Bridging the Human-Nature Connection Gap: The Impact of AI-Generated Nature in Storytelling

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Abstract

Forming a secure identity is fundamental for mental health and psychological well-being, yet young adults in Western society often face identity confusion and worsening mental health. This study investigates effects of combining narrative storytelling and AI-generated images of meaningful nature experiences on young adults' connection to nature and the emotional language use. Additionally, this research explores emotional themes of the narratives to understand better how young adults perceive their relationship with nature. Using a mixed-methods design, 47 participants were divided into experimental and control groups, with the former exposed to AI-generated images before storytelling and the control group after. Results indicated that AI-generated images did not significantly affect nature connectedness or emotional language in storytelling. Thematic analysis identified five emotional themes in narratives: Happiness, Connection, Peace, Introspection, and Awe, highlighting meaningful engagement with nature. The study suggests that while AI-generated nature images did not serve feelings of a nature experience, they may offer value in group storytelling sessions. Future research should consider personal preferences, emotional elements, and the timing of AI image presentation in storytelling. Additionally, conceptualising the human-nature relationship and its impact on identity formation is essential for developing effective interventions to promote mental health and well-being among young adults.

Keywords*: AI-generated nature images, young adults, narrative identity, storytelling, nature connectedness, emotional language*

Introduction

Forming a secure identity is fundamental in life. Erik Erikson emphasised in his book *Identity: Youth and Crisis* (1968) that "A sense of identity means being at one with oneself as one grows and develops" (p. 87). Individuals who have formed a secure identity during adolescence are able to find a sense of purpose in life (Burrow & Hill, 2011), and tend to be more resilient (Bogaerts et al., 2023; Meeus et al., 2012). These characteristics are essential for mental health and psychological well-being (Schwartz et al., 2013). However, young adults in Western society often experience feelings of identity confusion (Arnett, 2000), alongside worsening mental health trends (Twenge et al., 2019). These trends are generally attributed to cohort effects linked to challenges brought about by urbanisation (Kelly et al., 2018; Twenge et al., 2019). For example, in urbanised societies, young adults increasingly replace natural experiences with digital media (Pergams & Zaradic, 2006). Excessive use of social media can negatively affect one's concept of self and well-being, as it is associated with *upward* peer comparison (Scully et al., 2023) and the idea of idealised self-images (Erin, 2021).

Nature connectedness can benefit identity formation. Nature provides a context where individuals can reflect on their lives (Mayer et al., 2009). In addition, nature is associated with promoting self-acceptance (Pritchard et al., 2020). Accordingly, individuals who feel emotionally connected to nature report higher levels of personal growth and a sense of purpose in life, suggesting that connectedness to nature promotes a sense of direction and fulfilment (Howell et al., 2013; Pritchard et al., 2020). Experiencing growth and purpose are vital components of psychological well-being (Ryff & Keyes, 1995), and contribute to developing a secure identity (Pritchard et al., 2019). Notably, a single meaningful experience in nature can have a lasting impact on an individual's self-perception and relationship with nature (Mathers & Brymer, 2022). However, such experiences and emotional connections with nature are decreasing, especially among young adults (Soga et al., 2016).

Digital nature and narrative storytelling can promote feelings of nature connectedness. Technological advancements are inevitable, and these rapidly shifting trends among young adults require innovative solutions. One such solution could be to use the seeming disadvantage of technological progress as an advantage for the relationship between humans and nature. A promising approach could be through the use of personalised digital nature as a tool to bring young adults closer to real nature (Litleskare et al., 2020). Narratives about meaningful nature experiences may play an important part in integrating nature into our

concept of self (Spiegelaar, 2023), as they are emotionally situated (McLean et al., 2007). Additionally, narrative storytelling interventions have been found to support identity formation by promoting perspective-taking abilities (Adler et al., 2016), thereby contributing to understanding oneself and identity development (Bauer & McAdams, 2010). Virtual environment-based storytelling can improve self-perceptions and has the potential to facilitate positive shifts in perspective, thereby influencing personal growth (Georgieva & Georgiev, 2022).

This study aims to investigate how combining narratives and digital images of meaningful nature experiences can enhance young adults' connection with nature. It will also examine how viewing these images enriches the emotional language used in storytelling sessions. This research is particularly relevant for young adults, as savouring nature narratives could aid in healthy identity formation. Additionally, qualitative analysis of these narratives will provide insights into the human-nature relationship in young adults.

Narrative Identity and Storytelling

McAdams & McLean (2013) define the *narrative identity* as “a person’s internalised and evolving life story, integrating the reconstructed past and imagined future to provide life with some degree of unity and purpose” (p.233). A coherent narrative identity is crucial in shaping and maintaining a positive self-view (Waters & Fivush, 2015) and a meaningful sense of one´s identity (McAdams & McLean, 2013). The ability to construct or internalise meaningful moments into a coherent narrative identity typically develops during adolescence (McLean et al., 2010). This ability is associated with well-being when "life stories include themes of personal agency and exploration" (McAdams & McLean, 2013; p.233) and individuals are able to integrate these memories into a *coherent* self-concept (Habermas & Bluck, 2000). Individuals who develop a coherent narrative identity, tend to have better self-esteem (Liao et al., 2018), and are more resilient (Bogaerts et al., 2023; Meeus et al., 2012).

However, young adults in Western society experience prolonged periods of identity development, frequently accompanied by feelings of confusion (Arnett, 2000), leading to difficulties in integrating past experiences and future aspirations into a coherent story (McAdams & McLean, 2013). This state of confusion can disrupt various aspects of life, including relationships, career choices, and overall mental health (Schwartz et al., 2015). A qualitative analysis of young adults' narratives found that nature helped them to centre themselves, contributing to their well-being and sense of balance in life (Sofija et al., 2022).

Finding a balance within oneself through nature can be particularly helpful in protecting from feelings of confusion associated with anxiety (Martyn & Brymer, 2016), which is essential for developing a coherent narrative identity (McAdams & McLean, 2013). In turn, feeling in tune with one's identity is associated with greater life satisfaction and lower negative affect among young adults (Sumner et al., 2015).

Intersection Nature and Identity

Nature can be viewed as a part of our identity. The human-nature relationship could be seen as viewing oneself as part of the natural world (Lumber et al., 2017). However, debates continue in Western societies about whether humans are part of nature or distinct from it, affecting our sense of identity (Moreton & Hornsey, 2018; Schultz, 2002). The framework of *nature connectedness* is used to describe the relationship between humans and nature, which Schultz (2002, p. 67) defines as "the extent to which an individual incorporates nature into his or her cognitive self-representation". Lumber et al. (2017) point out that a relationship between humans and nature can only exist if an individual extends their self-concept to include nature. The notion *self-concept* refers to a cognitive framework encompassing various attitudes and beliefs about oneself and can affect one's sense of identity and self-worth (Wehrle & Fasbender, 2019). Moreover, nature connectedness is a multidimensional construct and can reflect a momentary feeling of closeness to nature (Mayer et al., 2005; Lumber et al., 2017), or become a stable character trait (Mayer & Frantz, 2004).

Nature connection is achieved through more than solely physical contact. The consensus in the literature is that personality traits, including nature connectedness, are influenced by genetic and environmental factors (Bouchard & McGue, 2003; Frantz et al., 2005). Research by Lumber et al. (2017) conceptualised five key pathways to nature connectedness: "contact, emotion, compassion, meaning, and beauty", primarily influenced by environmental factors. The authors Lumber et al. (2017) define *Contact* as having sensory contact with nature; *Emotion* involves emotional reactions evoked by nature; *Compassion* is described as feelings of responsibility to take care of nature; *Meaning* pertains to the personal significance found in nature experiences; *Beauty* refers to the subjective preference for the appearance of nature. Literature generally highlights the importance of perceiving beauty in nature to elicit positive emotional responses that foster feelings of connectedness (Anderson et al., 2018; Lumber et al., 2017; Richardson & Sheffield, 2017). For instance, the study by Lumber et al. (2017) found that physical walks alone did not increase nature connectedness,

but interventions incorporating sensory and emotional activities were effective. Underlining the pathway approach to nature connectedness, another study found that encouraging reflections on personal growth and meaning in the context of nature can significantly enhance one's sense of connectedness to the natural world (Lengieza, 2024). Therefore, are emotions and meaning key aspects to take into consideration when promoting feelings of nature connectedness.

