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The Effects of Acquaintanceship on Restoration in Nature

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Abstract

This study investigated whether acquaintanceship during a social encounter in nature affects the process of restoration. The MIST (Montreal Imaging Stress Task) was used to induce participants with stress, who were mainly female 68% students ranging from 18 to 30-year - olds. After having been induced with stress participants either encountered no one, a stranger or a superior during a forest walk. Self-reports and physiological measurements in the form of heart rate were used to gain insight into the process of restoration in nature and the effects of encountering someone more familiar. The physiological data gave further support to the beneficial effects of nature on restoration. However, encountering a stranger did not aid restoration compared to meeting no one as it was expected from previous research. Instead an increase in heart rate was observed, just as after the encounter with the superior. In the superior condition an additional after effect occurred besides heart rate rising, with participant's sensation of being away from daily stressors being significantly lower, compared to that of participants meeting no one, or a stranger. These outcomes indicate opportunities for future research to further examine the effects of encountering familiar people on stress restoration in nature.

Keywords: Stress, Nature, Restoration and Acquaintanceship

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1. Introduction

"Look deep, deep into nature and then you will understand everything better" - Albert Einstein (Nichols, 2013). In order to make sense of today's increasingly demanding world many people are indeed seeking out nature. Studying how the environment of people affects them and vice versa, environmental psychologists have created an entire field of study, with the effects of nature on people's ability to recover from stress being one part of this study. Such research has found that within this process of restoration in nature, there is also a social component, which has gained more attention in recent years, revealing that encountering strangers on walks through nature can influence stress reduction (Rieder, 2013).

The following study aims to support and expand our knowledge on these social aspects of restoration in natural environments, by investigating whether there are differences in the restoration of stress when meeting more familiar people such as a superior compared to meeting a stranger. The current study will introduce this new branch of research within the social aspects of restoration in nature, by examining the effects of meeting a superior, when trying to restore from stress in nature, compared to meeting a stranger.

The introduction will clarify why the restoration of stress remains an important goal, as well as describe two theories that explain psychological restoration. Then it will be demonstrated why exposure to nature is beneficial for restoration of stress. Furthermore it will be explained why the social context of restoration within nature plays an important role and how this study aims to expand our knowledge in this field. Finally, the hypotheses of this study will be described.

1.2 Restoration in nature

Stress occurs after a perceived threat and has evolved as an evolutionary function, sharpening our senses, increasing attention, muscle tension, blood pressure, sweat gland functioning, helping our ancestors to survive (Grahn & Stigsdotter, 2010). In today's society, however, this fight-or-flight reflex occurs frequently and has been shown to be associated with negative consequences for individuals and is sometimes referred to as an illness itself. Some of these dangers of sustained stress include increasing the chance of depression, schizophrenia, anxiety, exhaustion and fatigue syndromes (Grahn & Stigsdotter, 2010). Stress is even considered as one of the leading causes of death in the developed world, and prevention of stress-related diseases are seen as a priority by many health organizations (World Health Organization, 2017). The restoration from stress is therefore seen as a crucial factor in pertaining people's health (Grahn & Stigsdotter, 2010).

Amongst young adults, one of the favorite coping mechanisms against stress is exercise or walking, with 51% of millennials reporting to exercise or walk in order to cope with stress (Loehrke & Snider, 2013). Physical activities such as exercise and walking have been shown to help against stress, and even improve mental health (U.S. Department of Health and Human Services, 1999). A study by Hull and Michael (1995) demonstrated that walking within urban parks was directly correlated to stress reduction; further decreasing stress levels the longer participants remained in a park. Staats (2012) recapped Wohlwill's (1983) reasoning for nature being preferred over urban setting during stress restoration as "the lower arousal potential of nature, compared to that of urban environments, is caused by lower psychophysical intensity of stimulation-lower sound levels, colors that are less intense and lower complexity less contrast, more continuity, more gradual transitions in shapes and succession of stimuli, and slower movement" (p.446). Besides stress reduction other mental, as well as physical health benefits associated with a greater contact with nature, include improved recovery from surgery, due to a view of nature (Ulrich, 1984).

Thus, it can be implied that contact with natural environments is beneficial for people's mental as well as physical health, and is especially helpful in aiding the reduction of stress. In order to understand why nature is so helpful in restoring from stress, two theories of psychological restoration will be explained.

1.3 Theories of psychological restoration

The two theories of psychological restoration important for this study are the Psycho-Evolutionary Theory (PET) and the Attention Restoration Theory (ART). The Psycho-Evolutionary Theory or Stress Reduction Theory (SRT) from Roger Ulrich (1983) suggests that the restoration of stress in nature originates from an adaptive trait in human evolution. Ulrich (1983) explained that nature has been representing the source of everything necessary to survive, and environments advantages for survival such as settings with calm water, still receive high preference ratings in contemporary research (Staats, 2012). People that are stressed experience restoration in nature since seeing patterns of nature evokes feelings of pleasantness and a sense of calmness (Staats, 2012).

The Attention Restoration Theory (Kaplan 1995; Kaplan & Kaplan, 1989) was one of the first theories focusing on psychological restoration. Developed by Rachel Kaplan and Stephan Kaplan in the 1980s, ART uses the concept of attention to explain why spending time in nature is so advantageous for restoration. ART divides attention into two types, the first type of attention is called directed or voluntary attention and can lead to directed attention fatigue,

and the second form of attention is called effortless or involuntary attention (Kaplan & Kaplan, 1989; Kaplan 1995). Directed attention refers to the voluntary efforts of people to focus their attention on tasks of importance to them at the given moment. These include any tasks that require our focus and attention. In order to be able to focus and give our attention to such a task, people have to disregard other distracting stimuli, which therefore costs energy (Kaplan & Kaplan, 1989; Kaplan 1995). Since this directed mode of focusing attention is strenuous, through blocking out these other stimuli, it can become exhausting and lead to attention fatigue. This attention fatigue lowers capabilities to perform tasks that require concentration, which can lead to frustration.

Nature can aid recovery from this attention fatigue as nature does not require directed attention at something specific, but rather allows people to be in the effortless and involuntary attention state, where they do not need to expend effort to focus on one aspect in particular. ART has identified four requirements for a restorative environment, being away, fascination, extent, and compatibility. From these requirements for a restorative environment the first one of 'being away' will play an important role in this study. Similarly important is Kaplan's (1995) work on an integrative framework that connects ART that focuses more on attention restoration, with Ulrich's (1983) PET focusing on stress restoration. Kaplan (1995) elegantly explains how directed attention is a key psychological resource in coping with challenges and that the experience of nature can aid stress restoration by recovering directed attention.

After understanding the need for stress reduction, nature's qualities in helping with this process and going over two theories explaining psychological restoration, we will now begin exploring the rather new ventures of the social aspects within this field of restoration.

1.4 The social context of restoration

Given the importance of restoration from stress and also given that the global population is increasing at a rate of 1.84% per year with already more than 54% of the global population living in urban areas (World Health Organization, 2017), it is not surprising that there has been an increasing interest in the social components of restoration. Research by Staats and Hartig (2004) indicates that restoration of stress, when in nature might be socially determined, with participants preferring to be with a friend in nature, depending on the situation being dangerous or not. Rieder's (2013) master thesis follows this indication and she further examined the social component of the restoration of stress when in nature. More specifically Rieder (2013) showed that participants induced with stress would restore even more in nature meeting a stranger during a forest walk, opposite to the previous consensus about solitude

being superior for stress reduction within nature (Wohlwill, 1983). In Rieder's (2013) study mentally fatigued participants indicated that they would be disturbed by the presence of another. However, instead of supporting this belief of meeting others having a negative effect on participant's restoration, the opposite was found when examining the cardiovascular stress measurements showing that encountering a stranger aided restoration. Due to their controversial nature, these research findings have sparked a series of questions regarding social norms and how they affect stress restoration.

For her master thesis, Van Duyn (2014) tried to replicate the effects of social encounters aiding stress restoration found by Rieder (2013) and predicted that the number of social encounters would affect participants' ability to restore from nature. In order to test this Van Duyn (2014) created three conditions of no encounter, one encounter such as in Rieder´s (2013) research; as well as the third condition consisting of five encounters occurring in one-minute intervals, with unfamiliar others appearing after approximately one minute. Van Duyn (2014) found a decrease in heart rate after the one encounter condition similar to Rieder (2013), however did not find any evidence that the number of encounters would have an effect on stress reduction.

