Promoting Social Connectedness in International University Students by Using Storytelling and Virtual Nature

Serafima Anickova (s2578417)

Faculty of Behavioural, Management and Social Sciences, University of Twente

Bachelor's Thesis: Positive Clinical Psychology & Technology

1st Supervisor: Prof. Dr. Gerben Westerhof

2nd Supervisor: Kars Otten

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Abstract

The experience of studying abroad often poses challenges related to social adaptation and loneliness, emphasizing the significance of establishing strong social connections for well-being and academic success. This study investigated two potential approaches to facilitate social connectedness among international students: personal storytelling and exposure to spacious virtual nature, while also considering nature-relatedness. Four main effects were hypothesized: (1) personal storytelling positively influencing social connectedness, (2) spacious nature having a similar effect, (3) a significant increase in social connectedness from the combined effect of personal storytelling and spacious nature, and (4) nature-relatedness mediating the relationship between spacious nature exposure and social connectedness. Using convenience sampling, 99 international students participated in the study, which employed a 2x2 factorial design to examine the main effects of personal storytelling and spacious nature, as well as their interaction on social connectedness. Participants were randomly assigned to one of four conditions, involving exposure to either a spacious or non-spacious video and responding to a personal or neutral storytelling question. Pre- and post-questionnaires assessed social connectedness, and a nature-relatedness questionnaire was also administered. The results indicated a significant effect of personal storytelling compared to neutral one on the level of social connectedness. However, no significant differences in social connectedness between the spacious and non-spacious interaction conditions or their interaction with storytelling. These findings suggest that personal storytelling holds promise for fostering social connectedness while highlighting the need for further research to explore the potential of utilizing spacious nature and storytelling in enhancing social connectedness among international students.

Keywords: Social Connectedness, Virtual Nature, Spaciousness, Storytelling, International Students

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Studying abroad often brings various difficulties like social adaptation and loneliness, while having strong social connections is essential for better well-being and academic achievement (Gurung et al., 1997; Hawera & McCamley, 2020; Sawir et al., 2008). This paper discussed how international students' social connectedness can be facilitated by utilising personal storytelling and exposure to spacious virtual nature. Exposure to storytelling as well as virtual nature has been associated with happiness, and overall well-being, and may be key to fostering international students' social connectedness (Browning et al., 2020; Browning et al., 2023; McAdams & McLean, 2013; Weinstein et al., 2009).

From 2006 to 2021, there has been a significant rise in the number of international students studying undergraduate and graduate programs in the Netherlands (Nuffic., 2022). In 2006, Dutch universities welcomed 31,500 international students, whereas, in 2021, this number had increased to 115,100 students. More and more people are travelling abroad in search of better education and greater opportunities.

On one hand, such a decision could be a great investment in one’s future and help with career prospects. For example, Farrugia and Sanger (2017) found that academic experience abroad broadens one’s perspectives regarding possible career pathways as well as was proven to be useful for the development of communication and interpersonal skills. Sisavath (2021) agreed with such findings by suggesting that exchange abroad experience is associated with greater proficiency and interdisciplinary knowledge. Therefore, exchange programmes and abroad studying are quite beneficial and provide a great base for evolving both personally and academically.

But on the other hand, studying abroad may have its drawbacks. It can be argued that studying, which most often also suggests living, abroad requires serious motivation and psychological strength. People who migrate may face various challenges such as changes in their social environment, adaptation to a new culture and changes in their sense of self, which may harm their well-being and mental health (Bhugra, & Becker; 2005). For example, research suggested that due to a lack of networking in a new place of living as well as loss of contact with close ones, international students are highly likely to experience loneliness during their study abroad (Hawera & McCamley., 2020; Sawir et al., 2008). In turn, loneliness may put in danger psychological well-being by affecting perceived self-efficacy, and self-esteem, and by engaging maladaptive coping mechanisms (Hawkley & Cacioppo, 2010; McAvay et al., 1996; Shankar et al., 2011; Steptoe et al., 2004). In addition, according to Skromanis et al. (2018), international students are prone to engage in destructive and unhealthy behaviour, such as substance abuse or/and gambling. Thus, by moving abroad to pursue a greater education, one puts their psychological as well as physical health in danger.

Social Connectedness

Being an international student, as discussed above, may bring a lot of challenges, and requires quite stamina. Gurung et al. (1997) argued that networking in a place of living has an important impact on one's well-being. Weaver et al. (2022) explained that the desire to belong to a community is a basic human need that, when met, has a positive impact on both physical and mental health. And when it comes to a sense of belonging and perceived feeling of being valued as a member of a community, one can refer to the concept of *social connectedness* (Berkman et al., 2000).

According to Umberson and Montez (2010), experiencing social connectedness is crucial for one's health as it promotes life expectancy and resilience. Another study conducted by Gyasi et al. (2021), showed that strong social networks can decrease feelings of

loneliness, which is known to be quite damaging to one's health and well-being (Hawkley & Cacioppo, 2010; McAvay et al., 1996; Shankar et al., 2011; Steptoe et al., 2004). Moreover, Pym et al. (2011) discovered that social connectedness positively correlates with better academic performance. Similar findings were reported by Hm (2021), who stated that higher levels of social connectedness in immigrant students are associated with better achievements and general well-being. Thus, social connectedness is quite an important factor for well-being and can affect various aspects of international student's life.

Storytelling

To facilitate one's perceived social connectedness, it may be beneficial to refer to the tool of storytelling. Storytelling is one of the most commonly used method for establishing a connection with others and imparting our experiences (East et al., 2010). According to Hyland (2018), the act of personal storytelling involves actively summarising and presenting a particular part of our life experience. McAdams and McLean (2013) explained that sharing personal experiences can have a variety of beneficial impacts on mental health and well-being, including raising happiness levels, lowering stress levels, and elevating mood. Creating and sharing these personal stories assist people in making meaning of their experiences, establishing a sense of continuity in their lives, and forming an intelligible sense of who they are. Moreover, McAdams and McLean (2013) concluded that by fostering empathy, the sharing of experiences, and understanding, storytelling can also help people form social bonds. Indeed, according to Essary et al. (2021), engaging in personal storytelling writing task enchased willingness to share emotions and personal information which in turn helped in the creation of social bonds in school students. Thus, sharing personal experiences and stories can increase one's perceived social connectedness.

Nature and Nature Relatedness

Apart from storytelling, there are other possible ways to enchase one's perceived well-being and social connectedness: exposure to *nature*. Previous research has demonstrated that nature can inspire pleasant emotions and associations (Menzel & Reese., 2021). There is also a body of research suggesting that interaction with nature can improve not just physical and mental health but also facilitates one's well-being and cognitive functioning (Berman et al., 2012; Capaldi et al., 2014; Russel et al., 2013). Furthermore, as it is argued by Goldy and Piff (2020), exposure to nature can foster prosociality and engagement in social behaviour. For example, Guéguen and Stefan (2016) conducted an experiment, which showed that those who walked through a park were more likely to help a person who dropped a glove, suggesting that even short exposure to nature enchase pro-social behaviour. Moreover, Maas et al. (2009) found that green nature spaces in one's neighbourhood reduce feelings of isolation and foster a stronger sense of community. Thus, nature seems to have a positive impact on how connected to others we feel.