Feeling connected to nature promotes healthy identity formation. Nature's beauty helps individuals make sense of their experiences, contributing to a stronger sense of identity and purpose (Kaplan & Kaplan, 1989). Furthermore, including nature in one's self-concept, rather than seeing oneself as separate from nature, has been shown to promote various aspects of well-being (Capaldi et al., 2015; Passmore & Howell, 2014). Research consistently demonstrates that individuals with a strong connection to nature experience greater life satisfaction and report feeling happier (Ingulli & Lindbloom, 2013), and show more compassion for nature, such as sustainable behaviours (Lu et al., 2017; Richardson et al., 2020). Capaldi (2015) stated, “Even imagined experiences in nature can evoke intense feelings of awe and connectedness”. Awe experiences can lead to self-transcendence, invigorating the pursuit of the authentic self (Jiang & Sedikides, 2021), which can encourage individuals to seek greater meaning in their lives and develop a sense of belonging, which is vital for personal growth (Xiong, 2023). For instance, a study by Passmore and Howell (2014) found that nature connectedness promotes self-reflection, emotional regulation, and perspective-taking abilities. Moreover, it found that engaging with nature strengthens young people's self-esteem and resilience, which enables them to cope better with life's challenges and setbacks (Tillmann et al., 2018). The *Biophilia Hypothesis* suggests that interactions with nature have shaped the emotional aspects of human beings, leading to a desire to connect with nature for its associated pleasant feelings (Kurazumi et al., 2017; Lumber et al., 2017). In addition to the pleasant feelings associated with strengthening individual identity formation, it was found that feelings of nature connectedness extend beyond the immediate social circle, fostering empathy for humanity (Moreton et al., 2019).

Feeling disconnected from nature can negatively affect identity formation. In particular, young adults tend to feel disconnected from nature (Beery & Wolf-Watz, 2014), and the trend is rising (Soga & Gaston, 2016). Urbanisation, associated with increased use of social media, leads young people to lead a self-centred life and feel disconnected from others (Michikyan & Suárez-Orozco, 2016). Moreover, a lack of a perceived connection with nature

often results in feelings of loneliness (Heinrich & Gullone, 2006), which are associated with several adverse mental health outcomes, including low self-esteem and negative emotions (Al Khatib, 2012; Cacioppo et al., 2006; Heinrich & Gullone, 2006). Lower self-esteem can significantly hinder identity formation (Schwartz et al., 2013). Notably, Research by Moreton and Hornsey (2018) highlights the interconnectedness of social and environmental dimensions of connectedness, suggesting that one aspect can positively influence the other. That said, feelings of social disconnection are linked to heightened stress and negative emotions, further impeding healthy identity formation (Eisenberger et al., 2010; Taylor et al., 2020). This, in turn, raises the general question of how individuals view their relationship to nature as connected or distinct. The underlying challenge in our modern society is perhaps not just the pursuit of individuality but rather to overcome the perceived disconnection from the environment (Frantz et al., 2005). Thus, addressing the disconnection from the environment is crucial for both identity formation and societal well-being.

Relevance of Digital Nature in Storytelling

The presence of digital nature images in storytelling might influence feelings of connectedness. Generally, nature helps individuals organize and make sense of their personal experiences (Bratman et al., 2015), which is crucial for developing a coherent identity. Narrative storytelling interventions have also been shown to promote feelings of connectedness and well-being (Soundy & Reid, 2019). Recent research by Georgieva and Georgiev (2022) highlighted the potential of storytelling and virtual environments for narrative self-creation, which can enhance self-awareness and promote self-growth. Next to this, several studies have shown that digital nature can promote feelings of connectedness (Brambilla et al., 2022, 2023; Calogiuri et al., 2018; Leung et al., 2022; Otten et al., 2023) and well-being (Pasca et al., 2022; Reese et al., 2022).

Virtual natural environments can also motivate people to want to visit the environments they see (Brambilla et al., 2023; van Houwelingen-Snippe et al., 2023). Only brief exposure to digital nature has been found to enhance attentional capacity and cognitive performance (Valtchanov et al., 2010), which is particularly relevant for retrieving autobiographical information for storytelling (Rohde & Thompson, 2007). The Attention Restoration Theory (ART) is a theoretical framework that helps to explain such outcomes as it describes how natural environments serve restorative effects on cognitive functioning, particularly directed attention (Kaplan & Kaplan, 1989). Cognitive resources such as working memory capacity are essential for effectively searching and retrieving autobiographical memories, aiding in the

organization and recall of personal information (Unsworth et al., 2012). Additionally, virtual nature environments have been found to function as conversation starters (Otten et al., 2023), which is relevant for engaging in storytelling. Important to note is that digital nature is not meant to replace real nature but can complement it and serve as a tool to help individuals reconnect with the natural world (Litleskare et al., 2020).

Research Gap and Study Rationale

The growing disconnection from nature (Pergams & Zaradic, 2006; Beery & Wolf-Watz, 2014; Soga & Gaston, 2016), increasing psychological distress (Twenge et al., 2019), and extended identity formation phases (Arnett, 2000) highlight the need and potential for interventions aimed at reconnecting young adults with nature and themselves. Several studies have shown that digital nature can promote feelings of connectedness (e.g. Brambilla et al., 2022) and well-being (Pasca et al., 2022).

However, existing literature is sparse concerning how trait levels of nature connectedness affect feelings of connectedness young adults derive from exposure to digital nature (Browning et al., 2020; Calogiuri et al., 2018; Litleskare et al., 2020). Moreover, although effective, VR-based interventions often require collaboration among various professionals and are costly (Laver et al., 2017; Parsons & Rizzo, 2008; Rizzo et al., 2004; Slater & Sanchez-Vives, 2016). AI-generated images may offer a more accessible and cost-effective alternative to VR-based interventions by creating a digital nature that is tailored to users' individual needs (Wales & Mingyue Yuan, 2022). Research by Lumber et al. (2017) and Richardson et al. (2020) emphasises the importance of the emotional pathway in fostering nature connectedness at both a societal and individual level. Therefore, personalised AI nature images of meaningful experiences in nature may foster a sense of emotional connection to nature in young adults. Research suggests that individuals with low levels of nature connectedness may experience a greater increase in feelings of connectedness following digital nature experiences (Leung et al., 2022). Based on these findings, the following hypotheses are formulated:

Hypothesis 1a (H1a): AI-generated nature images presented during storytelling (compared to not watching) will significantly influence participants' state nature connectedness.

Hypothesis 1b (H1b): AI-generated nature images during storytelling (compared to not watching) will lead to a greater increase in state nature connectedness for participants with low trait nature connectedness compared to those with high trait nature connectedness

Additionally, using personal images created with participant involvement of writing a prompt could enhance emotional engagement, possibly increasing the richness of emotional language used in narrative (Loeffler, 2004; Flobak, 2019). In the context of storytelling, in combination with personalised AI nature images, the principle of *compatibility* within ART seems to be of importance (Kaplan & Kaplan, 1989). According to this principle, it is important that environment matches individual preferences and emotional needs to enhance directed attention and facilitate cognitive performance (Kaplan & Kaplan, 1989; Herzog et al., 2003). In turn, personalised AI-generated nature images may have the potential to provide this benefit by focusing on creating personal nature images based on meaningful experiences in nature (Göring et al., 2023), as perceiving beauty in nature is a subjective phenomenon (Lumber et al., 2017). Thus, personalised, AI-generated images of nature could contribute to a richer use of emotional language describing meaningful experiences in nature. Accordingly, the following hypothesis is proposed:

Hypothesis 2 (H2): The use of AI-generated images during the storytelling process will increase the use of emotional language compared to narratives without such images.

Lastly, this study aims to explore the emotional themes young adults express in narratives about meaningful nature experiences. There is still a lack of conceptual clarity in psychology regarding the human relationship with nature and the emotional factors involved in nature connectedness (Schultz, 2002; Sheffield et al., 2022; Tiscareno-Osorno et al., 2023).

Methods

Design

This study employed a between-subjects design, comparing participants exposed to personalized AI-generated nature images with those not exposed to these images. Data collection took place in two main phases: a common writing task for all participants and an interview session with two different conditions. These conditions investigated the effect of the independent variable, 'storytelling condition' (with or without AI images), on the dependent variables, 'state nature connectedness' and 'emotional language' (EL).

Experimental Condition

Participants in the experimental condition were shown AI-generated nature images at the beginning of the session to assess whether these images could influence their state nature connectedness (H1a) in relation to their pre-measured trait nature connectedness levels (H1b). This condition also examined whether the integration of AI-generated images into storytelling

increased the use of emotional language (H2). At the end of the session, participants chose their favourite from three different AI images and responded to open-ended questions about their preferences for integrating AI images into storytelling.

Control Condition

Participants engaged in storytelling sessions in the control condition without prior exposure to AI nature images (H1a). This setup measured their state nature connectedness relative to their trait nature connectedness levels (H1b) and compared the emotional language (H2) used to the experimental group. Similar to the experimental group, control participants also selected a favourite image from the same set of three AI-generated images after their storytelling session and answered the same open-ended questions regarding their preferences.

