



POSITIVE INFLUENCES OF ENVIRONMENTAL CONTEXT ON WELLBEING:

**DOES PRESENCE OF NATURE AND
DAYLIGHT HELP US FEEL BETTER IN
OUR DAILY LIVES?**

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ABSTRACT

Present study investigated the positive influences of environmental context; in particular effects of nature and daylight, on people's mental wellbeing (affective states and self-control) and people's relationship with most commonly visited locations. Experience sampling methodology was employed to measure the context and mental wellbeing and to achieve high ecological validity. Depth interviews were initiated to explore in depth participants' relationships with most commonly visited locations. The higher amounts of natural elements in the environment were found to boost relaxation and happiness. Restorative potential of the environment mediated these effects. Moreover participants had fewer temptations in more natural environments. Daylight showed positive trend in predicting vitality and significant effect in predicting participants' ability to concentrate. From depth interviews, home was found to be rated as the best location, where participants find peace and quiet at the end of the day and could rest. Moreover, home was reported to be the locations, where most temptations occur. When people searched for restoration, more natural locations were reported as destinations. The quality of social contacts appeared to greatly influence the perception of the location. Present study adds reasonable input to the research of the effects of nature and daylight on people's wellbeing and performance. Our study is one of the few to employ methodology with high ecological validity and perform research in the field setting.

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Finally I reached the point, which probably indicates, that in few minutes I will save this documents in PDF format and finish writing my master theses. At this moment, my eyes are hurting from starring at the screen for over 9 months, but that little tingling feeling somewhere deep inside says, that as soon as I'm done graduating, I will probably miss this researching, writing, getting tired, being stressed, being happy, being interested... Interested. Indeed, first of all, I would like to thank my great supervisor, Yvonne, who made me so interested in whatever I was doing for the past 2 years. I always loved people and wanted to help them improve their lives, however, I was not aware of the tools which could help me do that. And then, here in HTI department I met a person, who right away looked like a people's person. Beautiful, smiling, charming. That person helped me to find my ways. She inspired me for great projects I've recently done and new to come. And she guided me like a best supervisor, good friend and a very very good teacher. So, thank you Yvonne for being there for me and I am very proud to be your student!

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I. INTRODUCTION

In this paper we will concentrate on positive effects of environmental context on mental wellbeing in everyday life. In particular, we will investigate the effects of nature and daylight on people's mood and self-regulatory capacity. We will start with a general introduction to different perspectives on health and the importance of environmental context in helping people to maintain good mental health and overall wellbeing. Subsequently we will elaborate on which aspects of mental health are in focus throughout our study, and later in the introduction we will present the reader with the scientific foundation for the present research based on literature overview on restoration theories and the research on influences of (day)light on people's functioning. Finally, we will reveal the rationale for our study and present the research questions.

1.1. POSITIVE PERSPECTIVE ON HEALTH

Many things have changed since Alexander Fleming made a fortunate mistake in his laboratory by leaving the bacteria plate open throughout the night and thereby discovered one of the most revolutionary drugs – penicillin – which is commonly used to date. The medicine has developed much further, increasing the quality and length of people's life. Getting to know the human body more and more helped doctors and scientist to expand the idea of what health actually is, and that a healthy body alone does not make up for a healthy person yet.

The World Health Organization (WHO) in the year 1948 defined health as follows: *'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'*. After unraveling the components of health, people found the roots and causes of many diseases and most importantly they gained the understanding that the surrounding environment clearly has influences on their health, in both physical and psychological ways (e.g., a poorly ventilated room can cause headaches, junk food can cause obesity, stress from work and other worries can as well influence our moods and mental state, etc.). Therefore the research on health expanded from being only medical science to health psychology, healthcare science and even provided new directions for other disciplines. Psychologists and environmental psychologists started researching environmental influences on people's wellbeing and health. Environmental psychologists such as Stephen Kaplan and Roger Ulrich started exploring the benefits of interactions with nature and influences of natural environments on humans' wellbeing. Other researchers kept their focus on effects of light (natural light and other sorts of light) on humans' emotional wellbeing, performance or biological mechanisms, such as circadian rhythms. Baumeister, Tierney, Korpela and many others investigate the influences of certain environmental elements on people's ability to control their urges, emotions and overall self-monitoring, which is usually referred to as self-regulation. There are also more generalized theories. Already in the 1970's medical sociologist Aron Antonovsky started the development of *salutogenesis* theory, which focuses on human's capacity to fight the stresses of life and the naturally inborn resources people encompass to do that. Salutogeneses theorists aim to analyze health from its origins and to find the factors, which can help people sustain their health, rather than only define the possible harms of the environment (Alivia, Guadagni, Roberti di Sarsina, 2011; Lindstrom, Eriksson, 2005).

Sometimes it can be hard to find a strict line, where one scientific discipline ends and another starts. For example, scientists from the disciplines mentioned above – medical sociology, psychology and environmental psychology – are all analyzing influences of certain factors of the environment (relevant to their discipline) on people's wellbeing. Based on empirical studies they make conclusions and create theories from their own perspective. And although at times the techniques to approach the problem differ, the main similarity emerges

when we see, that those researchers try to find the positive influences from the environment, which could work as a fuel for our wellbeing. A different approach to health – salutogenesis – and the knowledge gained from disciplines, such as environmental psychology, could accelerate the changes in present healthcare systems and make it not only active in treating the disease, but as well transform it into a preventive organ, which helps people to retain healthy states for longer periods of time. Therefore we will investigate the environmental context from a salutogenetic perspective, by looking to positive effects of the environment on our participants' wellbeing. Based on theoretical background and variety of studies showing strong positive effects of nature and daylight on people's wellbeing and functioning, we will focus on these two environmental phenomena and their impact on humans' mental health in everyday lives. Additionally in this paper we will present our qualitative research on the relationship between people and their most commonly visited locations. We investigated the aspects of the environment that make those locations 'good' or 'bad'. We studied whether people consciously seek locations which they consider to be good for them. In addition we explored, whether the good locations have higher amounts of nature and if daylight plays a part in people's preferences. The qualitative part of the present study helped us to get more insight to interpret the results from quantitative data and provided ideas for future research with refined directions.

1.2. MENTAL HEALTH

"Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community" (WHO, 1948). From this definition it follows that a strong emotional base and a high self-regulatory capability represent good mental health. In the following paragraphs the important role of emotions and self-regulation on our mental wellbeing will be explained.

Emotional wellbeing is commonly explained by using terms such as 'affect' and 'emotions'. Affect generally covers longer lasting and usually 'objectless' traits of mental wellbeing, e.g., moods, feelings, physical sensations and attitudes. Emotions on the other hand are known to be momentary responses to personally relevant happenings. Although at first sight these two phenomena are somewhat different and are usually analyzed separately in the literature, most researchers are coming closer to a unanimous agreement that emotions are a subset of affect and that they have strong influence on our long term emotional wellbeing (Fredrickson, 2001). Fredrickson's Broaden and Build Theory of Positive Emotions explains the longer lasting effects of emotions on wellbeing. According to Fredrickson, positive emotions can not only produce optimal performance at the present moment (since they are momentary by definition), but also sustain it for a broader period of time. This leads to the same effects as positive affect is known to have on wellbeing – enhanced flexible, creative and integrative ways of thinking, better decision/choice making capabilities and increased motivation, which leads to good mental health (Fredrickson 2004; Fredrickson, 2002). Moreover positive affect has a tendency to increase and support our ability to self-regulate (Aspinwall, 1998; Tice et al. 2007). Self-control is one's ability to inhibit certain stimuli in the environment and respond to the other stimuli, which have relevant at the time being. This conscious process of self-regulation, by controlling our emotions, behavior, desires or thoughts, helps humans to survive alone and in society (Gailliot, Baumeister, 2007). The ability to self-regulate is known to influence people's success in different spheres of life. Research shows that people, who have better self-regulatory capacity, show higher performance in schools, have higher self-esteem and report better wellbeing. Moreover they are less likely to abuse substances (such as alcohol or drugs) or break diets, are less aggressive and can solve interpersonal conflicts better. Additionally self-regulation is an important part of the coping mechanism used to fight stresses of life, which are threatening our health and

overall wellbeing (Tangney, Baumeister, Boone, 2004; Ayduk et al. 2000; Taylor, Stanton, 2007). Therefore it is not surprising that self-regulation is one of the core ingredients of health.

So, how does self-regulation affect health? Good health requires a balanced lifestyle, where one eats healthy, gets enough exercise, sleeps well, avoids harmful habits, manages to find the solutions for everyday problems and so on. To be able to keep up with these healthy habits and maintain efficient living one must be capable to self-regulate and hold on positive motivation, which usually stimulates to continue living (healthy) lives (Bandura, 2005). Moreover, since in our research we focus on mental health, it is important to mention, that in the literature it is widely reported that ability to self-regulate is significantly poorer in people with psychiatric or psychological disorders, which yields the close relationship between good self-control and stable mental health (Taylor, Stanton, 2007). In the following paragraphs we will explain the self-regulation mechanism and what influences our self-regulatory capacity.

The importance of self-control for human functioning (healthy and successful living, etc.) encouraged psychologist to search and analyze the source of self-control and find reasons for failure in self-regulation. Many theories have been trying to explain how self-control works, however only recently scientist started to come closer to unanimous agreement, that self-control is a part of one big common resource, used for many physical and psychological processes in human's body (Baumeister, Vohs, Tice, 2007). According to Baumeister's Ego Depletion theory, people have one resource – *ego* – which is consumed for many tasks that humans have to perform, including self-regulation and emotional control. Overuse of this source without 'refilling' is one of the reasons why people fail in subsequent self-regulation. One good example illustrating the self-regulatory capacity as the 'one' source to control many processes, is a study performed in Baumeister's laboratories. Participants were asked to watch a sad movie and either amplify their emotions with facial expressions (experimental group I), suppress their emotions (experimental group II) or to behave normally (control group). After the movie participants were asked to perform a grip test – which involved squeezing a rubber handle as long as possible. Interestingly both experimental groups of participants performed significantly worse than the control group. This led to the conclusion, that regulation or amplification of emotions emptied the self-regulation source and significantly diminished participants' stamina to perform better on the physical grip test (Baumeister et al. 1998). In addition, self-regulatory capacity (*ego*) is strongly affected by negative emotions, rewards to oneself and physiological processes in the brain which are controlled by the flow of glucose. Negative emotions can empty the *ego* and diminish our ability to self-regulate; self-rewards and healthy consumption of sugar can increase our self-regulatory capacity. Since dieting requires a lot of self-control to avoid eating certain (groups of) food, Carels and colleagues' (2001) explored dieting behavior. In their study Carels' team indeed found that negative affect (sadness, tension) is highly correlated with perceived presence of temptations and the number of lapses (failure to self-regulate). Moreover, in line with previous research on self-regulation, Carels concluded that before the moments of lapses people felt like they were not motivated to resist the temptation and in general had lower confidence and self-esteem (which is linked to lower self-regulatory capacity) (Carels et al. 2001; Baumeister, Tierney, 2011). Hence, based on the research we can conclude that tasks which depletes the *ego*, negative affect and low glucose in the brain are factors which can impair the self-regulatory capacity.

Parallel to the knowledge gained about failure in self-regulation, researchers searched for the remedies to fuel *ego* and maintain our ability to self-control. As mentioned earlier positive emotions are known to have strengthening effects on self-regulation. In their study, Tice and colleagues (2007) tested different groups of people, by first depleting their *ego* and then enhancing positive emotions followed by a task which would rely on self-regulation (e.g. grip test). The results showed that the experimental groups performed as well as the

control groups on stamina tasks. This basically says that positive emotions, besides the effects on cognition and motivation, are crucial to successful self-regulation because, unlike negative emotions they have an ability to balance out ego depletion (Tice et al. 2007). In general, research revealed the big variety of complicated and interconnected physical (brain functioning) and psychological (emotions, ego-depletion, etc.) phenomena which are influencing our self-regulatory capacity, and thus our overall wellbeing and mental health (Heatherton, Wagner, 2011). However, it is important to note that the majority of the studies were performed in laboratories under conditions that in general have low ecological validity. Moreover no known research looked at the direct influence of nature or daylight on self-regulation. Is it possible to grasp the way people regulate themselves in a daily life? Recently Hofmann and colleagues (2011) investigated the everyday temptation in experience sampling study and found that desire is integrated in our lives and moreover we experience the desire approximately half of the time when we are awake. Hofmann's study showed not only the importance of self-regulation, but as well encouraged us to research self-regulation in daily life by employing the right methodology (experience sampling). Therefore the present study investigated the effects that environmental context (especially the presence of daylight and nature) has on people's capability to resist most common temptations and be able to concentrate on important tasks.

1.3. BENEFITS OF NATURE

When talking about positive influences of nature, one cannot avoid the word 'restoration'. Restoration, a term widely used in environmental psychology, is the process during which one recovers from stress or mental fatigue and returns to a neutral state. Nature plays a big role in restoration, and even without knowing a theory behind restoration processes most of us would agree that natural environments are where we get to restore the most. Three well-known scientists in environmental psychology research, Stephen and Rachel Kaplan and Roger Ulrich, started the search for underlying mechanisms governing the restoration process and investigating people's relationship with nature.

Attention restoration theory (ART) was developed by Stephen and Rachel Kaplans in 1980's. According to this theory, people get fatigued due to overuse of directed attention, which is a greatly important cognitive mechanism for our wellbeing. Directed attention is effortful and requires a lot of mental resources. As Kaplan and Kaplan describe in their theory, the use of directed attention without breaks, leads to mental fatigue and disrupted functioning. The key to restoration then is effortless attention – soft fascination. Natural environments are able to provide people with the possibility to rest the directed attention, by effortlessly enjoying fascinating attributes of the surroundings. In addition, natural environments are known to carry three other major qualities needed for restoration – experience of being away, extent, and the feeling of compatibility with the environment. Therefore nature, and even photographs or other visualizations of nature, are known to be very restorative (Kaplan, 1995).

Another perspective explaining restoration processes via interactions with nature is Ulrich's Psycho Evolutionary Theory (PET). According to PET, restoration is governed by immediate emotional responses, rather than attention as it is stated in ART. These, usually unconscious, responses have an influence on overall wellbeing, including cognitive abilities and behavioral patterns. The key role of nature as a source for restoration is based on evolution of humankind: in natural environments humans developed their cognitive abilities, learned how to find food, water and shelter, in other words – learned how to survive. In addition, they adapted their survival system so that quick reactions would help them notice the harmful environment (stressors, such as predators, no shelter, etc.) as well as find restoration, as soon as positive environments become accessible (in early days this was unthreatening natural environment, shelter, no predators, etc.).

Ulrich explains that precisely because of evolution, people have an inborn preference for unthreatening natural environments and its elements (trees, vegetation), which automatically enhance restoration from stress or cognitive overload (Ulrich, 1991; Ulrich, 1986). And although Ulrich's and Kaplan's theories explain restoration as processes governed by different mechanisms, both theories agree that nature enhances restoration and can improve people's wellbeing and functioning.

Indeed, many empirical studies have been able to confirm the theories presented above. Berman and colleagues found that even short walks in rural environments can improve the performance on tasks which require cognitive recourses (Berman, Jonides, Kaplan 2008). In another study, where again the effects of walks in rural and urban environments were investigated, researchers looked at the differences between two groups of people – with poor and with good mental health. Not only did walks in natural environments lead to significantly better mood measures, lower stress and better reflection on one's ability to handle personal projects, but moreover these results were also more salient in the poor mental health group (Roe, Aspinall, 2008). Vitality (higher energetic states) is another affective factor describing wellbeing which from empirical studies are known to be positively influenced by interactions with nature. Ryan and colleagues (2010) found, that exposure to natural environments was related to positive changes in subjective vitality. Moreover, the daily time spent outside positively correlated with higher energy levels even when controlling for the amount of physical activity or social interaction. Nature partially mediated this relationship.

It is also important to mention, that nature exhibits positive effects on people not only in experimental studies, but as well in real life. When Korpela and colleagues performed study about the influences of favorite places on wellbeing of American adults, they found that majority of favorite places could be categorized as natural places. They also discovered that scores on restorative potential of favorite places were significantly higher compared to unwanted places. In addition, research shows that besides the restorative potential favorite places provide people with ability to get away from the daily routine, relax and, most importantly, improve self-regulatory capacity (Korpela, et al 2001; Mason et al. 2010). In sum natural environments are beneficial for human beings because they can help us to restore from mental fatigue and stress and maintain wellbeing, including higher levels of energy and better self-regulation.

1.4. EFFECTS OF DAYLIGHT

Not only nature is known to have beneficial effect on our wellbeing, but (day)light as well. First of all, light is a physical phenomenon – electromagnetic radiation, which is crucial for our vision and which influences our cognitive functioning, by affecting alertness and performance (Vandewalle, Maquet, Dijk, 2009). Moreover, scientists discovered that light is also responsible for the functioning of our biological clock (human's inner clock, which regulates the time to sleep or to be awake). Recently, photosensitive ganglion cells on the retina were discovered and found to control our circadian rhythms. These retinal ganglion cells absorb light even when other two photoreceptors (rods and cones) are inactive. So, they constantly send signals to the part of the brain responsible for the pace of humans' biological clock (suprachiasmatic nucleus of hypothalamus) and this way we then know when it's the time to wake up and time to sleep (Sekaran et al. 2003; Gilles, Maquet, Dijk, 2009). Besides the effects on vision and circadian rhythms, exposure to natural light has influences on our emotional wellbeing.

One of the biological mechanisms explaining the positive effects of light on mood is the secretion of serotonin. Serotonin is the so called hormone of happiness. Lambert and colleagues found that the secretion of this hormone correlates with amounts of sunlight we get during the day. Since lower levels of serotonin can sometimes be the cause of (seasonal) depression, exposure to sunlight is believed to be beneficial for treatment

of disorders of this kind (Lambert et. al. 2002). For example, in their observational study, Benedetti and colleagues found that bipolar depression patients had shorter hospitalization periods (thus recovered faster), if they were exposed to sunlight in the morning (Benedetti et al. 2001). Vitamin D₃, also known as ‘sun hormone’, is another organic chemical which explains the positive effects of light on people. It is a steroid synthesized in the skin by the exposure to ultraviolet B radiation, which we get with the sunlight. Vitamin D₃ is known to increase the level of serotonin in the brain. In Lansdowne and Provost’s study it was shown that intake of the vitamin significantly increased positive mood in an experimental group of participants as compared to control group (Lansdowne, Provost, 1998).

A study of wellbeing of healthy nurses in University Hospital revealed that daily 3 hour exposure to daylight can significantly reduce the symptoms of burnout (the psychological stress found only in working environments). Denissen and colleagues (2008) in their study of weather influences on mood found significant effects of sunlight. A higher amount of sunlight participants experienced during the day significantly reduced tiredness in healthy population (Denissen et al., 2008). Moreover, it was found that short exposures to natural bright light can reduce afternoon sleepiness by increasing physical alertness (Kaida et al., 2006).

Not only sunlight has positive effects on people’s mental well-being, but appropriately chosen light can be used as a therapeutic tool to reduce symptoms of mental deficiencies, e.g. depression. Morning sessions of bright light therapy is known to be useful for people with seasonal and non-seasonal affective disorders. As Terman states in his review article, bright light therapy can be as efficient as most antidepressants and pharmacotherapy trials and is suggested to be used when the response to antidepressants is incomplete or delayed (Terman, Terman, 2005). Moreover bright light therapy sessions were shown to have strong effects on a healthy population as well. Office workers in Partonen’s and Lonnqvist’s study (2000), were instructed to use a bright light source for at least an hour per day for a period of four months. This resulted in better mood and reduced amount of depression symptoms.