In addition, one may refer to the concept of *nature-relatedness*. Schultz (2002) defined nature relatedness as "the extent to which an individual includes nature within his/her cognitive representation of self" (p.67). In other words, it can be understood as a way people perceive nature and their relationship with it. Research shows that nature-relatedness is a major predictor of perceived happiness, vitality, and better well-being (Nisbet., 2011; Zelenski et al., 2014). Moreover, research showed that nature-relatedness mediates the positive effect of exposure to nature on one's well-being and perceived quality of life (Baceviciene & Jankauskiene, 2022; Mayer et al., 2009; Pensini et al., 2016). Thus, nature may play quite an important role in facilitating and maintaining good well-being. But one problem with exposure to nature may be that not everyone has an easy opportunity to nature.

Virtual Nature

As there are people who may not have access to nature, virtual nature (VN) may be a solution. According to Litleskare et al. (2020), VN refers to technology that in a variety of ways imitates and facilitates the experience of the natural world. There is strong research evidence that VN may improve one's mood, and well-being and even reduce anxiety (Browning et al., 2020; Browning et al., 2023; Weinstein et al., 2009). Moreover, van Houwelingen-Snippe et al. (2020a) found that simply watching videos with VN increased the perceived social connectedness of participants. And even though exposure to nature in vivo may have a better effect on general well-being, VN shows great promise (White et al., 2022). But for VN to have any effect, it should be designed in such a way, that would capture attention and facilitate cognitive functions. For that one can refer to Attention Restoration Theory.

Attention Restoration Theory

A psychological framework called Attention Restoration Theory (ART) describes how nature can improve cognitive and attentional functioning in people (Kaplan and Kaplan, 1989). The theory postulates that exposure to nature can restore attentional resources depleted by directed attention activities. According to ART, restorative effects of the environment are based on four principles: soft fascination, mystery, spaciousness, and compatibility. However, the current study will only focus on the principle of spaciousness as there is compelling scientific evidence that natural settings with high levels of spaciousness significantly increase prosocial behaviour and social aspirations by lowering self-centeredness as well as encouraging a more inclusive sense of self and a wider mindset (Piff et al., 2015; van Houwelingen-Snippe et al., 2020b)

Kaplan and Kaplan (1989) explained the principle of *spaciousness* as the physical and perceptual expansiveness of nature. According to van Houwelingen-Snippe et al. (2020b) as

well as Keltner and Haidt (2003), nature can be considered as spacious when the observer perceives themself as small as opposed to something big. The studies of van Houwelingen-Snippe et al. (2020b) and Otten et al. (2023) showed that VN high in spaciousness greatly boosts one's sense of social connectedness as well as the desire to engage in social interaction. So, nature scenes high in spaciousness can facilitate one's social connectedness.

Current Study

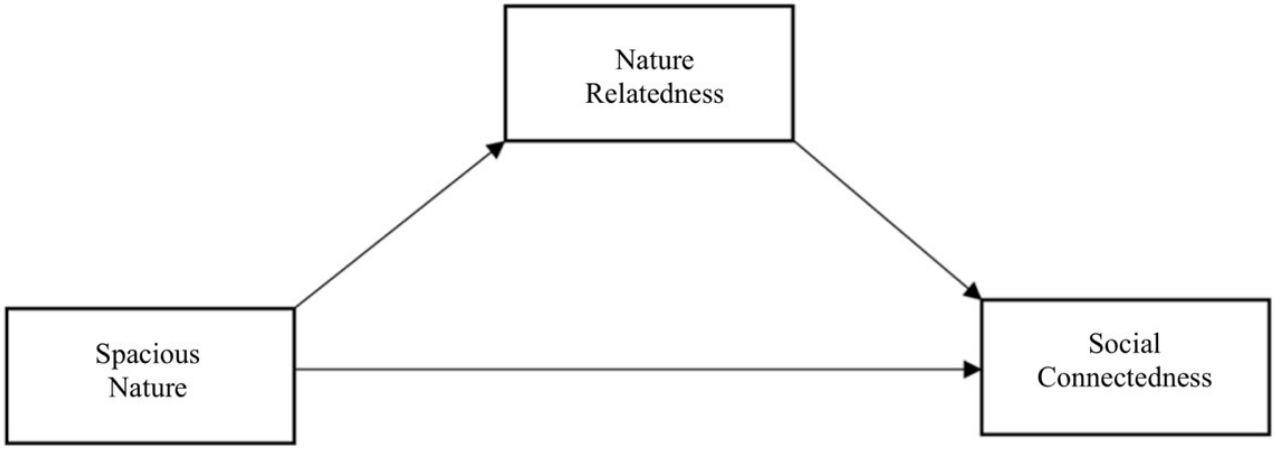
Exchange students and those who moved abroad for better future academic prospects are at risk of facing numerous interpersonal challenges and bad well-being due to a lack of stable social networks (Hawera & McCamley., 2020; Sawir et al., 2008). Thus, it is highly important to find a way to facilitate feelings of social connectedness in international students. The current study is aimed to explore the independent as well as combined effects of personal storytelling and spacious nature on the social connectedness of international students. As was mentioned above, there is scientific evidence that both storytelling and spacious VN have a positive effect on social connectedness (McAdams & McLean, 2013; Otten et al., 2023; Piff et al., 2015; van Houwelingen-Snippe et al., 2020a, 2020b). So, it was decided to compare levels of social connectedness among participants after engaging in personal storytelling versus engaging in neutral storytelling as well as compare the social connectedness scores after being exposed to spacious nature versus non-spacious nature. Moreover, according to Menzel and Reese (2021), exposure to nature helps to inspire pleasant emotions and associations. Thus, it can be expected that VN may facilitate one to engage in storytelling and share personal meaningful stories. But still, there is little research about the interaction of these concepts, thus, it was decided to explore such a relationship.

Further, it was decided to measure the mediation effect of nature relatedness between the spaciousness of nature and its effect on social connectedness (see Figure 1). The literature suggested that both: exposure to VN and high levels of nature-relatedness have a positive

effect on well-being and perceived happiness (Nisbet., 2011; Houwelingen-Snippe et al., 2020a; Zelenski et al., 2014). It is also suggested that nature-relatedness may mediate the relationship between exposure to real nature and higher levels of social connectedness (Pensini et al., 2016; Baceviciene & Jankauskiene., 2022; Mayer et al., 2009). Thus, it would be interesting to see if similar results would be obtained by using VN.

Figure 1

Expected Mediation Effect of Nature Relatedness Between Exposure to Spacious Nature and Social Connectedness



For that two research questions were formulated.

1. *What are the effects of personal storytelling and spacious nature on social connectedness?*
2. *Does nature relatedness mediate the relationship between exposure to spacious nature and social connectedness?*

In addition to two research questions, four hypotheses were constructed to investigate the effect of storytelling, VN, and nature-relatedness on social connectedness. First, personal storytelling was expected to trigger higher levels of social connectedness. Second, it was hypothesised that spacious nature will facilitate social connectedness. Third, the interaction effect is expected as personal storytelling may increase the effect of spacious nature on social

connectedness. And lastly, fourth, it is hypothesised that the nature-relatedness of participants would work as a mediator between exposure to spacious nature and social connectedness.

H1: Participants who experience personal storytelling will report higher levels of social connectedness compared to those who experience neutral storytelling.

H2: Participants who experience spacious nature will report higher levels of social connectedness compared to those who experience nature with lower spaciousness.

H3: Participants who experience the combined effect of spacious nature and personal storytelling will report higher levels of social connectedness compared to those who experience nature with lower spaciousness and neutral storytelling.

H4: Nature relatedness will mediate the relationship between exposure to spacious nature and social connectedness.