Participants

A sample of voluntary participants was utilised through snowball sampling and the University of Twente's Test Subject Pool. A total of 47 young adults aged between 20 and 30 years participated in this study. The majority of the sample were females, accounting for 68.75% (n=33), with males representing 29.17% (n=14) and one participant (2.08%) preferring not to disclose their gender. A substantial proportion were German (62.5%, n=30), followed by Dutch (18.75%, n=9). Other nationalities, including American, Austrian/Singaporean, British, Bulgarian, Czech, Danish, Portuguese, Spanish, and Slovak, each constituted approximately 2.08% of the sample (n=1 for each nationality). Participants were required to have internet access and complete all survey questions. Exclusions were made for participants who did not complete the second part of the study (n=4) or were older than 30 years (n=1). The median age of the sample was 22 years, with a mean age of 22.48 years (SD ≈ 2.06). Table 1 presents descriptive statistics of both conditions separately.

Table 1

Summary of Participant Characteristics by Condition

Characteristic	Experimental Group (n=24)	Control Group (n=23)
Mean Age (SD)	22.23(2.06)	23.67 (2.50)
Gender (n, %)		
Female	17 (70.83%)	16 (69.57%)
Male	6 (25.00%)	7 (30.43%)
Prefer not to disclose	1 (4.17%)	0 (0%)

Note. NC = Nature Connectedness.

Materials

Leonardo.ai

The study utilised the Artificial Intelligence program Leonardo.Ai (https://leonardo.ai/) to create personalised nature images. Developed in Australia, this user-friendly AI tool specialises in generating creative content based on text prompts, such as artwork or images. It offers users a high degree of control, including features like "prompt adherence" to adjust the level of image matching, "model fine-tuning" for specific style creation, an "image prompt" to tailor to particular layouts or compositions, and the option to provide "negative prompts" to exclude certain features from the image. Following generation, the output images can be further refined using the "canvas" option for precise adjustments. Moreover, Leonardo.Ai has the potential to produce realistic human figures and animals. This study used the free model `Stable Diffusion 2.0´, which was trained to create highly realistic outputs. The masking functions of Leonardo.Ai were used to personalise the images. Once the images were created, adjustments were made if they contained elements that did not match the participants' descriptions (e.g. if the description included "butterflies [striking details]" but the image did not show butterflies). The relevant areas were selected to either remove unwanted elements or create new elements, using the same terminology that the participants had provided in their descriptions. The aim of this method was to ensure that the images matched the participants' narratives as closely as possible. Table 2 depicts the generation process in this study was planned and followed with this template structure:

Table 2

Instructions for AI-generated Nature Images

Image	Settings	Additional Instructions
1 "*AI guess*"	Prompt Magic: On High Contrast: On Prompt Strength: 0.4	From online survey part 1 copy and paste in prompt section *'Title'* + *'Description'* and add the words *'Photorealistic, high rendering, panoramic shot'*
2 "*Enhanced adherence to prompt*"	Prompt Magic: On High Contrast: On Prompt Strength: 0.55	From online survey part 1 copy and paste in prompt section *'Title'* + *'Description'* and add the words 'Photorealistic, high rendering, panoramic shot'

3 "*All Variables + Striking Details*"	Prompt Magic: On High Contrast: On Prompt Strength: 0.55	From online survey part 1 copy and paste in prompt section *'Title'* + *'Description'* + *'Striking Details'* and add the words *'Photorealistic, high rendering, panoramic shot'*

To provide additional clarification, Figure 1 illustrates the generation process. It contains an example of the prompt format used in the study and the corresponding images generated by the AI.

Figure 1

Example generation process

1. AI guess

Prompt: *Sunset at arpoador* [Title]. *I was at the rock part of Arpoador in Rio reading and listening to my surroundings, I was watching the mountains on the other side of the beach while the sunsetted, I felt calm and fully clear in my head despite of the noises coming from the tourists and foreigners sitting on the same rock, I was feeling a sense of calmness and belonging just appreciating where I am in the given moment.*[Environment description]. *Photorealistic, high rendering, panoramic shot*

2. Enhanced adherence to prompt

Prompt: *Sunset at arpoador* [Title]. *I was at the rock part of Arpoador in Rio reading and listening to my surroundings, I was watching the mountains on the other side of the beach while the sunsetted, I felt calm and fully clear in my head despite of the noises coming from the tourists and foreigners sitting on the same rock, I was feeling a sense of calmness and belonging just appreciating where I am in the given moment.*[Environment description]. *Photorealistic, high rendering, panoramic shot*

3. All Variables + Striking Details

Prompt: *Sunset at arpoador* [Title]. *I was at the rock part of Arpoador in Rio reading and listening to my surroundings, I was watching the mountains on the other side of the beach while the sunsetted, I felt calm and fully clear in my head despite of the noises coming from the tourists and foreigners sitting on the same rock, I was feeling a sense of calmness and belonging just appreciating where I am in the given moment.*[Environment description] *the movement of the waves* [Striking Details] *Photorealistic, high rendering, panoramic shot*

Connectedness to nature

Two scales were used to measure the connectedness to nature of the participants in part 1. The first was the 14-item Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004), used to assess Trait Nature Connectedness (see Appendix B). The second was a modified version of the CNS (Mayer et al., 2005), consisting of 13 items, known as the state-CNS (see Appendix C). The state CNS consists of one item less than the original CNS, as one item was omitted due to incompatibility with the reformulation into the present tense. Both scales entail a Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). They can be employed together as the modified version rephrases the statements of the original one (CNS; Mayer & Frantz, 2004), into present tense. Examples of such rephrased statements are "I often feel a sense of oneness with the natural world around me" to "Right now I am feeling a sense of oneness with the natural world around me", or "I often feel part of the web of life" to "Presently I feel like I am part of the web of life". Moreover, research on student samples demonstrated good internal consistency, with high reliability rates (Mayer & Frantz, 2004, 2008; Frantz et al., 2005). Cronbach's alpha for the current sample was 0.892, which demonstrates good reliability.

Procedure

Informed consent (see Appendix A) and the surveys were distributed via Qualtrics XM (https://www.qualtrics.com/), which is a free-to-use software and offers reports of the gathered data.

This study's procedure consisted of two phases. In the first part of the study, participants received a link that led them to an online survey. They were (digitally) welcomed, and information about the aim of the study was provided first, followed by informed consent and a few demographic questions. Next, they filled out two questionnaires regarding trait connectedness to nature. This was followed by a question asking them to describe a meaningful experience in nature, come up with a title for it, and indicate what details stood out most to them. This survey could be completed in their own time and setting in approximately 30 min.