As can be concluded from the studies mentioned above, light can be used in treatments of psychiatric and psychological disorders. Moreover, good lighting and exposure to daylight everyday can help healthy population to increase their performance, maintain emotional wellbeing and avoid symptoms of psychological deficiencies (e.g. depression).

It is important to mention, that in the studies researching the beneficial effects of nature (see section 1.3) the effects of daylight are not fully excluded as an alternative explanation. Therefore in our study we will take into account both of the phenomena and parallelly investigate their effects on our participants wellbeing.

1.5. RATIONALE

As the reader got introduced to the benefits of interactions with nature and the positive effects of daylight on wellbeing and functioning, we would like to present the reasons for the present study and our research questions. Most of the research mentioned above in the introduction revealed many positive effects that nature and daylight have on people’s wellbeing or performance. However, the majority of these studies were performed in laboratories and never taking into account the effects of nature and daylight at the same time (controlling for effects of daylight, when researching the effects of nature and the opposite). Furthermore, no known studies to date have directly investigated the relationship between amounts of nature and daylight in everyday environments and mental health. Hence, in the present study through momentary assessments we investigated whether higher amounts of nature and daylight in the surrounding environments predict better mental wellbeing, including higher levels of vitality, better moods and self-regulation. We asked, if higher

amounts of nature in the surrounding environment predict better self-control, higher energy levels and better mood in daily setting? Does more daylight in the surrounding environment predict better self-control, higher energy levels and better mood in daily setting? And, if positive effects of daylight and/or nature are found, are these effects mediated by restorative potential of the environment? To answer these research questions we employ experience sampling methodology, previously used in studies of self-regulation and nature influences on vitality, which is known to have high ecological validity and is great tool to collect data in the field (Hofmann et al. 2011; Ryan et al. 2010).

In addition we gathered qualitative data about people's experiences and relationships with the most common locations that they are visiting during the week. Through this qualitative research we investigated the environmental elements, which according to our sample of participants help people to maintain positive wellbeing and achieve restoration. Moreover we researched people's awareness about beneficial effects of the surrounding environment and their behaviors governed by this awareness. We were interested which locations and what qualities of those locations are important for people to achieve relaxation. Our research questions were: what qualities of the locations are important for people to find restoration/relaxation? What strategies people use to restore/relax and do natural environments dominate the places, where people choose to restore? Are people aware of the effects that certain locations have on them? And if yes, do people seek locations, which they believe have beneficial effects on their wellbeing? The qualitative part of this study presented us with subjective insights and arguments, why nature and daylight would or would not be important for good wellbeing. Additionally, the qualitative part of this study was aimed to control for other environmental factors (e.g., social contacts or certain activities), which might have affected people's wellbeing and process of restoration. We expected to see to what level these factors influence people's choice of restorative environments.

The secondary goal of the present study is to pilot the methodology and apparatus for future research. The future study will explore the relationship between daylight and nature and mental wellbeing in people with poor mental health. Therefore we had to make sure, that the methodology and the apparatus are chosen properly and are causing as little inconvenience to the participants as possible.

Considering that the present study is a pilot, some outcomes and conclusions presented in this paper are not generalizable. However they provide strong guidelines to improvements in future studies of this kind. Moreover the reader is presented with promising trends showing the importance of daylight and nature in maintaining the healthy mental states in our daily lives.

In the following chapters we will present the tool, which was developed to validly and reliably measure the amounts of daylight and nature in the surrounding environments and the methodology we used to answer our research questions.

II. A TOOL TO MEASURE THE AMOUNT OF DAYLIGHT & NATURE IN THE SURROUNDING ENVIRONMENT

2.1. INTRODUCTION

Nowadays we can easily measure the length or weight of surrounding objects, we can check the temperature of the atmosphere or of a physical body, and we know many laws of physics to calculate the friction, power or speed. However in psychological research, objective measurement tools such as a ruler or thermometer, do not always work and therefore different methods have to be equipped. One of the tools used by psychologists is a questionnaire. With different questionnaires we can measure affect, mental state, preference, behavior, attitudes, etc. In our experience sampling study we will adopt some of these questionnaires to measure people's wellbeing. As the focus lies on investigating the effect of amount of nature and daylight on people's wellbeing, an instrument is also needed to measure the amount of nature and daylight consistently with an experience sampling protocol. Due to technological constraints we cannot use a light meter or perform calculations of the actual percentage of green with small portable devices. Therefore the tool we designed is a checklist, which can quasi objectively measure the amount of daylight and amount of nature in the surrounding environment. To test validity we compared objective measurements (actual measurements of amount of nature and amount of daylight in the surrounding environment) with scores obtained via this checklist and subjective measurements (subjective evaluation of amount of daylight and nature in the surrounding environment). The following sections present the reader with the design of the checklists and its validity test.

2.2. CHECKLIST

The checklist developed to measure amount of daylight and the amount of nature in the surrounding environment was based on Ryan et. al (2010) *Nature Experience Measure* questionnaire. We made a list of total 31 elements, which consisted of 9 elements representing nature objects (*field, animal, plant, water, window, tree, grass, bushes, flower*), 10 elements representing non-natural objects (*TV set, computer, car, book, chair, table, cycling path, building, traffic light, pavement*), 11 elements representing high amounts of daylight of which 'window' also belonged to nature objects (*objects directly lit by the sun, blue sky, daylight, clouds, sky behind me, sky above me, sky on the side of me, sky in front of me, shadows dropped by the sun, sun patches, window*), 2 nouns representing low amounts of daylight (*ceiling or roof above my head, artificial lights on*) and 1 filler item (*food*).

Items used to measure the naturalness of the site were adopted from Ryan's et al. list, however due to differences in Dutch landscape and with our target group (in Ryan's study students were used as participants to test the questionnaire) we changed some items. The items added to measure the levels of daylight were based on the objects in the surrounding, which could represent the presence of daylight (such as visibility of sky from the side, in the horizon or from above).

2.3. METHODS

2.3.1. Design

The validity was tested by comparing the scores obtained via checklists with actual and subjective measurements of daylight and nature at the location.

Participants of the study had to visit sixteen locations chosen by the experimenter (indoor and outdoor), which differed in naturalness and amount of daylight. In each location participants were asked to evaluate the site by filling in the questionnaire with the daylight and naturalness checklist and subjective items. Until the end of the evaluation of the last site, participants were not aware of what was being measured or what the purpose of the study was.

2.3.2. Participants

Ten participants, four females and six males, were recruited via the personal social network of the researcher. All participants had Dutch nationality and Dutch as their native language. Mean age was 27 years old, (SD = 3, age range: 24 - 32).

2.3.3. Procedure

There were 4 tours to the sites, with 4 groups of participants – a group of size 4, a group of size 3, a group of size 2 and a tour with only one participant.

On the assigned day and time participants came to IPO building on TU/e campus. At the meeting point, they were provided with experimental instructions in English and together with the experimenter left on a tour to visit all the sites to be evaluated. After arrival in each site participants were instructed in English to explore the scene while standing still and looking only to a certain direction, which was pointed by experimenter. In addition participants were provided the daylight and nature checklist and give the questionnaire containing

DEELNEMER INFORMATIE

LEEFTIJD:.....GESLACHT:.....

BEROEP:.....

Vragenlijst 1 Part.Nr. Site: #1

Hieronder staan een aantal objecten. Vink alle objecten aan, die je op dit moment in jouw directe omgeving kunt zien:

Zo vink je de objecten aan:

☒ Circle

De lucht (recht voor je)		Veld	Dier
Schaduw van de zon	Raam	Direct zonlicht op object(en)	TV
Zonnige plekken	Fietspad	Computer	Auto
De lucht (naast je)	Boom	Blaauwe lucht	Daglicht
Verkeerslicht	Gebouw	Boek	Plant
Plafond of dak boven je hoofd	Gras	Wolken	De lucht (achter je)
Bosjes	Bloem	Water	Stoel
Stoep	Kunstlicht dat aan is	Tafel	De lucht (recht boven je)

Turn The Page For More Questions

Geef aan hoe natuurlijk de omgeving om je heen is op dit moment:

☐ Helemaal stedelijk ☐ Half stedelijk / half natuurlijk ☐ Helemaal natuurlijk

Geef aan hoeveel daglicht er aanwezig is op de plaats waar je op dit moment bevindt:

☐ Helemaal geen ☐ Heel erg veel

Geef aan hoe licht de omgeving om je heen is op dit moment:

☐ Heel erg donker ☐ Heel erg licht

Geef aan hoe zonnig de omgeving om je heen is op dit moment:

☐ Helemaal niet zonnig ☐ Heel erg zonnig

Geef aan hoe plezierig de omgeving om je heen is op dit moment:

☐ Helemaal niet plezierig ☐ Heel erg plezierig

Figure 1: Pre-test questionnaire example

subjective questions. The instructions, checklist and subjective questionnaire were in Dutch (for the example of the questionnaire see Figure 1). When all of the sixteen sites were visited and evaluated participants were thanked and reimbursed.

The average time of pilot study was 1,5 hours and participants were reimbursed with 15 Euros.

2.3.4. Setting

Before the pilot study each of the 16 sites was visited by the researcher and an observation angle and direction was chosen. In Figure 2 two examples are presented (left: 95% naturalness, right: 36% naturalness). In the Appendix A photographs of all 16 sites can be found.



Figure 2: Natural (left) and Urban (right) landscapes

2.3.5. Measures

Objective Measurements

To test the validity of the checklist, locations visited during the pre-test had to vary in naturalness and amount of daylight available. Sixteen sites were selected so that the amount of nature varied from 2% to 95% per site with the mean of 40% ($M=40$, $SD=36$). The naturalness was measured by taking the panoramic picture of the site (see Figure 2) and calculating the rough percentage of the pixels representing natural objects (e.g., trees, bushes, grass, sky), relative to the urban objects (e.g., pavement, car, building) in the picture. This was done by using selection tool in Adobe Photoshop CS 5, which provides the number of selected pixels.

The variation in light levels was achieved by performing the experiment on different days and at different times of the day (11AM, 1PM, 3PM). During the visits to the 16 sites the experimenter measured the light levels using a lux-meter in both horizontal (at the height of ~90cm from the ground) and vertical (at the height of ~150cm from the ground), directions. The light levels varied from 35 to 17 000 lux, when measured horizontally, ($M=3848$, $SD=4270$), and from 10 to 16 000 lux, when measured vertically, ($M=1715$, $SD=2445$). Because of such a wide range in light measurements, in the validity check the logarithmic transformation was applied on this data.

Quasi-objective measurements

Quasi-objective measures of the amount of daylight and nature in each of the 16 sites were obtained via the checklists. Participants were asked to select each object from the checklist, which they see in their surrounding environment. The full lists of items translated into English are presented in the Table 1.

Table 1: Checklists items

DAYLIGHT ITEMS	NATURE ITEMS
The Sky In front of you	
Shadows dropped by the sun	
Sun patches	Window
The Sky on the side of you	Tree
Blue Sky	Grass
Daylight	Bushes
Clouds	Flower
The Sky behind you	Field
Ceiling	Animal
Artificial lights which are on	Plant
Window	Water

Subjective measurements

Five subjective measures of naturalness, daylight and pleasantness were included to collect participants' subjective evaluation of the surrounding environment. Three questions were meant to measure the subjective amount of daylight in the surrounding environment:

How much daylight is there in the surrounding environment (absolutely not/very much)?

How light is the surrounding environment (absolutely not/very much)?

How sunny is the surrounding environment (absolutely not/very much)?

Internal consistency of these items was low (Cronbach's Alpha = 0.20). Therefore instead of using three items as a scale, in further analyses we relied on separate items correlations with objective measurements of the daylight. The other two questions asked participants to rate the naturalness and pleasantness of the environment.

Subjective naturalness was measured by asking a question: *How natural do you find the environment you are in at the moment (absolutely urban/absolutely natural)?*

The subjective pleasantness of the environment was measured by asking participants: *How pleasant is the surrounding environment (absolutely not/very much)?*

2.4. RESULTS

2.4.1. Internal Consistency

There are two ways to obtain the naturalness and daylight coefficients from the checklist data. The coefficients can be obtained by adding 1 point for each natural/daylight item checked and subtracting 1 point for each non-natural/low daylight item checked e.g. tree = 1, car = -1. A second way to calculate the coefficients is to add 1 point for each natural/daylight item checked and to add 0 for each non-natural/low daylight item checked. We used both of these methods to calculate naturalness and daylight coefficients in our validity analyses. Coefficients calculated using the first method end with '-1', coefficients calculated using the second methods end with '0'.

We tested the internal consistency of both variants of naturalness and daylight checklists. The internal consistency of naturalness checklist calculated in either way was found to be acceptable (Cronbach's alpha >0.7). The daylight checklists as well had acceptable internal consistencies (Chronbach's alpha >0.76). See Table 2 for overview

Table 2: Internal Consistencies of Naturalness and Daylight Checklists

	Naturalness Coefficient 0	Naturalness Coefficient -1	Daylight Coefficient 0	Daylight Coefficient -1
Cronbach's Alpha	0.73	0.73	0.76	0.76
Number of Items	19	19	13	13

2.4.2. Validity

2.4.2.1. External Validity of Quasi-Objective Measurements

External Validity of Quasi-objective measures

Firstly in the Figure 3 the descriptive statistics is presented in the boxplot. Y-axis depicts the values of Naturalness Coefficient, X-axis represents the objective naturalness in each of the 16 sites.

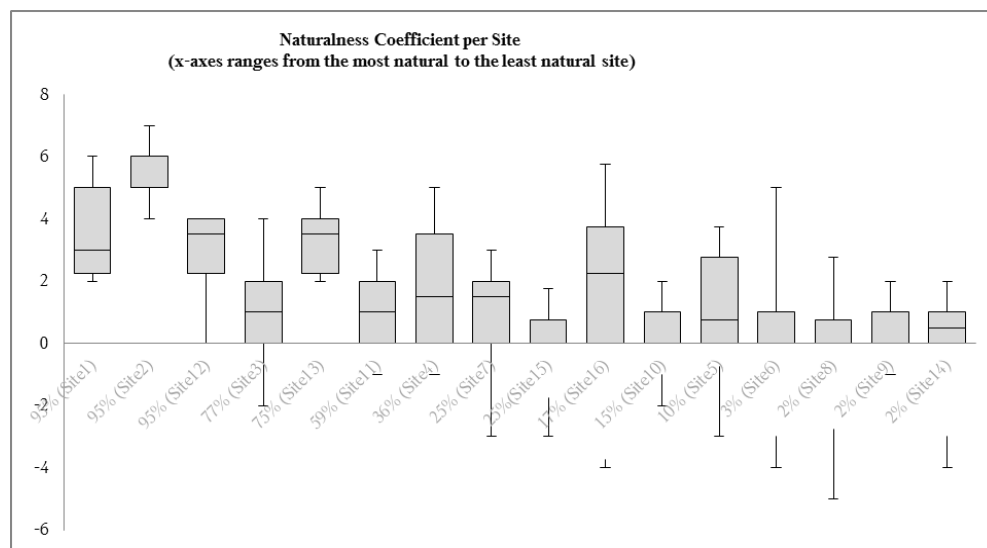


Figure 3: Boxplot per each of 16 sites

In the scatter plots below (Figure 4), the relationships between the objective measures of the daylight (Lux measured horizontally and Lux measured vertically) and quasi-objective daylight measures (Daylight Coefficient scores) are presented.

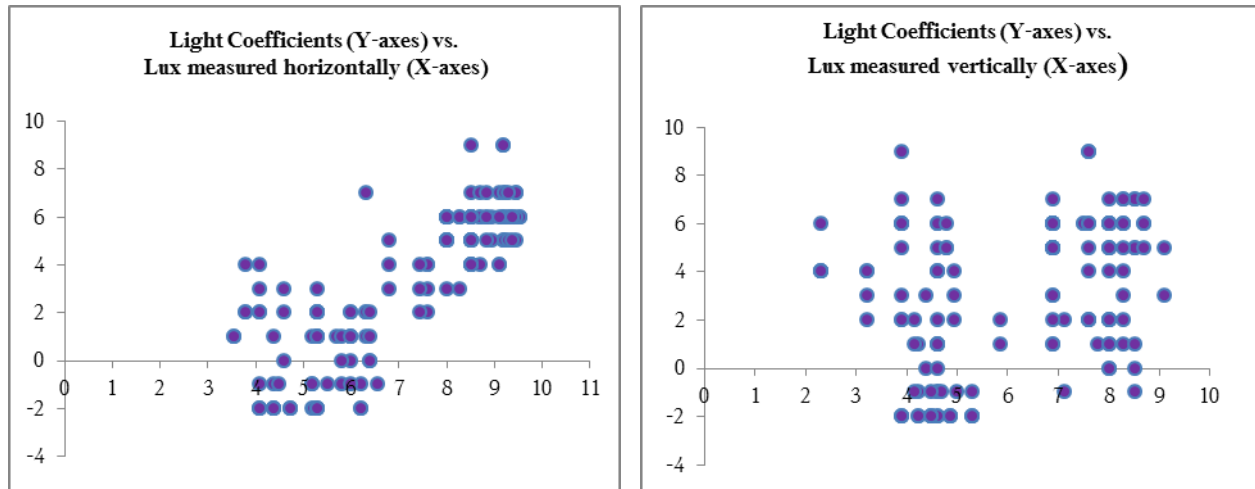


Figure 4: Scatter plots objective measurements of daylight with quasi-objective measures of daylight

Correlations between objective measurements (the percentage of natural objects and actual luminance of each site) and coefficients obtained via checklists are presented in Table 3.

Table 3: Correlations between Objective and Quasi-objective measurements of Daylight and Nature

		Naturalness rating obtained via checklist		Daylight rating obtained via checklist		Objective Measurements		
		Naturalness Coefficient -1	Naturalness Coefficient 0	Daylight Coefficient -1	Daylight Coefficient 0	Naturalness %	ln(Lux) (Vertically)	ln(Lux) (Horizontally)
Naturalness rating obtained via checklist	Naturalness Coefficient -1	*	0.66**	0.63**	0.56**	0.74**	0.67**	0.66**
	Naturalness Coefficient 0		*	0.70**	0.69**	0.69**	0.61**	0.55**
Daylight rating obtained via checklist	Daylight Coefficient -1			*	0.97**	0.74**	0.83**	0.82**
	Daylight Coefficient 0				*	0.65**	0.79**	0.76**
Objective Measurements	Naturalness %					*	0.71**	0.73**
	ln(Lux) (Vertically)						*	0.93**
	ln(Lux) (Horizontally)							*

Correlations are significant with $p < 0.01$

As can be seen from Table 3 the objective measurements correlated significantly with quasi-objective measurements. Interestingly, Naturalness Coefficient -1 and Daylight Coefficient -1 have higher correlations with objective measures, than Naturalness Coefficient 0 and Daylight Coefficient 0. Thus, results show, that naturalness and daylight coefficients have higher validity, when calculations are performed using first method (by adding 1 point for each natural/daylight item checked and subtracting 1point for each not natural/low daylight item checked).

2.4.2.2. *External Validity of Subjective Measurements*

We calculated the correlation between subjective and objective measures. Results show that subjective evaluation of naturalness (item: *How natural is the surrounding environment?*) had a high correlation with the actual amount of naturalness. Interestingly this item has a slightly higher correlation than the measurements obtained via Naturalness Coefficient -1. The amount of daylight in the surrounding environment (*How much daylight there is in the surrounding environment?*) is significantly correlated with the actual amount of daylight (objective measurements). The correlations show that a quasi-objective measurement of daylight (Daylight Coefficient -1) has higher validity than this subjective item.

The item *How light is the surrounding environment?* correlated with the objective measurements of the amount of daylight as well. However, the correlations were lower. The item *How sunny is the surrounding environment?* seems a non-valid measurement of the amount of daylight, since it does not correlate with the objective measures at all.