Methods

Design

The study design for this research was a 2x2 experimental design, with participants randomly assigned to one of four conditions: personal storytelling and spacious nature, personal storytelling and non-spacious nature, neutral storytelling and spacious nature, and neutral storytelling and non-spacious nature. Participants' social connectedness was measured using standardised scales before and after the intervention, while nature connectedness was measured only before the intervention. This study has been ethically approved by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

Participants

The sample consisted of 99 participants: 62 were women, 36 were males and 1 was non-binary/third gender. The ages of the participants ranged between 18 and 30 years old (M = 22, SD = 1.99). There were 20 different nationalities in total; however, most participants

were from Germany (49.5%) and Latvia (22.2%). The highest educational degrees for participants were a high school diploma (66.7%) and a bachelor's degree (19.2%). Socio-demographic data of participants across all conditions can be appreciated in Table 1. To check for differences in gender, nationality, and education between four conditions a chi-square test was conducted. No significant association was found between nationality and four conditions, X2 (9) = 6.098, p = 0.633. Similarly, the test did not find any significant association between gender and four conditions, X2 (6) = 4.514, p = 0.477. No significant association was found between education and four conditions, X2 (12) = 8.744, p = 0.754. Finally, when checking for differences in age between conditions, the Kruskal-Wallis test showed no significant differences, X2(3) = 2.953, p = 0.399.

Table 1

Socio-demographic Data of the Participants Across Conditions

Baseline characteristic	PS[a] x SN[b]		NS[c] x SN		PS x NSN[d]		NS x NSN		Total	
	n	%	n	%	n	%	n	%	n	%
Nationality										
German	15	53.57	10	50.0	15	60.0	9	34.62	49	49.5
Latvian	3	10.71	6	30.0	7	28.0	6	23.08	22	22.2
Russian	2	7.14	1	5.0	1	4.0	2	7.69	6	6.1
Other	8	28.57	3	15.0	2	8.0	9	34.62	22	22.2
Gender										
Male	7	25.0	9	45.0	10	40.0	10	38.46	36	36.3
Female	20	71.43	11	55.0	15	60.0	16	61.54	62	62.6
Non-binary/third gender	1	3.57	0	0	0	0	0	0	1	1.1
Education										
High school diploma	20	71.43	11	55.0	17	68.0	18	69.23	66	66.7

Table 1 Continued

	PS[a] x SN[b]		NS[c] x SN		PS x NSN[d]		NS x NSN		Total	
	n	%	n	%	n	n	%	n	%	n
Some college but no degree	4	14.29	2	10.0	3	12.0	2	7.69	11	11.1
Associate degree in college (2-year)	0	0	1	5.0	0	0	0	0	1	1.0
Bachelor's diploma	4	14.29	6	30.0	4	16.0	5	19.23	19	19.2
Master's diploma	0	0	0	0	1	4.0	1	3.85	2	2.0
Age	M	SD	M	SD	M	SD	M	SD	M	SD
	21.36	1.62	22.05	1.67	22.04	2.05	21.58	2.45	21.72	1.98

Note. n=99

[a] Personal Storytelling

[b] Spacious Nature

[c] Neutral Storytelling

[d] Non-Spacious Nature

Materials

To manipulate the participant's perceived social connectedness two videos and two storytelling questions were produced. First, a pilot study was conducted with a small questionnaire and nine nature videos to see which videos would be most effective in priming the participants (see Appendix A). The videos were produced using the software Virtual Nature Healing Environment provided by the BMS lab of the University of Twente. For ensuring a better immersion, it was decided to include sounds of nature in the videos (Ratcliffe et al., 2013). Based on the results of the pilot test, two videos were chosen: the one that was perceived as the most spacious and the one that was perceived as the least spacious. The two videos that were used in the final experiment can be appreciated in Figure 2 and Figure 3.

Figure 2

Spacious Nature

Figure 3

Non-Spacious Nature

Second, storytelling questions were constructed. Personal storytelling question addressed any positive memory that is associated with a prior watched video: “After watching the video, please try to remember a memory that has been meaningful to you. Describe it as detailed as possible. Think about: Who was the main person in this situation,

you, or someone else? When and where did this happen? What happened, what did you do or say, what did others do or say? Are there sensory details (see, hear, smell, feel, taste)? Can you picture it as a movie? Please take your time describing the memory".

A neutral storytelling question addressed what a participant did yesterday: "After watching the video, please write down what you have done yesterday. Try to remember it as detailed as possible and describe it. Think about where you were, who you were with and what happened. Please take your time describing the course of your day".

Instruments

To calculate nature-relatedness and social connectedness scores two scales were used. As was purposed by Nisbet & Zelenski (2013), the scores for the nature-relatedness scale were calculated by assigning numerical values to participants' responses on a six-item Likert scale (see Appendix B). An example of the item is: "My relationship to nature is an important part of who I am". Responses ranged from one (strongly agree) to five (strongly disagree), with a score of three indicating a neutral response. A total score was calculated for each participant by averaging their responses across all six items. Scores could range from one to five, with higher scores indicating greater agreement with the statements. Nisbet and Zelenski (2013), reported good reliability of the scale: a Cronbach's α=0.83. Similarly, in the sample of the current study reliability had a value of Cronbach's α=0.81.

The scores for the social connectedness scale, as was purposed by Lee and Robbins (1995), were calculated by assigning numerical values to participants' responses on an eight-item Likert scale (see Appendix C). An example of the item is: "I don't feel that I participate with anyone or any group". Similarly, to nature relatedness scoring system, responses ranged from one (strongly agree) to five (strongly disagree), with a score of three indicating a neutral response. However, a total score for pre and post-measures was calculated for each participant by summing their responses across all eight items. Scores could range from eight

to forty, with higher scores indicating greater agreement with the statements. The scale has high reliability (α=0.91) and good validity (Lee & Robbins, 1995). The reliability within the sample of the current study showed similar tendencies: Cronbach's α=0.91 for the pre-measurement and α=0.92 for the post-measurement.

Procedure

Participants for the study were recruited using the SONA system, and through convenience sampling by sharing the link via messengers and social media (Instagram, Facebook, WhatsApp, Telegram). Students who participated in this study through SONA received 0.5 credits when completed. To participate in the study, individuals were required to be at least 18 years old and have a stable internet connection. They also were advised to use a laptop and headphones for better emersion into the nature scene.

Firstly, participants were presented with an informed consent form. After that, participants were asked about their age, gender, educational level, and nationality. Next, participants were asked to fill out questionnaires measuring their nature-relatedness as well as social connectedness. Further, participants were randomly split into two groups to watch one video: the spacious nature video or the non-spacious nature video. The nature scenes included animated elements (moving trees, grass, flowers) and sound effects of nature. Afterwards, participants were again randomly split into two groups and were asked to answer either personal or neutral storytelling questions. Lastly, all participants were asked one more time to fill out social connectedness questionnaire and provide any comments regarding the study if they wanted to.

Data Analysis

To test hypothesises the statistical program RStudio, Version 2023.03.1+446 was used. First, missing value checks were performed on the dataset, and potentially problematic observations were identified. By deleting observations with incomplete or missing responses,

a data cleaning process was carried out to assure the integrity of data. This produced a clean dataset that was free of inaccurate or partial data and was prepared for the following analyses.

Second, it was decided to check assumptions of normality. For that, a Shapiro-Wilk test was performed. The test was performed on the entire sample for variables of nature relatedness, pre-measure of social connectedness and post-measure of social connectedness (see Table 2). The results indicated that the data were not normally distributed (all p-values < .05). Therefore, it was decided to use non-parametric tests for analysing the data.

Third, the difference score for social connectedness was calculated (post-measure – pre-measure = difference score) and used in all the analyses afterwards as a dependent variable.