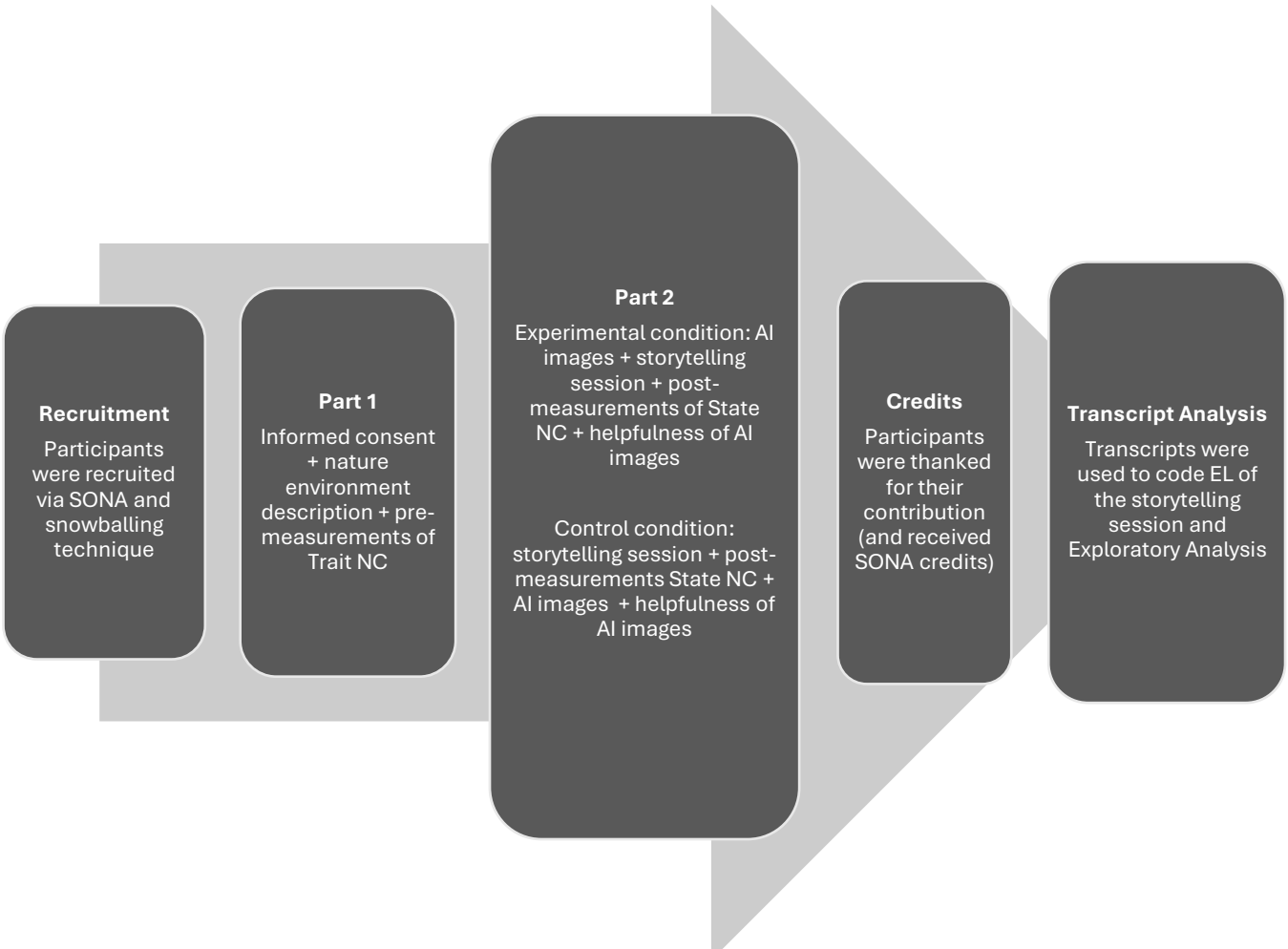
The second part of the study was an in-person storytelling session. In these sessions, participants were randomly assigned to condition one or two (see Figure 1). In condition one, the participants were presented with three AI images created according to the instructions in Table 1, from which they could pick the most preferred. Then, they were asked to retell their meaningful nature experience in detail, accompanied by the chosen nature image in front of

them on a laptop screen. The storytelling was, if necessary, assisted with questions by the researcher from a semi-structured interview template. Lastly, they filled out the questionnaires about their state nature connectedness and two open questions about the helpfulness of the AI images.

The sequence of steps in condition two was reversed in the sense that the participants first did the storytelling and then were shown the images. This option would be the control condition. Then again, they filled out questionnaires regarding their emotional state, feelings of social connectedness, and state of nature connectedness with two open questions about the helpfulness of the AI images. After this, the participants were thanked for their participation, and any remaining questions were answered. The second part also lasted for approximately thirty minutes.

Figure 2

Research Procedure



Note. SONA= University of Twente's SONA website. NC = Nature Connectedness. EL = Emotional Language

Data Analysis

To address the research question and test the hypotheses, a mixed-methods approach was employed.

Quantitative Approach

The software RStudio version 1.4.1717 was used to analyze data gathered from Qualtrics. Descriptive statistics were calculated to provide an overview of the sample demographics, including age, sex, and nationality. Participants who did not complete the second part of the study (n=4) or were older than 30 years (n=1) were removed from the dataset. As a preparation of testing H1b, participants were categorized into "*High*" and "*Low*" nature connectedness groups using a median split in the Trait Nature Connectedness scale. Composite scores for each participant were calculated by averaging the scores across all items on the Trait Nature Connectedness scale, deriving mean scores. Participants whose mean scores were above the median (> 4.96) were categorized as having 'High' Trait Nature Connectedness. Participants whose scores were equal to or below the median (≤ 4.96) were categorized as having 'Low' Trait Nature Connectedness.

Moreover, a randomization check was conducted to ensure no significant differences between the groups (AI vs. No AI) and trait nature connectedness level (High vs. Low) in terms of age ($\chi^2 = 1.75$, df = 3, p = .63) and gender ($\chi^2 = 3.65$, df = 6, p = .72). The randomization test was successful, as there were no significant differences in participant characteristics between the two groups (see Appendix D). Additionally, the parametric assumptions of the two questionnaires, as well as Cronbach's alpha, were tested to assess the internal consistency of the questionnaires. Normality assumptions for the state nature connectedness level were violated (W = 0.94585, p = 0.02741). Therefore, the quantitative hypotheses (H1a, H1b, and H2) were tested non-parametrically (see Appendix D).

To test H1a, the Kruskal-Wallis test was used to compare state nature connectedness between AI and No AI groups (see "Results"). Testing H1b, another Kruskal-Wallis test was employed to evaluate differences in state nature connectedness across four groups formed by the interaction of trait nature connectedness levels (High vs. Low) and exposure to AI-generated imagery (AI vs. No AI) during the storytelling sessions. Further analysis was conducted using Dunn's Test with Bonferroni correction, to further specify differing groups.

To test H2, Storytelling sessions were transcribed using otter.ai (https://otter.ai/home). Microsoft Excel was used for organized and feasible coding. Transcripts were hand-coded for EL use across positive, ambivalent, and negative valence. Examples include for: Positive EL:

"joy", "good", "enjoy"; Ambivalent EL: "felt different", "feeling it so much", "just shocked"; Negative EL: "a bit scary", "kind of insecure". Positive, ambivalent, and negative EL scores were summed and standardized to create *combined* EL scores to test H2. Inter-rater reliability for (Positive, ambivalent, and negative) EL ratings was assessed using Fleiss' Kappa, with ratings provided by three raters across six transcripts. The Fleiss' Kappa value was 0.67, indicating substantial agreement among the raters (Landis & Koch, 1977), and was statistically significant, $z = 5.48$, $p < .001$.

Qualitative Approach

A primarily inductive thematic analysis was implemented using Clarke's (2006) six-phase framework to systematically identify and examine patterns of emotional themes expressed by participants in their narratives of meaningful experiences in nature (see "Table 5"). The aim was to deepen the understanding of the emotional dimensions of nature connectedness among young adults. Following Bree and Gallagher's (2016) guidance, Microsoft Excel was used to code the emotional themes effectively. This approach ensured an inductive exploration of the data, allowing themes to emerge from the participants' narratives.

Results

Table 3 presents the descriptive Statistics for Age and Gender by Group (AI vs. No AI) and Trait Level (High vs. Low).

Table 3

Descriptive Statistics for Age and Gender by Group and Trait Level

Storytelling condition	NC Trait Level	Mean Age (SD)	Female	Male	Other
Without AI Image	High	23.67 (2.45)	6	3	0
With AI image	High	22.23 (1.89)	10	3	0
Without AI Image	Low	22.21 (2.15)	10	4	0
With AI image	Low	22.55 (1.75)	7	3	1

Note. Mean Age is reported in years. Counts reflect the number of participants who identify as female, male or prefer not to say (other)

H1a*: AI-generated nature images presented during storytelling (compared to not watching) will significantly influence participants' state nature connectedness.*