The master thesis of Kessels (2016) investigated the social context of restoration, analyzing the effect of external social pressures on restoration in public parks within urban areas. Kessels (2016) explored whether people would follow injunctive norms related to 'politeness' and 'respect for privacy' when encountering a stranger. Based on these social injunctive norms, Kessels (2016) created a research design in which participants had to make a decision between two paths in nature with one having an unfamiliar other present and the other path being empty. Kessels (2016) found that most people would avoid a stranger on a path when given the choice and chose the empty path, even though she predicted that rejecting a potential encounter with another person when choosing between paths would lead to negative feelings such as guilt. Kessels (2016) included the mere presence effect in her research, arguing that the presence of others in people's environment directs their attention to those others reducing cognitive resources available, leading mentally fatigued participants to prefer avoiding social interactions. Research exploring the initial interaction between strangers by Berger and Calabrese (1975) reveals that there are social norms regarding interactions of strangers that lead to uncertainty, which can be unpleasant and could explain why stressed people would want to avoid these interactions. This liking for less social interaction when aiming to restore are hypothesized to be related to the lack of evaluative feedback when in nature, which has been named as one of nature's most charming attribute when aiming to

restore (Wohlwill, 1983). This preference for less evaluative feedback brings us to the aims of this research.

1.5 Aim of the present study and hypotheses

The overall aim of the present study is to further investigate the social components of stress restoration when in nature. This study refers to the increased social obligation to greet someone with increasing acquaintanceship (Bicchieri, 2006), and will investigate how such normative expectations can influence restoration from stress when being in nature. This study will test if there is a significant difference in stress restoration in nature when comparing an encounter with someone more familiar to encountering a stranger. More specifically it will be tested if meeting a superior that participants have been introduced to, will influence restoration from stress when in nature differently then encountering a stranger.

The reasoning behind meeting someone more familiar compared to a stranger, leading to a difference in restoration from stress stem from what has been mentioned earlier in the context of the Attention Restoration Theory (ART). The first requirement for a restorative environment was named by Kaplan & Kaplan (1989) Kaplan (1995) as 'being away'. Rieder (2013) explained this as "a person has to have a sense of 'being away' to gain psychological distance from routines that tax directed attention" (p.4). This sense of 'being away' and gaining psychological distance that Rieder (2013) mentioned, seems to be something different than what previous research has defined as solitude. The Oxford Dictionaries (2017) define solitude as "the state or situation of being alone", but in the context of restoration, solitude seems to have a different meaning. Long and Averill (2003) conceptualize solitude as "a state of relative social disengagement, usually characterized by decreased social inhibitions and increased freedom to choose one's mental and physical activities" (p.37). This latter definition comes closer to Kaplan & Kaplan (1989) division of 'being away' into the physical getting away from a situation and the psychological getting away from a stressor. Given the physical displacement of people from stressors when restoring in nature this study will focus on people's ability to create psychological distance from stressors of daily life.

Collado, Staats and Sorrel (2016) demonstrated that a link between nature and work related activities, as is the case with children of farmers, reduced abilities to restore in nature. Collado et al. (2016) focused on children and how being in an environment associated with work can constrain restoration. For the present study it is predicted that university students restoring in nature will be constrained in their process of restoration of stress when their work environment is brought to the setting in the form of a university superior passing by.

The initial aim of this research is to replicate the findings of Rieder (2013) concerning meeting strangers leading to more restoration from stress than not meeting anyone. Rieder's (2013) results showed that among stressed participants those having encountered a stranger during the forest walk experienced lower heart rates than those that encountered no one, which is a sign of stress restoration. The self-report and the physiological measurement results of conditions one and two will be compared to investigate if Rieder's (2013) results can be replicated. For the conditions, this means self-report and physiological measurement scores will show that participants in condition two experienced more stress restoration than participants in condition one.

Hypothesis 1: Meeting a stranger, during a walk through nature will not harm participant's ability to restore from stress, but can aid stress restoration.

The relationship that people can have with the person they are encountering while restoring in nature has not been investigated so far. The aim of condition three is, therefore, to initiate an acquaintance with a superior and allow this study to explore if the relationship that participants have with people they encounter while aiming to restore from stress in nature has an effect. In his book, Bicchieri (2006) describes that social norms are like the grammar of society and specify what is acceptable and what is not. Bicchieri (2006) explains that when in public greeting an acquaintance has something to do with respect for the other and that the slightest omission of doing so can offend the other and changes the relation to that person. Due to this higher requirement to interact with an acquaintance, and more being at stake compared to when passing a stranger, it is possible that participants will have higher levels of anticipation as well as stress when encountering an acquaintance especially when in the form of a superior. The social obligation to interact with an acquaintance could lead to the forfeit of the sense of 'being away' and having psychological distance from stressors of daily life, which is a requirement for a restorative environment (Kaplan & Kaplan, 1989; Kaplan 1995). Meeting an acquaintance in the form of a superior during a walk through nature could, therefore, hinder stress reduction. For the conditions, this means that self-report and physiological measurement scores will show that participants in condition three-experienced less stress restoration than participants in condition one and two.

Hypothesis 2: Meeting a superior, during a walk through nature will negatively influence the ability of participants to restore from stress.

2. Method

2.1. *Participants and design*

There is some disagreement as to which age group suffers the most from stress. With some arguing that due to physical and psychological changes, as well as an increase in diseases and losses of relatives the older generations experience more stress (Orsega-Smith, Mowen, Payne & Godbey, 2004). The opposite was discovered through an online survey by the American Psychological Association, which showed that millennials aged 18-33 suffered the most from stress. Besides from the 2,020 participants adults and older, the age group with an increase of stress were millennials, aged 18-33 (Loehrke, & Snider, 2013). The target group for this study has been millennials aging 18-33 years old who speak Dutch. Recruitment of participants was done through flyers, an online platform called Sona and approaching students inside the Faculty of Social Sciences. The incentive for students to participate was either earning 2 credits as a first-year student or 6 euros for all other participants. From the 86 participants that took part in this study 82 working data sets could be obtained. One participant wanted to stop the experiment because she nearly fainted during one of the early morning sessions of this experiment. For two participants the computer of the lab crashed during the videos and for the last missing data set there were complications with saving. From the 82 functioning datasets three participants did not fit into the desired age range of this study, with two being older than 33, being 38 and 59 and one participant being too young being 16 years old. From the remaining 79 participants, with functioning data sets, 54 were female. The age range was from 18-30 years of age with an average age of 21,3 years. 31 participants studied Psychology, 16 Pedagogical Sciences and 5 Medicine. The remaining 27 participants represented a diverse mix of studies. From the 79 participants 74 had usable physiological data for heart rate. The participants were randomly assigned to one of the three conditions, with condition one referring to the no encounter scenario, condition two referring to the scenario where participants encounter a stranger during the forest walk video and condition three refers to the scenario where participants are introduced and get acquainted to the superior before they encounter him during the forest walk video. The social encounter conditions of encountering no one, a stranger and Dr. Wit were the between-subject factors and the four phases, (MIST), (beginning of forest walk), (encounter) and (end of forest walk) of the experiment were the within-subject factors.

2.2. Montreal Imaging Stress Task

The MIST (Montreal Imaging Stress Task) was used to induce stress in all participants. This tool requires participants to answer arithmetic tasks under time pressure. The arithmetic

questions vary significantly in complexity, ranging from simply adding up to a combination of multiplication, dividing, adding and subtracting. By informing participants to be fast and correct before starting the task as well as evoking evaluative pressure during the task through arrows representing once own performance compared to the average performance, stress is induced into participants. Additionally, participants were informed between tasks that their current efforts are insufficient. This procedure of the MIST (Figure 1) has been shown to be a reliable and valid measurement for inducing stress in participants (Dedovic et al., 2005; Rieder 2013).

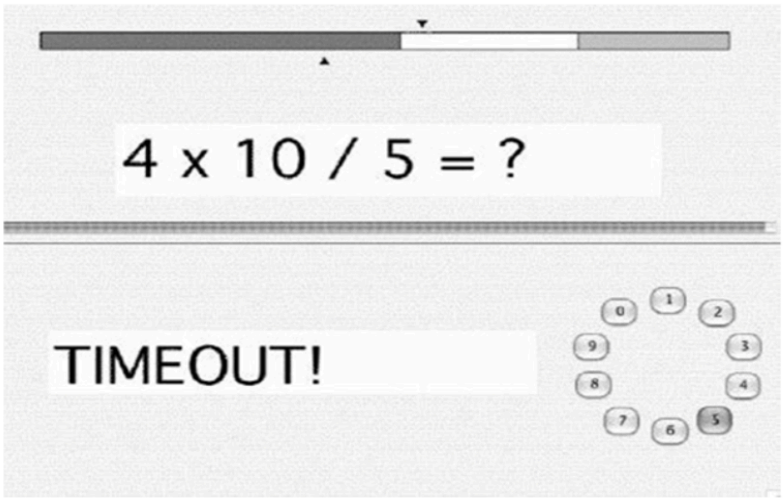

Figure 1 MIST

2.3. *Experiment*

This study was done in a lab using a combination of physiological measurements and self-report measures. Since this study follows up on Rieder's (2013) research, one aim of this study was to replicate her findings regarding the positive effect of an encounter with another person while restoring from stress in nature. This study is guided by Rieder's (2013) work of developing valid measures in this domain of stress reduction in nature. When she was developing her 6.29-minute long video, which simulated a walk through the natural environment of a forest, Rieder (2013) paid a lot of attention to making this image as close to reality as possible. She based her reasoning of using a video of a walk in nature on research findings demonstrating that images of nature that are close to reality, can provoke similar experiences of an actual walk in nature (Hetherington, Daniel, & Brown 1993). Rieder (2013) also made sure that the path through the forest walk did not show any signs of threat and was very clear and easy to follow. Following Rieder's (2013) successful example, the videos for this study were created under very similar circumstances. The forest walk videos were filmed during a sunny day using the camera of an iPhone 5, from which a scene be seen in Figure 2.