Lastly, subjective pleasantness of the surrounding environment significantly correlates with objective naturalness of the surrounding environment and objective measurements of light when measured horizontally, however the correlations are not high.

The correlations between subjective measurements and objective measurements of daylight and naturalness are presented in Table 4.

Table 4: Correlations between Objective and Subjective measurements of Daylight and Naturalness

	Subjective Measurements					Objective Measurements			
		How natural?	How much daylight?	How light?	How sunny?	How Pleasant?	Naturalness %	Ln(Lux) (Vertically)	Ln(Lux) (Horizontally)
Subjective Measurements	How natural?	*	0.61**	-	-	0.50**	0.84**	0.61**	0.60
	How much daylight?		*	0.23**	-	0.30**	0.62**	0.69**	0.50**
	How light?			*	-	0.37**	-	-	0.16*
	How sunny?				*	-	-	-	-
	How Pleasant?					*	0.38**	-	0.17*
Objective Measurements	Naturalness %						*	0.71**	0.74**
	ln(Lux) (Vertically)							*	0.93**
	ln(Lux) (Horizontally)								*

** Correlations significant with $p < 0.01$

* Correlation significant with $p < 0.05$

2.4.2.3. Convergence Validity

Thirdly the correlation between quasi objective measures and subjective measures was calculated. The results show significant correlations between the naturalness coefficient and the item evaluating the subjective naturalness of the site. Correlations between daylight coefficients and the subjective measurements are only significant for the items: How much daylight there is in the surrounding environment? and How sunny is the surrounding environment?, but correlations are not high. Pleasantness significantly correlates with the quasi objective measures of daylight and naturalness, however again, correlations are low.

From the results it can be seen that the item How light is the surrounding environment? can be discarded from the subjective measures due to a lack of significant correlations with quasi objective measurements.

Correlations between checklist coefficients and subjective measurements are presented in Table 5.

Table 5: Correlations between Quasi-objective and Subjective measurements of Daylight and Nature

		Naturalness rating obtained via checklist		Daylight rating obtained via checklist			Subjective Measurements			
		Naturalness Coefficient -1	Naturalness Coefficient 0	Daylight Coefficient -1	Daylight Coefficient 0	How natural?	How much daylight?	How light?	How sunny?	How Pleasant?
Naturalness rating obtained via checklist	Naturalness Coefficient -1	*	0.66**	0.64**	0.56**	0.68**	0.59**	-	-	0.30**
	Naturalness Coefficient 0		*	0.70**	0.68**	0.70**	0.65**	-	-	0.48**
Daylight rating obtained via checklist	Daylight Coefficient -1			*	0.98**	0.63**	0.82**	-	0.20*	0.14**
	Daylight Coefficient 0				*	0.55**	0.68**	-	0.27**	0.17*
Subjective Measurements	How natural?					*	0.61**	-	-	0.50**
	How much daylight?						*	0.23**	-	0.30**
	How light?							*	-	0.34**
	How sunny?								*	-
	How Pleasant?									*

** Correlations significant with $p < 0.01$ * Correlation significant with $p < 0.05$

2.5. DISCUSSION

The aim of the pilot study was to design and test the questionnaire, which could be used to evaluate the amount of daylight and the amount of nature in the surrounding environment.

The results show that the Naturalness and Daylight checklists are reliable and valid tools to measure the amounts of daylight and nature in the surrounding environments. Higher validities were reached when naturalness and daylight coefficients were calculated by adding 1 point for each natural/daylight item checked and subtracting 1 for each not natural/low daylight item checked. Therefore we will use this method to extract the naturalness and daylight coefficients in future studies.

Several items from the subjective questions correlated significantly with the objective measurements. Moreover, interestingly, the item *How natural is the surrounding environment?* showed higher correlations with objective measures than the quasi-objective checklist. Thus in our experience sampling study we will employ both of these measurements.

The items which were meant to measure the subjective amounts of daylight did not perform well, except the item *How much daylight there is in the surrounding environment?*, which had higher correlation with objective measurement of light. Therefore this item will be integrated in the experience sampling questionnaire and the other two (*How sunny is the environment?* and *How light is the environment?*) will be discarded.

As expected, subjective evaluations of pleasantness positively correlated with objective and quasi objective measurements of daylight and naturalness. Correlations were not high, however significant. Restorative potential of the environment could have mediating effects in the relationship between nature, daylight and wellbeing. Therefore pleasantness will be integrated in the environmental context assessment in the following experience sampling study.

All in all, the first step towards researching the effects of nature and daylight on wellbeing was successful – we designed the instrument to measure the amounts of these two aspects in surrounding environment. The next step is to search for the effects of different amounts of daylight and nature, and if they exist investigate them closely. In the following sections we will present the reader with the main experience sampling study.

III.METHODS

3.1. INTRODUCTION

In this chapter we will present the methodology, chosen for the main study. To research the relationship between nature and daylight and people's wellbeing we have chosen experience sampling method. As already mentioned in the introduction, one of the main reasons for choosing experience sampling is its high ecological validity and suitability for empirical studies in the field. To set up experience sampling and collect the data about participants mental health states we performed ecological interviews. Moreover, as explained in introduction, after experience sampling we held depth interviews. The main goals of these interviews were to get participants' feedback on experimental procedure, reflect on experience sampling week and get in-depth information about the relationship between common locations participants visit during the week and people's awareness of effects those locations have on them. The following subsection will present the general design of the study, participants and experimental design for each of the subparts of the main study: Ecological Interview, Experience Sampling and Depth Interviews.

3.2. GENERAL DESIGN

In the present study we used experience sampling methodology to assess the influences of environmental context, in particular influences of naturalness and amounts of daylight in the environment, on people's wellbeing. Experiences were sampled for six consecutive days, at eight random times per day. After the experience sampling protocol depth interviews followed to obtain better understanding of the relationship between certain locations and people's wellbeing and to analyze the participants' awareness of this relationship.

3.3. PARTICIPANTS

Nineteen participants were recruited via the TU/e participants' data base and via the researcher's personal network. Age restriction was added – participants between 18 and 60 years old were being recruited. Two participants withdrew themselves during the study due to personal reasons. The mean age of the remaining seventeen participants was 41.1(SD=12.9) with age range 20-58 years. Nine participants were females with mean age 40.9 years (SD=11.5 years), eight participants were males with mean age of 41.3 years (SD=15.0 years). Six participants indicated having (or still studying for) university degree (WO), six participants indicated having Higher Professional Education (HBO) and five participants indicated having Middle-Level Applied education (MBO). Due to language restrictions in the study (most questionnaires used were in Dutch), participants were required to have Dutch as their native language.

While recruiting, the main goal was to find a representative sample of the general population. The goal was reached successfully – sample had a good age, education and gender distributions.

For participation in the study participants received reimbursement of 30 Euros.

3.4. ECOLOGICAL INTERVIEW

3.4.1. Design

The main goal of the ecological interview was to prepare the experience sampling application for the experience sampling procedure and to instruct the participant.

3.4.2. Procedure

Each participant was met at the agreed time in the lobby of the IPO building on TU/e campus and taken to the interview room. After the informed consent form was signed, the participant was introduced to the schedule of the study and the ecological interview started.

First, participant was asked to list seven the most commonly visited locations during the week, then the most frequent temptations were assessed. When the temptations list was ready, the following questionnaires were administered: mental health questionnaires and the questionnaires of evaluation of seven listed locations. While the participant was filling in the questionnaires, the experimenter pre-programmed the HTC mobile device with locations and temptations which the participant listed earlier. In the last part of the ecological interview the participant was instructed how to handle the experience sampling procedure using the HTC mobile device; the experience sampling application was explained, possible pitfalls of the experience sampling application were presented and the solutions were listed.

Besides the HTC mobile device, the participant was provided with paper-based sleep quality questionnaires, user manual and contact details of the experimenter.

At the end of the session the return of the phone and depth interview was scheduled, the participant was thanked for participation, wished success and seen out.

3.4.3. Setting

The ecological interview was performed in a quiet environment. A private room was used in order to avoid external cues, which could disturb the conversation or other tasks which participant was performing (e.g., filling in the questionnaires for trait mental health state during ecological interview).

3.4.4. Measures

Common Location and Frequent Temptations

During the ecological interview the evaluation of the most common locations were obtained. Participants were asked to provide the most common locations they visit during the week and name the most frequent temptations. The most frequent locations and temptations were added to the digital questionnaire used during the six experience sampling days. If the participant was not able to list seven locations at once, the experimenter asked the participant to think through a single working day and a single weekend day and the locations visited during those days. The participant was asked to list the seven strongest temptations which he/she is usually trying to resist, after seven locations were named. If the participant was not able to list all seven temptations at once, the experimenter provided the participant with a list of general groups of temptations (Hofmann, Vohs, Baumeister, 2012).

In addition the participant was asked to evaluate each of the 7 locations, by filling in a questionnaire. Participants were provided with bipolar 5 point Likert scales: *Unpleasant* to *Pleasant*, *Risky* to *Safe*, *Bad For You* to *Good For You*, *Stressful* to *Relaxing*, *Ugly* to *Beautiful*, *Tiring* to *Energizing*, *Cold* to *Warm*, *Busy* to *Quite*. In addition participants were asked how often they generally visited the location (*Less than weekly/1-3 times per week/4-6 times per week/Daily*), how long do they typically stayed there (*<30 minutes/30min-1horus/1-2horus/>2hours*) and who usually went there with them (open question).

Mental health questionnaires

Mental health was assessed using:

SCL-90 (e.g., *How often in the past week, including today have you experienced: headache, feeling of being afraid, etc;* the responses were registered with 5 point Likert scales, ranging from *Absolutely not* to *Very much*). SCL-90 is a multidimensional scale, which helps to assess different mental and/or physical symptoms/complaints person recently had (e.g., fear, anger, insomnia, etc.), (Arrindell, Ettema, 1986);

SF-36 (e.g., *I get sick faster than other people, I am not as healthy as other people I know, etc.*; the responses for these questions were registered with 5 point Likert scales, ranging from *Absolutely Not Correct* to *Very Correct*). SF-36 is a multi-purpose, short-form health survey, which provides 8-scale profile of functional health, well-being scores, psychometrically-based physical and mental health summary measures and a preference-based health utility index, (Ware, Sherbourne, 1992);

PSS & TSC (e.g., *How often in the past month: you felt stressed or nervous, became angry because you could not control certain things, etc.*; the responses were registered with 5 point Likert scale, ranging from *Never* to *Very often*). PSS is the scale developed to measure the stressful appraisal in one's life and TSC is a checklist commonly used to assess the posttraumatic stress, (Cohen, Williamson, 1988);

Beck Depression Inventory (there were 21 items in the questionnaire; each item consisted of 4 statements: e.g., *I don't feel sad, I feel sad, I am very sad and cannot get rid of it, I am so sad, that I cannot cope with this anymore*). BDI is one of the most commonly used tools assessing the severity of the depression, (Does, 2002);

Implicit Connectedness with Nature, (Schultz, 2004).

Location evaluation forms and trait questionnaires to extract the mental health state were paper based.

The outcomes of the Mental Health questionnaires will not be discussed in this paper.

The full protocol of the ecological interview can be found in Appendix B.

3.5. EXPERIENCE SAMPLING

3.5.1. Design

Experience sampling started the day after the ecological interview and continued for six consecutive days.

The questionnaires used in the experience sampling application measured participants' wellbeing (e.g., mood, self-control) and contextual information (e.g., amount of daylight, naturalness of the environment), so that later on the experimenter could analyze the presence of the relationship between these two phenomenon. In addition participants entered their current location. Moreover the sleep quality was assessed every experience sampling day.

3.5.2. Procedure

During the first meeting the participant was instructed to turn on the HTC mobile device before 8AM on the first experience sampling day.

Each experience sampling day started with filling in the sleep quality paper questionnaires about the previous night. The experience sampling application ran questionnaires at eight random times per day between 8AM and 10PM. The restrictions for the intervals between questionnaires were: no less than 15 minutes and no more than 3 hours in between the questionnaires.

After six experience sampling days the participant returned the device to the experimenter.

3.5.3. Apparatus

The experience sampling procedure was controlled by an application developed in the Human Technology Interaction department at Eindhoven University of Technology. The application was written in C# programming language using the application template for Windows Mobile devices. This application was later installed on HTC Touch Cruise mobile device running Windows Mobile 6 operating system.

The experience sampling application was automatically scheduling and running the questionnaires. When the time for a questionnaire came, the HTC device notified the participant with beeps and vibration. The participant would see the screen with the start button and a timer (see Figure 5 for examples of the application screens). Each time a beep went off 300 seconds were given for the participant to decide to fill in the questionnaire. The auditory signal lasted for 5 seconds. Every 60 seconds until the end of 300s the reminder beep was going off. If the participant did not respond within 300s the application would register a missed questionnaire and wait until the next beep.

The application automatically went to sleep after all of the 8 questionnaires of the day had been presented to the participant, independent of whether or not the participant filled it in. In addition, if the experience sampling application was started after 10PM, it would also be working on a night mode. The next morning, before 8 AM, the experience sampling application would automatically wake up and start to schedule questionnaires for the new experience sampling day.

The participant was kept aware of the activity levels of the experience sampling application. If there were yet questionnaires to come participants could see the screen with indication: ‘Till the next questionnaire!’ During the night regime (sleep mode), participants saw the screen with a message wishing them good night rest.



Figure 5: Screenshots of Experience Sampling Application

3.5.4. Measures

Mood

Participants' mood was assessed with a four dimensional mood questionnaire based on famous PANAS and POMS scales and developed in TU/e Human Technology Interaction department. The four dimensions were: happiness (e.g. *At this moment I feel happy, calm, etc.*), relaxation (e.g. *At this moment I feel relaxed, tense, etc.*), energy (e.g. *At this moment I feel energetic, alert, etc.*) and sadness (e.g. *At this moment I feel sad, dejected, etc.*). For the responses 5 points Likert scale were used (*Absolutely not/Very much*). The mood scores were obtained by calculating the average score in each subscale. The reliability of the subscales is presented in the Table 6.

Table 6: Internal Consistencies of Mood subscales

	Cronbach's alpha	Number of Items
Energy	0.88	8
Relaxation	0.81	5
Happiness	0.81	3
Sadness	0.83	2

Self-control

Self-control was assessed by measuring the ability to concentrate, the presence of temptations and ability to resist the temptations.

To assess the concentration the participant was presented with the statement: *At this moment, I can concentrate well* and the 5 point Likert scale, ranging from *Agree* to *Disagree*.

The presence of temptations was assessed by providing the participant with the list of temptations (seven temptations, which participant listed during ecological interview and option to select "other") and the question: *Since the last beep, did you have any of the temptations from the list below?* Participant had a choice to select from 0 to 8 temptations from the checklist.

The strength of the strongest temptation was assessed with the question: *How strong was the strongest temptation ?* To answer the question, the participant had to indicate his/her answer on a 5 point Likert scale, ranging from *Absolutely no temptation* to *Very strong*.

The resistance to temptations was measured by asking the question: *Did you give into that temptation?* To answer the question participant had to choose from two answers: *Yes* or *No*.

The assessment of self-control was based on Hofmann's et al. (2012) experience sampling study performed to measure desire and desire regulation in everyday life.

Perceived control

Perceived control was measured by asking people to what extent they feel helpless and to what extent everything what happens is decided by others: *What happens at this moment is mostly decided by others* and *I*

feel helpless. The response scale was 5 point Likert scale, ranging from *Agree* to *Disagree*. These items were not taken from any known scale; moreover the two items had a very low Cronbach's alpha of 0.12.

Contextual information: amount of daylight & amount of nature

The amounts of nature and daylight were measured using the quasi objective checklist and subjective evaluations of amount of daylight and naturalness in the surrounding environment, developed in our pre-study (see previous Chapter II). The participant was presented with all the 32-items checklist (items representing natural object, non-natural object, daylight, low amounts of daylight and a filler item – *food*) in 4 windows (8 items per window). In each window the participant could choose as many items, as he/she wanted. After selecting the answers from the checklist participants went to the next screen of the questionnaire by pressing the button '*next*'. The Cronbach's alpha for daylight checklist was 0.83, the Cronbach's alpha for naturalness checklist was 0.55.

Contextual information: Restorative potential

Restorative potential of the surrounding environment was assessed using a shortened version of Perceived Restorativeness Scale (Hartig et al. 1997). We used the following seven items: *The present environment is beautiful; The present environment is attractive; I would like to stay here longer; It seems like a break from my everyday worries; My attention is drawn to many interesting things; There is so much to explore here; It offers me an escape experience* and a 5 point Likert scale to assess the answers, ranging from *Agree* to *Disagree*. In addition we included two filler items: *The present environment is busy; There is a lot of noise here*. The Cronbach's alpha of the restorativeness scale was 0.90.

Contextual information: Salient event

Due to possible effects on wellbeing participants were asked if any salient event had happened since the last beep and if yes, then, to rate the pleasantness of this event using 5 point Likert scale, ranging from *Very unpleasant* to *Very pleasant*.

Contextual information: Social contacts, physical & mental activity

The participant was asked how much social contact he/she had since the last beep. To answer the question the 5 point scale was provided, ranging from *Absolutely no* to *Very much*. The pleasantness of the social contacts was rated on the 5 point Likert scale, ranging from *Very unpleasant* to *Very pleasant*.

Physical and mental activities were assessed as possible influences on reports on mood, self or personal control. The participant was asked how much physical/mental activity he/she had since the last beep. The answer was assessed with 5 point Likert scale, ranging from *Absolutely no* to *Very much*.

Morning diary

In the morning diary we assessed the quality and length of sleep for each experience sampling day. Sleep quality was assessed with Karolinska Sleep Diary questionnaire (Keklund, Akerstedt, 1996).

The Sleep Quality Index was obtained by calculating the mean score of the following items: *How easy did you fall asleep*, (5 point Likert scale, ranging from *very difficult* to *very easy*); *How was your sleep* (5 point Likert scale, ranging from *very poor* to *very good*); *How calm was your sleep* (5 point Likert scale, ranging from *very restless* to *very calm*). The Cronbach's alpha of these items was 0.30.

The results obtained from Morning diary will not be presented in this paper, due to lost data.

3.6. DEPTH INTERVIEWS

3.6.1. Design

Semi-structured depth interviews were performed after the retrieval of the experience sampling data. The main goal of these interviews was to get more insight in participant's relationship with the locations which he/she listed during the ecological interview. We wanted to find out whether participants were aware of the influences that certain locations have on them and their strategies to cope with those influences (do they try to seek/avoid good/bad locations).

The secondary goals were to find out whether the experience sampling week was overall a regular week for the participant, and what difficulties the participant had faced with the experience sampling protocol and HTC mobile device.

3.6.2. Procedure

Each participant was met at the agreed time in the lobby of the IPO building and taken to the interview room. The participant was introduced to the schedule and the first topic was presented.

In the first part of the interview the participant was asked to provide feedback on the experience sampling week (experience sampling methodology, HTC mobile device) and report the presence of any salient or unexpected events which happened during experience sampling week.

The locations listed in the ecological interview were analyzed in depth in the second part of the interview. Participants were asked to describe each location by explaining what makes it a good or a bad location, which effects (positive, negative, restorative, tiring, etc.) these locations have on the participant and whether they had tried to seek or to avoid those locations.

In the last part of the interview participants were presented with a feedback letter.

The interview lasted approximately 25 minutes.

The full protocol of the depth interview and example of feedback letter can be found in Appendix C.

3.6.3. Setting

The setting for the depth interview was the same as for ecological interview. See Section 3.4.3.

A voice recording program, integrated in researcher's laptop, was used to record the interview additionally the interviews were later transcribed.