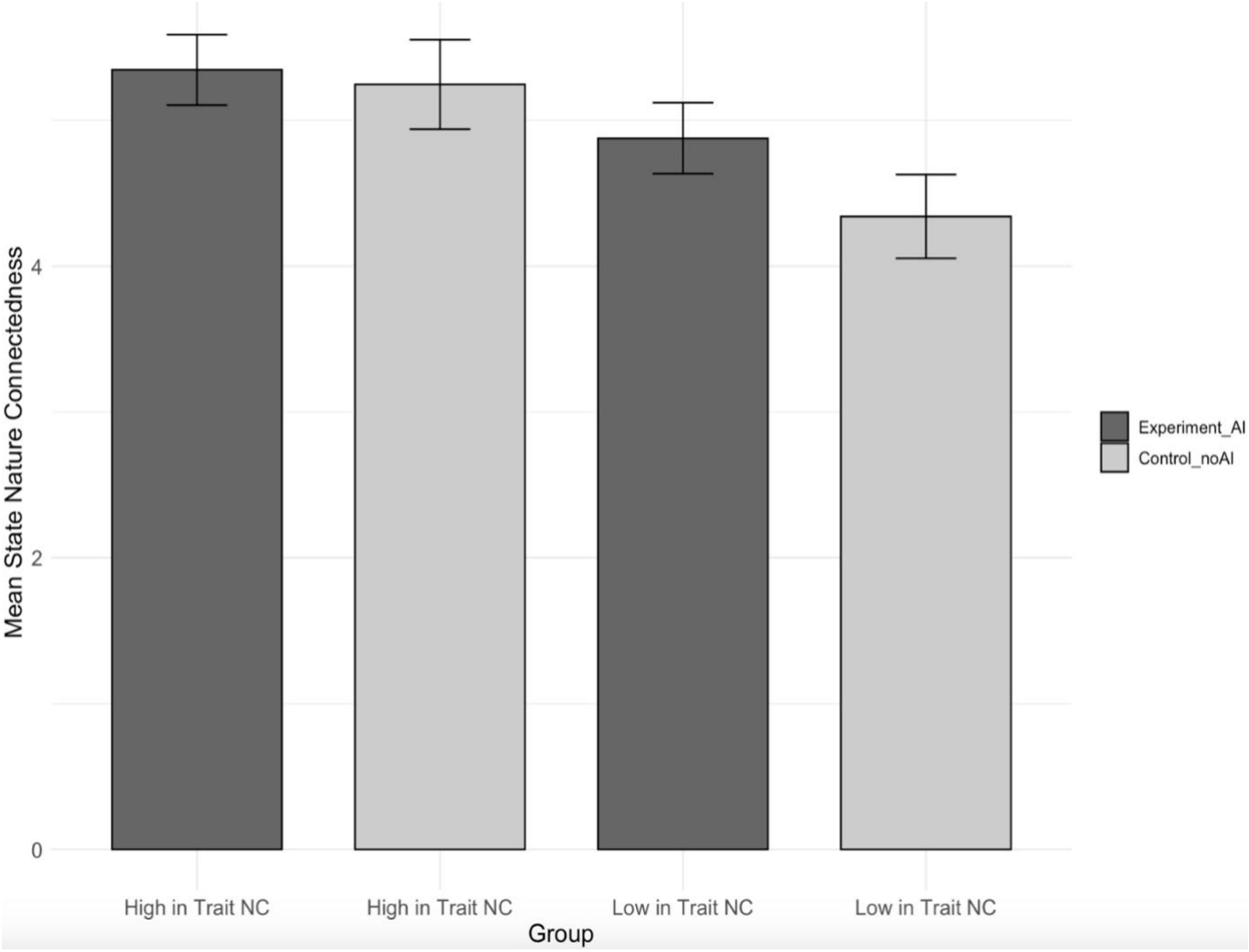
To test H1a, we conducted a Kruskal-Wallis test comparing the state nature connectedness between the AI and No AI groups. The results showed no significant differences in state nature connectedness between the AI and No AI groups ($\chi^2 = 0.92$, df = 1, p = 0.34). This indicates that the presence of AI-generated images alone did not significantly affect state nature connectedness compared to the control condition without AI-generated imagery. Therefore, we reject Hypothesis 1a.

H1b*: AI-generated nature images during storytelling (compared to not watching) will lead to a greater increase in state nature connectedness for participants with low trait nature connectedness compared to those with high trait nature connectedness*

Similarly, A Kruskal-Wallis test was employed to test H1b, evaluating differences in state nature connectedness across four groups formed by the interaction of trait nature connectedness levels (High vs. Low) and exposure to AI-generated imagery (AI vs. No AI) during the storytelling sessions. The test revealed significant differences among the groups ($\chi^2 = 9.56$, df = 3, p = 0.02). A bar chart with error bars visualised the differences in state nature connectedness between the groups, indicating that participants with low trait nature connectedness exhibited a greater increase in state-nature connectedness when exposed to AI-generated images (see Figure 3). Further analysis using Dunn's Test with Bonferroni correction identified a significant difference, particularly between the group with low trait nature connectedness without AI images and the group with high trait nature connectedness with AI images (Z = -2.73, adjusted p = 0.02). No other group comparisons reached significance after adjustments for multiple testing. Therefore, H1b was not supported.

Figure 3

Impact of AI Image on State Nature Connectedness by Trait Level



Note. NC = Nature Connectedness; Error bars represent the standard error

H2: The use of AI-generated images during the storytelling process will significantly increase the use of emotional language compared to those without AI-generated images.

A Wilcoxon rank sum test was conducted to compare the use of emotional language between participants exposed to AI-generated images and those who were not. Table 4 shows the distribution of results for the different types of emotional language. The results indicated no significant difference in the use of emotional language between the groups ($W = 291.5$, $p = 0.573$). Thus, Hypothesis 2 was not supported.

Table 4

Descriptive Statistics for Emotional Language Scores by Condition

Storytelling Condition		Without AI Image (n = 23)	With AI Image (n = 24)
EL Positive			
	Mean (SD)	5.70 (2.86)	6.38 (3.74)
	Median	5.00	4.50
	Min	1	1
	Max	11	14
EL Ambivalent			
	Mean (SD)	1.52 (1.81)	1.25 (1.82)
	Median	1.00	0.00
	Min	0	0
	Max	7	7
EL Negative			
	Mean (SD)	0.43 (0.66)	0.25 (0.53)
	Median	0.00	0.00
	Min	0	0
	Max	2	3
EL Combined			
	Mean (SD)	7.65 (3.60)	7.88 (4.64)
	Median	6.00	5.50
	Min	3	0
	Max	13	21

Note. EL Scores = Emotional Language; SD = Standard Deviation; Min = Minimum; Max = Maximum; Median, Min, and Max are sum scores.

Exploratory Positive Emotional Language

The thematic analysis of participant narratives revealed five main themes (see Table 4): Happiness, Connection, Peace, Reflection, and Awe. Each theme includes several subthemes contributing to the main theme, as detailed in Table 5 with example expressions from participants.

Happiness was the most frequently mentioned theme, appearing in 27.3% of the total mentions. Participants often expressed feelings of *joy*, such as "just enjoy" (14.5%), and *pleasure*, "nice feeling" (12.8%).

Connection was the second most frequent theme, accounting for 20.9% of the total mentions. This theme encompasses feelings of *oneness with nature*, "I'm one with nature" (7.3%) and *social connection* such as "my friend" (13.6%).

Peace was mentioned in 18.6% of the total occurrences and included subthemes of calmness, "really calm" (10.8%), solitude, "just very alone" (4.4%), and mindfulness, "a meditative experience" (3.4%).

Introspection was identified in 15.1% of the total mentions, with subthemes of *self-awareness*, "self-reflecting" (3.5%), *gratitude*, "felt grateful, thankful" (4.9%), and *thoughtfulness*, "alone in my own thoughts" (6.7%).

Awe was the least mentioned theme, appearing in 7.0% of the total mentions, encompassing subthemes such as *amazement*, "amazed me" (3.2%), and *sublimity*, "insignificant feeling, but also the beauty" (3.8%).

It is important to note that the subthemes identified often exist simultaneously. For example, participant 13 mentioned, “[…] we were just thinking about how appreciative we were of being young. Having fun and being fit and healthy. I would say I felt pretty content and happy to be myself.” In this example, one participant 13 describes an experience with friends (connection) and simultaneously states, "I felt pretty content and happy to be myself" (happiness and introspection). This expression was primarily categorized under Introspection as the subthemes outweighed other possible categorizations.

Table 5

Emotional Themes in Participant Narratives with Example Quotes

Main Theme	Sub-Themes	Example Quotes
Happiness	Joy	“[…] my heart was filled up with so much joy […]” (PP45); “I felt just complete happy, and I just didn't have any bad feeling in this moment.” (PP4)
	Feeling free	“It's almost like as though you have freedom. As if I didn't have freedom before - I obviously did - but it was a different kind. It was like a unique feeling of freedom for me.” (PP9)
Connection	Pleasure	“It was very wholesome […]” (PP16)
	Oneness with nature	“[…] I´m one with nature[...]" (PP4); “I felt pretty much in touch with nature” (PP40)
	Social connection	“I was feeling some kind of feeling like a whole I don't know, like part of the world.” (PP7); “[…] my friend and I just build a new bond which um we didn't have before, and I think nature made it possible for us to connect on some certain deeper level.” (PP27)
Peace	Solitude	“So I decided to go on a little adventure and I wanted to be alone as well.” (28)”; “After the whole walk in nature, I felt very peaceful and very enlightened, I would say.” (PP25)
	Mindfulness	“I really can calm down and it was kind of like a meditative experience in that way."(PP23); “I felt like very clear minded” (PP7); “I was just observing my feelings without feeling the need to, you know, push against them, bottle them up.” (PP14) “I felt like I could be completely present in the moment without distractions, and I felt less stressed when while I was walking through that Botanical Garden” (PP41)
	Calmness	“It was very calming to be like in the middle of the city in that forest thing.” (PP18)

Introspection	Self-awareness or - reflection	"Those are like the moments where I can best deal with it. So those are the moments where I get the most emotional, […] to rethink moments and relive moments. Deal with them."(PP30); "[…], I was alone in my own thoughts, but not every way more like in a in a calm way, in a very, very self-reflecting way" (PP36); "[…] I can be myself again" (PP17)
	Gratitude	"[…] you're just enjoying it and appreciating the beauty of nature, essentially." (PP19); "[…] we were just thinking about how appreciative we were of being young." (PP13)
Awe	Amazement	"It felt both surreal but also natural, you know. Especially with the cold water." (PP22); "I felt very small, but in a good way" (PP14); "[…] kind of gave it a magical touch." (PP12); "I think everyone should see this. Because it's amazing" (PP33)
	Sublimity	"I felt like nature around me was so much more than I could grasp... It gave me this kind of insignificant feeling, but also the beauty of the greatness of nature around you." (PP12)
	Inspiration or transcendental awareness	"I was aware that I was experiencing something bigger than me" (PP45); "Like I'm part of something bigger and this is just like you look up and in the cosmos, you see the movement and you're like, well, maybe I'm a very, very small being in such a big world and stuff like this" (P40)

Note. Example quotes are direct statements from participants

Additional Results

In our study, participants were asked "*Do you think it would have been more helpful to look at the pictures before or after the storytelling session? Please explain*". Their preferences were also analysed in the context of the condition they were in (experimental group - before, control group - after).