Table 2

Results of Shapiro-Wilk test for variables of Nature Relatedness, Pre-Measure of Social Connectedness and Post-Measure of Social Connectedness

Variable	W	p-value
Nature Relatedness	0.97	0.03
Pre-measure of Social Connectedness	0.92	<0.001
Post-measure of Social Connectedness	0.86	<0.001

To test the hypotheses of the current study, three statistical tests were used. The first and second hypotheses were tested employing the Mann-Whitney test. This test is a non-parametric way of assessing if two independent groups differ on a single variable, which in the current study is a difference score of social connectedness (McKnight & Najab; 2010). In the case of the first hypothesis, the comparison was between personal and neutral storytelling groups. In the case of the second: spacious nature and non-spacious nature groups. As a criterion for the Mann-Whitney data analysis, a p-value of 0.05 ($p<0.05$) was used. Further, for the effect size of Mann-Whitney U tests, Cliff's delta statistic was used. Macbeth et al.

(2011) stated that it is a “non-parametric effect size measure that quantifies the amount of difference between two groups of observations…”. A group distribution overlaps entirely when the effect size is 0, while an effect size of +1.0 or -1.0 implies that there is no overlap between the two groups. To easily interpret Cliff’s delta effect sizes, Romano et al. (2006) purposed these cut-offs: insignificant effect (< 0.147), small effect (between 0.147 and 0.33), medium effect (between 0.33 and 0.474), or strong effect (> 0.474).

To test the third hypothesis the Aligned Rank Transform (ART) method was employed followed by the Analysis of Variance of Aligned Rank Transformed (ART-ANOVA). According to Wobbrock et al. (2011), this method allows to overcome limitations of other parametric approaches such as a requirement for normal distribution of the data. Authors explained that “ART relies on a preprocessing step that “aligns” data before applying averaged ranks, after which point common ANOVA procedures can be used” (Wobbrock et al., 2011, p. 143). As a criterion for the ART-ANOVA, a 95% confidence interval with a p-value of 0.05 ($p<0.05$) was used. After the analysis, as suggested by Kay (2021), the effect size of the interaction was calculated using partial eta-squared. For easier interpretation of partial eta-squared Miles and Shevlin (2001) suggested these cut-offs: small (0.01 – 0.059), medium (0.06 – 0.139), large (0.14 and above).

To test the fourth hypothesis Causal Mediation Analysis was conducted using Nonparametric Bootstrap Confidence Intervals with the Percentile Method. According to Imai et al. (2010), this method is highly effective when applied to nonparametric models. The dependent variable in this analysis was the difference score of social connectedness, the independent variable was exposure to spacious nature, and the mediating variable was a nature-relatedness score. As a criterion for the Causal Mediation Analysis, a 95% confidence interval with a p-value of 0.05 ($p<0.05$) was used.

Results

Descriptive Statistics

Firstly, the nature-relatedness of participants was calculated. The average nature-relatedness score across participants was 3.22, which suggests that, on average, participants in this study feel moderately related to nature. Secondly, to examine the effect of VN and storytelling on one's level of social connectedness, descriptive statistics were performed (see Table 3). The mean (M) and standard deviation (SD) scores of the participants' social connectedness scores under four different experimental conditions as well as nature relatedness scores were revealed by these data.

Table 3

Descriptive Statistics of the Pre-, Post-, and Difference Scores of Social Connectedness as well as Nature-Relatedness Scores Between Conditions

	PS[a] x SN[b]		NS[c] x SN		PS x NSN[d]		NS x NSN		Total	
Sample Size	28		20		25		26		99	
	M	SD	M	SD	M	SD	M	SD	M	SD
Pre-Experimental SC[e]	29.39	8.83	32.05	7.54	29.64	7.14	33.23	6.11	31	7.57
Post-Experimental SC	34.60	5.76	32.40	8.33	32.16	7.12	34.73	5.60	33.56	6.67
SC Difference Score	5.28	8.66	0.35	2.58	2.52	4.35	1.5	2.94	2.58	5.66
Nature Relatedness	3.23	0.87	3.23	0.79	3.32	0.84	3.11	0.87	3.22	0.84

[a] Personal Storytelling
[b] Spacious Nature
[c] Neutral Storytelling
[d] Non-Spacious Nature
[e] Social Connectedness

Inferential Statistics

In Table 4 one may see the test results for the first and second hypotheses. For the first hypothesis, which aimed to investigate the differences in social connectedness between participants who experienced personal storytelling and those who experienced neutral storytelling, the analysis revealed a significant difference among the social connectedness

medians between conditions, U = 1581, p = 0.010. After calculating median values, it appeared that the difference score of social connectedness was greater for the personal storytelling condition (Mdn = 2) than for the neutral condition (Mdn = 0.5) (see Figure 4). Based on these results the first hypothesis is accepted. Based on the analysis using Cliff's Delta, the effect size was estimated to be 0.297 (95% CI [0.071, 0.494]) for the first hypothesis testing, indicating a small effect size. It suggested that the personal storytelling group tended to have higher rankings compared to the neutral one.

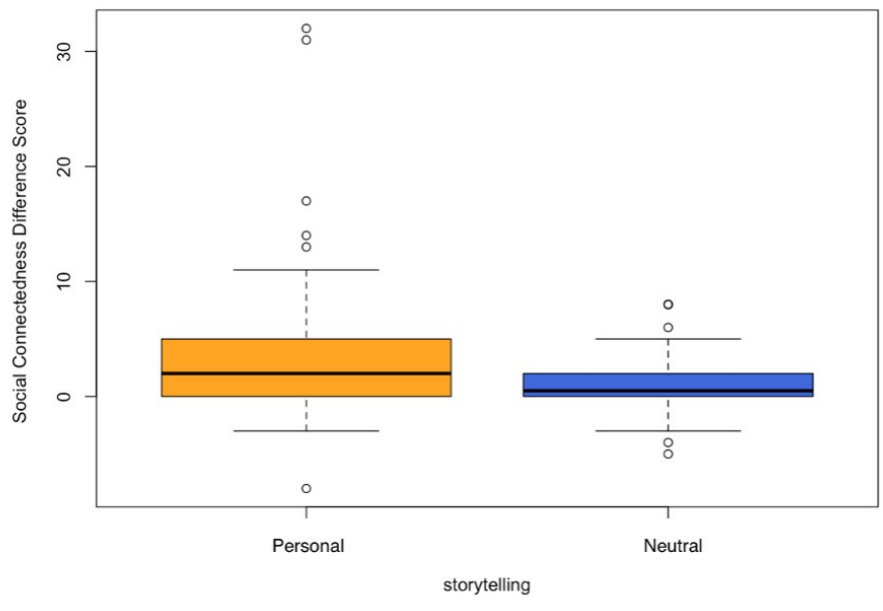
Table 4

Results of Mann-Whitney U and Cliff's Delta Tests for First and Second Hypotheses

Hypothesis	Comparison	Test-statistics	p-value	Effect Size
First Hypothesis	Personal Storytelling vs. Neutral Storytelling	1581	0.010	0.297
Second Hypothesis	Spacious Nature vs. Non-spacious Nature	1159	0.649	-0.053

