground area M
8 A boy removed his shoes and started playing with them in nature, walking with only socks B
9 Small kids majorly played in the designated playground with swings and slides M
10 3 boys having a contest of who can throw a branch the furthest. B
11 Boy took out a huge branch out of I don't know where, brought it to play in the middle of the playground. B
12 Girls hiding and chatting in the bin area. G
13 Tool making, rope and hoop to make a lasso. B

Pretend Play

1 Playing with sticks as knights B
2 Imaginary play behind the small school B
3 4 girls went to a gardening box that has aromatics, pretend to cook, kitchen pretend G
4 Pretends to be explorers or something through the bushes using sticks etc. M
5 Girls are organizing some kind of stand, pretend play market G
6 Few girls singing along the music, pretending to be on stage/doing the voices (juries too) G
7 Pretend to make a fire (or actually try) with a lot of branches, playing survivors B
8 Two girls were playing with a rope, used as some kind of a leash, one girl leading the other around in nature, going around trees and giving her leaves and petals to eat. They exchanged roles sometimes. G

9 Two boys playing with branches swords-like B
10 A girl and a boy pretending to be adventurers in nature. M
11 Girl alone in nature, looks like she is in her own world. G
12 Pretend play subway surfer (drawing with crayons). B
13 Pretend play with branches, middle-ages war. B
14 2 boys exploring the nature, pretending to be some kind of heroes B
15 3 boys pretending to be enemies, fighting with imaginary powers in nature. B
16 Two boys playing swords with branches. B
17 Girls pretend play with bikes as delivery service. G

Rough and Tumble Play

1 A group fight for a ball as a play (3 girls 2 boys) M
2 Teasing /fight in the south of the nature area, fighting for a big branch B
3 6 boys fighting over a bike on the basketball court B
4 3 girls are carrying a boy, seemingly interrogating him, seems to be part of an organized game. M

Chasing/Organised Game

1 Hide and Seek in the bushes (small children) M
2 Play tag around the bushes (SC) M
3 Playing hide and seek with prisoners, playfield being the nature isle, prison of one side near the rocks, the other one near the bikes. M
4 Group Hide & Seek, Mixed, all in nature, a lot of kids climbed trees to hide M
5 Chasing around the cabin of equipment G
6 A group of girls playing Green Light Red Light in the tree circle. G
7 Prisoners game around the pole, one team chasing others around the whole playground. M
8 Organized Hide and Seek around the bushes M
9 Chasing game organized, ~10 kids, play zone around the pole and the hill. M
10 Girls on bike chasing other girls not on bikes G
11 Organized play, boys catching girls M
12 Kids playing off-ground tag in the circle of tree (there are rocks there) M
13 Chasing in the tree circle and playing on rocks B
14 Boy chasing each other's, some kind of tag B
15 Organizing a game, boy around the pole B
16 5 girls playing tag G
17 Huge play organized, Hide and Seek in the whole school ground. M
18 Organized play, chase the one with the cap. ~10 kids M
19 Girls playing red light green light near the bins. G
20 Boys vs girls in nature M
21 Mainly girls, play tag in nature area M
22 Hide and seek behind the bins. M
23 Off-ground tag between boys B
24 5 boys playing tag around the bike area B
25 Organized play in the whole school ground (and beyond), boys vs girls M
26 Boys playing the floor is lava in nature, grabbing and climbing on branches. B

Sport

1 Kids racing down the hill multiple times M

2 Football game on the field, ~10 B
3 7 kids playing football on the small field M
4 4 girls playing ping pong near the tree circle G
5 Boys playing basketball B
6 ~15 Kids playing on football on small terrain, adults as judges. M
7 Few girls races on a bike on the line behind the bushes. G
8 Kids playing Football on the field with adults around M
9 ~17 Kids playing football on the main field B
10 2 boys playing actual ping pong B
11 Other group of boys playing football on the small field B
12 On the big field, other boys started to play football with some girls also M
13 Few boys playing basketball, joined by some girls M
14 9 boys left on the football field, penalty competition. B
15 4 girls playing basketball G
16 Playing goal keep near the ball wall M
17 Boys playing basketball, group watching them M
18 Football play on the field, only boys but girl watching B
19 Boys playing football on the field B
20 Rope jumping, hula hoops M
21 Goal keeping M
22 Some girls play football (field) after boys left G
23 Some boys play football on the small field B
24 Basketball mixed M
25 Boys playing football on the field B
26 Boys playing football in the small terrain B

Other

1 two girls walking around chatting, not seemed to play G
2 4 boys chatting on a bench in the tree circle B
3 Group chatting and playing in the bin area behind the bikes G
4 Girls drawing on the floor with crayons G
5 Some girls chatting around the bikes G
6 2 girls lying on benches and chatting G
7 A group of girls sitting on some fence and chatting G
8 Girls chatting in the bin area behind the bikes G
9 Boys sitting on benches in the planet area B
10 Two girls were drawing on the ground with crayons. G
11 Group of girls chatting and sitting in the bike/trash area. G
12 Girls drawing on the ground with crayons (deathly hollows) G
13 4 girls just walk around the place chatting. G
14 2 boys just sitting on a bench near the gymnasium B
15 Bunch of girls gathering around the planet G
16 A lot of dancing on the playground because of the music M
17 A boy felt from climbing a tree, yelled for two second then left to dance to ABBA. B
18 6 boys sitting on a ping pong table, singing/vibing to the music B
19 Music starts so dancing starts M