Table 6

Summary of presumed preferences for viewing AI images before or after storytelling

Storytelling Condition	Preferred Before (n)	Preferred After (n)	Neutral (n)
With AI Image	18	4	3
Without AI Image	6	12	4
Conditions Combined	24	16	7

Participants provided various reasons for their chosen preferences. Those who chose *before* felt that the images helped them "remember more details" or "refresh" their memory, facilitating better storytelling. Additionally, participants often noted that the images helped evoke feelings and emotions that were beneficial for storytelling. Another common theme

among those who preferred seeing the images before the session was that the image helped visualise the story more clearly (PP43: "so I would have a clear picture in mind of what I am talking about").

Those who preferred *after* often voiced concerns about potential changes in the story if they saw an image that did not perfectly fit their memory. Additionally, participants believed that seeing the images after storytelling would help reconcile their memories without introducing bias (PP9: "I feel as though recalling memories of the past before looking at the AI picture allowed me to remember important details first, then remember smaller details when comparing with the AI picture"). Another common theme was that seeing the AI image afterwards gave them a better position to choose the most suitable one (PP6: "Because you can then find the best suiting picture"). Ambivalent or neutral preferences often expressed uncertainty or noted benefits in both approaches, depending on whether they thought the image was suitable or accurate for their personal preferences (PP17: "I don't know, I think both ways are good because I like talking with the help of how I imagine something, but since the picture was this accurate, I also liked looking at it from time to time").

Discussion

This study aimed to investigate whether personalized AI-generated nature images influenced storytelling, focusing on their impact on young adults' nature connectedness and emotional richness in narratives. Contrary to expectations, the AI-generated images did not significantly enhance nature connectedness or the emotional richness of the narratives. Moreover, participants with low trait nature connectedness did not show a significantly greater increase in state nature connectedness than those with high trait nature connectedness when exposed to AI-generated images. However, a small difference was observed between the low and high trait groups. The predominantly positive tone and the theme of happiness prevalent in young adults' narratives about nature were also noteworthy.

Both H1a, that *AI-generated nature images presented during storytelling would significantly influence participants' state nature connectedness*; And H1b, that *AI-generated nature images would lead to a greater increase in state nature connectedness for participants with low trait nature connectedness compared to those with high trait nature connectedness*, were not supported. This is contrary to findings from several studies that have shown digital nature can promote feelings of connectedness (e.g. Brambilla et al., 2022, 2023; Calogiuri et al., 2018), as well as the expectation that individuals with low trait nature connectedness would benefit more from such interventions (Leung et al., 2022).

One possible explanation is that the AI images did not provide a sufficient sense of immersion, as a 2-dimensional screen can reduce the feeling of being fully immersed in an environment. Unlike more immersive environments, such as VR, 2D screens may not provide the same level of sensory engagement to enforce feelings of nature connectedness (Yeo et al., 2020). In addition, the predominantly positive valence of the recalled memories, as seen in Table 4, may have influenced this outcome. Participants noted that the images provided them with an observer's perspective, which may have influenced their feelings of connectedness to nature. According to D'Argembeau et al. (2002), positive memories are more likely to be recalled from a field perspective, seeing the event through one's own eyes. Compared to neutral memories, which are more likely to be recalled from an observer perspective, seeing oneself from an external point of view (D'Argembeau et al., 2002). Moreover, participants expressed that the image could "inspire thoughts" or "it can jumpstart my memory", acting as a cue (van den Hoven & Eggen, 2009), but less seeing oneself standing in this environment again (PP8: "it was hard for me to look back at the situation from my perspective"). Therefore, the AI-generated images may have functioned more like photographic souvenirs rather than creating a feeling of being there (Marín-Morales et al., 2019). For example, participant 24 voiced "I think the image portrayed my experience accurately […] it just felt like it was another photo that I took". In connection to seeing the image as a photograph, the two-dimensional screen and size of a computer may limit feelings of connectedness due to perceived boundaries, a factor typically found in the context of viewing the natural environment itself (Rompay et al., 2023).

Although there was no significant difference between the low and high nature connectedness groups (H1b) on the measures of nature connectedness, a small visual positive trend was observed for the low trait group in the AI condition (see Figure 3). Perhaps this means that for a few participants, the feeling of vastness could be transcended (PP45: "it helped me because it matched the views I had from the boat, and I could easily feel like I was there" or PP9: "The AI image managed to capture the vastness of the landscape […] I can feel that I am able to place myself in the 'reality' of the image". This should warrant future investigations, as findings of Yeo et al. (2020) suggest that digital nature can motivate people to experience the real nature seen in the image (PP17: "it made me in the mood to go to that place again").

Also, the second hypothesis that *the use of AI-generated images during the storytelling process will increase the use of emotional EL compared to narratives without such images*

was rejected. The results were not consistent with the expectation that the compatibility principle in ART, the environment should match an individual's cognitive and emotional needs in order to facilitate cognitive performance (Herzog et al., 2003), would play a role in enhancing emotional engagement and narrative richness by matching needs with personalised digital nature images. However, a similar reasoning to H1a and b may have played a role here, in that digital nature should provide an immersive experience to maximise its potential to promote *effortless* attention and thus enhance cognitive performance. The AI- images may have functioned more like static images, conveying a feeling of observing the environment from the outside, thus failing to capture attention effortlessly and potentially producing to draw *directed* attention (Herzog et al., 2003). Moreover, a cognitive dissonance caused by the artificial nature of the AI-generated images (PP44: "my brain had to adjust to the differences") may have hindered the realization of ART's benefits, as participants at times found it difficult to reconcile these images with their real-life experiences during storytelling (Murcia et al., 2015). This could have hampered their ability to remember and retell emotional details, as noted by participants who found the AI images distracting when simultaneously telling a story (Bates et al., 2023).

In terms of the compatibility principle (ART), this study highlights the importance of focusing on "beauty" characteristics of nature that are associated with emotions (Lumber et al., 2017). Previous research has highlighted the benefit of the accuracy of digital nature (Litleskare et al., 2020). However, participant 43 in this study interestingly voiced “It was accurate but didn’t capture the feeling of the image in my head”. This is in line with research by Li et al. (2019), pointing out that incorporating emotional elements can enhance the viewer's engagement and overall experience, for example, through techniques such as colour adjustments (Li et al., 2019). The results of our study, therefore, emphasize that aesthetic experiences are subjective and unique (Vessel et al., 2012). For 2D nature images, it may be more important to highlight aspects that evoke emotions rather than focusing solely on memorable details (Li et al., 2019). Underlining this line of reasoning, participant 9 voiced: “When I recall my nature experience, I always recall the vastness of the mountains […]. The AI image managed to capture the vastness […] I felt a sense of familiarity when looking at the AI image. Although the image was not exactly as I recalled, I can feel that I am able to place myself in the 'reality' of the image”. While ART provides a framework for understanding the benefits of digital nature, considering the context and manner of application, such as 2D versus 3D digital nature, are crucial. Concludingly, AI-generated

images should not replace real nature experiences, as digital nature images do not provide sensory experiences important for encouraging attention restoration effects (PP4: "I could see the leaves moving in the wind, and it looked very beautiful" (Radikovic et al., 2005). However, immersive digital nature environments can benefit those with barriers to access to real nature, such as the elderly (Schwanen & Páez, 2010), individuals with busy work schedules (Friedman et al., 2008), or hospital patients (Vincent et al., 2010).