Figure 4

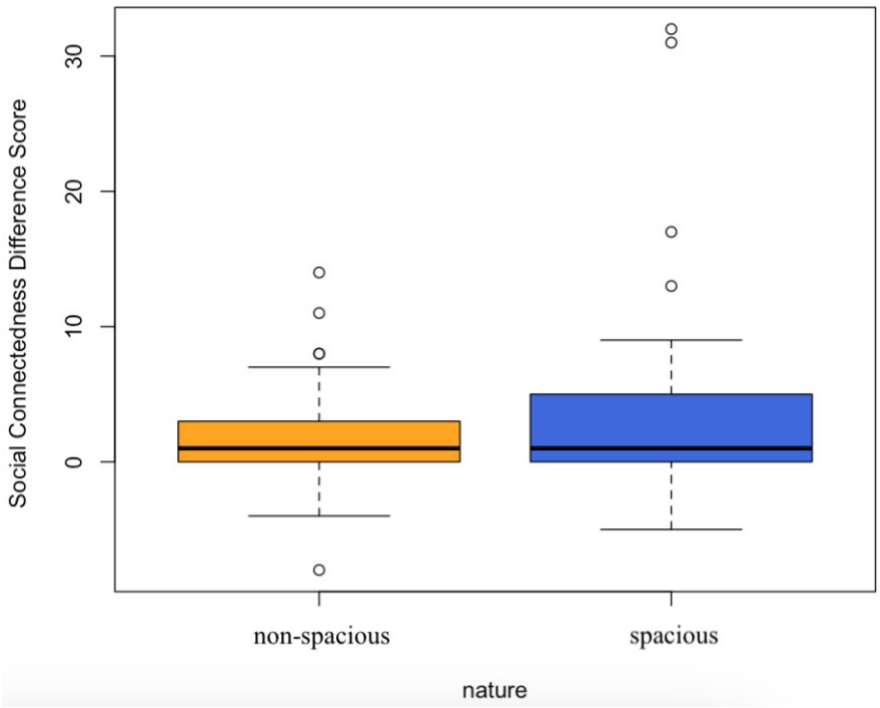
Boxplot of Social Connectedness Difference Score by Storytelling



For the second hypothesis, which aimed to investigate the differences in social connectedness between participants who experienced spacious nature and those who experienced non-spacious nature, the analysis did not reveal any significant difference among medians of social connectedness difference score, U = 1159, p = 0.649. The visualisation of medians of social connectedness difference score can be appreciated In Figure 5. Based on these results the second hypothesis is rejected. According to the analysis using Cliff's Delta, the effect size estimate was -0.053 (95% CI [-0.278, 0.177]), indicating an insignificant difference in rankings between the two groups: exposure to spacious nature and exposure to non-spacious nature.

Figure 5

Boxplot of Social Connectedness Difference Score by Nature

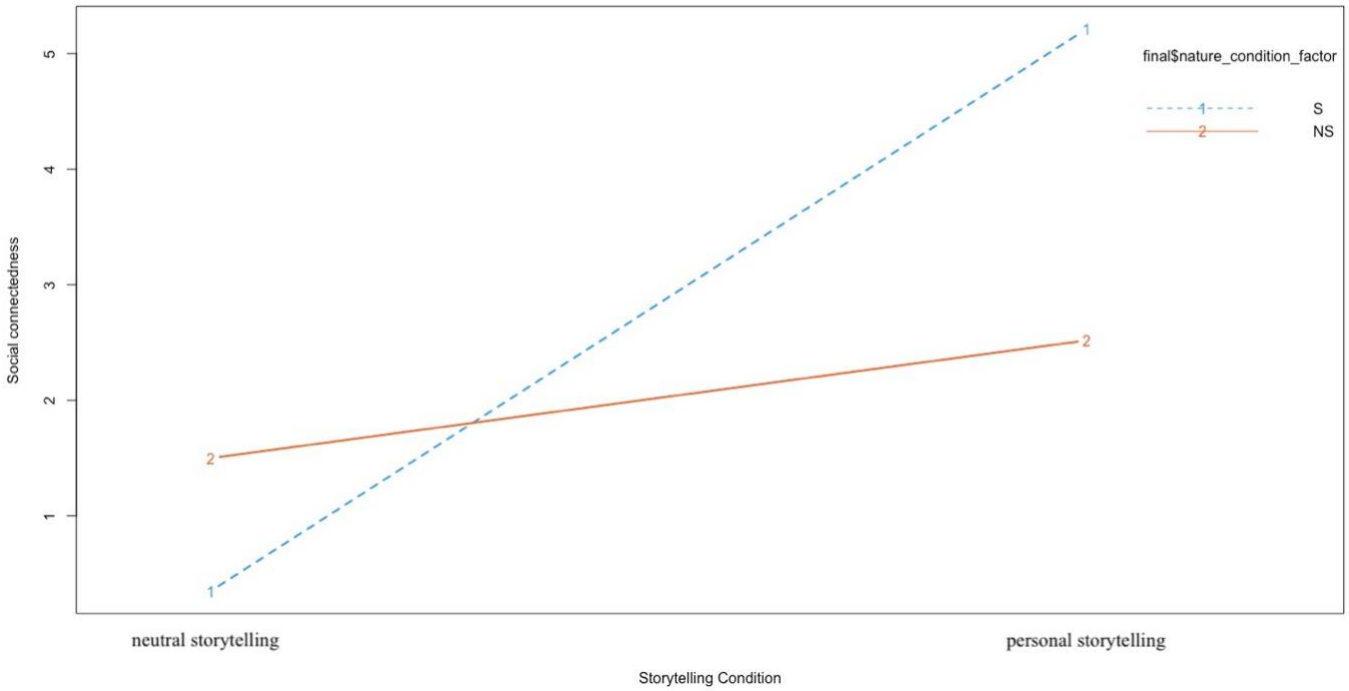


For the third hypothesis, which proposed that participants who experienced the combined effect of spacious nature and personal storytelling would exhibit higher levels of social connectedness compared to those who experienced nature with lower spaciousness and

neutral storytelling, the ART-ANOVA analysis indicated a non-significant interaction effect between storytelling and nature ($F(1, 95) = 2.93$, $p = 0.09$). Therefore, the third hypothesis is rejected. To further explore the observed interaction, a visual representation was created (see Figure 6). The plot demonstrates that the lines representing different conditions intersect, suggesting a potential interaction. To quantify the effect size, an eta-squared test was performed, yielding an effect size of 0.03, which indicates a small effect.

Figure 6

Interaction Plot of Social Connectedness: Storytelling x Nature Condition



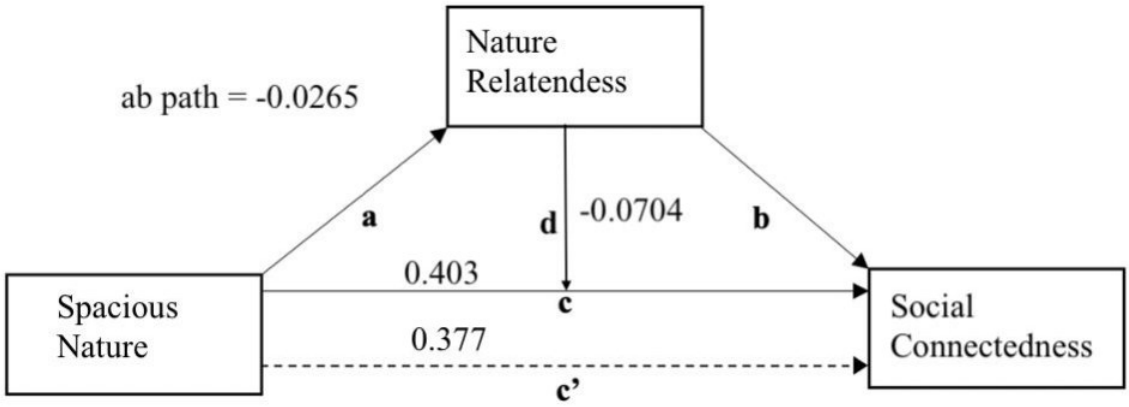
Note. "S" stands for spacious nature, while "NS" for non-spacious nature.