3.6.4. Interview Schedule

Feedback on experience sampling methodology

During the depth interview the participant was asked to provide feedback on experience sampling methodology and HTC mobile device. The examples of the questions asked follows: *What problems did you encounter with experience sampling protocol? What was fun, what was annoying? Did the HTC mobile device work properly and if not, what did you do to solve the problems?*

General evaluation of experience sampling week

The participant was asked to report on the experience sampling week with the question: *Was it a regular week?* The following questions: *Did you have any salient (stressful) events during that week?* *Did you do anything special to relax?* were used for probing further.

Evaluation of locations

The participant was asked to analyze each location, listed in the previous interview by means of what effects (positive or negative) the location had on the participant. Participants were asked what makes a location restorative or the opposite – stressful. Participants were given questions such as: *What kind of effect does this location produce on you? Is it in general a good location or bad? Or does it have both qualities? What causes those feelings?* From this part of the interview, the interviewer was able to extract from participants' their awareness of the influence which location has on them. Lastly participants were asked if they had tried to seek the restorative and avoid the stressful locations by going/not going there.

Participants feedback letter

The participant was presented with feedback letter, which contained *relaxation, happiness, sadness, energy, attractiveness* and *self-control* scores per location created from the data gathered during experience sampling week. The example of the graph of happiness levels in each location is presented in Figure 6. Together with participant the interviewer went through each graph (relaxation, happiness, etc.) and explained to the participant what it means. Additionally participant was asked, whether the feedback is representative.

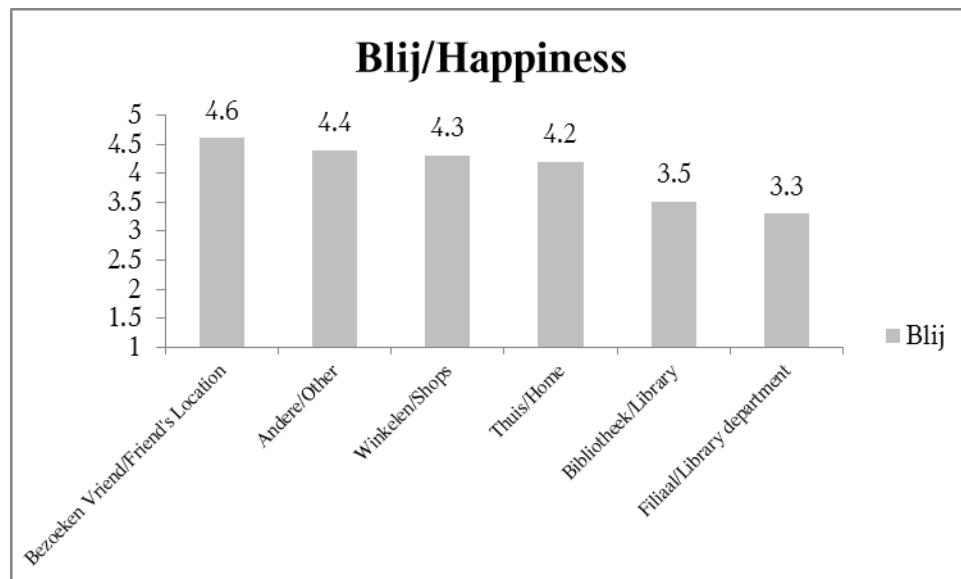


Figure 6: Scores of happiness per location (example from the feedback letter)

3.7. DATA ANALYSES

3.7.1. Experience Sampling

The experience sampling data was analyzed using the Mixed Models procedure in SPSS statistics software. The 1-level model was used, because the repeated measurements were nested within participants (subject level). One set of measurements (48 measurements expected = 8 repeated measures per day * 6 consecutive days) was extracted from each of 17 participants. In total we predicted $8 * 6 * 17 = 816$ measurements.

The research questions were relational – can wellbeing be influenced by contextual elements, the amount of naturalness and the amount of daylight. We checked whether mood and self-regulation could be predicted by the scores of naturalness and amount of daylight of the environment (linear mixed effect modeling). We also analyzed whether restorative potential of the environment influences the relationship between wellbeing and daylight and nature. In addition, we checked for effects of other contextual variables on these relationships just mentioned (effects of daylight and nature), e.g. (how) did social contacts, physical/mental activities or presence of salient events affect the relationship between daylight and nature and emotional wellbeing.

3.7.2. Depth Interviews

Firstly, it is important to mention, that five a priori concepts emerged before the beginning of the analyses. Therefore after transcription of each interview, the interviewer coded the data based on 5 themes, which arose due to knowledge gained from the literature study and insights gathered from the interview sessions. The researcher then read the transcripts and looked for the confirmations and rejections of the primary themes. After this step, themes list was extended with 5 more themes, which evolved from the familiarization with transcribed data. Then, the transcripts were analyzed again, by looking for confirming as well as opposing arguments for each of the 10 themes. Each theme was represented in the Excel table with two columns of quotations or summaries from the transcripts. One column was with data supporting the theme, the other included opposing arguments. In the final step conclusions were made from the later table. Results were finalized and reported.

IV. RESULTS

In this section we present the results of the main study. Based on chronological order, first the subjective locations evaluations, obtained during ecological interview will be presented, then the effects of Nature and Daylight on mental wellbeing (mood and self-regulation), obtained from the experience sampling study will be revealed and finally the results of analyses of the depth interviews will be described.

4.1. SUBJECTIVE EVALUATIONS OF THE MOST COMMONLY VISITED LOCATIONS

During ecological interview we asked our participants to evaluate their most commonly visited locations in 8 dimensions. As already mentioned in experience sampling results section, during the data analyses we assigned the locations from each participant into 13 groups and one 'other' location. The 13 groups are: Natural Environments, Social and Leisure Environments, Hobby Locations, Grocery Shopping, Shopping, Home, Sports Locations, Work, Family Locations, Children's Hobbies, Church, Physiotherapy and Transportation. Church and Transportation were 2 locations mentioned by 2 different participants only once. They formed no group and were not possible to couple, because of the big difference in activity held there.

Per each group of locations we calculated the average ratings of Pleasantness, Safeness, Goodness, Relaxation, Beautifulness, Energy levels, Warmness and Quietness. The results are presented in a Table 7. As expected, natural environments had high scores in Pleasantness, Goodness, Beautifulness and Relaxation. Home seemed to be stable environment with highest scores in safety. Sports and physiotherapy locations had high scores in Goodness and lower scores in Energy.

Table 7: Averaged results of location evaluations per group of locations

	Pleasant	Safe	Good	Relaxing	Beautiful	Energizing	Warm	Quiet
Natural Environments (11)	4.82 (SD=0.41)	3.91 (SD=0.83)	4.82 (SD=0.41)	4.55 (SD=0.69)	4.73 (SD=0.40)	3.82 (SD=1.17)	3.45 (SD=0.52)	3.73 (SD=1.19)
Social Leisure Environments (22)	4.68 (SD=0.65)	4.14 (SD=0.99)	4.05 (SD=0.84)	4.23 (SD=0.69)	3.86 (SD=0.71)	3.50 (SD=0.86)	3.91 (SD=0.68)	3.05 (SD=0.95)
Hobby locations (8)	4.63 (SD=0.74)	4.35 (SD=0.89)	4.38 (SD=1.06)	4.00 (SD=1.07)	3.63 (SD=0.92)	3.63 (SD=1.06)	3.63 (SD=1.06)	2.38 (SD=1.19)
Grocery shopping (12)	3.92 (SD=0.67)	4.08 (SD=0.90)	3.75 (SD=0.75)	3.50 (SD=0.67)	3.25 (SD=0.87)	3.08 (SD=0.67)	3.17 (SD=0.39)	2.67 (SD=0.78)
Shopping areas (7)	4.71 (SD=0.49)	4.00 (SD=0.82)	4.00 (SD=0.82)	4.14 (SD=0.69)	3.71 (SD=1.11)	3.29 (SD=0.95)	3.57 (SD=0.79)	3.00 (SD=0.82)
Home (18)	4.83 (SD=0.38)	4.89 (SD=0.32)	4.61 (SD=0.61)	4.33 (SD=0.87)	4.28 (SD=1.02)	3.83 (SD=0.77)	4.06 (SD=0.87)	3.83 (SD=0.99)
Sports locations (9)	4.22 (SD=0.83)	3.67 (SD=0.87)	4.78 (SD=0.44)	3.78 (SD=0.97)	2.78 (SD=1.39)	3.33 (SD=1.00)	3.44 (SD=0.73)	2.67 (SD=0.71)
Work (14)	3.79 (SD=0.80)	4.21 (SD=0.58)	3.79 (SD=0.80)	2.64 (SD=1.01)	3.57 (SD=1.16)	2.79 (SD=0.89)	3.64 (SD=1.08)	2.14 (SD=1.23)
Family locations (8)	4.38 (SD=0.74)	4.63 (SD=0.74)	4.12 (SD=0.84)	3.88 (SD=1.13)	4.13 (SD=0.99)	3.88 (SD=0.99)	3.63 (SD=1.06)	3.75 (SD=1.28)
Children's Hobbies (4)	4.25 (SD=0.50)	4.50 (SD=0.58)	3.00 (SD=0.82)	4.00 (SD=1.16)	3.50 (SD=1.00_)	3.00 (SD=0.00)	3.50 (SD=1.29)	4.50 (SD=0.58)
<i>Church*</i>	4	4	4	3	4	4	4	5
Physiotherapy (2)	3.00 (SD=0.00)	3.00 (SD=1.41)	5.00 (SD=0.00)	3.50 (SD=0.71)	3.50 (SD=0.71)	2.50 (SD=0.71)	3.00 (SD=0.00)	3.00 (SD=0.00)
<i>Transportation*</i>	2	1	1	1	3	1	2	1

*Only one person mentioned this location

4.2. EXPERIENCE SAMPLING

4.2.1. Descriptive Statistics

Firstly some descriptive data about the experience sampling is presented.

Response rate

We expected to get 816 responses from 17 participants (as mentioned in the methods section, it was planned to sample 8 times per day for 6 consecutive days). However mainly due to technical issues with HTC mobile device, the sample rate was somewhat lower. We recorded 714 samples, with 166 missed questionnaires, which makes response rate of 76.8 percent.

Types of locations and most common locations visited

Fourteen groups of locations were extracted after all the participants finished the experience sampling: Natural Environments, Social and Leisure Environments, Hobby Locations, Grocery Shopping, Shopping, Home, Sports Locations, Work, Family Locations, Children's Hobbies, Church, Physiotherapy, Transportation and other locations. In Figure 7 the frequencies of responses to experience sampling questionnaires at these locations are presented.

Averages of Naturalness and Daylight Coefficients per location and Correlations of subjective and quasi-objective measurements

In Table 8a the averages and range of the Naturalness and Daylight coefficients per location are presented. In Table 8b the correlations between subjective and quasi-objective measurements are presented.

Average mood per location

In Table 9 the averages in each dimension of mood measures (Energy, Relaxation, Happiness and Sadness) per each of the fourteen locations are presented.

Number of Temptations per location and the percentage of lapses

In Table 10 the overview of the actual number of temptations and percentage of lapses in each location are presented. In addition relative numbers of temptations and percentage of lapses per visit are shown.

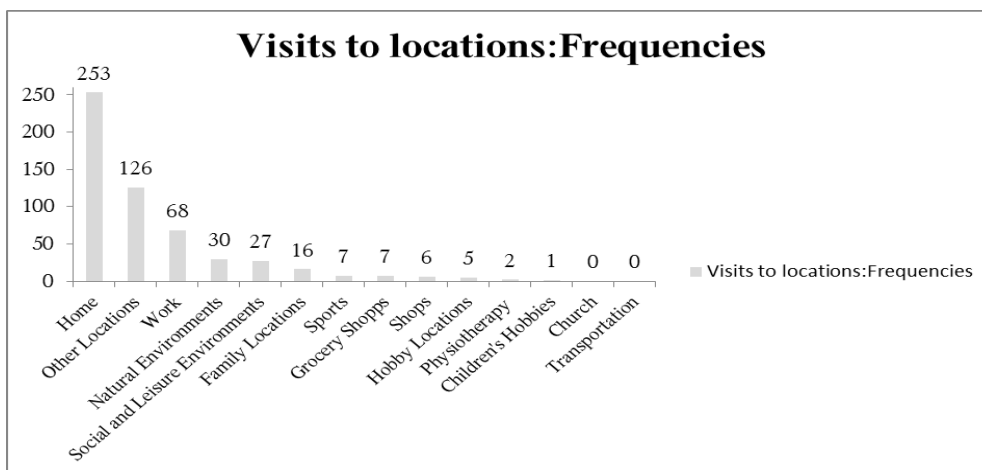


Figure 7: Number of samples per location group

Table 8a

		Home	Other Locations	Work	Natural Environments	Social and Leisure Environments	Family Locations	Sports Locations	Grocery shopping	Shopping	Hobby Locations	Physiotherapy	Children's Hobbies	Church	Transportation
Naturalness Coefficient	<i>MEAN</i>	-0.95	-1.75	1.25	4.2	-0.19	0.19	0.86	0.14	-1.5	0	0.5	2	-	-
	<i>SD</i>	2.44	1.94	2.58	1.99	2.3	2.04	2.44	2.73	1.87	2.12	0.71	-	-	-
	<i>Range</i>	-6. 6	-4. 5	-5. 8	-2. 7	-4. 6	-2. 5	-2. 4	-3. 3	-4. 1	-2. 3	0. 1	2. 2	-	-
Daylight Coefficient	<i>MEAN</i>	3.34	1.9	5.03	8.37	5.19	3.13	1.43	6.86	4	3	0.5	7	-	-
	<i>SD</i>	2.84	2.86	3.64	2.55	3.32	3.42	3.46	2.12	4.34	3.6	0.71	-	-	-
	<i>Range</i>	-2. 11	-2. 10	-2. 11	2. 11	-1. 10	-1. 11	-2. 8	3. 10	-2. 10	-2. 8	0. 1	7. 7	-	-

Table 8b

	Naturalness Coefficient	Daylight Coefficient	How natural is the surrounding environment?	How much daylight there is in the surrounding environment?
Naturalness Coefficient	x	0.54**	0.61**	0.38**
Daylight Coefficient		x	0.51**	0.64**
How natural is the surrounding environment?			x	0.39**
How much daylight there is in the surrounding environment?				x

Table 9

		Home	Other	Work	Natural Environments	Social and Leisure Environment	Family Locations	Sports	Grocery shops	Shops	Hobby Locations	Physiotherapy	Children's Hobbies	Church	Transportation
Energy	<i>MEAN</i>	3.65	3.67	4.02	4.36	4.26	3.74	3.45	4.11	3.92	4.3	4.5	3.75	-	-
	<i>SD</i>	0.77	0.68	0.79	0.39	0.67	0.71	0.53	0.38	0.53	0.47	0.35	-	-	-
Relaxation	<i>MEAN</i>	4.16	3.88	4.19	4.51	4.7	4.29	4.09	4.4	4.5	3.92	4.8	4.6	-	-
	<i>SD</i>	0.71	0.74	0.71	0.69	0.37	0.65	0.25	0.37	0.25	1.14	0.28	-	-	-
Happiness	<i>MEAN</i>	3.46	3.17	3.81	4.42	4.25	3.63	3.62	3.52	3.72	3.8	4.67	3.33	-	-
	<i>SD</i>	0.72	0.58	0.81	0.75	0.5	0.68	0.62	0.42	0.44	0.8	0.47	-	-	-
Sadness	<i>MEAN</i>	1.38	1.38	1.37	1.32	1.07	1.41	1.64	1.21	1.00	1.20	1.00	1.00	-	-
	<i>SD</i>	0.75	0.63	0.91	0.75	0.3	0.69	0.91	0.39	0	0.27	0	-	-	-

Table 10

	Home	Other Locations	Work	Natural Environments	Social and Leisure Environments	Family Locations	Sports Locations	Grocery shopping	Shopping	Hobby Locations	Physiotherapy	Children's Hobbies	Church	Transportation
Number of temptations	156	66	29	13	25	14	2	3	1	2	1	1	-	-
(%) of lapses	71.15	60.61	68.97	69.23	52.00	64.29	50.00	66.67	100.00	50.00	100.00	100.00	-	-
Number of temptations per visit	0.62	0.52	0.43	0.43	0.93	0.88	0.29	0.43	0.17	0.4	0.50	1	-	-
Relative (%) of lapses per visit	70.76	77.42	68.43	69.53	51.77	63.63	49.26	66.78	9.80	50.00	10.00	10.00	-	-

4.2.2. Main Effects of Nature and Daylight on Emotional Wellbeing

The quantitative data analysis was done using linear mixed models procedure in SPSS statistical package. Four dimensions of mood – energy, relaxation, happiness and sadness – were taken as dependent variables. As mentioned in the methods section we used 1-level linear mixed models. The measurements were nested within participants and therefore we included random intercepts in all of our models. In the main effects analyses, the Amount of Nature and the Amount of Daylight in the environment were used as predictors and were included as covariates, due to continuous dimension of the variables. Analyses were repeated twice by first taking quasi-objective measurements of the Amount of Daylight and the Amount of Nature as predictors (Naturalness and Daylight coefficients), and then taking the subjective measurements of the Amount of Daylight and the Amount of Nature as predictors (Subjective Naturalness and Subjective Amount of Daylight).

Energy

The analysis of the main effects of Naturalness and Daylight coefficients on energy levels showed that both Amount of Nature and Amount of Daylight were not significantly related to Energy levels, however, the Amount of Nature showed a positive trend (nature, $F(1, 544)=3.53$; $p=0.06$); daylight, $F(1, 540)=1.59$; $p=0.21$)).

No significant effect of the Subjective Naturalness was found on Energy levels ($F(1, 548)=2.68$, $p=0.80$) when it was included in the model as a predictor. Here, however, the Subjective Amount of Daylight showed a positive trend – ($F(1, 546)=3.59$; $p=0.06$). The model parameters are presented in Table 11.

Relaxation

The Naturalness coefficient was a significant predictor of Relaxation, $F(1, 542)=11.30$; $p<0.01$). The Daylight coefficient didn't show any significant effect here ($F(1, 539)=0.20$; ($p=0.89$)).

Analyses of the subjective measures of Amount of Nature and the Amount of Daylight effects on the Relaxation levels as well showed a significant effect of Subjective Naturalness, $F(1, 547)=13.39$; $p<0.01$). Subjective Amount of Daylight showed no significant effects ($F(1, 544)=0.01$; $p=0.92$). The model parameters are presented in Table 11.

Happiness

The Naturalness coefficient also had a significant effect on Happiness levels ($F(1, 546)=18.72$; $p<0.01$). The Daylight coefficient, again, had no significant effect ($F(1, 541)=1.72$; $p=0.19$).

In the model with subjective measurements, higher levels of Subjective Naturalness further significantly predicted Happiness ($F(1, 548)=19.45$; $p<0.01$). The Subjective Amount of Daylight had no significant effects on Happiness ($F(1, 548)=2.54$; $p=0.11$). The model parameters are presented in Table 11.

Sadness

Neither Daylight coefficient ($F(1, 543)=0.07$; $p=0.79$), nor Naturalness coefficient ($F(1, 539)=0.53$; $p=0.47$) had any significant effects on the levels of Sadness, when quasi-objective measurements of nature and daylight were included into the model as predictors.

The same, non-significant results were obtained when the subjective measurements of naturalness and daylight were included in the model predicting Sadness: the Subjective Amount of Daylight ($F(1, 545)=0.05$; $p=0.82$), the Subjective Naturalness ($F(1, 548)=0.98$; $p=0.32$). The model parameters are presented in Table 11.