Figure 2 Scene from forest walk

2.4. Social encounter

To test if the relationship that people have to a person that they encounter while trying to restore in nature has an effect on people's ability to restore from stress, a pilot study was conducted. For this pilot study 72 people participated who were presented with a picture of the woman (Appendix B) that appears in the simulated forest walk video of Rieder (2013). Participants were asked if meeting such a person when aiming to restore in nature would influence their ability to restore from stress. The results of this part of the pilot showed that more than half of the participants indicated that meeting such a person as shown on the picture would have a positive effect on their ability to restore from stress in nature. From the participants the main feedback for this pilot study revolved around the relationship they had to the student shown in the video, with many participants declaring that the relationship that they would have with the person they would meet when trying to restore in nature would be an influential factor on this process. The initial idea was that this study would manipulate the relationship that participants will have to the actress in the video by introducing her as a superior. However to make sure that such a manipulation would be effective in acquainting participants to the actress and create a reference to students work environment another pilot study was conducted. This second pilot was a between-subject comparison between introducing

the actress as a normal woman compared to introducing her as a superior. For this second pilot study, 67 people participated. 32 participated in the condition of answering the survey without the introduction sentence about the actress and just interpreted according to meeting the woman they saw on the picture. 35 participants participated in the condition of meeting the woman (called Ms Emma Borten) with the introduction sentence "Please imagine that you are trying to recover from stress and that while you are restoring during a walk through a park or forest you would encounter the woman below. The woman below is called Emma Borten. Ms. Borten is 25 and a Ph.D. candidate in Statistics for which she also teaches workgroups at Leiden University. Ms. Borten is part of the committee that is responsible for checking for fraud and plagiarism in papers submitted by students." This more elaborate introduction aimed to make the participants more acquainted with the woman in the video and elicit realistic feelings of meeting a superior whom is representing someone from the students work environment. The hypothesis for this pilot study was that the introduction sentence making the participants acquainted with the actress would influence social obligations and normative expectations. However, the results of the study show that there were no significant differences between how participants perceived the actress. The introduction sentence was therefore not a strong enough manipulation. The feedback from participants for the second pilot study was that the picture of the actress influenced their answers the most and that the introduction sentence was partially ignored because the picture showed the actress so very friendly and smiling. Participants also expressed their disbelief in imagining the twenty-five-year-old actress on the picture as a supervisor. Therefore a new video and actor had to be found for which it was important that the actor would be seen as believable and more neutral.

The new actor is Dr. Arjaan Wit of the Social and Organizational department of Leiden University (Figure 3). Dr. Wit has through his more mature appearance the advantage of being a realistic supervisor. Additionally, it was possible with Dr. Wit as an actor to ensure that during the encounter the actor used a more neutral facial expression. Rieder (2013) made sure that the female actress in her videos was wearing casual clothing and looked normal. For the new videos of the present study, the same can be said about Dr. Wit as an actor. Dr. Wit is also wearing normal clothing so that he can be seen both as a superior as well as a normal stranger walking by. Rieder (2013) conducted a personality test on her female actor with 20 participants rating the degree to which her actress could be perceived as scary. The female actress received low scores on characteristics of scary, threatening, vain, dominant and excitable. It was, therefore, safe for Rieder (2013) to assume that the female actress represented someone non-threatening. The same was done for Dr. Wit by translating Rieder's (2013) pre-test measure

from Dutch to English and asking participants to evaluate a picture from Dr. Wit on the same characteristics. The outcome of this pre-test measure (Appendix A) was that Dr. Wit is not perceived as scary and that it is safe to assume that Dr. Wit as an actor represents someone non-threatening. 20 participants were asked to participate in the evaluation of Dr. Wit and were given the picture of Dr. Wit seen in Figure 3 below. The participants of this pre-test had to choose between characteristics such as being 1(unfriendly) up to 7(friendly) on a scale from 1 to 7. Participants attributed lower scores to Dr. Wit on characteristics such as scary (M= 2.6, SD=0.88), threatening (M= 3.3, SD=1.17), vain (M= 3.0, SD=1.27), dominant (M= 3.6, SD=1.18), excitable (M= 4, SD=1.31) and abnormal (M= 2.75, SD=1.14). These results show that Dr. Wit is not scary, threatening, vain, dominant, excitable nor abnormal. Dr. Wit was evaluated as only slightly higher on the characteristics of being friendly (M= 4.55, SD=1.09), pleasant (M= 4.4, SD=1.6), and trustworthy (M= 4.75, SD=0.89). These results confirm that the efforts of finding a non-threatening yet more neutral actor with whom the manipulation can work have been successful.

Figure 3 Picture of pre-test evaluation

The new video with Dr. Wit present is 4 minutes and 54 seconds long and Dr. Wit becomes visible after 2 minutes and 55 seconds of the video. The encounter with the 57-year

old occurs with him slowly approaching from the end of a path, which is clearly visible. It takes 42 seconds for Dr. Wit in the video to be right in front of the participant. While passing the participant he looks at the participant but does not greet. The moment when Dr. Wit is right in front of the participant can be seen in Figure 4.

Figure 4 Actor Dr. Wit during forest walk

2.5.Procedure

Once participants arrived at the experimental laboratory, located in the Faculty of Social Sciences of Leiden University, they received a brief explanation of the study and were asked to sign an informed consent form. Each participant was then randomly assigned to one of the three conditions. All participants, regardless of the condition they were assigned to, were made familiar with the physiological measurement tools and underwent a stress measurement used to

gain a base measure of the participants' stress levels, by having them watch a relaxing video for 5 minutes. After watching this baseline video participants did the MIST stress-inducing task. Then, depending on which condition the participant was in, they were or were not introduced to Dr. Wit and started watching one of the videos of the forest walk where they did or did not encounter Dr. Wit depending on the condition the participant was in. After having watched the video participants were asked to fill in the self-report measurements and the manipulation checks were administered. After having completed the experiment, participants were debriefed and rewarded with 2 credits or 6 euros.

2.6. Measures

To create a comparable replication of Rieder's (2013) findings necessary for hypothesis 1, similar measures were used during this study. These measures include a baseline relaxation score, stress manipulation check, self-reports and physiological data in the form of analyzing the heart rate of participants.

2.6.1 Manipulation checks

Relaxation score

In order to control for stress levels before the experiment, participants were shown a very relaxing diving video where they saw underwater sea life in a calming atmosphere. During the final minute of this baseline video, an average heart rate was measured representing a resting heart rate.

Stress manipulation check

The ability of the MIST of inducing stress was measured by comparing the baseline heart rate to the heart rate during the MIST using a paired sample t-test. Additionally, the difference between the PANAS scores before the MIST and after the MIST was compared.

Familiarity Check

After the experiment participants in condition two were asked if they knew and could recognize the person they encountered during the video. This was done to ensure that participants in condition two did not know Dr. Wit and therefore encountered a stranger.

2.6.2. *Physiological measurement, Heart rate (Hr)*

The heart rate of participants was measured using an electrocardiograph (ECG), which defines the heart rate in beats per minute (bpm).

Equipment

The equipment necessary for conducting this research was a Biopac system to collect physiological data continuously during the experiment, and an electrocardiograph (ECG).

2.6.3. Analysis of physiological data

Rieder (2013) based her analysis of the participant's sympathetic nervous system on the primary function of stress, activating and mobilizing the body for action. This causes upon other physiological changes an increased heart rate, which will be the measure used in this experiment to assess stress. To investigate the effects of the different manipulations and to be able to compare them between the conditions different time periods were analyzed. Rieder (2013) calculated means of physiological measurements for six consecutive time periods during her experiment, nearly the same was done during this experiment. First an average of the last minute during the relaxation video or baseline was taken, second the average of the beginning minutes of the MIST test, third the mean of the first restorative minutes of the walk, fourth the average during the encounter and fifth an average of the effects after the encounter. Rieder (2013) had included one more interval number six of the physiological measurements during the last minutes of the walk (final restoration), however, for this study, this was not taken into consideration as the last minute of the video and the minute after the encounter would be mostly overlapping. The intervals for the physiological measurements are all one minute long except of the encounter interval, which is 53 seconds.