As a third objective, this study *explored the emotional themes young adults express in narratives about meaningful experiences in nature* and identified five predominant emotional themes in young adults' narratives about meaningful experiences in nature: Happiness, Connection, Peace, Introspection, and Awe. These themes align with the multidimensional approach to pathways towards nature connectedness, emphasizing the importance of engaging emotionally and meaningfully with nature (Lumber et al., 2017; Richardson et al., 2020). Lumber et al. (2017) highlighted that “the appreciation of nature’s beauty serves as a mediating factor” between sensory contact and emotional engagement, as illustrated by a participant who expressed, “looking at some snowed mountains and it was just like my heart was filled up with so much joy” (PP45). Importantly, in the context of the Identity formation of young adults, pleasant emotions were often then related to the topic of being able to centre themselves (PP28: "I felt like I could be completely present in the moment"), gratitude (PP13: "appreciative of being young"), or contentment (PP13: "I felt pretty content and happy to be myself”).

While many impactful experiences occurred in 'special places' like mountain peaks known for eliciting awe (Lu et al., 2017), young adults also appreciated nature in 'ordinary' settings (Van Houwelingen-Snippe et al., 2020). Participant 30 noted that "least significant moments" often let them “feel a closer emotional connection to nature,” reasoning, “then I can feel basically anywhere else, and I can relive or rethink moments that have happened in my pretty fast-paced life”. Moreover participant 36 shared how running in the forest, as opposed to the city, helped them work through emotions related to a negative view of self and improve their self-concept, explaining, “Being in nature really helped me find some kind of happiness and calmness; I was alone with my thoughts in a very reflective way,” and concluded, “I’m very proud of myself for reaching a point where I am accepting myself. The forest definitely helped me with this.” These findings underline the need for addressing this rising trend of disconnection among young adults to promote an adaptive identity (Bogaerts et. al. 2023). Addressing should be less knowledge teaching based, which was predominantly

done in this target group, as such finds highlight "a need to move beyond a superficial contact with nature" (Lumber et al. 2017, p.21).

Interestingly, the notion of self-centeredness in individualistic societies (Oyserman et al., 2002), has been associated with an increased disconnection from nature (Beery & Wolf-Watz, 2014). However, participants mostly described their sense of self in a "very self-reflecting way," aligning with the notion of reflective self-awareness (Richardson & Sheffield, 2015). Reflective self-awareness involves an introspective focus on one's thoughts and feelings, which contrasts with objective self-awareness, where individuals view themselves from an external perspective, often leading to self-centeredness and acting as a barrier to nature connectedness (Frantz et al., 2005). Reflective self-awareness appears to play a significant role in how young adults integrate nature experiences into their personal narratives, influencing their well-being and identity formation. Concluding, emotions felt during nature experiences can shape and strengthen the relationship with nature and one's identity. Richardson et al. (2020, p. 389) pointed out, "Engage emotionally with nature and find happiness and wonder in nature. Note the good things in nature, the joy and calm that they can bring. Embrace nature at times of sorrow." Supporting this, participant 44 described a hike where the flow of water helped in dealing with feelings of fragility due to recent life upheavals:

> *[…] the water flowing into the pond, made me really calm and I sat down and listened to my inner self and just tried to feel. I got into a really relaxed state. Which allowed me to connect deeper to my emotions at that point. So I let the emotions flow. I remember crying quite a lot, because it just overcame me, all the feelings that were the bad feelings that were myself. So I yeah, I just let them flow I wasn't judging myself at that time, which was quite nice because I had that before in another situations. I was not too familiar with me crying or too familiar with getting into like, strong emotions like anger or crying for example, like sadness. But this calm setting […] it was just me and nature allowed me to really be open and connect myself with your feelings. […] And I think that was so freeing to realize that me connecting with nature in that moment and being in in the state of calmness and tranquility definitely allowed me to feel as much as I did […]. Especially like the flow of water, which kind of in the moment where I got into my inner self and started almost meditating. It felt like the flow of the water in the background kind of transcended to the flow of my own self and the flow of my tears going through me.*

This narrative provides an interesting perspective considering the notion of Image Schemas and cognition: Viewing life as a journey may influence our perception of identity,

life paths, and the integration of new elements, such as nature, into our self-concept (Hedblom et al., 2015).

Limitations and Future Directions

One limitation of this study is the potential misclassification of participants as having low trait nature connectedness, as these individuals might not actually be low in nature connectedness compared to the general population. The sample was predominantly female with low cultural diversity, and both gender and culture can affect feelings of nature connectedness (Eisler et al., 2003). Additionally, some participants asked about the meaning of "feelings of vastness," suggesting that the questionnaire's transcendental meaning was not always understood, potentially impacting trait classification (Lercher, 1996). This study used the Connectedness to Nature Scale (CNS), a reliable measure of emotional connection to nature (Perrin & Benassi, 2009). However, a systematic review highlighted that various nature connectedness measures address different dimensions—emotional, cognitive, and experiential—to varying extents (Tiscareno-Osorno et al., 2023).

Future research should use more robust experimental designs, such as crossover, mixed (split-plot), or repeated measures, to better investigate potential confounding variables on the effects of AI-generated images and storytelling. Expanding measurement tools to include scales like the Nature Relatedness Scale (NR-6) and the Inclusion of Nature in Self (INS) scale could provide a more comprehensive understanding of individuals with a low emotional connection to nature (Tiscareno-Osorno et al., 2023). Research is inconclusive on the extent of gender differences in nature connectedness (Di Fabio & Rosen, 2019; Eisler et al., 2003) and how cultural background influences nature connectedness in young adults (Fränkel et al., 2019). Interestingly participant 33 named their experience “Peaceful nature and different cultural insights”. Therefore, it is also valuable to further investigate personal characteristics such as gender and cultural background that correlate with low nature connectedness and the fluidity of this trait in young adults.

Another limitation concerns the potential mismatch between AI-generated images and participants' expectations. This involves the accuracy of the AI images and whether distortions affect memory, immersion, or emotional reliving (Teo & Chia, 2018). During storytelling sessions, participants noted that perfectly accurate images were not necessary and might even introduce memory bias if there were discrepancies. However, Participants emphasized the importance of capturing elements of nature connected to the narrative's emotion. For instance, one participant appreciated how the image captured the “lighting

conditions of a lake at night" or described the sky as "deep purple, pink, and orange all blending into one colour", such characteristics reflect the concept of *mystery* in ART (Kaplan & Kaplan, 1989). Incorporating highly accurate digital images of nature might have been a limitation rather than an added value to enriching narratives. One participant mentioned, "It helped me remember the story because the scene that was not clearly visible gave me a similar impression and feeling to the original moment I experienced." This factor was not controlled for in this study and should be considered in future research.

Hence, future research should focus on assessing personal preferences for AI images before storytelling and contrasting different fine-tuning rounds. For example, implementing prompting rounds, where participants are asked to write objectively about how the details looked versus what colours or characteristics made them feel a certain way in the nature setting. Participants noted specific elements such as "trees that looked super fluffy" or "the vastness of mountains", highlighting how colour and perception differences affect emotional communication (Mohsen & Ahmed, 2014). It has been found that emotional content enhances the subjective feeling of remembering, even if the objective accuracy of contextual details is not improved (Sharot et al., 2004). Moreover, including participants in the creation of AI imagery more and controlling for personal aesthetic preferences in prompts might also enrich the emotional engagement (Flobak et al., 2019). Thereby possibly taking into account subjective preferences for "beauty" or learning styles of individuals as one participant voiced "I attach the most emotions to something that I can imagine visually". It would be interesting to explore the natural features of ART, such as mystery in the context of narratives, as perfectly accurate images are not always necessary for effective storytelling (Magliano et al., 2017). Hence, emotional aspect of such images may be more important for memory and immersion than precise accuracy in the context of visual cues and storytelling. Future studies should further explore these aspects to optimize the use of AI-generated images in enhancing emotional engagement and the storytelling experience.

Lastly, a limitation of this study is the thematic analysis of awe, which, based on existing literature, may not fully capture how young adults express awe. The language young adults use to describe awe may differ significantly from that found in existing literature (Darbor et al., 2016). Hence, the expression of awe among young adults in this study may not have been fully captured as expressions such as "the view was very, very nice", "what was really, really nice was the view" or "super nice" were not counted as a theme of awe. Future research should explore the nuances of how young adults articulate experiences of awe and

other emotions in their own words. Research by Xiong (2023) suggests that awe promotes authenticity by aligning actions with one's true self, thereby reducing fear of disapproval or inauthentic behaviour within social groups. Therefore, further studies could investigate the role of awe in promoting authenticity and its impact on young adults' identity formation.