Finally, to test the fourth hypothesis, a causal mediation analysis was conducted using the nonparametric bootstrap method with 1000 simulations. The analysis aimed to examine the potential mediating effect of nature-relatedness on the relationship between exposure to spacious nature and social connectedness (see Figure 7). The estimated Average Causal Mediation Effect was -0.0265 (95% CI [-0.3931, 0.36]) with p-value = 0.88, indicating a non-significant indirect effect of exposure to spacious nature on social connectedness through

nature relatedness (path ab). The Average Direct Effect was 0.4034 (95% CI [-1.7035, 2.54]) and p-value = 0.69, showing no significant direct effect of exposure to spacious nature on social connectedness (path c). The Total Effect, which combines the direct and indirect effects, was 0.3768 (95% CI [-1.7505, 2.54]) with p-value = 0.71 was not statistically significant (path c'). The Proportion Mediated was estimated as -0.0704 (95% CI [-1.5387, 1.32]) with p-value = 0.96, indicating no significant proportion of the total effect mediated by nature relatedness (path d). These findings suggest that there is no evidence to support the hypothesis that the variable nature-relatedness mediates the relationship between exposure to spacious nature and social connectedness in the given sample. Thus, the fourth hypothesis is rejected.

Figure 7

Mediation Effect of Nature Relatedness Between Exposure to Spacious Nature and Social Connectedness



Discussion

This study aimed to investigate two possible ways of facilitating social connectedness: personal storytelling and exposure to spacious VN. The literature suggested that both personal storytelling and spacious nature would facilitate one's social connectedness (McAdams & McLean, 2013; Piff et al., 2015; van Houwelingen-Snippe et al., 2020a, 2020b). It was also suggested that one's rate of nature-relatedness would mediate the

effect of exposure to spacious nature on social connectedness. For that, four hypotheses and two research questions were formulated. Followingly, each of those will be discussed in light of the findings.

H1: Effects of Personal Storytelling

The hypothesis that "*Participants who experience personal storytelling will report higher levels of social connectedness compared to those who experience neutral storytelling"* is accepted. The results imply that personal storytelling can strengthen one's social connectedness and therefore are in line with scientific literature (McAdams & McLean., 2013). The emotional engagement and relatability that personal stories generate may be the reason why they are so effective at facilitating one's perceived social connectedness (Essary et al., 2021).

H2: **Effects of Spacious Nature**

The hypothesis that "*Participants who experience spacious nature will report higher levels of social connectedness compared to those who experience nature with lower spaciousness*" is rejected. Findings suggest that social connectedness is not directly influenced by one's experience of spaciousness in nature. The reason why these results differ from other literature results may be in several points. First, Houwelingen-Snippe et al. (2020b), in their study, presented nature stimuli using a 4K projector and scent machine. Moreover, their study was conducted in laboratory settings. Unlike the study of van Houwelingen-Snippe et al. (2020b), the current experiment was conducted unsupervised, and participants were asked to watch videos on a laptop or smartphone. So, it may be the case that differences in stimuli presentation could affect the perception of videos. Moreover, there is a possibility that the online experiment failed to capture the full attention of participants. While watching videos on their laptops or smartphones it is possible that they could be affected by some external stimuli that disturbed their watching experience. Second, while the study of

Otten et al., (2023) consisted only of the Dutch elderly, for the current study international university students were required. It may be the case that the age differences could explain different results, as older adults might be more responsive to nature exposure.

H3: Combined Effect of Personal Storytelling and Spacious Nature

The hypothesis that "*Participants who experience the combined effect of spacious nature and personal storytelling will report higher levels of social connectedness compared to those who experience nature with lower spaciousness and neutral storytelling*" is rejected.

This study's unique design, examining the relationship between spaciousness and personal storytelling and their combined effect on social connectedness, means that there is limited existing literature for direct comparison and analysis. The discrepancy between the expectations and the actual findings might be attributed to the same reasons as the rejection of the second hypothesis, as personal storytelling alone did have a significant influence on social connectedness. However, it is crucial to note that the lack of statistical significance does not imply that there are no significant patterns or effects. The plot's visual pattern revealed interesting tendencies that call for more research. Thus, the non-significant result from the analysis may be attributed to some limitations of this study, which are discussed further in this paper.

H4: Mediation Effect of Nature-Relatedness

The hypothesis that "*Nature-relatedness will mediate the relationship between exposure to spacious nature and social connectedness"* is rejected**.**

The reason why expectations were not met may lie in difference with the previously conducted research. In this study VN environment was used, while literature suggested that nature-relatedness may mediate the relationship between exposure to real nature and higher levels of social connectedness (Baceviciene & Jankauskiene., 2022; Mayer et al., 2009; Pensini et al., 2016). It could be purposed that such mediation effect may exist only between

exposure to real nature and higher levels of social connectedness. It is possible that videos of the current study lacked the necessary stimuli for participants to immerse in nature scenes and, therefore, nature relatedness did not play a role in the effect of spacious nature on social connectedness.

Limitations and Strengths

Based on the performed analysis, three out of four hypotheses are rejected. But these results are not enough to completely dismiss all previous research done on this topic as this study has several limitations. Firstly, the second hypothesis shows a very minimal effect size, so it seems to be rejected right away, independent of the sample size. The first hypothesis is accepted despite the small sample size. Thus, it is only the third hypothesis that might have been rejected due to a lack of statistical power. The plot's intersecting lines suggest the presence of potential interaction patterns. It is possible that the effect size would have attained statistical significance with a bigger sample size. Therefore, rather than indicating a complete lack of an effect, the lack of significance should be understood in the context of inadequate statistical power. Secondly, several participants indicated that even though they did not have any problems while watching a video, the quality of the videos was very bad. This is an example of such a comment: *"...If modern graphics or real nature were used, I would have felt completely different"*. It may be the case that bad videos could negatively influence immersion in a nature environment. Thirdly, mean scores for the pre-measure of social connectedness showed rather high values. This raises the possibility of a ceiling effect, which would make it difficult to identify significant differences between pre- and post-measures and to see the impact of exposure to nature on social connectedness.

There are also some strengths of the current study that are worth mentioning. First, as already mentioned, this study has a unique design as it assesses the relationship between spaciousness and personal storytelling and their combined effect on social connectedness. It

put a first step in the understanding of such relationships and could help to evolve new research in this area of interest. Second, the pilot test was conducted and made it easier to construct videos with high levels of spaciousness for the main experiment. Third, both social connectedness and nature-relatedness scales appeared to have quite high reliability, which fosters confidence in reported measures of social connectedness and nature-relatedness.

Recommendations for Future Research

In future research, it could be valuable to explore additional factors that potentially influence social connectedness, for example, cultural background. Cultural variations in storytelling traditions and perceptions of nature highlight the limitations of generalizing findings from a predominantly European sample (McCabe, 1997; Selin, 2013). Conducting cross-cultural studies involving diverse groups would provide insights into the consistency of effects across different cultural backgrounds. Storytelling customs, for instance, might vary greatly amongst cultures (McCabe., 1997). Collective storytelling (sharing stories in group) or the passing down of cultural legacy through storytelling may be a more important concept in some cultures. Other cultures, on the other hand, might place a higher value on personal storytelling and experiences. Thus, if storytelling questions would align with the cultural values of participants, they would be more effective in facilitating social connectedness. Moreover, investigating differences in geography and applying these differences while contracting videos could offer valuable perspectives. For example, people who lived and are used to tropical areas could find movies showing lush rainforests and colourful fauna more relatable, whereas people from arid areas would connect with nature scenes of vast deserts and hardy vegetation. By matching videos to the geographic differences of participants, it may increase engagement in the watching process.