2.7.Analysis of the conditions

The first condition, of not encountering anyone while restoring in nature as well as the second condition, of encountering a stranger in nature were conducted very similarly to Rieder's (2013) research. For the control condition participants watched the video with no one present. For the second condition participants watched the video with Dr. Wit present but did not receive any information about Dr. Wit prior to watching the video. In each condition, heart rates were measured throughout the entire experiment.

For the third condition, an introduction of Dr. Wit occurred before watching the forest walk video. Participants were introduced to Dr. Wit using an edited version of his profile on the university media platform. This includes a picture of him (Figure 3) and the text "In order to make you acquainted with Dr. Arjaan Wit here is a picture and description of him. Dr. Wit is 57 years old and is a Director of Studies at Leiden University. Dr. Wit is also on the Board of Course and Examination Regulations. Dr. Wit has, similar to you, also agreed to take part in

this experiment." This introductory sentence aims to elicit feelings of connectedness with Dr. Wit so that participants will be able to answer the self-reports as accurately as possible and are able to imagine how meeting a superior acquaintance would influence their ability to restore from stress in nature. Dr. Wit's specific achievements and leading role in the Social and Organizational Psychology department are not particularly highlighted to ensure that all participants independent of their studies are able to relate to Dr. Wit as a superior. By highlighting his position on the Board of Course and Examination regulations at Leiden University a superior role is emphasized that is relatable for all participants.

In order to keep the conditions as similar as possible conditions one and condition two also received an introduction to a superior. To ensure that this introduction did not manipulate the participants it was placed at the beginning of the study, introducing the supervisor of this study Dr. Henk Staats. Participants saw a picture of Dr. Staats (Appendix C) taken with a very similar background as that of Dr. Wit and also received an introduction of him "This is Dr. Henk Staats, who works for the Social and Organizational Psychology department of Leiden University. Dr. Staats is our supervisor for this research and asked us to tell our participants that he is available for questions regarding this experiment. Dr. Staats is not taking part in this experiment."

The idea for the design of this manipulation stem's from Antheunis, Valkenburg, and Peter (2010) who investigated in their research "Getting acquainted through social network sites: Testing a model of online uncertainty reduction and social attraction" how people used social network sites such as Facebook to decrease uncertainty about unfamiliar people viewed online. One of the uncertainty reduction strategies used to gain information about a person online was the passive strategy. The passive strategy involves observing the target persons' profile discreetly, which includes viewing the persons picture and a self-description of the person (Antheunis, Valkenburg & Peter, 2010). Antheunis, Valkenburg, and Peter (2010) results showed that the passive strategy was the most frequently used uncertainty reduction strategy with nearly all (98.9%) participants using some sort of passive strategy in order to get more acquainted with the target person online. With 90% of young adults ranging between the age of 18 up to 29 using social media websites in 2015 (Pew Research center Internet and Technology, 2017), it can be assumed that participants of this study were familiar with the design of this manipulation and were able to reduce uncertainty and become more acquainted with Dr. Wit having received a picture and description of him. For the third condition participants' stress levels were also measured analyzing heart rates and self-reports. The

differences between the three conditions, therefore, are based on the relationships that participants have with the actor present or not present in the video.

2.8.Self-reports

Rieder's (2013) original self-report measurements have been adjusted by the Master students following her research. Van Duyn (2014) for example focused her self-report measurements more on the perception of the safety of participants. More relevant to this study is that Van Duyn (2014) included a mood measure of participants in the form of the PANAS scale. Kessels (2016) focused on the social norms during an encounter, and her work on a self-report scale with five components on the expectancy of participants of a forest walk was applied. This study has added self-report measures relating to who participants encountered, either someone unfamiliar or someone that participants got acquainted to.

Mood measure Short form of PANAS

Using confirmatory factor analysis on a large sample (n=2651) ranging from 18-79 years of age Mackinnon et al. (1999) demonstrated that the short form of the PANAS with only 10 items is a recommendable instrument for assessing positive and negative Affect. This short form of the PANAS is especially useful in order to minimize the efforts of participants when they have to fill in such a survey several times, such as in this study. McIntyre, Watson and, Cunningham (1990) showed that social interactions and exercise increased positive affect, whereas test stress did not have an influence on positive effect. Negative affect, on the other hand, was increased significantly by test stress but neither by social interaction nor exercise. For this study, these results are so interesting because after attaining baseline positive and negative affects of the participants, it was possible to compare these scores with the scores of participants after having been induced with stress through the MIST and then after having watched the forest walk video. The PANAS consisting of 10 items asked participants to what degree do you feel:

1. Van Streek = Upset
2. *Uitgelaten* = Excited
3. Overstuur= Distressed
4. Angstig= Scared
5. *Enthousiast*= Enthusiastic
6. *Alert*= Alert
7. *Geïnspireerd*= Inspired
8. Nerveus= Nervous
9. *Vastberaden*= Determined
10. Bang= Afraid

The Dutch positive affect measures are underlined and in italics. The results of the PANAS were analyzed through a within subject comparison. The PANAS was administered after the baseline (Panas1) after the MIST (Panas2) and after the forest walk Video (Panas3). The 10 questions of the PANAS are divided into two categories positive and negative affect. Numbers 2,5,6,7 and 9 measure positive affect and numbers 1,3,4,8 and 10 measure negative affect. By combining the 5 positive items a variable PApanas1 (positive affect panas1) was created and similarly combining the 5 negative items a variable NApanas1 (Negative affect panas1) was created. The same was done for Panas2 combining the 5 positive items a variable PApanas2 (positive affect panas2) was created and similarly combining the 5 negative items a variable NApanas2 (Negative affect panas2) was created. The same was done for Panas3 combining the 5 positive items a variable PApanas3 (positive affect panas3) was created and similarly combining the 5 negative items a variable NApanas3 (Negative affect panas3). Each combination of items was checked for sufficient levels of internal consistency.

- PApanas1 (positive affect panas1, Cronbach's alpha 0.70) and NApanas1 (Negative affect panas1, Cronbach's alpha 0.84) represent the baseline measures of affect
- PApanas2 (Cronbach's alpha 0.66) and NApanas2 (Cronbach's alpha 0.82) represent the participant's affective state after the MIST
- PApanas3 (Cronbach's alpha 0.78) and NApanas3 (Cronbach's alpha 0.84) represent the participant's affective state after watching the forest walk video

Experience of Restoration and contact experience

Kessels (2016) conducted a Principal Factor Analysis (PCA) on the items relevant to the experience of restoration and contact experience of the walk. Using the eigenvalues-larger-than-one criterion she derived five components. These five components each reached sufficient levels of internal consistency 'sensitivity to behavioral norms' (Cronbach's alpha 0.86) =, 'negative effects of presence of others on restoration' (Cronbach's alpha 0.81), 'perceived likelihood of restoration' (Cronbach's alpha 0.86), 'social stimulation' (Cronbach's alpha 0.67) and 'opportunity for social contact' (Cronbach's alpha 0.76). In this study, the same questions about the experience of restoration and contact experience during the forest walk were asked. To check if the internal reliability was also high enough during this study, Cronbach's alphas were done for each component.

Sensitivity to Behavioral Norms: Adjust behavior, Adapt to people, Take people into account, Being judged, Being observed, Being restricted (Cronbach's alpha 0.90).

Negative Effects of Presence of Others on Restoration: Others distract, Others negate attention

to nature, Others negate effects of nature, Others reduce relaxation, Others lead to thoughts of mundane matters (Cronbach's alpha 0.87).

Perceived Likelihood of Restoration: Unwind completely, Become myself again, Relax/Calm down, Renew energy (Cronbach's alpha 0.92).

Social Stimulation: Many things going on around, See lots of different people, Many people around (Cronbach's alpha 0.74).

Opportunity for Social Contact: Opportunity to share experiences, Opportunity to make contact (Cronbach's alpha 0.61).

Kessels (2016) also added 5 questions more specific to her own study regarding the social expectations of encountering people during a forest walk.

Social expectations during an encounter: Not nice to walk away from someone, Not nice to start a conversation with someone, Burden someone by approaching them, expected of me to leave others alone, expected of me to approach other. Also for the 5 items of this sixth component, the internal reliability was high enough. (Cronbach's alpha 0.70).

Being away questions

From the original measure of restorative quality in environments by Hartig, Korpela, Evans, and Gärling (1997) the scale focusing on the sensation of "being way" was extended. Besides asking about the experience of escaping other sensations during the forest walk and the walk in this environment allowing to get a good break from day-to-day routines, a number of items were created asking if the forest walk protected against unwanted distractions, if the forest walk gave the sensation of not having to do things that one did not want to do, and it was asked if during the forest walk one could let go of all obligations. The internal reliability of these five questions was high (Cronbach's alpha 0.87).