Table 11: Parameters of wellbeing models

Dependent Variable	Naturalness coefficient			Daylight coefficient		
	B ₁	T-value	Significance	B ₂	T-value	Significance
<i>Energy</i>	0.02	1.88	0.06	0.01	1.26	0.21
<i>Relaxation</i>	0.04	3.36	0.00	-0.00	-0.14	0.89
<i>Happiness</i>	0.06	4.33	0.00	0.01	1.31	0.19
<i>Sadness</i>	0.01	0.73	0.47	-0.00	-0.27	0.77
Dependent Variable	How natural/urban is the environment?			How much daylight is there present?		
	B ₁	T-value	Significance	B ₂	T-value	Significance
<i>Energy</i>	0.05	1.64	0.10	0.05	1.90	0.06
<i>Relaxation</i>	0.06	3.16	0.00	0.02	0.92	0.36
<i>Happiness</i>	0.13	4.41	0.00	0.05	1.59	0.11
<i>Sadness</i>	0.03	0.99	0.32	0.01	0.23	0.82

4.2.3. Main Effects of Nature and Daylight on Self-Regulation

In self-regulation model the variables defining self-regulatory capacity, Ability to Concentrate, Number of Temptations per day and Percentage of Lapses were taken as dependent variables. The amounts of Daylight and Nature were added as continuous predictors.

Ability to concentrate

When quasi-objective measurements of Amount of Nature and Amount of Daylight were added to the model as predictors neither Naturalness coefficient, ($F(1, 547)=1.10$; $p=0.30$), nor Daylight coefficient, ($F(1, 543)=1.52$; $p=0.22$), showed any significant effects. However, when subjective measurements of Amount of Nature and Daylight were added to the model, Subjective Amount of Daylight significantly predicted ability to concentrate – ($F(1, 549)=7.25$; $p<0.05$). The Subjective Naturalness showed no significant effect, ($F(1, 546)=0.23$; $p=0.64$). The estimates of the models are presented in Table 12.

Table 12: Parameters of Ability to concentrate models

Dependent Variable	Naturalness coefficient			Daylight coefficient		
	B ₁	T-value	Significance	B ₂	T-value	Significance
<i>Ability to Concentrate</i>	0.02	1.05	0.30	0.02	1.23	0.22
Dependent Variable	How natural/urban is the environment?			How much daylight is there present?		
	B ₁	T-value	Significance	B ₂	T-value	Significance
<i>Ability to Concentrate</i>	0.02	0.47	0.64	0.11	2.69	0.01

Temptations

As mentioned above self-control was also measured by the ability to resist the strongest temptations. The analysis of temptations was done with averaged data per day, because in the experience sampling questionnaire the question about the presence of temptations was pointing to a period between the previous and the present beep. First, the average number of temptations per day was calculated – $M=3$, $SD=2.02$ and the average percentage of lapses was found – $M=75.31\%$, $SD=44.29\%$, then the average strength of temptations per day was extracted – $M=3.38$, $SD=1.12$.

As mentioned above the Number of Temptations and the Percentage of Lapses were taken as dependent variable. The Average Strength of temptations was used in a model as a predictor of Percentage of Lapses.

No significant effects of the Naturalness coefficient ($F(1, 101)=0.13$; $p=0.72$) nor the Daylight coefficient ($F(1, 95)=0.40$; $p=0.53$) were found on the Number of Temptations per day, with quasi objective measurements of daylight and nature. Interestingly, when subjective measurements of nature and daylight were included in analyses, the Subjective Naturalness showed significant effect on the Average Number of Temptations participants had: Subjective Naturalness, ($F(1, 79)=4.32$; $p<0.05$) and a trend of the Subjective Amount of Daylight– ($F(1, 92)=3.59$; $p=0.06$). Estimates of model parameters show that participants had fewer temptations in more natural environments, moreover model shows that daylight levels in those environments were lower (see parameters in Table 12).

Amount of Nature and Amount of Daylight had no significant effects on the Average Percentage of Lapses, Naturalness coefficient ($F(1, 100)=0.03$; $p=0.87$), Daylight coefficient ($F(1, 99)=0.03$; $p=0.87$). The same results were obtained, when subjective measurements of daylight and nature were included in self-control model – the Percentage of Lapses was not explained by the Subjective Naturalness ($F(1, 80)=0.49$; $p=0.49$), nor by the Subjective Amount of Daylight ($F(1, 92)=0.08$; $p=0.77$).

When the average Strength of Temptations was added to the model as predictor of the Percentage of Lapses, the effects of the quasi-objectively measured Amount of Nature, Naturalness coefficient ($F(1, 100)=0.13$; $p=0.72$)

and the quasi-objectively measured Amount of Daylight, Daylight coefficient ($F(1, 99)=0.04$, $p=0.84$) remained non-significant, but the average Strength of the Temptation did predict the number of lapses per day, ($F(1, 85)=10.58$; $p<0.01$).

When we added the Average Strength of Temptations to the model with subjective predictors of nature and daylight, the Average Percentage of Lapses remained unexplained by neither the Subjective Naturalness ($F(1, 59)=1.42$, $p=0.24$), nor the Subjective Amount of Daylight ($F(1, 77)=0.01$; $p=0.93$), but the Average Strength of Temptations had a significant main effect ($F(1, 83)=11.46$; $p<0.01$).

The estimates of the models are presented in Table 13.

Table 13: Parameters of the self-regulation models

Dependent Variable	Naturalness coefficient			Daylight coefficient			The Strength of temptation		
	B ₁	T-value	Sig.	B ₂	T-value	Sig.	B ₃	T-value	Sig.
<i>Number of temptations</i>	0.04	0.36	0.72	-0.06	-0.63	0.53	-	-	-
<i>Giving into temptations (%)</i>	-0.03	-0.35	0.72	-0.01	0.20	0.84	0.43	3.25	0.00
Dependent Variable	Subjective naturalness per day			Subjective amount of daylight per day			The Strength of temptations		
	B ₁	T-value	Sig.	B ₂	T-value	Sig.	B ₃	T-value	Sig.
<i>Number of temptations</i>	-0.54	-2.08	0.04	0.53	1.90	0.06	-	-	-
<i>Giving into temptations (%)</i>	-0.22	-1.19	0.24	0.02	0.09	0.93	0.44	3.39	0.00

4.2.4. Restorativeness and Emotional Wellbeing

Restorative potential of the environment is directly related to our ability to restore from cognitive overload and stress. Moreover the amount of nature and daylight are integral parts of restorativeness (see Introduction). It is interesting to see whether restorative potential of the environment had any mediating effects. Due to significant correlations with other predictors – Amounts of Nature and Daylight – it was added to the analysis. The correlations are presented in the Table 14.

Table 14

	Naturalness Coefficient	Daylight Coefficient	How natural/urban is the environment?	How much daylight is there present?	Restorativeness
Naturalness Coefficient	x	0.54**	0.61**	0.38**	0.37**
Daylight Coefficient		x	0.51**	0.64**	0.37**
How natural/urban is the environment?			x	0.39**	0.42**
How much daylight is there present?				x	0.37**
Restorativeness					x

Correlations significant with $p < 0.01$

Energy

Adding Restorativeness as predictor into the Energy model, did not change the main effects of quasi-objective measurements of daylight and nature: the Daylight coefficient ($F(1, 525)=1.78$; $p=0.18$) and the Naturalness coefficient ($F(1, 528)=3.24$; $p=0.07$) remained non-significant. Restorativeness as well appeared to be not a significant predictor ($F(1, 527)=0.66$; $p=0.42$).

Including three predictors, Amount of Daylight, the Amount of Nature and the Restorativeness in the model of Energy levels, with subjective measurements of daylight and nature, showed no significant effects as well: the Subjective Naturalness – ($F(1, 535)=3.16$; $p=0.08$), the Subjective Amount of Daylight – ($F(1, 531)=3.69$; $p=0.06$), Restorativeness – ($F(1, 529)=1.15$; $p=0.29$).

Relaxation

When Restorativeness was added to a model to predict the Relaxation together with quasi-objective measurements of daylight and nature, Restorativeness appeared to be the only significant predictor ($F(1, 525)=33.79$; $p<0.01$). The Naturalness coefficient showed a positive trend, ($F(1, 526)=3.53$; $p<0.06$), the Daylight coefficient was not significant ($F(1, 524)=1.25$, $p=0.26$).

Restorativeness became the only significant predictor in the model of Relaxation, when subjective measurements of daylight and nature were used: Restoration – ($F(1, 527)=29.18$; $p<0.01$), the Subjective Naturalness – ($F(1, 532)=1.43$ ($p=0.23$), the Subjective Amount of Daylight – ($F(1, 528)=0.18$; $p=0.68$).

Happiness

When Restorativeness was added in the Happiness model with quasi-objective measurements of daylight and nature, the Naturalness coefficient ($F(1, 531)=6.27, p<0.05$) and Restorativeness ($F(1, 530)=41.05, p<0.01$) were significant predictors of Happiness. The Daylight coefficient showed no significant effects ($F(1, 527)=0.00, p=0.99$).

When Restorativeness was added to the model of Happiness with subjective measurements of daylight and nature as predictors - Restorativeness became the only significant predictor. Restorativeness – $F(1, 532) = 38, 11$ ($p<0.01$), Subjective Naturalness – $F(1, 534) = 2.68$ ($p=0.10$), Subjective Amount of Daylight – $F(1, 533) = 0.13$ ($p=0.72$).

Sadness

When Restorativeness was added in the Sadness model, the quasi-objective predictors of the Naturalness Coefficient ($F(1, 528)=0.13, p=0.71$) and the Daylight coefficient ($F(1, 525)=0.24, p=0.62$) remained not significant, Restorativeness showed a trend ($F(1, 527)=3.19, p=0.08$).

None of the predictors were significant, when subjective measurement of daylight and nature together with Restorativeness were added into the model as: Restorativeness – $F(1, 529) = 1.95, p<0.16$, Subjective Naturalness – $F(1, 535) = 0.44, p=0.51$, Subjective Amount of Daylight – $F(1, 530) = 0.03, p=0.86$. The estimates of the models are presented in the Table 15.

Table 15

Dependent Variable	Naturalness coefficient			Daylight coefficient			Restorativeness		
	B ₁	T-value	Sig.	B ₂	T-value	Sig.	B ₃	T-value	Sig.
Energy	0.02	1.80	0.07	0.01	1.33	0.18	-0.03	-0.81	0.42
Relaxation	0.02	1.88	0.06	-0.01	-1.12	0.26	0.08	5.81	0.00
Happiness	0.03	2.51	0.01	0.00	0.01	0.99	0.22	6.41	0.00
Sadness	0.00	0.36	0.72	-0.00	-0.49	0.62	0.06	1.79	0.08
Dependent Variable	Subjective naturalness per day			Subjective amount of daylight per day			Restorativeness		
	B ₁	T-value	Sig.	B ₂	T-value	Sig.	B ₃	T-value	Sig.
Energy	0.05	1.78	0.08	0.05	1.92	0.06	-0.04	-1.07	0.29
Relaxation	0.01	0.28	0.78	-0.00	-0.01	0.99	0.16	7.00	0.00
Happiness	0.05	1.64	0.10	0.01	0.35	0.72	0.22	6.17	0.00
Sadness	0.02	0.66	0.51	-0.00	-0.17	0.86	0.05	1.40	0.16

4.2.5. Influences of other Environmental Factors

Due to small sample size, analyses with more predictors would not be reliable. Therefore we do not report the results in this paper. However, we still checked the possible effects of other contextual elements, such as, social contacts, physical and mental activity and the pleasantness of a salient event. After noticing interesting trends, we decided to add these results to Appendix D, arguing that for the future research it would be useful to see, which variables might be important to account for. Short overview of the results is provided in the following paragraph.

When the other contextual variables were included into naturalness and daylight models one by one as a third predictor, some significant effects appeared. The Amount of Social Contacts showed positive influences on Happiness and Energy levels. The Amount of Mental Workload had positive influences on Energy levels and negative influences on Relaxation levels. The Amount of Physical Activity positively influenced Happiness levels and negatively – Relaxation levels. The Pleasantness of The Salient Event had positive influences on Energy, Relaxation and Happiness levels.

4.3. DISCUSSION OF THE RESULTS OF EXPERIENCE SAMPLING

We performed experience sampling study to investigate the effects of nature and daylight on people's wellbeing and functioning. We used 2 different tools to evaluate amounts of nature and daylight in the environment. The findings of our study on effects of nature and daylight on mood and self-regulation are discussed in following sections. In the last section we explain the differences we observed in effectiveness of subjective and quasi-objective measurements of daylight and nature.

4.3.1. Emotional Wellbeing (effects of Daylight, Nature and Restorativeness)

One of the most important findings of the experience sampling study was that the amount of nature (measured in both, quasi-objective and subjective ways) significantly predicted Relaxation and Happiness – two important factors describing our emotional wellbeing. Results indicated that people felt more relaxed and happier in more natural environments. These effects were partially mediated by the perceived restorative potential of the environment. Because, when restorative potential was added as a third predictor, it decreased the significant effects of naturalness. Although we cannot draw causal relationship from our results, natural and more restorative environments had stronger positive effects on participants' happiness and relaxation levels. These findings are consistent with the research on effects of nature on wellbeing and restorativeness theories (Roe & Aspinall; 2008; Berman, Jonides, Kaplan, 2008). Moreover results of our study suggest that interactions with nature and natural elements in our environments are really important for our wellbeing in our daily lives, since we performed experience sampling in the field.

Nature showed another interesting result, however, this time it was not a significant effect but a trend. We found that higher amounts of nature (measured quasi-objectively) predicted higher energy levels. This trend fits literature on vitality. In Ryan's et al. (2010) study it was found that interactions with nature and daily time spent outside predict vitality.

Unexpectedly, daylight did not show any significant effects on emotional wellbeing. However, we did observe a positive trend in the model of Energy. Higher amounts of daylight (measured subjectively), as one would expect, predicted higher levels of energy. Although it is only a trend, this finding is consistent with previous research on effects of natural light on people's wellbeing. As Denissen et al. (2008) found in their study, our results show that participants exposed to more daylight were less tired. The less strong effects of daylight could

be caused by several reasons. Firstly, the measurements of daylight might have been not as efficient as expected, meaning, that daylight coefficient and subjective amount of daylight were not representative of actual levels of daylight in our participants' environments. However, the results of the pretest and the correlations with objective measurements do not suggest this (see sections 2.4.2.1. and 2.4.2.2. for the pretest results). Secondly, daylight is more dynamic, than for example, nature. Meaning, that natural objects (such as trees, plants, etc.) are more likely to stay in the constant location/surrounding, meanwhile the amount of daylight changes with the time of the day. Thus, this might make it hard to measure the direct effects of daylight on wellbeing in the field.

Interestingly, no effects of nature or daylight were found on the sadness dimension of mood measures.

4.3.2. Self-Regulation and effects of Nature and Daylight

Ability to concentration is an indicator of good self-regulation. Our results show a significant positive effect of daylight (measured subjectively) on people's ability to concentrate. It was found, that higher amounts of daylight predicted better concentration. This is an interesting result illustrating significant effect of daylight on self-regulation. Ability to concentrate is one's capability to control the attention and therefore requires a lot of cognitive resources. Research shows, that exposure to (day)light is influencing our cognitive performance (Vandewalle, Maquet, Dijk, 2009). Results of present study are in line with previous research. However there is a possibility of confound – time of the day. Due to small sample size, we did not control for the effects of time of the day, when analyzing the effects of naturalness and daylight on ability to concentrate (assigning samples of 17 participants into parts of the day, in our case would reduce the number of data points too much). Therefore, higher amounts of daylight could indicate the parts of the day when more activities requiring more concentration are done (working, school, etc.).

Nature did not show any significant effects on ability to concentrate.

Nature (measured subjectively) showed a significant effect on the number of temptations. Participants in the environments with higher amounts of nature reported experiencing fewer temptations. In the same model daylight exhibited a trend, which suggests that more daylight predicted more temptations. The significant effect of nature could be explained by people's ability to restore in more natural places and therefore increase the self-regulatory capacity. Kaplan and Berman (2010) discussed the relationship between directed attention and self-regulatory capacity. According to them directed attention and self-regulatory capacity share the same source. Nature is able to restore the fatigued directed attention, and our results suggest that it can as well influence self-regulatory capacity. This could be the reason, why in natural environments people showed less proneness to be tempted. Another reason for lower number of temptations in natural environments could be the availability of things. Meaning, that natural environments might contain less temptations in general (there are no candies, soda's, etc.). However we lack the information about whether the environments with higher levels of nature were truly natural or more urban environments with access to nature (picture, windows, etc.).

Nature did not show any other significant effects on self-regulation. Daylight, excluding a trend mentioned above, had no significant effects on the number or temptations and the percentage of lapses. We try to explain it as follows. Since direct effects of amounts of nature on self-regulation were not measured yet in any known research, we cannot compare it to other findings. To explain the present outcome we look at limitations of our study. We measured self-regulation on every momentary assessment during experience sampling by asking our participants whether any temptations had occurred since the previous beep. However, the data about the amounts of nature and daylight was gathered on the exact moment when experience was sampled. Due to this,

to analyze the naturalness and daylight effects on self-regulation we had to average data per each experience sampling day. We argued, that self-control data obtained this way will be representative of the average amount of temptation per day and the average amount of naturalness and daylight experienced per day. However this manipulation significantly reduced the amount of the data points, therefore the analyses lost power, which reduced our possibility to find any significant effects. Based on this we would suggest in future studies to collect the data on self-regulation in the same way Hofmann and colleagues (2011) did in their study. Meaning, questionnaire should ask the participants to report about the present temptations, but not all the temptations since previous beep. This way, the amounts of nature and daylight and the number of temptations will be gathered alongside and there will be no need for data approximation.

As expected based on Hoffman et al. study (2011), we found that the strength of temptations predicts the percentage of lapses in self-regulation. In previous research it was shown, that strength of desire significantly predicts lapses in temptations. In our study even with low number of data points we were able to confirm these results.

4.3.3. Differences between Subjective and Quasi-Objective measurements of Nature and Daylight

Besides the significant results we observed the differences in the way our measurement tools worked. Firstly, the quasi-objective and subjective measurements of nature had different effects on the number of temptations people had on the average. There, we only saw the significant effect of subjective naturalness on the number of temptations; and no effects of naturalness, when quasi-objective measurements were used in the model. Secondly, we observed the significant effect of subjective amount of daylight on the ability to concentrate. However the quasi-objective amount of daylight did not show any significant effect. These differences can appear because of several reasons. The subjective questions about the amount of daylight and the amount of nature were based on the same design as other questions which were measuring the mood, ability to concentrate, etc. They were asking directly about the present feelings and the surrounding environments, such as: *‘How well are you able to concentrate at the moment?’* and *‘How much daylight there is in the surrounding environment?’*. This could cause the participants to notice the environment more than before the experience sampling (actually, participants reported in the depth interviews, that they became more aware of their feelings and their surroundings) and bias their answers, by increasing awareness of the levels of nature and daylight in the surrounding environment. Moreover repeated measures of the experience sampling methodology could make participants to get accustomed to the questions and learn to reflect on the naturalness of the environment as well as automatize the process of answering the questions. We cannot conclude whether it is good or bad outcome, because we do not have truly objective measurements to compare the subjective and quasi-objective scores with. However due to moderate correlation between two measurement tools, the idea, that both tools are measuring different things is unlikely or at least needs more research to be confirmed.

4.4. DEPTH INTERVIEWS

4.4.1. Feedback on HTC Mobile Devices

In this section we will present the results from the participants’ feedback sessions on the Experience Sampling procedure and apparatus we used to perform it.

The technical difficulties with HTC mobile device and Experience Sampling application

Participants reported several problems, which they encountered with HTC mobile devices. The most common fault was the malfunctioning of the experience sampling application. The operating system, Windows Mobile 6, appeared to not fully support the application developed in the HTI department. All participants reported, that at least once, at the end of the questionnaire they received an error message, after which the whole operating system would crash and the participant would need to restart the device and the experience sampling program. What is important to mention though, is that no questionnaire data was lost, even when the system crashed. Participants also reported that these problems mostly happened in the second part of the day:

‘with the device I had some problems <...> especially later in the day, around the evening, 7PM’, (female, 53 years old); ‘during the day it works well, but then at 6-7 o’clock in the evening it starts showing errors’, (female, 23 years old); ‘it had a schedule, because it mostly had problems after the last questions, that I filled in’, (female, 42 years old).