Furthermore, the current study exclusively focused on the principle of spaciousness of ART theory and did not provide evidence that nature environments constructed solely based

on spaciousness principles impact social connectedness. Other alterations in the traits of the natural environment, which could have potentially affected the measured outcome, were not accounted for in this study. For example, Kaplan and Kaplan (1989) propose three additional principles equally crucial for restoring attentional resources. Research has indicated that the principle of mystery can evoke distinct associations and perceptions (Otten et al., 2023). Hence, future research should encompass diverse landscapes, and incorporate other ART principles to attain a more comprehensive understanding of the effects of nature on social connectedness.

Conclusion

In conclusion, this research shows that sharing personal stories helps strengthen social connectedness. The feeling of spaciousness in VN does not appear to have a direct effect on social connectedness, and the combination of spacious virtual nature and personal storytelling does not result in noticeably greater levels of social connectedness than other conditions. Additionally, the relationship between exposure to spacious VN and social connectedness was not significantly mediated by the individual's nature-relatedness. These results demonstrate the complexity of social connectedness-influencing factors and point to the need for further research to examine potential contributing factors and mechanisms to the interaction between nature, storytelling, and social connectedness.

References

Baceviciene, M., & Jankauskiene, R. (2022). The Mediating Effect of Nature Restorativeness, Stress Level, and Nature Connectedness in the Association between Nature Exposure and Quality of Life. *International journal of environmental research and public health*, *19*(4), 2098. https://doi.org/10.3390/ijerph19042098

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. Social Science & Medicine, 51(6), 843-857. https://doi.org/10.1016/s0277-9536(00)00065-4

Berman, M. G., Kross, E., Krpan, K. M., Askren, M. K., Burson, A., Deldin, P. J., Kaplan, S., Sherdell, L., Gotlib, I. H., & Jonides, J. (2012). Interacting with nature improves cognition and affect for individuals with depression. *Journal of affective disorders*, *140*(3), 300–305. https://doi.org/10.1016/j.jad.2012.03.012

Browning, M. H., Shin, S., Drong, G., McAnirlin, O., Gagnon, R. J., Ranganathan, S., ... & Heller, W. (2023). Daily exposure to virtual nature reduces symptoms of anxiety in college students. *Scientific reports*, *13*(1), 1239.

Browning, M. H., Mimnaugh, K. J., Van Riper, C. J., Laurent, H. K., & LaValle, S. M. (2020). Can simulated nature support mental health? Comparing short, single-doses of 360-degree nature videos in virtual reality with the outdoors. *Frontiers in psychology*, *10*, 2667. https://doi.org/10.3389/fpsyg.2019.02667

Bhugra, D., & Becker, M. A. (2005). Migration, cultural bereavement and cultural identity. *World psychiatry : official journal of the World Psychiatric Association (WPA)*, *4*(1), 18–24.

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). Flourishing in nature: A review of the benefits of connecting with nature and its application as a wellbeing intervention. International Journal of Wellbeing, 4(2), 1-16. doi:10.5502/ijw.v4i2.2

Essary, J., DeRosa, J., & Salim, D. (2021). Supporting Literacy and Social connectedness in a Pandemic Through the "Autobiographical R/W/L/S" Method. In J. Tussey & L. Haas (Eds.), Handbook of Research on Supporting Social and Emotional Development Through Literacy Education (pp. 322-344). IGI Global. 28 https://doi.org/10.4018/978-1-7998-7464-5.ch015

Farrugia, C., & Sanger, J. (2017). Gaining an employment edge: The impact of study abroad on 21st century skills & career prospects in the United States. *Washington, DC: IIE Center for Academic Mobility Research and Impact*. doi:10.13140/RG.2.2.10644.04485

Goldy, S. P., & Piff, P. K. (2020). Toward a social ecology of prosociality: why, when, and where nature enhances social connection. Current Opinion in Psychology, 32, 27-31. https://doi.org/https://doi.org/10.1016/j.copsyc.2019.06.016

Guéguen, N., & Stefan, J. (2016). "Green altruism" short immersion in natural green environments and helping behavior. *Environment and behavior*, *48*(2), 324-342. https://doi-org.ezproxy2.utwente.nl/10.1177/0013916514536576

Gurung, R., Sarason, B., & Sarason, I. (1997). Close personal relationships and health outcomes: A key to the role of social support. *Handbook of personal relationships: Theory, research and interventions*, 547-573.

Gyasi, R. M., Phillips, D. R., Asante, F., & Boateng, S. (2021). Physical activity and predictors of loneliness in community-dwelling older adults: The role of social connectedness. *Geriatric nursing*, *42*(2), 592-598. https://doi.org/10.1016/j.gerinurse.2020.11.004

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of behavioral medicine*, *40*(2), 218-

227.Nisbet, E. K., & Zelenski, J. M. (2013). The NR-6: A new brief measure of nature relatedness. *Frontiers in psychology*, *4*, 813. doi: 10.1007/s12160-010-9210-8

Hm, A. (2021). Cultural pluralism and social connectedness as predictors of immigrant students' social wellbeing and achievements. *Journal of Ethnic and Cultural Studies*, *8*(4), 154-170.

Hyland, K. (2018). Narrative, identity and academic storytelling. *ILCEA. Revue de l'Institut des langues et cultures d'Europe, Amérique, Afrique, Asie et Australie*, (31). https://doi.org/10.4000/ilcea.4677

Imai, K., Keele, L., Tingley, D., & Yamamoto, T. (2010). Causal mediation analysis using R. In *Advances in social science research using R* (pp. 129-154). Springer New York. https://doi.org/10.1007/978-1-4419-1764-5_8

Kay, M. (2020). "Effect sizes with ART. *The Comprehensive R Archive Network. Retrieved from May*, *26*, 2020.

Keltner, D., & Haidt, J. (2003). Approaching awe, a moral, spiritual, and aesthetic emotion. *Cognition and emotion*, *17*(2), 297-314. https://doi.org/10.1080/02699930302297

Lee, R. M., & Robbins, S. B. (1995). Measuring belongingness: The social connectedness and the social assurance scales. *Journal of counseling psychology*, *42*(2), 232. http://dx.doi.org.ezproxy2.utwente.nl/10.1037/0022-0167.42.2.232

Litleskare, S., E. MacIntyre, T., & Calogiuri, G. (2020). Enable, reconnect and augment: a new ERA of virtual nature research and application. *International Journal of Environmental Research and Public Health*, *17*(5), 1738. https://doi.org/10.3390/ijerph17051738

Maas, J., Van Dillen, S. M., Verheij, R. A., & Groenewegen, P. P. (2009). Social contacts as a possible mechanism behind the relation between green space and health. *Health & place*, *15*(2), 586-595. http://dx.doi.org/10.1016/j.healthplace.2008.09.006

Macbeth, G., Razumiejczyk, E. & Ledesma, R. D. (2011). Cliff's Delta Calculator: A non-parametric effect size program for two groups of observations. *Universitas Psychologica,* 10 (2), 545-555.

Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why isnature beneficial. *The role of connectedness to nature. Environment and Behavior*, *41*(5), 607-643. doi: 10.1177/0013916508319745.