Condition-specific questions about the Encounter

As this study is the first to investigate the effect of acquaintanceship on the restoration of stress, condition-specific questions were created. Four items in condition two asked participants how pleasant, positive, annoying, stressful they found it to encounter a stranger. For condition three four items asked participants how pleasant, positive, annoying, stressful they found it to encounter Dr. Wit.

3. Results

3.1 Manipulation Check

3.1.1 Stress manipulation check

The ability of the MIST of inducing stress was checked using a paired sampled t-test for comparing the mean baseline heart rate to the mean heart rate during the MIST for the 74 participants with usable heart rate data. The paired sampled t-test revealed that the increase of 1.6 heart beats per minute during the MIST is significantly higher compared to participants heart rate during the baseline video $t(73)= -2.72$, ($p< 0.05$). This increase in heart rate indicates that the MIST was successful in inducing stress into the participants. Additionally, to analyzing the heart rate differences the difference between the PANAS scores before the MIST and after the MIST were compared using a paired sampled t-test. The means of the PANAS for positive affect before the MIST $M = 13.02$ (SD = 3.4) compared to after the MIST $M = 11.28$ (SD = 3.2) decreased changed significantly $t(78)= 4.97$, ($p<0.05$). The means of the PANAS for negative affect before the MIST $M = 6.73$ (SD = 2.7) compared to after the MIST $M = 9.52$ (SD = 3.8) increased significantly $t(78)= -7.18$, ($p<0.05$). Especially this increase in negative affect has been shown to be indicative of test stress (McIntyre, Watson & Cunningham, 1990). Based on both the differences in heart rate as well as the differences in affect it can be assumed that the MIST successfully induced stress into the participants.

3.1.2 Familiarity Check

After the experiment participants in condition two were asked if they knew and could recognize the person they encountered during the Video. From the 24 participants in condition two, seven indicated that they recognized the person they encountered. However from these seven participants none was able to identify Dr. Wit and five out of the seven falsely identified Dr. Wit as “Dr Henk Staats, Hans S(Projectleider), de onderzoeker, de professor or hendriksen”. It can, therefore, be assumed that participants in condition two did not know Dr. Wit and therefore encountered a stranger. For condition three it was not checked if participants recognized Dr. Wit because they received a picture and introduction of him right before watching the forest walk video in which they encountered him. It was assumed that participants would recognize Dr. Wit as they were introduced to him less than three minutes before meeting him, however to be absolutely sure future research could ask participants to identify him.

3.2 Heart rate analysis

A repeated measure ANOVA was conducted to compare the heart rate differences of participants. The within-subject factors were the different phases each participant went through during the experiment. For each of these phases, the MIST and the three time periods during the forest walk, at the beginning (first 60 seconds of the video), during the encounter (53 seconds encounter) and afterwards (last 60 seconds of the video), the baseline heart rate of each participant was subtracted to attain a comparable difference score. The between factor scores were the three different conditions, no one present, encountering a stranger and encountering Dr. Wit. For heart rate there was no main effect for the between subject factor Condition that participants were in $F(2,71)= 0.63$, ($p=0.53$). However, there was a significant interaction effect between Phases and Condition $F(4.8,170.6)= 3.27$, ($p<0.05$). The within-subject analysis illustrated in Table 1 shows that peoples heart rate differs depending on the phase they were in during the experiment. With the difference between phases being highly significant $F(2.4,170.6)= 44,63$, ($p<0.01$).

Table 1. *Heart rate differences during each phase between conditions*

Mean(Std. Errors)	MIST	Beginning forest walk	Encounter	After Encounter
No Encounter	1.09(1.02)	-4.55(1.05)	-1.88(1.17)	-2.08(1.07)
Encounter Stranger	1.28(1.04)	-3.17(1.07)	-3.39(1.19)	-0.30(1.09)
Encounter Dr. Wit	2.44(1.02)	-5.27(1.05)	-5.20(1.17)	-3.26(1.07)

* Note all scores represent values relative to the baseline score

In all conditions heart rate increased during the MIST, once again demonstrating its ability to evoke stress. Post hoc tests investigating the differences between phases revealed that once participants started to watch the forest walk video their heart rate lowered an average of 5.9 beats per minute compared to their heart rate during the MIST which is highly significant ($p<0.01$). This decrease in heart rate supports existing literature on the restorative effects of nature, even when simulated through a video (Hetherington, Daniel, & Brown 1993). For condition one no encounter took place and the initial large effect of restoration of an average decrease of heart rate -4.55(1.05) at the beginning of the forest walk video decreased to around a 2 beat per minute lower heart rate for the latter two phases of the video. Aiming to replicate Riders' (2013) findings (hypothesis one), it was expected that for condition two during the encounter phase participants heart rate would further lower. This is the case from -3.17(1.07) to -3.39(1.19) but not significantly. For condition three the opposite was expected that heart rate would rise when encountering the superior. This was the case with the heart rate increasing from -5.27(1.05) to -5.20(1.17), however again not significantly. Interestingly for both condition two and three is that even though there seemed to be no immediate effect of the

encounter, with heart rate not changing significantly, however after the encounter heart rate increased meaningfully in both conditions. In condition two the paired sample t-test shows that heart rate increased significantly from during the encounter -3.39(1.19) up to -0.30(1.09) after the encounter $t(23)= -3.28$, ($p< 0.01$). For condition three the heart rate increased significantly from during the encounter -5.20(1.17) up to -3.26(1.07) after the encounter $t(24)= -2.63$, ($p< 0.05$).

Figure 5 aids to illustrate the difference in heart rate between the four phases and between the conditions. Since there are differences already visible for the MIST (phase 1) and in the beginning of the video (phase 2) were there should not be differences between conditions, it seems that due to a small sample size, individual differences in heart rate had already an effect. This study will, therefore, emphasize on analyzing the differences of heart rate within each condition. The findings most essential to this study are that heart rate lowers in all conditions with the beginning of the forest walk (phase 2), that there is no significant effect during the encounter (phase 3) neither in condition two nor condition three and that in contrast to condition one where no encounter took place both encounter conditions two and three experience an after affect (phase 4) with an significant increase in heart rate.

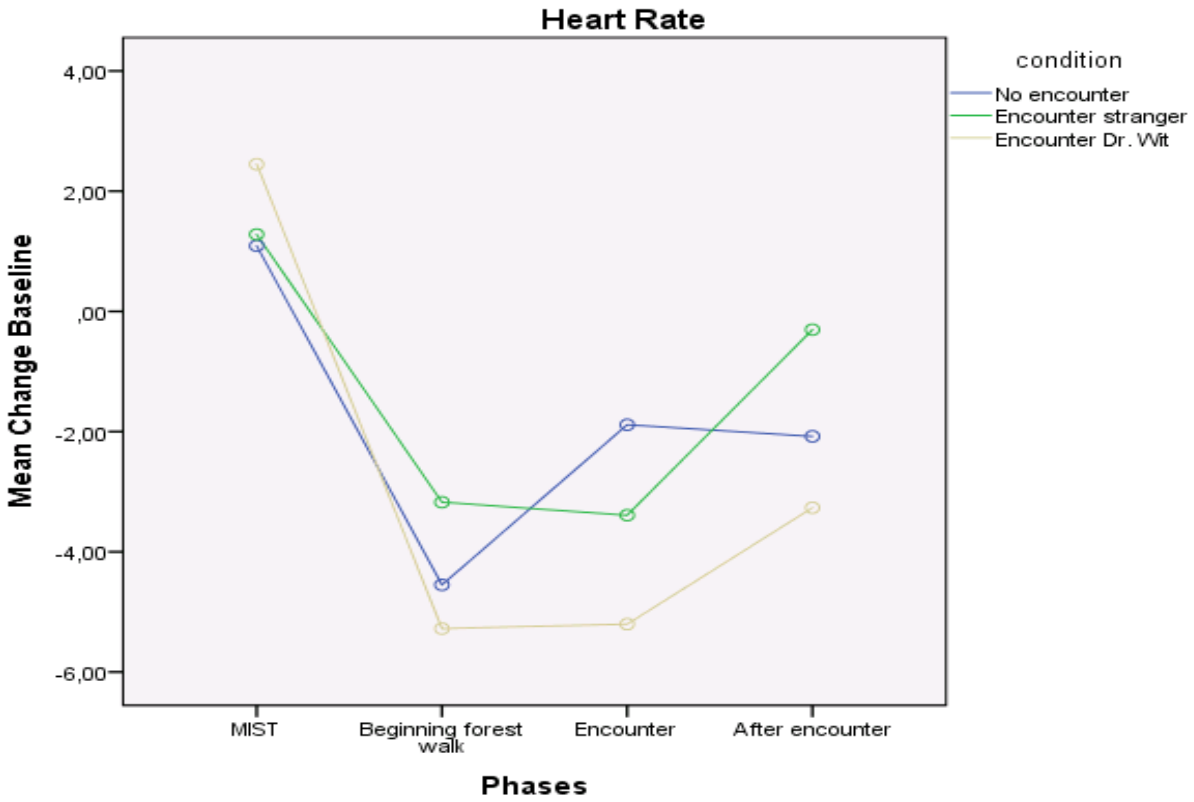

Figure 5 Difference scores from baseline heart rate along phases of the study between conditions