Another technical problem was caused by the external programs, which by default were installed in the HTC device (e.g. TOMTOM). Those programs are opened by pressing one of the keyboard buttons or by touching the touch screen. Some participants reported that even though they had a protective sleeve, the buttons were still pressed by accident and the newly opened program, e.g., TOMTOM would block the screen of the experience sampling application. Because participants were not always able to exit the newly opened application, sometimes they missed questionnaires unintentionally and had to restart the device together with experience sampling program. Examples of experiences:

‘you touch the screen a little bit, the screen switches from one to the other’, (male, 49 years old); ‘the telephone didn’t do what it should do <...> it was in my bag and then somehow it would still get punched <...>[she sees, that] TOMTOM is on’, (female, 35 years old); ‘sometimes you press those buttons and then it [the questionnaire] gets away’, (female, 23 years old).

Some other problems were related to the battery life of the HTC phone. If participants forgot to charge the phone, the battery would eventually die and the experience sampling program would of course stop functioning, e.g.:

‘I would turn it on and the screen went black all the time <...> But when I plugged it into electricity, then it worked’, (female, 57 years old); ‘it’s silly, that you have to charge it every night’, (male, 29 years old).

Other experiences with experience sampling procedure

In general the experience sampling seemed to be nice experience for majority of participants and only occasionally it caused negative feelings. Neither randomness, nor multiple samples were reported as very intrusive, however some participants did mention, that sampling 8 times per day might be somewhat too often. Further paragraphs present these experiences in more detail.

Malfunction of the device caused some participants to experience negative emotions/affect, e.g.

‘I found the system very stressful in my opinion’, (male, 49 years old); ‘malfunctioning was really annoying’, female, (23 years old).

However, when they were asked to rate the experience sampling as an experience in more general terms (as a participation in the experiment), most participants reported positive or neutral feedback, e.g.:

'experience was very interesting', (male, 49 years old); *'overall, experience sampling was okay'*, (female, 28); *'Good, not irritating. It is used for the experiment, so you know what you can expect from it'*, (female, 43 years old); *'It went well, it was not very fun or something. It went well'*, (male, 24 years old).

However, there were also reports, that sometimes the beeping was disturbing and the idea, that one has to fill in questionnaires randomly throughout the day, was annoying, e.g.:

'beeping was not usually in the most convenient moments', (male, 24 years old); *'well, it's irritating, to have a thing'[HTC device] all the time with you and do something with it'*, (male, 29 years old).

In addition six participants reported, that in their opinion experience was sampled too often, e.g.,

'the only problem was, it was random and sometimes it gave the same questionnaire in 15min, <...> the randomness is maybe okay, but it should at least wait half an hour', (female, 57 years old); *'I think if you do [fill in the questionnaire] in the morning, in the afternoon and evening, three times must be enough. <...> three or maybe four times. <...> 8 is too much, in my opinion'*, (male, 49 years old).

When participants were asked whether the randomness of the questionnaires was irritating, nobody had any negative comments.

Two participants mentioned that it would be better if experience sampling application would be installed into their own mobile phone. This way, they would be more aware of auditory signals and it would feel more comfortable to carry only one phone, instead of two.

Reasons for missed questionnaires

Missed questionnaires are defined as not answered questionnaires (it is different than sampling rate, which is the expected number of samples, having in mind 8 samples per day, for 6 consecutive days). The number of missed questionnaires was registered by experience sampling application. As already mentioned in the section about technical issues with the HTC device, some questionnaires were missed, because participants were not able to handle the HTC mobile phone. The other, reasons for missed questionnaires are presented below.

There were few reports, that participants were not able to hear the beeping device and therefore missed couple of the questionnaires. However, the most commonly reported reason for missed questionnaires was the other activity, which could not be interrupted by the questionnaires, such as work meetings, golfing, paying bridge:

'well, I had to turn off the sound sometimes, because of the meetings, etc.', (female, 23 years old); *'sometimes you are in circumstances, you cannot do it. I was playing Golf and couldn't hear it properly, because it was in my bag and I couldn't wear [take it] it with me'*, (female, 53 years old).

There were also reports, that the environment was too loud to hear the beep or that the participant would forget to take the HTC device along, when leaving home, e.g.:

'I am often in a noisy situation and I cannot hear the phone', (male, 49 years old); *'couple of times I forgot to take it along'*, (male, 24 years old).

Open feedback on the questions and questionnaire structure

A few participants reported that the location was not representative of their responses on emotional wellbeing and other measures (temptations, etc.). The main reason for these reports was that participants received the beep right after entering a certain location; thus, they did not stay there long enough to be affected by the surrounding environment (including levels of daylight and amount of nature):

'if I say I am in a certain location, sometimes, I was in that location for only couple of minutes', (male, 20 years old).

One participant reported that the response scales could have been longer than 5 points, because he noticed that it was hard for him to answer the questions:

'I really thought that the scale of 7 or the scale of 9 would be much more precise in what I would like to answer', (male 49 years old).

Two participants were not satisfied, that they were not able to go back and fix their answers. One participant found the questions in general difficult to answer because they were closed questions:

'I find the questions sometimes very difficult to answer, because, you know, they all are closed questions', male, (24 years old).

4.4.2. Reflections on Experience Sampling Week and representativeness of feedback letter

In this section we will present an overview gathered from the participants' about the experience sampling week. The main aim of this part of the results is to show that experience sampling did not change the major routines people have in their everyday life, and that the experience sampling week, in general, was representative of a usual week in participants' life.

Week

Nine participants reported that the experience sampling week was just like a regular week. Four participants reported that in addition to a regular week they had encountered a salient event, which was worth mentioning: one participant had an MRI scan (no results that week, just the MRI scan, which according to her was a routine health check); another participant was happy to succeed on one of his home fixing tasks; one participant bought a house; and the last one indicated that he spent a weekend abroad. Finally one participant indicated that his regular week was more boring than usual.

Eight participants said that their week was not an ordinary week. Five of them indicated that irregularity was caused by a holiday or additional leisure activities: a holiday in France, a weekend with friends, and more time spent at parents' house, due to a long weekend. Two participants reported that their week was unusually bad: one participant had had an emotional breakdown; the other participant had family problems, with one of the family members getting very ill. One participant indicated that due to his unemployment all of his weeks are irregular. The experience sampling week, thus, was no exception

Representativeness of the feedback letter

When participants were presented with their feedback constructed of experience sampling data, all participants confirmed that the emotional wellbeing was representative of how they on average felt during the experience sampling week.

4.4.3. Evaluations of Most Commonly Visited Locations

In this section we present the results of analyses of evaluations of the locations, which participants listed as their most commonly visited locations. We applied the Framework Analyses method (Lacey, Luff, 2001), because the experimenter was already familiar with the contents of the depth interviews and developed a few a priori concepts. A priori concepts later were combined with emergent concepts, which were found during the coding of the qualitative data.

4.4.3.1. Thematic Framework

Five themes were formed based on expectations of the present study, Korpela's study (2010) and trends, which the interviewer noticed while performing all of the 17 interviews. Those themes are presented below:

A Priori Themes

- I. *Natural places are favored, when there is a need for relaxation/restoration*
- II. *Good places clear minds, help forget the daily worries, sort out the feelings, can provide comfort, give privacy and help to relax*
- III. *Participants seek good locations or try to stay there longer*
- IV. *Participants are more stressed in the places they consider bad for them*
- V. *Social contacts influence the perception of the place*

The first theme was based on previous research on restoration and our expectations to find positive effects of interaction with nature and natural environments on people's wellbeing. The second theme can be referred to Korpela's et al. study about place-based self-regulation and associated mental health of urban adolescents, where the qualities of good places were defined as in our second theme. The third theme, as well as the first theme, emerged from our expectations. The last two were formulated during the interviews, due to emerging trends.

Themes which emerged after familiarization with data

- VI. *Participants are less resistant to temptations at home*
- VII. *Places where participants feel relaxed have more temptations and enhance lapses*
- VIII. *Participants feel more energetic in their social environments*
- IX. *Schedule/habitual behaviors are connected to certain locations (such as supermarkets), which are usually rated as neutral*
- X. *Physical activity makes people feel good, therefore the locations, where they do sports are rated good, however due to the effort it takes, people procrastinate sports*

The last five themes emerged, while getting more familiar with data, by transcribing the interviews and reading the data.

4.4.3.2. Mapping

In this section we explain all of the ten themes and present supporting and/or opposing arguments, based on the transcripts of the depths interviews.

Theme I: Natural places are favored, when there is a need for relaxation/restoration

During the interview 11 participants noted, that the places where they relax or feel relaxed are in natural environments or at least environments, which have higher amounts of natural elements (e.g. home garden, golf field). Five participants consciously mentioned, that they feel good and relaxed, because of trees and green that they see around, e.g.:

'The place it's so open and full of trees, it's almost in nature, you have the lake behind, no cars no factories, no moped, no ambulance, you only hear yourself [talks about midget golf field]', (male, 49 years old); 'I like walking. You always walk in nature, never on the asphalt, always nice pads, always nice routes. I can make a lot of pictures. I take a lot of pictures. And the rest is mental [relaxation]', (female, 51 years old).

The other participants just indicated the locations, where they felt relaxed without specifying that those are natural environments, e.g.:

'I go there when I need it. But I also go there, when I need more energy [talking about the city park]', (female, 42 years old).

A common activity people engage into when they seek restoration, is going for a walk. Walking can be coupled with relaxing in nature. It was mentioned a few times. For example, a male student of 20 years old goes for a walk with his mother, every time he spends time in his parents place. Another female participant, 57 years old, goes for a walk when she gets stressed.

The theme had one opposing argument. A female participant, 23 years old, indicated that natural environments are not the ones, where she prefers to relax:

'but it really depends on whether the location is nice and whether there are people there. That's more important for me than having a tree or a plant. It's nice, but the whole, instead of really nature – I am just as happy in Amsterdam city center, as in the forest. Maybe I'm even happier in Amsterdam city center.'

Results suggest that participants spontaneously choose locations with more natural elements, when they seek for restoration. Sometimes the interactions with nature are couple with activities, which allow us to spend more time in nature (e.g., going for a walk in the forest).

Theme II: Good places clear minds, help to forget the daily worries, sort out the feelings, can provide comfort, give privacy and help to relax

The good places varied from home to friend's home to children's football training field. However home was dominant in carrying more restorative qualities – 10 participant listed home besides the other locations and described it as a place, where they get privacy, don't need to wear any masks and can just be themselves. For example, for the 58 years old male participant home is a place where he relaxes and finds his privacy, as well as enjoys his family circle:

'Family, everything together. It's a good place! My wife has her own room, I have my own room. <...> I have a shelter, I built it <...> I have a smoking room'.

Female participant, 53 years old, describe home as the best place to be:

'In general the best place for me is home, where I can be completely myself and I don't have to wear any masks. Take off clothes, put something cozy on. And home is the best place to be for me'.

Talking about other good locations and activities, walking as well was reported as an activity, which helps people to get mental rest and get rid of tiring thoughts. A couple of participants said, that they relax in certain locations, by doing nothing, which can be interpreted as low cognitive load and no worries, e.g., football field where her son plays is the relaxing place:

'relaxing, and just watching and doing nothing and talk to other people', (female, 42 years old).

Three participants reported that although home is usually a positive place, sometimes it can cause different feelings. Latter is opposing argument to present theme about the positive effects of good places (in this case home). According to participants, at home we can also remember the worries we had during the day, or in general remain stressed due to bigger problems which are recently on our minds. For example, one female participant reported sometimes thinking about the worries at work when already lying in bed to sleep; other participant said that at home he often has his mind busy with what still needs to be done for the homework, etc. Moreover female participant of 42 years old said that often when she is at home, due to unemployment, she feels like she is always reminded that she is not working and procrastinating the job hunt.

In sum, participants reported home as being one of the best locations, where most of the time people can relax, be themselves, get enough privacy and rest. Sometimes, however people bring their daily worries home and this leads to restless mind.

Theme III: Participants seek good locations or try to stay there longer

Generally the great majority of participants reported to proactively seek good locations. People stay at home, visit friends, go to sports or take a walk. For example a couple of participants enjoy being in the location, where their children play football or do other sports. They both said that sometimes they try to compete with their spouses to get a chance to bring their children to football or the other sports classes. They reported actively seeking these good locations. The others told the interviewer about their habits to go for a walk when they are stressed or their minds are busy. They as well reported consciously seeking these activities/locations. One male participant, 49 years old, said that during the day he even schedules the visits to certain locations which are good for him, e.g. sports center and supermarket and if he feels the need for relaxation, he stays there longer:

'yes, I try to stay a little longer. I schedule that I will go to certain places every day, like SSC or AH. And if I am little restless, then I stay a little longer'.

However, when participants were asked whether they also avoid unpleasant or unlikable locations, most of the participants said, that due to their responsibilities and presence of certain schedule in life, they cannot avoid those locations. For example, 51 years old female participant dislikes going to physiotherapy and does not like supermarkets, especially when supermarkets are full of people. Although she does not like physiotherapy, the participant said that she always goes to join the classes, because it is important for her good health. However, when participant has to do the grocery shopping and go to the supermarket, she allows herself to decide

whether to go or not depending on whether peak hour is over or not. There were other participants who had similar responses about supermarkets and work. Therefore the conclusion is that people only can avoid certain locations, when they have no obligations to be there. One cannot avoid work, because it is unpleasant, this would result in no income and a lot of stress. However, one can choose to do grocery shopping at the time, when nobody is there or just choose to go to a different supermarket.

In sum, participants seek for good locations. Moreover, when participants are aware of positive effects, they actively try to stay in good locations longer.

Theme IV: Participants are more stressed in the places they consider bad for them

Fifty seven years old female participant has very stressful working conditions, because half year in advance, she knows, that from January, she is fired. She reported several bad effects, which she experiences while at work:

‘work makes me stressed always, especially from the February till now [middle of June]. Because I am fired from [coming] January and people are not very nice to me. And they try to put me away. Therefore I am living in a big stress’.

The latter case might be a little extreme example. In general quite few participants reported their work as the location, where they have to go and that it is fluctuating in a sense, how one is feeling there. Because of variety of reasons, such as relationship with boss, workload, presence of colleagues, work sometimes is reported as a stressful or less pleasant environment. For example 28 years old female says:

‘work is one of the locations, which can be good or bad. If there are many deadlines then there is more stress as well’.

In general, from the lists of the most common locations not many were really bad. Therefore it is hard to confirm or reject this theme. The first example about work being a bad location for the 57 years old female supports the theme (it causes her much more stress, than other locations). The second example however neither supports nor rejects the theme, because there seems to be the interrelationship between the amount stress and location.

Theme V: Social contacts influence the perception of the place

Social contacts have a great influence on people and their feelings. Not surprisingly our participants reported the same ideas. Forty nine years old male said, that:

‘when I ever feel stressed is when I am surrounded by people with stresses’.

As well as provide negative influence, social contacts can make people feel much better. Majority of participants reported, that whenever they feel worse, they try to go and meet their friends or stay with their family. For example 57 years old female said that she seeks to visit her friends and talk about her stresses. This helps her to recover:

‘Yeah, I seek locations, which are good, [such as] music school, I visit friends. To talk about situations and to put it all out [to get rid of stress, talk about the feelings]’.

No contra arguments to this theme were found.

Theme VI: Participants are less resistant to temptations at home

According to participants reports home is the location, where they feel tempted the most and give into temptations more often. There were some interesting explanations why this is so. Firstly, one of the more common reasons was the accessibility of things at home. Twenty years old male participant said:

‘And at home, there are many things I can do. If I have to do homework, I can choose not to do it, because I have more choice, what to do’.

Female participant of 51 years old reported that all the food she usually feels tempted for, is more accessible at home rather than in the forest, where she goes for a long walk:

‘Yes, when I am busy with all kinds of things, there [at home] are also many things around and I can take them [foods which she is tempted for]. If I go for a walk, I only have what I have in my bag [one sandwich], so I cannot get more’.

Couple of participants said, that they give into temptations at home, because there they can forget or release their stress of the day, 57 years old female said (when asked where she gives into most temptations):

‘At home. To release the stress. I feel very pity about myself. And at work I am not myself anymore, I am very closed, I can’t say anything because, everything is against me’.

There were also 3 participants who did not mention home as the primary location for lapses and temptations. One female participant said, that bar and social environments are where she gets tempted the most and has the most lapses. The other participant as well listed other locations where he has most temptations (such as coffee shops, areas, where he goes for a walk with children, etc.). Finally 36 years old female participant said she makes sure, that home has less temptations (buys less food, does not buy unhealthy food) and therefore she has more temptations in other locations (such as work).

In general, from the interviews it appeared, that at home people have less control over themselves; they come there to relax and therefore have and give into temptations more than in other locations. Moreover, there are more temptations accessible compared to other places (such as nature, etc.). The second group of locations where people experience more temptations were social leisure environments. Participants’ reports about most temptations at home and in more social environments (bars, coffee shops, etc.), introduces us to the following theme: that more temptations occur in the places, where people feel more relaxed.

Theme VII: Places where participants feel relaxed have more temptations and enhance lapses

Following from Theme II, home was noted as one of the best locations. Moreover, from the Theme VI we can conclude, that home is the location, where participants have most temptations and lapses. This is consistent with the present theme, that most temptations and lapses in self-control occur in the places, where we feel more relaxed. In addition, to give more precision, people reported the environments, such as social gatherings at friends’ places or bars, being full of temptations and thus enhancing more lapses. Thirty five years old female said that the bar is the place with the most temptations:

‘Yes, I go there thinking, this time I am not going to drink that much, but then the night goes on and..’.

Interestingly, there was couple of reports opposing to this theme. Some participants noted that they get most tempted if they are in stressful situations or stressful locations. According to 58 years old male, his biggest temptation is smoking. Whenever he feels like the situation is becoming unpleasant for him he tries to sneak out for a smoke:

'They also have new people and introduction meeting (of the football team), with 50 people! I never go there... That's for me stressful. I smoke outside'.

Another 53 years old female participant during experience sampling week had many family problems and stressful situations at work. She reported that the locations where she felt the most stressed enhanced her to give into the most temptations:

'In this week, I think temptations were coming mostly in my mother's place and maybe, second place - work.'

Our findings suggest, that most temptations occur, where people are the most relaxed; in the locations, such as home or social leisure environments. In addition completely opposite experiences were also observed. According to few participants stress can enhance the experience of temptations and cause them to fail in self-regulation.

Theme VIII: Participants feel more energetic in their social environments

Half of the participants reported social environments, such as friends' places, hobby locations or shopping malls being as energizing locations. For example, thirty six years old female said:

'But it's the company which makes it nice. There's a lot happening, what depends on others and it's always good stuff, fun stuff that is why my place is more calming and their place is more entertaining and energizing.'

Another female participant of 51 years old said that she gets very energetic and assertive, when she plays bridge with her friends:

'I want to do it for myself, the best I can do. And then I hope to win. But win is not the first goal. <...> to do my best [is the first goal]'

In general social environments usually require people to be active, by either engaging into common activities or communicating with people in the surrounding, therefore it is not surprising, that our results show, that people feel more energetic, when surrounded by others.

Theme IX: Scheduled/habitual behaviors are connected to certain locations (such as supermarkets), which are usually rated as neutral

Four participants listed certain locations as a part of their schedule. Schedule related locations were mostly grocery shopping, which has no big effect on how the participants feel there. Forty two years old female said:

'The supermarket and grocery shopping, they are just normal. You need to do it. It's kind of 'regular business' you're doing'.