McAdams, D. P., & McLean, K. C. (2013). Narrative identity. Current Directions in Psychological Science, 22(3), 233-238. https://doi.org/10.1177/0963721413475622

McAvay, G. J., Seeman, T. E., & Rodin, J. (1996). A longitudinal study of change in domain-specific self-efficacy among older adults. *The journals of gerontology. Series B, Psychological sciences and social sciences*, *51*(5), P243–P253. https://doi-org.ezproxy2.utwente.nl/10.1093/geronb/51b.5.p243

McCabe, A. (1997). Cultural background and storytelling: A review and implications for schooling. *The Elementary School Journal*, *97*(5), 453-473. Nisbet, E. K. (2011). *A nature relatedness intervention to promote happiness and environmental concern* (Doctoral dissertation, Carleton University).

McKnight, P. E., & Najab, J. (2010). Mann-Whitney U Test. *The Corsini encyclopedia of psychology*, 1-1. https://doi-org.ezproxy2.utwente.nl/10.1002/9780470479216.corpsy0524

Menzel, C., & Reese, G. (2021). Implicit Associations With Nature and Urban Environments: Effects of Lower-Level Processed Image Properties. *Frontiers in Psychology*, *12*, 591403. https://doi.org/10.3389/fpsyg.2021.591403

Miles, J., & Shevlin, M. (2001). *Applying regression and correlation: a guide for students and researchers.* London: Sage.

Nuffic. (August 1, 2022). International students in the Netherlands from 2006 to 2021 [Graph]. In *Statista*. Retrieved March 1, 2023, from https://www.statista.com/statistics/699754/international-students-in-the-netherlands/

Pensini, P., Horn, E., & Caltabiano, N. J. (2016). An exploration of the relationships between adults' childhood and current nature exposure and their mental well-being. *Children, Youth and Environments*, *26*(1), 125-147. doi: 10.7721/chilyoutenvi.26.1.0125.

Piff, P. K., Dietze, P., Feinberg, M., Stancato, D. M., & Keltner, D. (2015). Awe, the small self, and prosocial behavior. *Journal of personality and social psychology*, *108*(6), 883. doi: 10.1037/pspi0000018

Pym, J., Goodman, S., & Patsika, N. (2011). Does belonging matter?: Exploring the role of social connectedness as a critical factor in students' transition to higher education. *Psychology in Society*, (42), 35-50.

Ratcliffe, E., Gatersleben, B., & Sowden, P. T. (2013). Bird sounds and their contributions to perceived attention restoration and stress recovery. *Journal of Environmental Psychology*, *36*, 221-228. https://doi.org/10.1016/j.jenvp.2013.08.004

Romano, J., Kromrey, J. D., Coraggio, J., Skowronek, J., & Devine, L. (2006, October). Exploring methods for evaluating group differences on the NSSE and other surveys: Are the t-test and Cohen'sd indices the most appropriate choices. In *annual meeting of the Southern Association for Institutional Research* (pp. 1-51). Citeseer.

Russell, R., Guerry, A. D., Balvanera, P., Gould, R. K., Basurto, X., Chan, K. M. A., Klain, S., Levine, J., & Tam, J. (2013). Humans and nature: How knowing and experiencing nature affect well-being. Annual Review of Environment and Resources, 38, 473-502. https://doi-org.ezproxy2.utwente.nl/10.1146/annurev-environ-012312-110838

Sawir, E., Marginson, S., Deumert, A., Nyland, C., & Ramia, G. (2008). Loneliness and international students: An Australian study. *Journal of studies in international education*, *12*(2), 148-180. https://doi.org/10.1177/10283153072996

Schultz, P.W. (2002). Inclusion with Nature: The Psychology Of Human-Nature Relations. In: Schmuck, P., Schultz, W.P. (eds) Psychology of Sustainable Development. Springer, Boston, MA. https://doi.org/10.1007/978-1-4615-0995-0_4

Selin, H. (Ed.). (2013). *Nature across cultures: Views of nature and the environment in non-Western cultures* (Vol. 4). Springer Science & Business Media.Sisavath, S. (2021). Benefits of Studying Abroad for Graduate Employability: Perspectives of Exchange Students From Lao Universities. *Journal of International Students*, *11*(3), 547-566. https://doi.org/10.32674/jis.v11i3.2779

Shankar, A., McMunn, A., Banks, J., & Steptoe, A. (2011). Loneliness, social isolation, and behavioral and biological health indicators in older adults. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*, *30*(4), 377–385. https://doi-org.ezproxy2.utwente.nl/10.1037/a0022826

Skromanis, S., Cooling, N., Rodgers, B., Purton, T., Fan, F., Bridgman, H., Harris, K., Presser, J., & Mond, J. (2018). Health and Well-Being of International University Students, and Comparison with Domestic Students, in Tasmania, Australia. *International Journal of Environmental Research and Public Health*, *15*(6), 1147. https://doi.org/10.3390/ijerph15061147

Steptoe, A., Owen, N., Kunz-Ebrecht, S. R., & Brydon, L. (2004). Loneliness and neuroendocrine, cardiovascular, and inflammatory stress responses in middle-aged men and women. *Psychoneuroendocrinology*, *29*(5), 593–611. https://doi-org.ezproxy2.utwente.nl/10.1016/S0306-4530(03)00086-6

Umberson, D., & Montez, J. K. (2010). Social relationships and health: A flashpoint for health policy. Journal of Health and Social Behavior, 51(Suppl), S54-S66. https://doi.org/10.1177/0022146510383501

van Houwelingen-Snippe, J., van Rompay, T. J. L., & Ben Allouch, S. (2020a). Feeling Connected after Experiencing Digital Nature: A Survey Study. *International Journal of Environmental Research and Public Health*, *17*(18), 6879. MDPI AG. http://dx.doi.org/10.3390/ijerph17186879

van Houwelingen-Snippe, J., van Rompay, T. J., de Jong, M. D., & Ben Allouch, S. (2020b). Does digital nature enhance social aspirations? An experimental study. *International journal of environmental research and public health*, *17*(4), 1454.

Wawera, A. S., & McCamley, A. (2020). Loneliness among international students in the UK. *Journal of Further and Higher Education*, *44*(9), 1262-1274. https://doi-org.ezproxy2.utwente.nl/10.1080/0309877X.2019.1673326

Weaver, R. H., Sano, Y., Lanigan, J., et al. (2022). Perceived Changes in Social Connectedness Across the Life Course: A Mixed Method Approach. *The International Journal of Aging and Human Development*, 96(2), 201-218. https://doi.org/10.1177/00914150221077955

Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. *Personality and social psychology bulletin*, *35*(10), 1315-1329.https://doi.org/10.1177/0146167209341649

White, M. P., Yeo, N. L., Vassiljev, P., Lundstedt, R., Wallergård, M., Albin, M., & Lõhmus, M. (2018). A prescription for "nature"–the potential of using virtual nature in therapeutics. *Neuropsychiatric disease and treatment*, 3001-3013. doi: 10.2147/NDT.S179038

Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and feeling connected: The distinct role of nature relatedness. *Environment and behavior*, *46*(1), 3-23. doi: 10.1177/0013916512451901

Appendices

Appendix A

Videos For Pilot Test

Appendix B

Nature Relatedness Scale

My ideal vacation spot would be a remote, wilderness area.
I always think about how my actions affect the environment.
My connection to nature and the environment is a part of my spirituality.
I take notice of wildlife wherever I am.
My relationship to nature is an important part of who I am.
I feel very connected to all living things and the earth.

Appendix C

Social Connectedness Scale

I feel disconnected from the world around me.
Even around people I know, I don't feel that I really belong.
I feel so distant from people.
I have no sense of togetherness with my peers.
I don't feel related to anyone.
I catch myself losing all sense of connectedness with society.
Even among my friends, there is no sense of brother/sisterhood.
I don't feel that I participate with anyone or any group.