3.3 Self-reports

3.3.1 Affective state PANAS

A repeated measure ANOVA was conducted to compare the differences in the positive and negative affect of participants along the experiment, by comparing the PANAS scores of participants before the MIST, after the MIST and after the forest walk video. The within-subject factors were the three instances in which each participant filled in the PANAS during the experiment and the two measures of affect. For each of the Instances that a participant took the PANAS, before the MIST, after the MIST and after the forest walk, the items for each affect were combined so that each participant received a score of positive affect and negative affect for each of the three times they took the PANAS during the experiment. The between factor scores were the three different conditions, no one present, encountering a stranger and encountering Dr. Wit. For the PANAS measures of affect there was a main effect for the between subject factor condition that participants were in $F(2,76)= 116.98$, ($p<0.05$).
For the within subject factor of different Instances that a participant took the PANAS during the experiment there was a main effect $F(1,76)= 40.70$, ($p<0.01$) and for the within subject factor of affect there was a main effect $F(1,76)= 102.64$, ($p<0.01$). There was no significant interaction effect between the overall interaction of instances, affect and condition neither was there a significant interaction effect between instances and condition nor was there a significant interaction effect between for affect and condition, but there was a significant interaction effect between the different instances participants took the PANAS and their affect scores $F(1,76)= 31.57$, ($p<0.01$).

Analyzing these differences of participants affect during the experiment the PANAS can be especially conclusive when comparing participants affect after the MIST to after the forest walk video. The means of the PANAS for positive affect after the MIST $M = 11.28$ (SD = 3.2) compared to after the Forest walk video $M = 9.95$ (SD = 3.6) changed significantly $t(78)= 3.75$, ($p<0.01$). This decrease in positive affect is in contrast to what would be expected following McIntyre, Watson, and Cunningham (1990) research where social interactions and exercise increased Positive affect. The paired samples t-test shows that the means of the PANAS for negative affect after the MIST $M = 9.52$ (SD = 3.8) compared to after the forest walk $M = 6.35$ (SD = 2.5) decreased significantly $t(78)= 8.59$, ($p<0.01$). This decrease in negative affect is as anticipated, as it is a sign of a decrease in stress through watching the forest walk video. Table 2 also shows the differences between the conditions, with the no encounter condition not undergoing a significant decline in positive affect after the forest video, such as condition two and three are. The post hoc tests revealed that condition one is significantly different from

conditions two ($p<0.05$) and three ($p<0.05$), however conditions two and three are not significantly different from each other.

Table 2. *PANAS scores after the MIST test compared to after the forest video*

Mean(Std. Errors)	PA(MIST)	PA(Forest video)	NA(MIST)	NA(Forest video)
No Encounter	11.96(0.63)	11.37(0.68)	10.33(0.73)	7.03(0.47)
Encounter Stranger	11.12(0.65)	9.20(0.71)	9.20(0.76)	6.36(0.49)
Encounter Dr. Wit	10.74(0.67)	9.22(0.68)	9.00(0.73)	5.66(0.47)

*PA= Positive Affect and NA= Negative Affect

The PANAS scores, therefore, indicate that participants that encountered someone during their forest walk, independent, of who it was, had their positive affect negatively influenced as it can be seen in Figure 6.

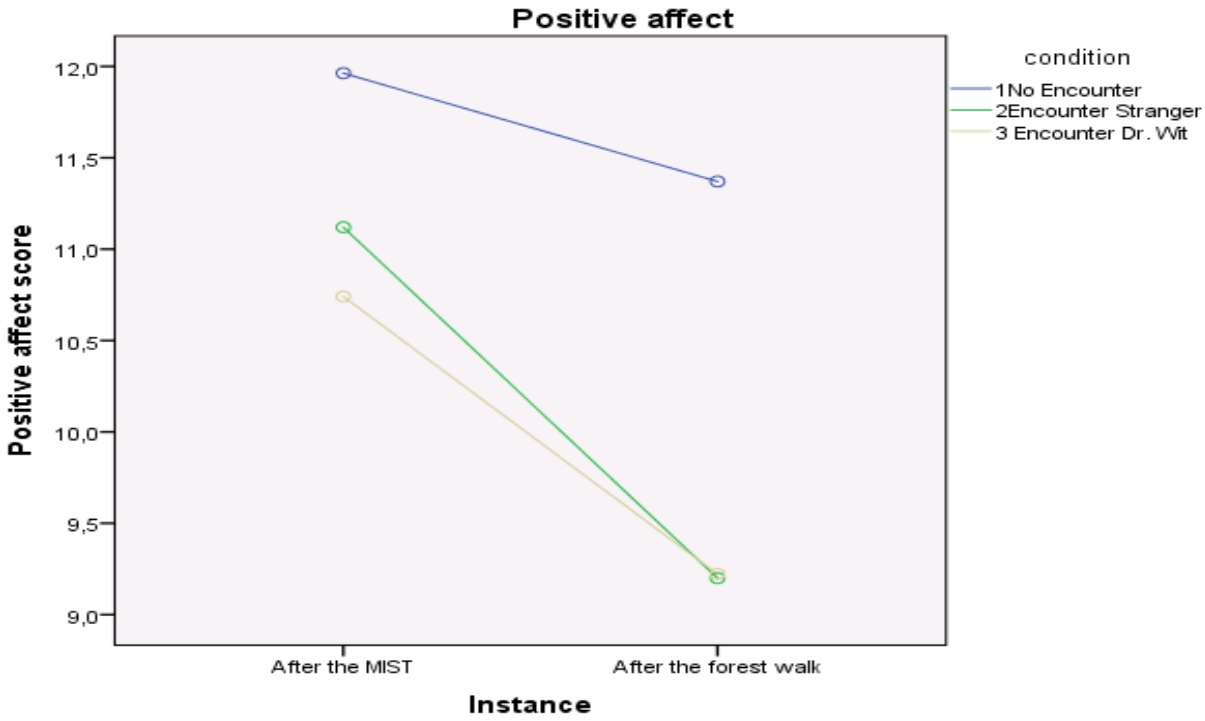

Figure 6 The change in positive affect

3.3.2 Experience of restoration and contact experience

Once participants completed the forest walk video and filled in the last PANAS they answered twenty-five questions about the experience of restoration and contact experience of the forest walk. From the 6 components created out of the 25 items only two components showed differences between the conditions. The between-subject test for Component one about the *Sensitivity to Behavioral Norms*, revealed that participants in condition one felt less observed and felt less like having to take others into account during the forest walk than participants in condition two. That this difference is significant $F(2,76)= 3.15$, ($p<0.05$), is not

very surprising as participants in condition one did not encounter anyone. More interesting is that even though there is no overall significant difference for component 2 among the conditions $F(2,76)= 2.8$, ($p=0.06$), there is a significant difference between condition one and three for component 2 ($p<0.05$). However, since component 2 asked about the *Negative Effects of Presence of Others on Restoration*, also this effect has to be viewed, as mere support for the design of the study as participants in condition one did not encounter anyone.

3.3.3 Being away

Participants also answered questions related to their sensation of 'being away' after watching the forest walk video. For this set of questions the between-subject analysis revealed that the condition manipulation seems to have been effective, as the condition participants were in affected their sensation of 'being away' significantly $F(2,76)= 6.03$, ($p<0.05$). No significant difference was found between condition one and two ($p=0.43$), but condition three is significantly different from conditions one ($p<0.05$) and two ($p<0.05$). The means of the conditions show that for condition one $M = 4.77$ (SD = 0.21) and condition two $M = 4.52$ (SD = 0.22) the sensation of 'being away' was rated much higher than for participants in condition three $M = 3.74$ (SD = 0.21). These results indicate that participants that got introduced to Dr. Wit in condition three lost their sense of getting a good break from day-to-day routines, unwanted distractions, not having to do things that one did not want to do, and sensation of letting go of all obligations. These results are aligning with hypothesis two.

3.3.4 Condition specific questions

Participants in conditions two and three were asked four additional items more specifically about how pleasant, positive, annoying, stressful they found their encounter during the forest walk. For two of these questions significant differences occurred, for how Annoying it was to encounter the person $F(1,52)= 7.79$, ($p<0.05$) and for how stressful it was to encounter the person $F(1,52)= 6.04$, ($p<0.05$). Participants in condition two found it below average $M = 3.48$ (SD = 0.28) annoying to meet the stranger, opposing to hypothesis 2 participants in condition three found it even less $M = 2.37$ (SD = 0.27) annoying to meet Dr. Wit. Participants in condition two found it below average $M = 3.12$ (SD = 0.29) stressful to meet the stranger, opposing to hypothesis 2 participants in condition three found it even less $M = 2.11$ (SD = 0.28) stressful to meet Dr. Wit. These counterintuitive results could stem from participants not wanting to give a negative rating to someone they just got acquainted to and know has taken part in this study and is a superior.