On the other hand another 4 participants actually reported liking grocery shopping and that shopping for food at the end of the day can even make them feel better:

'Oh, supermarket is nice, because it's a place you go after work. <...> it was so, that I go there every day. Just to walk around and to get the things I need, but since my girlfriend moved in, and she does the groceries, I don't go so often anymore...' (29 years old male).

In sum some locations are meant to help us survive and besides performing certain function, usually have no other effects. For majority of our participants supermarkets, or other grocery shops are locations, which have no major influence on wellbeing and are basically visited, when in need for food or other good. On the other hand some participants enjoy shopping in general, therefore even grocery shopping is a pleasant rather than neutral experience.

Theme X: Physical activity makes people feel good, therefore the locations, where they do sports are rated good, however due to the effort sports take people sometimes procrastinate sports

It was mentioned, that sports help people relax not only physically, but as well mentally. People worry less about their stresses during physical workout. This causes them to feel good afterwards (both from physical and psychological perspectives). Twenty eight years old female said:

'So, if you go there [sports center].. Most of the times you think, oh no, I have to go there [feel laziness].. But if you go there you feel better! <...> Yeah, but I just go, because I need to go..'

Fifty two years old female said:

'Sports center - that's for relaxation. Sporting, even when you're tired, I think gives you a good feeling afterwards'.

Forty two years old female participant as well said:

'Especially, when I decided to go to the gym, afterwards, I felt great! And I already know that is good for me, but still I am postponing those things [sports]'.

Our results suggest, that is a relationship between good places, stress and cognitive overload. People, who have worries, can rest in active environments, such as sports centers or gyms, where their minds and bodies are busy. However sporting takes a lot of energy and self-control to do it. Therefore people even while being aware of good effects of sports sometimes delay engaging into sporting.

4.5. DISCUSSION OF THE RESULTS OF DEPTH INTERVIEWS

Firstly we will discuss the results relevant to improvements of future studies using experience sampling methodology. Latter is based on inferences made from participants' reports on usability of the experience sampling device and overall experience. Later we will introduce the reader with the insights on the results extracted after the investigation of the relationship between people's wellbeing and their most commonly visited locations.

4.5.1. Experience Sampling

4.5.1.1. Technical issues

One of the major findings from the depth interviews was the list of improvements, which should be done on the technology used for data collection. This was based on the negative feedback gathered about the experience

sampling device. Participants felt unsatisfied and disturbed due to malfunctioning of the HTC mobile phone. Most problems were reported concerning bugs in the system, which caused interruptions in data collection. Moreover HTC device had more functions than only experience sampling, which disturbed the work of experience sampling application and thus, annoyed the participants. This leads to the conclusion, that experience sampling study should use the technology, which is designed in particular to perform experience sampling with automatized data collection as little trouble for participant as possible (the device runs the application automatically, saves the data, does not make participant think whether he/she has to do anything extra, is clear in feedback, what is happening with the system, etc.). Technology should be clear, user friendly and have only one function; or the application of experience sampling could be adapted to other operating systems so, that participants would be able to install the application on their personal cell-phones.

4.5.1.2. Methodology

Although experience sampling could be quite intrusive, because people have to stop what they are doing to fill in the questionnaires, from our participants' reports experience sampling appeared to be an interesting and not annoying experimental experience. Participants did mention couple of times that throughout their participation in the study, there were times when they felt interrupted and not in the mood to answer the beeps, however, as just mentioned, general feedback was positive. Moreover, high response rate (over 70%) supports implies the successful use of experiences sampling methodology in the field studies. Additionally, the representativeness of participants' feedback letters supports this conclusion; since all the participants agreed with the feedback they received about their emotional states during the experience sampling week (recap: this feedback was created from the data collected during experience sampling).

4.5.2. People and locations

We investigated the relationship between our participants and their most commonly visited locations. People were asked to try and group locations from the list of seven most commonly visited locations to be good or bad, taking into account the feelings that those locations enhance. The list of good locations, majority of participants started with naming 'home' as one of the best locations. People, then argued, that home is the location, where they can be absolutely free from the world and act more or less as they want. Moreover home is the location created by personal standards and therefore most of the time home has the aesthetical properties and comfort one needs. Other good locations can be divided into two groups – social (leisure) environments and sports. It was common for people to report that good locations are where their friends or family are. Moreover, social contacts with friends were usually coupled with more energetic, active relaxation (as compared to home). Other group of good places, mentioned by almost every participant, was sports locations. Interestingly sports locations were most of the time coupled with sports activity and were always rated as very beneficial and good places for wellbeing. However, most of the participants indicated, that although they are aware of good effects that sports have on them, they have to push themselves and work on their personal determination to go to/do sports. One of the major conclusions we made about the relationship between good places and people was in line with Korpela's et al. (2010) study about favorite locations in urban adolescents. As mentioned above, we found that good places (which most of the time was home, friends/family locations, sports) indeed clear mind, help to forget daily worries and sort our feelings, help to relax and give privacy.

When people were asked to think about bad locations, none was listed to allow us make more general conclusions. Couple of participants however, stated that unpleasant factors, such as heavy workload or unfriendly social situations, have effects on their perception of place. For example one participant said that stress is where others around him are stressed. Most of the participants listed work as location, which they

prefer the least. However, only one extreme case said that work is definitely the worst location. Majority of people evaluated work as less positive location, because it is the place where one has to go, to be able to survive (earn money). Moreover at work one has less control over the activities which are done there, choice of social contacts and the environmental aspects, such as aesthetics. It is interesting to mention, that mainly the bad social situation, but not aesthetical or other qualities, influenced the perception of the work environment.

Besides good and bad locations participants mentioned that some locations are neutral (neither good nor bad). Those locations were usually related to the scheduled activities or activities, which are crucial for survival. Most commonly neutral locations were assigned to a group of grocery shops or supermarkets.

Our investigation of most common locations and people's relationship with them we suggests that home is the location evaluated as the most pleasant and relaxing. Friends home, other social environments and sports locations were reported to be very good locations, which through increase in vitality and positive moods can affect people's wellbeing. The locations, such as work, where people have less control over the environment and tasks they have to do, are favored less. And finally, some locations, such as supermarkets, according to participants have no significant influence on wellbeing.

4.5.3. Relaxation, natural locations and daylight

In line with our expectations many locations where people chose to relax could be rated as more natural locations or locations with variety of natural elements, such as home garden, city park, midget golf course, forest, walks through urban and natural parts of the town and so on. Moreover about half of the participants indicated, that natural elements, such as trees and grass, in particular are important for their restorative experience. Most of the time experience of nature is couple with relaxing activity, such as walking or sitting down to enjoy the environment. It is important to mention, that participants were not explicitly asked about the importance of nature or natural environments to their relaxation, therefore the probability to encounter the response bias was diminished. Participants' reports on their experiences with nature, once more in our study indicated the importance of nature and beneficial effects of natural environments on our wellbeing (see section 5.1.1.).

Unfortunately no participants talked about influences of daylight on relaxation. There were couple not explicit notions, that windows and light environment is important at working space, but those were more of the aesthetical descriptions of the environment and mentioned shortly only by two participants. Since participants mentioned nature all by themselves without actual questions from interviewer and nature appeared to be very important for restoration, the fact that daylight was not mentioned could also tell something about people's awareness of the presence of daylight. Again, the dynamics of light comes to the surface as one of the possible explanations. Light not only changes throughout the day, but as well the amounts of daylight change through the seasons. Its dynamics is very special, cyclic and relatively slow, compared to how nature can vary in one's environment. People are used to these changes of daylight and probably do not notice them as strong; or it is possible that the effects of daylight are noticed within the longer period of time (we can quickly notice the difference between built environment in the neighborhood and city park, thus nature is probably more salient). This could be supported by the salience of seasonal psychiatric disorders when the daylight is significantly less available – in winter, rather than in summer time. Another thing which could influence the results could be the seasonal influence. We performed our study in the summer time, when the amounts of daylight are pretty high, so people did not have a lack of it or did not have to explicitly look for daylight when restoring. All in all the influences and importance of daylight on people's wellbeing in daily life needs more research.

4.5.4. Self-Control and common locations

According to quantitative data most of temptations and lapses occur at home. The qualitative data obtained via depth interviews confirmed the findings from experience sampling. Indeed home was one of the locations, which participants listed as full of temptations and where they reported most lapses. The reasons behind could be explained with Baumeister's ego depletion theory. People go home to relax after all day of activities at work or school, where they must control their urges and desires much more. Moreover some participants reported, that at home they have less control over themselves and that at home they allow themselves more due to constraints and stresses experienced throughout the day. Another reason for more lapses is the same as for experience sampling data – more things are available at home, such as foods, TV, computers and free time, which we can choose to spend while lying on the couch instead of going to sports. Other locations where participants reported having more temptations and lapses were the social relaxation environments, such as bars, friends place. This finding is in line with previous research, Carel's study of dieting behavior, where participants had more lapses when surrounded by other people. Social contacts have very strong influence not only on our wellbeing in general (as mentioned before – stress and the opposite), but as well on self-control. This variable should definitely be accounted for in future studies, because it appeared to be important in both more subjective reports during depth interviews as well as in experience sampling study.

V. GENERAL DISCUSSION

The experience sampling study was designed to explore the relationship between the presence of nature and daylight and people's wellbeing in everyday lives. We expected that higher amounts of nature and daylight in the surrounding environment would exhibit increased vitality, better mood and self-regulation on our participants. In addition we expected that restorative potential of those environments would mediate the main effects of nature and daylight. Data gathered from momentary responses of 17 participants throughout the study revealed interesting results and mostly in the predicted direction. Although the small participant sample does not allow us to make generalizable conclusions, our results once more indicated the beneficial effects of nature and its elements on people's emotional wellbeing. Moreover, these effects were observed in the field study, using highly ecologically valid instrument. Therefore our results are adding a great input to the research on restorative environments and benefits of interactions with nature. And, although daylight effects were not as strong as expected, we still observed couple of trends showing positive effects of daylight on emotional wellbeing and significant effect of daylight on measurements related to self-regulation. Our experience shows, that daylight requires much more attention and refined tools to be able to observe the effects on wellbeing and self-regulation.

Besides the experience sampling, we performed depth interviews with the main goal to gather qualitative data about the relationships between people and the locations they commonly visit during the week. The analysis of this qualitative data revealed many attributes of locations which are important for relaxation/restoration. Actually, we once again found that nature plays an important role when people look for rest or relaxation. Daylight on the other hand, was not coming up in the depth interviews. In line with experience sampling results, we were not able to conclude that daylight is as important as nature for restoration. We were neither able to determine the way people perceive daylight and how valuable it is for their wellbeing looking from subjective perspective.

Since daylight showed different effects in experience sampling study than nature and was not salient in people's reports about good for them locations it deserves more attention in this chapter. In general, from depth interviews daylight seemed to be less noticeable, than nature and natural objects in the environment, which does not mean that daylight is in any way less important. This outcome probably shows the great difference between daylight and nature and the ways these two phenomena affect people. Previous studies mostly investigated effects of nature and daylight in the laboratory studies or under high experimental control, (such as, effects of daylight on hospitalized patients and their recovery time dependence on amount of sunlight they get; effects of walks in nature on cognitive functioning etc.). Our study used methodology with high ecological validity to explore positive effects of nature and daylight in the real world setting. And we were able to confirm the results which were observed in the laboratory studies about restorative experiences and positive effects of nature. However, the investigation of the effects of daylight was not as successful as expected, but our experience shows that daylight should definitely be included in the future studies. Only, with more attention on certain external measures, which could be affecting the way daylight works on human's wellbeing. For example, it is definitely important to take time of the day and season into account. As we already mentioned in specific discussion, perhaps, in the summer season the experience sampling study might not exhibit salient effects of daylight, since in general there just is enough light. We performed experience sampling in the months of May and June and were gathering data from 8AM till 10PM. The sunrise time in those months varies from 5:22AM to 6:09 AM and the sunset – 9:07PM to 10:06PM. Moreover, the percentage of sunny days is as well higher at that time of the year. In addition it would be interesting to hear, what are the subjective opinions about the influences of daylight in people's everyday life, therefore it would be interesting to perform a set of interviews

where participants could explain how and if they think daylight affects them in their daily routine. This could help to improve the data collection in experience sampling, by adding extra knowledge about the external variables, which should be controlled for when researching the effects of daylight on wellbeing.

When talking about self-regulation we must return to the depth interviews. The investigation of self-regulation and its relationship with most commonly visited locations showed that people are the most tempted at home and in the places, where they spend their free time. In this case it means, that people are tempted more when they let themselves relax, reduce the control over themselves, in social leisure environments and in the locations, where the things are more accessible. These findings are in line with previous research on self-regulations (such as, Carel et al., 2001 or Hoffman et al., 2011 studies). However, it is important to mention that our data is qualitative and therefore it is richer in details and subjective experiences. There was also great variety of other influences, such as amount of social contacts and activity, which appeared to affect people's perception of the location, especially, when that location was not home, but related to some 'duty based' activity, such as work. These findings are as well not conclusive, except that those influences matter. Since small sample size in experience sampling study did not allow us to discuss the influences of other environmental variables on wellbeing, we can still state from the depth interviews that these factors (social contacts, cognitive load) should definitely be taken into account in future studies. Since small sample size affected the results of the present study, it is time to discuss the limitations of our study.

5.1. Study Limitations

One of the biggest limitations of the present study was the small amount of participants, which resulted in less statistical power when analyzing the quantitative data. Another great limitation of this study was the apparatus used for experience sampling. Unfortunately participants reported many troubles with the HTC mobile device and experience sampling program. It can be now concluded, that experience sampling application was not compatible with the operating system of the HTC mobile phone and therefore failed a lot. Moreover, according to participants the device was too big, uncomfortable to carry along and not user friendly.

Another possible limitation, which comes along with experience sampling study and can affect the way participants respond to the questionnaires, is the frequent sampling, which leads to participants learning the questionnaires. It is possible, that certain data is distorted, because participants were to accustomed with the questionnaires. We do not know whether that was the case in our study, but we strongly agree to take this into account, when using experience sampling methodology.

When talking about the qualitative part of the study, the study limitation was that the same person had a role of interviewer, transcriber and as well analyzed the qualitative data. If one person is doing all of the things previously mentioned the risk of experimenters bias appears. Moreover, the interviewer did not speak fluent Dutch and the participants were forced to exchange mother tongue to English language. And although all the participants spoke good English, it is possible, that in this sort of Depth interview communication in native language would ease up the conversation and reveal more interesting information relevant to the research.

5.2. Conclusions

Our findings once more show that nature plays an important role in providing people with possibilities to restore and relax on a daily bases. We have confirmed the previous research both through experience sampling and depth interviews and found the positive influences of nature on emotional wellbeing. Moreover the amount of nature in the surrounding environment was found to predict the number of temptations participant

experience in that environment (the higher level of nature is, the less temptations we experience). Although the number of participants in our study is not high enough to generalize the results obtained via analysis of quantitative data, with support of results from the depth interviews we can conclude that nature affects our wellbeing and is crucial for daily environments, where people relax. We cannot conclude that nature or natural elements increase self-regulatory capacity as well as we cannot reject this idea. This is due to lack of information, whether natural environments, where actually less rich with temptations or whether indeed, the restorative potential of natural environments increased people's ability to self-regulate. We suggest, that more research should be done on this topic.

Daylight on the other hand did not exhibit such strong effects as nature did. However we did notice promising trends that amount of daylight is affecting our vitality and ability to concentrate. Therefore we strongly suggest continuing investigation of effects of daylight on wellbeing and self-regulation while taking into account seasonal change and natural variability of daylight depending on the time of the day, which could have influences on expected effects.

Finally, from the participants' reflections on their experience sampling week, we can conclude, that the results were representative of what participants' wellbeing was during experiences sampling week. In addition none of the participants reported having too much trouble with the experience sampling procedure. Therefore we can strongly recommend this methodology with high ecological validity for future studies.

5.3. Technological Implications

Major technological implications concern the experience sampling methodology and improvements of apparatus. From our experience we can claim, that there is much more attention needed, when choosing or designing the apparatus for experience sampling. Firstly the device should be user friendly and clearly have only one function – asking the participant to fill in the questionnaires, when the time comes. It should not be overloaded with buttons or any unnecessary software, which could interrupt functioning of the experience sampling application or mislead the user. It should provide the user with clear feedback – in which state the experience sampling application is (are there going to be more questionnaires, is this a night time, etc.) and that all the responses were saved after participant filled in the questionnaire (if possible, the device could track and save questionnaire data online). Moreover, some participants suggested the idea, that experience sampling application should be adaptable to different operating systems of smart phones, so that they could install it on their own cell phones. Secondly, the device could be improved to a level that it is able to calculate and save relevant objective measures about the environment. We noticed that some extra data would be very useful for analyses and interpretation of experience sampling data, such as actual levels of daylight or the knowledge about how much time participants spent in a certain location. These are the suggestions for the future studies using experience sampling methodology or the designers designing the experience sampling apparatus.

Another practical implication arises from the results of our study about the benefits of natural environments. Since present study supports the findings of previous research, we can claim, that natural environments could be very beneficial in design of healing environments or environments, where people are treated (for example hospitals with chronic patients). Our study shows, that in daily lives interactions with nature help people to feel better and have higher tonus, therefore hospitals with more natural elements could have the same effect and help patients throughout their treatment period. Moreover, if indeed natural environments could reduce the number of temptations people have or restore self-regulatory capacity, maybe it would be beneficial to consider more natural environments for rehabilitation centers (addict rehabilitation centers). Last suggestion of course needs much more deeper research on effects of nature on self-regulation, but the first steps are already done.

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APPENDIX A: Photographs of the sites evaluated in the pre-test study



CAPTION:



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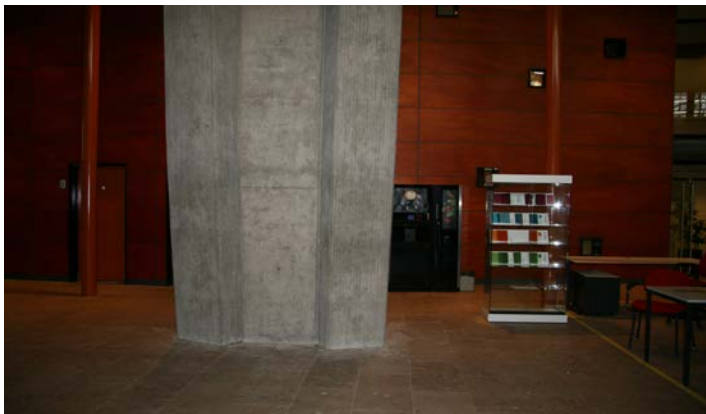




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APPENDIX B: Protocol of the Ecological Interview

FIRST MEETING

Participant Information

Name: Phone number:

Email:

Address:

ID:

SCHEDULE OF FIRST MEETING SESSION

1. Introduction

2. Ecological Interview

3. ****

***Participant:** Fills out questionnaires

***Interviewer:** Finalizes & Installs Experience sampling program

4. Introduction to daily routine of experience sampling study

5. Introduction to HTC device & User Manual

7. Scheduling the phone return date and Depth Interview

[SCRIPT]

Introduction

Dear [*participants name*], thank you very much for agreeing to participate in our study. I will briefly explain the content of this study, what you will have to do, how we will reimburse you and what are our responsibilities. After that I will ask you to read the informed consent form and if you agree with all the conditions I will ask you to sign it.

[Interviewer presents the brief introduction to the study & Informed Consent Form]

[Participant is asked to read and sign Informed Consent Form]

Before we start with the following topics of the schedule, do you have any questions, or requests?

Start of the Ecological Interview.