4. Discussion

The objective of this study was to explore whether an encounter with a more familiar person in nature would influence restoration. The reason why nature has such beneficial effects and aids restoration have been investigated by Kaplan and Kaplan, (1995), who created the Attention Restoration Theory (ART). ART states that for our demanding daily responsibilities we need to focus our attention, which is strenuous, as we need to block out other stimuli, and if done over a prolonged period can become exhausting and lead to attention fatigue (Kaplan & Kaplan, 1995). Kaplan and Kaplan (1995) explain that one of four reasons why nature is so beneficial for restoration is that people gain a sensation of 'being away', which was examined in this study. Within this restoration in nature, there is also a social component, which is very relevant as people are seldom alone in public places of nature. Following Berger and Calabrese (1975) who demonstrated that the interaction between strangers, and the social norms during such an interaction, can lead to unpleasant uncertainty which stressed people would rather avoid, Rieder (2013) investigated the effects of encountering a stranger during a forest walk on restoration. Evaluating both self-reports and physiological data Rieder (2013) showed that stressed participants report, that encountering a stranger has a negative effect on their restoration, whereas their physiological data indicated that encountering a stranger leads to even more restoration. Following research has tried to expand our knowledge about this social component within restoration in nature. The possibility of the number of encounters having an effect on restoration has been explored by Van Duyn (2014) who did not find that the number of encounters to be decisive for restoration. Furthermore, the external social pressures related to politeness and respect for privacy were investigated by giving participants a choice between proceeding a path with an unfamiliar person present or not. Kessels (2016) found that participants preferred to avoid the stranger even though she predicted that would lead to negative feelings such as guilt. However, the increased social obligation to greet someone with increasing acquaintanceship (Bicchieri, 2006), had until now not been taken into consideration during restoration in nature.

Using three different conditions no encounter, encountering a stranger and encountering a superior (Dr. Wit) this study tested the effects of acquaintanceship on restoration. After participants were induced with stress through the MIST, participants in the superior condition got acquainted with Dr. With through receiving a picture and a short description of him. During the forest walk video participants than either encountered Dr. Wit or no one. The level of restoration of participants was determined using both self-report and physiological measurements during the entire study.

In order to replicate earlier findings of Rieder (2013), that encountering a stranger can aid stress restoration in nature (hypothesis one), the physiological measurement of heart rate was compared throughout the different phases of the experiment. This analysis revealed that for all participants the MIST was effective in inducing stress and for all participants watching the forest walk video led to a significant decrease in heart rate and therefore a reduction of stress. For hypothesis one the difference in heart rate between before and during the encounter with a stranger was analyzed, revealing no significant change. After the encounter with a stranger, the initial restoration disappeared and participants in the condition encountering a stranger had again a heart rate close to their baseline measure. The first hypothesis could therefore not be supported, as the results indicate that encountering a stranger did not aid restoration in nature. After an adjustment for the initial rather large decrease in heart rate, the no encounter condition remained at a two beat per minute decrease in heart rate throughout the video. This outcome is in line with earlier theorizing and research (Wohlwill, 1983; Ulrich, 1984; Kaplan, 1995) demonstrating the beneficial effects of nature for restoration.

Regarding the second hypothesis, whether the encounter with a more familiar person in the form of a University professor called Dr. Wit would hinder the restoration of stress in nature a similar analysis of heart rate was done such as for hypothesis one. By comparing the heart rate before and during the encounter no significant difference was found, indicating that encountering a superior had no effect. However similar to the stranger condition, an after effect occurred after the encounter with the superior. In comparison to the heart rate during the encounter with the superior a significant increase of heart rate occurred after that encounter. This observation is in line with the second hypothesis and is the first suggestion that encountering someone familiar in the form of a superior negatively influences participant's restoration from stress in nature.

Besides analyzing the heart rate throughout the experiment several self-report measures were administered. One of these self-reports was the mood measure PANAS, which was used to check if the MIST was successful in inducing stress into the participants by measuring before and after this arithmetic's test. The decrease in positive and increase in negative affect after the MIST showed that the MIST was successful in inducing stress into the participants. However, besides this manipulation check, the PANAS was also used to explore the changes in affect after the forest walk video. This analysis showed that participants experienced a decrease in negative affect representing a decrease in stress after watching the forest walk video. There is also a difference between conditions with the encounter conditions two and three leading to a decrease in positive affect. As this effect is not present in the no encounter condition it seems as

if independent, of who participants meet a negative influence on positive affect occurs. In comparison to the no encounter condition the two encounter conditions thus both lead to an decrease in positive affect as well as an increase in heart rate, which indicate that meeting someone independent of who it is would be bad for stress restoration in nature. However, the more specific questions about the sensation of 'being away' from daily stressors, during the forest walk revealed significant differences between the conditions. The no encounter condition and encountering a stranger condition were the same, but encountering the superior Dr. Wit was significantly different from the other two conditions. With the no encounter condition and encountering a stranger condition having a significantly higher sensation of 'being away' than people who encountered Dr. Wit. These results are therefore in line with the second hypothesis as it demonstrates that participants that got introduced to Dr. Wit had a less of a sense of getting a good break from day-to-day routines, unwanted distractions, not having to do things that one did not want to do, and the sensation of letting go of all obligations, than participants who did not encounter anyone or who encountered Dr. Wit as a stranger. Taking the increase in heart rate after the encounter with a superior as the first support for hypothesis two this clear difference in the sensation of 'being away' is the second support for hypothesis two.

Another set of questions asked participants to specifically evaluate the encounter with the stranger or Dr. Wit depending on the participants' condition. These questions showed that participants encountering and evaluating Dr. Wit, found it significantly less stressful and annoying to meet Dr. Wit when they had been introduced to him before than the participants who met him as a stranger. These results are counterintuitive and could have many reasons such as that participants not wanting to give a negative rating to someone they just got acquainted to and know has taken part in this study and is a superior. Overall these results highlighted that the actual encounter with Dr. Wit was not unpleasant for participants. The experience of the forest walk was rated very similarly among the participants with no informative results, except that participants that encountered no one had less of a sensation having to take others into account and less negative effects of the presence of others.

Analyzing all different self-report measures as well as the heart rate differences it can be concluded that no further support could be found for Rieder's (2013) results that encountering a stranger during a forest walk aid restoration (hypothesis one). Nevertheless, both heart rate and self-report data suggest that encountering a more familiar person in the form of a superior during a forest walk can negatively affect the restorative qualities of nature and lead to a decrease in the sensation of 'being away' (hypothesis two). This negative effect on the restorative qualities of nature however only decreased the beneficial effect of nature and did not

cancel them completely so that participants still had a lower heart rate than during their baseline measurement. The negative after effect of an increased heart rate and the decrease in positive affect after the forest walk video thus occur in both encounter conditions, but in comparison to the other conditions it's the encounter with an acquaintance that lead to a much lower sensation of 'being away' from daily stressors. Due to the complexity of these noteworthy effects future research is needed to investigate whether Roberts Frost's famous quote "Two roads diverged in a wood, and I—I took the one less traveled by, And that has made all the difference" (Poetry Foundation, 2016), is also applicable to stress restoration in nature and if who you meet is the decisive factor in this process.

Accomplishments of this study include to have further supported the beneficial effects of nature for stress restoration and to have introduced a new branch to the field of restoration in nature by focusing on how the acquaintanceship during an encounter effects restoration. In combination with the multiple pilot studies it has been revealed that whom participants have to evaluate and encounter can be an influential factor of their experience in nature. In regards to the actor of this study this meant that several criterion had to be met such as representing both a normal stranger and a believable superior, while being non-threatening yet not extraordinarily pleasant either. This study therefore has to attribute much of its success to Dr. Wit's contribution in making the forest walk video, as he was perceived relatively neutral and enabled this study to attain unbiased results.

4.2 Limitations:

The results of this study have to be put into the perspective of the means of this study. First, this study specifically tested millennials aging from 18 to 30 years of age and can therefore reveal information relevant to this specific age group. Second, this was a lab study, which allowed us to control for all external factors but meant that participants only watched a simulated forest walk. Crucial sensations such as smell and touch were missing during this experiment. This limitation should however emphasize the results of this study because restoration and the effects of encountering someone should be accentuated in real life. The rather small sample size and unbalanced gender ratio of this study has to be seen as limitations, since the differences in heart rate between participants influenced the condition averages of heart rate already before the manipulations. The design of this study is also a limitation, as participants were not introduced to Dr. Wit in person. Also, the video quality could have been improved by using better equipment for this study such as using a professional camera to film the forest walk videos.