Ecological Interview

Participants ID:

Date & Time:

Interviewer:

Purpose: During this interview we will ask you to list your most commonly visited locations/places during your regular week. We will also ask you to name a number of temptations, which you usually have and try to resist. All this information will be used to finalize your experience sampling questionnaire, which you will be filling in in coming six days. *Shall we start?*

Locations: Imagine your regular week Monday through Sunday. Could you please list seven locations/places which you regularly go to (are at)? [*E.g. home, supermarket, work, gym, etc.*]

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

If participant did not manage to name 7 locations/places, we ask him/her the following:

Could you go through your regular working day and your regular weekend day, and try to list those most commonly visited locations again? We still need **X** of them.

- 1.
- 2.
- 3.
- 4.
- X.

Thank you. So, now we have seven most commonly visited locations during your regular week. Those are [*interviewer reads the list*]. Could you please order them descending order from the most commonly visited to less commonly visited? [*Interviewer writes the order of the locations next to the location in the lists above.*]

Temptations: We came to the second part of this interview. Could you please list seven strongest temptations you try to resist. By ‘temptations’ we mean something, what you know you should not do (**or decided not to do anymore**), something what is bad for you, e.g. smoking, eating candy, etc.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

If participant did not manage to name temptations, we ask him/her the following:

We still need **X** of temptations. Could you please select that number of temptations from the list of temptations I will now introduce to you [*Interviewer show the list printed on a separate page. The list is included as an appendix to this protocol. Bellow one can see the example of the temptations.*].

Food (sugar, junk food, other foods)

Hygiene related (biting nails, cleaning the house too much/too little, etc.)

Non- Alcohol Drinks (soda's, juice, etc.)

Alcohol

Coffee

Tabaco

Other substances

Sex

Media (too much internet, computer games)

Spending Money

Work

Social Contacts (too much talking on a phone, chatting, avoiding talking to people, facebooking, etc.)

Leisure activities (too much sports, games, gambling)

Sleep (taking a nap, when you shouldn't)

Thank you. You have listed seven biggest temptations. Those are [*interviewer reads the list*]. Could you please order these temptations from strongest to less strong? [*Interviewer writes the order of the locations next to the location in the lists above.*]

Now we will proceed to the second part of today's meeting – Questionnaires.

Introduction to the daily routine of Experience Sampling

In this study for six days you will be filling in the questionnaire 8 time per day between 8AM and 22PM. The times, when you will have to fill in the questionnaire will vary each day. Those timings are generated randomly by the experience sampling program which is installed on the HTC phone. You will be asked to carry the phone with you throughout the day. When the time, to fill out the questionnaire, comes, the phone will give you an auditory notification or it will vibrate (depending on a setting you chose). I will explain you later, how these notifications work. We are asking you to respond to as many of these questionnaires as possible. However it is important to know, that if you skip the 'beep', the questionnaire at certain moment throughout the day, there is nothing wrong with that. The program registers the questionnaire as not answered, restarts itself and schedules the next questionnaire according to the time of the day. You don't have to do anything.

Each of six experimental days will start with you filling in the morning diary [*interviewer shows the diary*]. The rest of the day you continue with your regular daily activities, except, as I already said, you will be asked to carry HTC phone with you and whenever time comes fill in the questionnaire. This will take you on approximately 4 – 5 minutes each time. At first it might take a bit longer, but when you will get used to the format of the questionnaire it should go smoother and faster. At the end of the day, right before you go to sleep, you will have to fill in the night diary [*interviewer shows the night diary*].

After 6th day, it will be [*insert the scheduled date*] the phone will have to be return to me. We will schedule this return at the end of this meeting.

Introduction to HTC device & User Manual

Now I will introduce you to the device we will use to perform experience sampling study. If you have any questions about the device, make sure you use User Manual to solve your problem and if the answer is not there, then contact me. The contact details are provided here [*Interviewer shows the part of User Manual, where contact details are provided*].

Phone

[*while showing the device*] This is the device you will be using to fill in the questionnaires. It works as follows:

When the phone is on, you will always see the screen slightly on. The light should never go off, because absolutely black screen indicates, that the experience sampling program stopped working. **By default setting you should not encounter any problems except: low battery & accidentally pressing the Stand By button here, which as you see is purposely covered with a sticker** [*interviewer shows the button*]. Therefore, please do not try to change any system setting of the phone, it is crucial to keep the system working the way it does today.

If you notice, that the battery is getting empty, please recharge it.

We advise you to charge the phone every evening before you go to bed.

PLEASE DO NOT REMOVE THIS STICKER on the Stand By button, unless you need to **RESTART** or **TURN OFF/ON** this device. Right after you perform this action, please, put the sticker back on.

Here, in the User Manual, is the technical part where you can find out how to use the phone, when you are at home [*Interviewer shows the relevant part in the User Manual*].

Experience sampling ‘Runner’

Now I will show you how the Experience Sampling application works. As you see, this interface resembles the Windows interface.

Tomorrow morning, you will have to take the following steps to turn on the experience sampling program [*Interviewer guides the participant through the steps to start experience sampling program according to the User Manual, then lets the participant to try run the experience sampling program*]. Do you have any questions?

Filling in the questionnaire

Now we will have a demonstration of how to fill in the questionnaire [*Interviewer opens the Questionnaire on HTC and helps participant to go through it, while explaining every step, if necessary*].

User Manual

As you saw, this user manual contains a lot of information about how to use the device and make sure that the experience sampling program is running properly. Please make sure you read it carefully before you start the study tomorrow. If you have any questions, don't hesitate to contact me at any time. You can either call me, or send me an email. You can find contact details at the end of the user manual.

Scheduling the return of the phone and Depth Interview

We reached the last part of this meeting. We have to schedule the phone return and Depth Interview.

[Scheduling]

Thank you for participation again. Do you have any last questions?

If not:

See you next week! Best of luck. Goodbye.

APPENDIX C: Protocol of the Depth Interview

DEPTH INTERVIEW

[SCRIPT]

Purpose: We would like to evaluate our study from your point of view. That is: to get your feedback, to find out how you felt during the study, did you like it, or was it too disturbing, etc.

In addition we would like to get more insight about the places you have listed in the first session and your relationship with the places.

And the last part of this interview, as promised will be your personal feedback. We will provide you with the results according to the questionnaire data gained during those six days while we were ‘sampling your experience’.

Participant’s feedback session

1. How do you characterize the overall experience with this study [*interesting, fun, frustrating, annoying*]?
 - Were there any troubles you encountered? What sort of troubles [*e.g. technical – with the phone, psychological, physical – too tiring, not willing to participate so much anymore*]? Why?
 - How do you rate the experience sampling application?
 - What was good & easy to use?
 - Was it comfortable/uncomfortable?
 - Was it fun/annoying?
 - Is there anything you would like to change, improve?
2. Did you miss any questionnaires?
If yes:
 - Please, estimate how many times do you think you missed the ‘beep’?

Looking back to the week

[Let’s talk about the experience sampling week itself.]

3. Did you do anything specific this week to relax?
4. Were there any salient events, which caused you (a lot of) stress or uncomfortable feelings? Did you feel the need to restore?
5. How did you look for restoration? What did you do? Where did you go?
6. Overall, was this week a regular week? Why/Why not?

Questions about the data gathered during the study & Individual Feedback Session

7. Look at the list of locations, which we were using in this study. Do you think you are aware which of these locations are **good/bad** for you?
 - Which causes you to feel better or worse?
 - Where can you restore?
 - Where you think you get actually more tired?
 - Where do you feel happy/sad?
 - Where do you feel stressed?
 - Where do you feel the most tempted?
 - Where do you feel the most energetic?

[For each of the locations, which participant indicates as inducing certain feeling, we ask the following questions:]

8. Location **X**? Why do you think you felt **Y** in this location? [e.g. Y=bad, good, sad, tired, restored, could control yourself good, couldn't control yourself, you were tempted, etc.]

[Experimenter helps participant to analyze each location from the list separately, If no mentioned and described above in Q7. In addition participant is asked:]

If more negative estimation:

Did you try to avoid this location, stay there shorter, since it is associated with more negative feeling(s)?

If more positive estimation:

Did you try to seek to be in this place, stay there longer, since it is associated with more positive feeling(s)?

*[Feedback] You felt at the location **X** the most **Y** [Y could be happy, tempted, energetic, sad, restored].*

If the feedback is incoherent with expectation

9. Are you surprised? Is it unexpected? Could you still see why this place caused you to feel in this way?

Missed questionnaires

As we told you during the first meeting, the experienced sampling program registered the times, when you skipped, missed the questionnaires. You have skipped/missed in total **Y** questionnaires per 6 days. That makes the average of **X** skipped/missed questionnaires per day.

10. Could you tell us the main reasons why this happened?

Was it conscious decision (e.g. you decided to not check the phone that hour(s)), or technical problem (e.g. the problem with the phone, you didn't hear, feel the notification)?

Closing

Do you have any final questions?

If not

Thank you again for participating! We very much appreciate your great input to this study. Where would you like us to send your feedback letter [*Email or By post*]?

[*Interviewer reimburses the participant and escorts him/her from the room*]

APPENDIX D: Results of the analyses of other contextual variables

The Amount of Social Contacts

Energy

In previous sections we presented significant effects of the Amount of Nature on Energy, Relaxation and Happiness, when both, the Amount of Nature and the Amount of Daylight were included in the model as predictors. We controlled for the Amount of Social Contacts, by adding it as a predictor into the models with Naturalness and Daylight Coefficients. We found two significant effects. Firstly, the Amount of Social Contacts ($F(1, 529)=8.33, p<0.01$) was a significant predictor and removed the significant effect of the Naturalness Coefficient (the effect became not significant with $F(1, 529)=2.85, p=0.09$) in predicting the Energy levels; the Daylight Coefficient became significant as well ($F(1, 529)=7.99, p<0.01$).

When the Amount of Social Contacts was added to the model as a predictor of Energy levels together with subjective measurements of naturalness and daylight, the Subjective Amount of Naturalness became a significant predictor, $F(1, 529)=20.25, p<0.01$, The Amount of Social Contacts was a significant predictor as well, $F(1, 529)=5.76, p<0.05$. The Subjective Amount of Daylight lost its significant effect, $F(1, 529)=1.57, p=0.21$.

Happiness

When the Amount of Social Contacts was added as predictor in predicting Happiness, both the Naturalness Coefficient ($F(1, 529)=14.52, p<0.01$) and the Amount of Social contacts ($F(1, 529)=12.37, p<0.01$) were significant predictors of Happiness. The Daylight Coefficient remained not significant, $F(1, 529)=3.62, p=0.06$.

The Amount of Social Contacts, together with the Subjective Amount of Nature were the significant predictors of Happiness (F statistics for the Amount of social contacts, $F(1, 529)=10.34, p<0.01$; F statistics for the Subjective Amount of Nature, $F(1, 529)=27.24, p<0.01$). The Subjective Amount of Daylight as well became a significant predictor, $F(1, 529)=6.69, p<0.05$.

Relaxation

Controlling for Amount of Social contacts in the models of Relaxation showed no changes in the model (the Amount of Nature stayed the only significant predictor, $F(1, 529)=16.89, p<0.01$).

In the model of Relaxation with subjective measurements of daylight and nature, the Amount of Social Contacts did not change the previous model (where the Amount of Daylight and Nature taken as the only predictors) and had no significant effect ($F(1, 529)=1.98, p=0.16$).

The coefficients of the models are presented in the Table 1.

Table 1: Model coefficients

	Naturalness coefficient			Daylight coefficient			The Amount of Social Contacts		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	.020	1.33	0.19	0.01	1.21	0.23	0.05	2.16	0.03
Happiness	0.05	3.81	0.00	0.02	1.90	0.06	0.09	3.52	0.00
	How natural is the surrounding environment?			How much daylight there is in the surrounding environment?			The Amount of Social Contacts		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	0.13	4.50	0.00	0.04	1.25	0.21	0.06	2.40	0.02
Relaxation	0.08	4.41	0.00	0.03	1.45	0.14	-0.24	-0.41	0.16
Happiness	0.15	5.22	0.00	0.08	2.59	0.01	0.08	3.22	0.00

The Amount of Mental Workload

Energy

In the next step of our analyses we added the Mental Workload to the model as one of the predictors. In the model of Energy, both the Naturalness Coefficient ($F(1, 522)=4.02, p<0.05$) and the Amount of Mental Workload ($F(1, 521)=19.13, p<0.01$) were significant predictors. The Daylight Coefficient remained not significant, $F(1, 519)= 1.62, p=0.20$.

When the Mental Workload was added to the Energy model as an additional predictor, together with subjective measurements of light and daylight, we have found the significant effect of the Subjective Amount of Nature ($F(1,529),p<0.01$), however the Amount of Workload did not have any effect on the Energy levels ($F(1,529)=2.06, p=0.15$), and the Subjective Amount of Daylight lost its significant effect ($F(1,529)=1.77, p=0.18$).

Relaxation

In the Relaxation model, the Naturalness Coefficient ($F(1, 524) = 13.34, p<0.01$) and the Amount of Mental Workload ($F(1, 521)= 14.01, p<0.01$) were significant predictors. The Daylight Coefficient stayed not significant, $F(1, 523) = 0.68, p=0.41$.

When the Mental Workload was added to the model of Relaxation, the significant effect of the Subjective Amount of Nature remained ($F(1,529)=14.52$, $p<0.01$) and the Mental Workload was as well significant predictor of the Relaxation ($F(1,529)=40.89$, $p<0.01$). The Subjective Amount of Daylight remained not significant ($F(1,529)=1.51$, $p=0.22$).

Happiness

Mental Workload did not show any significant effects, when added to the model of Happiness with quasi-objective measurement of nature and daylight.

When Mental Workload was added to the model of Happiness with subjective predictors, all three predictors were significant: Mental Workload, $F(1,529)=5.49$, $p<0.05$; the Amount of Nature, $F(1,529)=27.05$, $p<0.01$ and the Amount of Daylight, $F(1,529)=5.25$, $p<0.05$.

The coefficients of the models are presented bellow in the Table 2.

Table 2: Model coefficients

	Naturalness coefficient			Daylight coefficient			The Amount of Mental Workload		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	0.20	2.00	0.05	0.01	1.27	0.20	0.11	4.37	0.00
Relaxation	0.03	3.65	0.00	-0.01	-0.83	0.00	-0.06	-3.74	0.00
	How natural is the surrounding environment?			How much daylight there is in the surrounding environment?			The Amount of Mental Workload		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	0.14	4.81	0.00	0.04	1.33	0.18	0.04	1.44	0.15
Relaxation	0.07	3.81	0.00	0.02	1.23	0.22	-0.12	-6.39	0.00
Happiness	0.15	5.20	0.00	0.08	2.50	0.01	-0.07	-2.34	0.02

The Amount of Physical Activity

Energy

In the Energy model, when the Amount of Physical Activity was added, none of the predictors were significant: the Naturalness Coefficient ($F(1,524)=1.78$, $p=0.18$), the Daylight Coefficient, $F(1,521)=1.02$, $p=0.31$ and the Amount of Physical Activity, $F(1, 520)=1.85$, $p=0.18$.

The Amount of Physical Activity was not significant in the model of Energy with subjective measurements of daylight and nature, $F(1,530)=0.46$, $p=0.50$, however, it removed the significant effect of the Subjective Amount of Daylight ($F(1,530)= 1.40$, $p=0.24$) and left the Subjective Amount of Nature as one significant predictor of Energy levels, $F(1,530)=21.94$, $p<0.01$.

Relaxation

In the model of Relaxation both the Naturalness Coefficient ($F(1, 524) = 19.00$, $p<0.01$) and the Amount of Physical ($F(1, 520) = 5.40$, $p<0.05$) activity were significant predictors. The Daylight Coefficient remained not significant – $F(1, 521) = 0.36$ $p=0.55$.

The Amount of physical Activity had not changed the model of Relaxation with subjective measurements of amount of nature and daylight, $F(1,530)=1.27$, $p=0.26$.

Happiness

No changes were found in the model of Energy with quasi-objective measurements of daylight and nature.

In the model of Happiness with subjective measurements of nature and daylight, all three predictors were significant: the Subjective Amount of Nature, $F(1, 530)= 30.10$, $p<0.01$, the Subjective Amount of Daylight, $F(1,530)=5.35$, $p<0.05$ and the Amount of Physical Activity, $F(1,530)=5.81$, $p<0.05$.

The coefficients of the models are presented below in the Table 3.

Table 3: Model coefficients

	Naturalness coefficient			Daylight coefficient			The Amount of Mental Workload		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Relaxation	0.04	4.36	0.00	-0.00	-0.60	0.05	-0.04	-2.32	0.02
Happiness	0.04	3.35	0.00	0.01	1.17	0.24	0.06	2.52	0.01
	How natural is the surrounding environment?			How much daylight there is in the surrounding environment?			The Amount of Physical Activity		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	1.14	4.68	0.00	0.04	1.18	0.24	0.02	0.68	0.50
Happiness	0.16	5.49	0.00	0.07	2.31	0.02	0.07	2.41	0.02

The Pleasantness of Salient event

When the Pleasantness of the Salient Event was added as a predictor together with quasi-objective measurements of daylight and nature, it was found to be significant in both, predicting Energy ($F(1, 53) = 16.90$, $p < 0.01$) levels and Happiness ($F(1, 57) = 35.30$, $p < 0.01$).

In Energy model, the Naturalness Coefficient effect became not significant ($F(1, 51) = 2.34$, $p = 0.13$), when the Pleasantness of the Salient Event was added as a predictor. The same happened in the analyses of the Happiness model, the Naturalness Coefficient became not significant, $F(1, 52) = 0.37$, $p = 0.55$.

Daylight Coefficient remained not significant in Energy ($F(1, 49) = 0.82$, $p = 0.37$) model as well as in Happiness model ($F(1, 50) = 0.50$, $p = 0.48$).

Adding the Pleasantness of the Salient Event into a model of Energy levels with subjective predictors, removed the trend of the Subjective Amount of Daylight, $F(1, 60) = 1.56$, $p = 0.22$ and became the only significant predictor in the model, $F(1, 60) = 12.56$, $p < 0.01$. The Subjective Amount of Nature remained not significant, $F(1, 60) = 1.67$, $p = 0.20$.

The Pleasantness of the Salient Event as well was the only significant predictor in the Relaxation model, $F(1, 60) = 5.71$, $p < 0.05$; the Subjective Amount of Nature, $F(1, 60) = 0.65$, $p = 0.42$, the Subjective Amount of Daylight $F(1, 60) = 2.68$, $p = 0.11$.

The same happened in the model of Happiness, where the Pleasantness of the Salient Event had a significant effect on the Happiness levels, $F(1, 60) = 41.05$, $p < 0.01$. The Subjective Amount of Nature ($F(1, 60) = 1.21$, $p = 0.28$) and the Subjective Amount of Daylight ($F(1, 60) = 0.56$, $p = 0.46$) were not significant.

The coefficients of the models are presented below in the Table 4.

Table 4: Model coefficients

	Naturalness coefficient			Daylight coefficient			The Amount of Mental Workload		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	0.04	1.52	0.13	0.02	0.91	0.37	0.22	4.11	0.00
Happiness	-0.02	-0.61	0.55	0.02	0.71	0.48	0.34	5.94	0.00
	How natural is the surrounding environment?			How much daylight there is in the surrounding environment?			The Pleasantness of the Salient Event		
Dependent Variable	Estimate	T-value	Significance	Estimate	T-value	Significance	Estimate	T-value	Significance
Energy	-0.13	-1.29	0.20	0.11	1.25	0.22	0.26	3.54	0.00
Relaxation	-0.06	-0.81	0.42	0.12	1.64	0.12	0.14	2.39	0.02
Happiness	-0.10	-1.10	0.28	0.06	0.75	0.46	0.44	6.41	0.00