4.3 Future research:

Besides testing the effects of nature and encounters in real nature with genuine actors future research could improve the design of this study by making participants really acquainted with the person they are encountering in the video. A replication of this study could have participant get a formal introduction with the real Dr. Wit allowing them to really get acquainted to him. Following the results of this research, it can be suggested that future research should investigate the effects of encounters of people with other forms of familiarity. Examples of this could be that participants encounter a fellow peer student or a teacher. Other forms of familiarity could be coupled to authority such as encountering a police officer during a restorative walk in nature. In order to gain a direct comparison of how participants restoration is influenced by encountering a stranger compared to encountering someone more familiar, participants could first encounter a stranger and than afterwards the more familiar person. Future research could also investigate smaller and more specific time periods during the walk, in order to attain even more specific results. Even the encounter with local animals such as geese (appendix D) during a restorative walk could be insightful. Geese are big enough to impact a person's walk and can require their attention while not being particularly frightening. An encounter with geese that do not judge a person could then be compared to an encounter with a stranger or a more familiar person. In line with study it would be very interesting to find out why participants that encountered an acquaintance in the form of a superior had such a lower sensation of 'being away', which future research could examine with open questions after the encounter.

References

Antheunis, M. L., Valkenburg, P. M., & Peter, J. (2010). Getting acquainted through social network sites: Testing a model of online uncertainty reduction and social attraction. *Computers in Human Behavior*, *26*, 100-109. doi:10.1016/j.chb.2009.07.005

Berger, C.R., & Calbrese, R. J. (1975). Some explorations in initial interaction and beyond: toward a developmental theory of interpersonal communication. *Human Communication Research*, *1,*99-112. doi:10.1111/j.1468-2958.1975.tb00258.x

Bicchieri, C. (2006). *The grammar of society: The nature and dynamics of social norms*.

Collado, S., Staats, H., & Sorrel, M. A. (2016). A relational model of perceived restorativeness: Intertwined effects of obligations, familiarity, security and parental supervision. *Journal of Environmental Psychology*, *48*, 24-32. doi:10.1016/j.jenvp.2016.08.004

Dedovic, K. Renwick, R., Mahani, N. K., Engert, V., Lupien, S. J., & Pruessner, J. C. (2005). The Montreal imaging stress task: Using functional imaging to investigate the effects perceiving and processing psychosocial stress in the human brain. *Journal of Psychiatry &* of *Neuroscience, 30,* 319–325.

Grahn, P., & Stigsdotter, U. K. (2010). The relation between perceived sensory dimensions of urban green space and stress restoration. *Landscape and Urban Planning*, *94*, 264-275. doi:10.1016/j.landurbplan.2009.10.012

Hartig, T., Korpela, K., Evans, G. W., & Gärling, T. (1997). A measure of restorative quality in environments. *Scandinavian Housing and Planning Research*, *14*(4), 175-194. doi:10.1080/02815739708730435

Hetherington, J., Daniel, T. C. & Brown, T. C. (1993). Is motion more important than it sounds? The medium of presentation in environmental perception research. *Journal of Environmental Psychology, 13*, 283-291.

Hull, R., & Michael, S. E. (1995). Nature-based Recreation, mood change, and stress restoration. *Leisure Sciences*, *17*, 1-14. doi:10.1080/01490409509513239

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge: Cambridge University Press.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*, 169-182. doi:10.1016/0272-4944(95)90001-2

Kessels, F.J.M. (2016). Evaluating the role of social norms in restorative situational preferences. (Unpublished MSc Thesis, Leiden University)

Loehrke, J., & Snider, J. (2013). Who's feeling stressed? Young adults, new survey shows. Retrieved from https://www.usatoday.com/story/news/nation/2013/02/06/stress-psychology-millennials-depression/1878295/

Long, C. R., & Averill, J. R. (2003). Solitude: An Exploration of Benefits of Being Alone. *Journal for the Theory of Social Behaviour*, *33*, 21-44. doi:10.1111/1468-5914.00204

Mackinnon, A., Jorm, A. F., Christensen, H., Korten, A. E., Jacomb, P. A., & Rodgers, B. (1999). A short form of the Positive and Negative Affect Schedule: evaluation of factorial validity and invariance across demographic variables in a community sample. *Personality and Individual Differences*, *27*(3), 405-416.

McIntyre, C. W., Watson, D., & Cunningham, A. C. (1990). The effects of social interaction, exercise, and test stress on positive and negative affect. *Bulletin of the Psychonomic Society*, *28*(2), 141-143.

Nichols, M. (2013). *My Inner Nature*. Retrieved from http://talkingwriting.com/my-inner-nature

Orsega-Smith, E., Mowen, A., Payne, L., & Godbey, G. (2004). The interaction of stress and park use on psycho-physiological health in older adults. *Journal of Leisure Research*, *36*, 232-256.

Oxford Dictionaries. (2017). solitude - definition of solitude in English | Oxford Dictionaries. Retrieved from https://en.oxforddictionaries.com/definition/solitude

Pew Research center Internet and Technology. (2017). Social Media Usage: 2005-2015 | Pew Research Center. Retrieved from http://www.pewinternet.org/2015/10/08/social-networking-usage-2005-2015/

Poetry Foundation. (2016). *The Road Not Taken by Robert Frost*. Retrieved from https://www.poetryfoundation.org/poems/44272/the-road-not-taken

Rieder, M. (2013). Effects of a social encounter on restoration in nature. Unpublished MSc Thesis, Leiden University.

Staats, H., & Clayton, S. D. (2012). Restorative Environments. In *The Oxford handbook of environmental and conservation psychology* (pp. 445-458). New York: Oxford University Press.

Staats, H., & Hartig, T. (2004). Alone or with a friend: A social context for psychological restoration and environmental preferences. Journal of Environmental Psychology, 24(2), 199–211.

Ulrich, R. S. (1983). Aesthetic and Affective Response to Natural Environment. *Behavior and the Natural Environment*, 85-125. doi:10.1007/978-1-4613-3539-9_4

Ulrich, R. (1984). View through a window may influence recovery from surgery. *Science*, *224*(4647), 420-421. doi:10.1126/science.6143402

United States. Public Health Service. Office of the Surgeon General. National Center for Chronic Disease Prevention and Health Promotion (U.S.) President's Council on Physical Fitness and Sports (U.S.). (1999). *Physical activity and health: A report of the*

surgeon general. Atlanta, Ga.: U.S. Dept. of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Van Duyn, L. (2014). Restoration in nature and the effects of a social. (Unpublished MSc Thesis, Leiden University)

World Health Organsitation. (2017). WHO | Urban population growth. Retrieved from http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/

Wohlwill, J. F. (1983). The Concept of Nature. *Behavior and the Natural Environment*, 5-37. doi:10.1007/978-1-4613-3539-9_2

Appendix

Appendix A)

Pre-test Questionnaire

Dear participant,

For this master thesis research, the rating about the person you see on the picture is important. You choose on a scale from one to six the extent to which the following features fit this person best. Click in the box of your choice.

Picture

Following below are some characteristics of the person in the picture. Estimate the person and click on the corresponding box. Take your time to look back at the picture during each question.

1. Unfriendly Friendly

1 2 3 4 5 6 7

2. Relaxed Tensed

1 2 3 4 5 6 7

3. Introvert Extravert

1 2 3 4 5 6 7

4 Harmless Dangerous

1 2 3 4 5 6 7

5.Modest Vainglorious

1 2 3 4 5 6 7

6. Calm Irritable

1 2 3 4 5 6 7

7. Unkind Kind

1 2 3 4 5 6 7

8.Submissive Dominant

1 2 3 4 5 6 7

9.Unreliable Reliable

1 2 3 4 5 6 7

10. Gentle Threatening

1 2 3 4 5 6 7

11. Normal Abnormal

1 2 3 4 5 6 7

Appendix B

Initial actress

Participants of the second pilot study gave the feedback that the picture of the actress influenced their answers the most and that the introduction sentence was partially ignored because the picture showed the actress so very friendly and smiling. For the new video and actor, it was therefore important that the actor would be seen as more neutral

Appendix C

(ONLY FOR CONDITION 1 AND 2: Introductie van Dr. Staats)

Dit is Dr. Henk Staats, hij is universitair docent binnen de sociale en organisatorische afdeling aan de Universiteit Leiden. Dr. Staats is onze leidinggevende binnen dit onderzoek. Dr. Staats heeft ons gevraagd om te vermelden dat hij open staat voor vragen en opmerkingen betreffende dit onderzoek. Dr. Staats neemt zelf niet deel aan dit onderzoek.

Appendix D

Example of a possible encounter with an animal such as geese. Geese are not particularly frightening, but require the attention for a certain amount. Once they are gone however in comparison to encountering a real person people should not deliberate about what did the geese think of me.