Practical Applications

The digital nature is versatile and can be of significant benefit in cases of mobility impairments in which high levels of accuracy are typically considered advantageous (Zhang et al., 2017). However, this study found that personalized AI images did not significantly increase feelings of nature connectedness, nor was there a significant difference between low and high trait groups. It remains unclear whether AI images enhanced the richness of emotional language during storytelling, as no significant effect was found, possibly due to high variation in responses.

Digital nature, in the form of AI images, should not replace the beneficial sensory experiences of real nature that promote emotional states that are beneficial for a secure identity formation. Young adults experiencing an *extinction of experience* (Soga & Gaston, 2016), experiencing nature does not mean documenting it with media, and can hamper meaningful interactions, as Participant 30 voiced “taking a break from a fast-paced life”. Although the direct impact on nature connectedness values was not significant, AI-generated imagery can still play a role as an engaging additive to storytelling, as Participant 21 described: "When it comes to the storytelling, not only does it bring the story to life, it is also fun to look at". According to Heidegger, technology is not just a collection of tools but a way of revealing the world, shaping our perceptions and interactions by highlighting certain elements while obscuring others. AI images offer a unique feature compared to traditional photos, allowing individuals to emphasize elements they find beautiful or to convey emotions. Expressing emotions through art in positive arts interventions has been found to help university students flourish, promoting self-reflection and awareness (Darewych, 2019).

Personal AI images, therefore, offer the opportunity to share memories and emotions creatively, potentially being more suitable for group storytelling than individual storytelling. Savouring nature has been shown to mediate positive feelings of nature contact, especially when experiences are shared with others (Sato et al., 2017). Group narratives create a space for experiencing nature stories, contributing to healthy identity formation (Prins et al., 2013). This collective sharing reinforces positive emotions associated with nature experiences and provides a sense of belonging (Anderson & Mack, 2019), thereby promoting secure identity

formation. Additionally, shared experiences of awe can strengthen social bonds and collective identity. However, the timing of using such images should be carefully considered, as images can influence our memories (Loftus & Hoffman, 1989). One participant noted, "The image should be based on the story, not the story on the image", suggesting that he prefers to experience meaningful memories through storytelling first and then engage with the image as a souvenir. Conversely, some participants felt that the image served as a "memory aid". As the creation and use of AI images is still at an early stage, further evaluation of the timing and different prompting conditions is needed to assess their suitability for storytelling.

Conclusion

The effectiveness of digital nature images is highly dependent on context, personal preferences and the type of digital nature used. This study found that personalised AI images did not facilitate a connection to nature or emotional language in storytelling, although they may serve as helpful memory cues. AI images potentially add value to young adults' identity formation in group storytelling sessions. They offer a unique way for individuals to highlight elements of nature that they find beautiful or to creatively convey their emotions. Given the rise in mental health problems, identity confusion and disconnection from nature among young adults, AI nature should be used not as a solution but as a complement to move people away from constant technological immersion. In doing so, it may help counteract the negative effects of excessive digital media use, which contribute to self-centredness and social disconnection. Ultimately, the goal should be to use AI-generated nature as a bridge to help individuals reflect on nature and self in meaningful ways. First and foremost, however, it is essential to gain clarity in conceptualising the human-nature relationship within the field of psychology. This understanding will allow for more precise operationalisation and research that is important at both individual and societal levels.

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Appendices

Appendix A – Informed Consent Form

Please, carefully read the following information about your participation in this study.

- I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.

- I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

- I understand that taking part in the study involves completing individual questionnaires and an audio-recorded interview that will be transcribed to text, which will be deleted by the end of this research. Any personal information will not be shared beyond the study team.

- I understand that taking part in the study involves the following risks: possible negative emotions from reexperiencing a meaningful event.

- I agree to be audio recorded, and that the information I provide can be anonymously quoted in research outputs.

After reading the above, do you agree to voluntarily take part in this study?

- Yes, I consent
- No

Contact Information for Questions about Your Rights as a Research Participant: If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Appendix B

Connectedness to Nature Scale – trait version

Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers.

In the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

1 (strongly disagree) – 4 (neutral) – 7 (strongly agree)

1. I often feel a sense of oneness with the natural world around me.
2. I think of the natural world as a community to which I belong.
3. I recognize and appreciate the intelligence of other living organisms.
4. I often feel disconnected from nature.
5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
6. I often feel a kinship with animals and plants.
7. I feel as though I belong to the Earth as equally as it belongs to me.
8. I have a deep understanding of how my actions affect the natural world.
9. I often feel part of the web of life.
10. I feel that all inhabitants of Earth, human, and nonhuman, share a common ‘life force’.
11. Like a tree can be part of a forest, I feel embedded within the broader natural world.
12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.
13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.
14. My personal welfare is independent of the welfare of the natural world.

Appendix C

Connectedness to Nature Scale – state version

Please answer each of these questions in terms of the way you feel at the present moment. There are no right or wrong answers.

Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing.

1 (strongly disagree) – 4 (neutral) – 7 (strongly agree)

1. Right now I'm feeling a sense of oneness with the natural world around me.
2. At the moment, I'm feeling that the natural world is a community to which I belong.
3. I presently recognize and appreciate the intelligence of other living organisms.
4. At the present moment, I don't feel connected to nature.
5. At the moment, I can imagine myself as part of the larger cyclical process of living.
6. At this moment, I'm feeling a kinship with animals and plants.
7. Right now, I feel as though I belong to the earth just as much as it belongs to me.
8. Right now, I am feeling deeply aware of how my actions affect the natural world.
9. Presently, I feel like I am part of the web of life.
10. Right now, I feel that all inhabitants of earth, human and nonhuman, share a common life force.
11. At the moment, I am feeling embedded within the broader natural world, like a tree in a forest.
12. When I think of humans' place on earth right now, I consider them to be the most valuable species in nature.
13. At this moment, I am feeling like I am only a part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

Appendix D

Additional Results Confounding Variables Investigation

Violation of normality assumption: Levene's Test for Homogeneity of Variances indicated that variances were homogeneous for both mean trait nature connectedness ($F = 0.1013$, $p = 0.7517$) and mean state nature connectedness ($F = 0.2334$, $p = 0.6313$) across the different conditions. Parametric assumption tests were conducted to assess the normality and homogeneity of variances for mean trait and state nature connectedness scores across conditions. The shapiro-wilk test indicated that mean trait nature connectedness scores did not significantly deviate from normality ($W = 0.95393$, $p = 0.05744$). However, mean state nature connectedness scores in Combdata showed significant deviations from normality ($W = 0.94585$, $p = 0.02741$).

Checking for confounding variables age and gender: A Kruskal-Wallis test was performed to compare age across different conditions and trait levels, revealing no significant differences in age across the groups ($\chi^2 = 1.75$, $df = 3$, $p = .63$). Additionally, a Chi-square test for gender distribution indicated no significant differences across the groups ($\chi^2 = 3.65$, $df = 6$, $p = .72$). These results suggest that age and gender distributions are not significantly different across the groups and are unlikely to be confounding variables influencing the observed differences in state nature connectedness.

Appendix E

Example Images from Participants with Titles

Note: The chosen favourite images are listed below. The images are displayed in descending order as follows: 1) AI guess, 2) Enhanced adherence to prompt, 3) All variables + striking details and striking details

PP13 "Sunrise on Mulcahen":

3 All variables + striking details

PP10 "Chasing freedom in wilderness":

2 Enhanced adherence to prompt

PP4 "Mountain magic: a journey of connection and joy"

2 Enhanced adherence to prompt

PP6 “A green oasis in the Scottish Highlands”

1 AI guess

PP83 “Sound of silence”:

1 AI guess

PP30 “Appreciating the insignificant moments in nature”

1 AI guess

PP43 “One of the best days that summer”

1 AI guess

PP41 “Escaping the rush of daily life

1 AI guess

PP46 “Between fears and fantasies”

3 All variables + striking details

PP39 “Recharging in the forest”

3 All variables + striking details

PP27 “Walk at the lake

1 AI guess

PP33 “Peaceful nature and different cultural insights”

3 All variables + striking details

PP8 “Purple dreams”

3 All variables + striking details

PP28 “Reconnecting”

1 AI guess

PP16 “Breakfast on the roof of the world”

2 Enhanced adherence to prompt

PP32 “Forest oasis”

2 Enhanced adherence to prompt

PP7 “Sunset at arpoador”

1 AI guess

PP5 “Calmness in nature

1 AI guess

PP2 “The power of the green mountain

2 Enhanced adherence to prompt

PP1 “Beach in the Seychelles”

2 Enhanced adherence to prompt

PP17 “Sunny days at the lake”

3 All variables + striking details

PP29 “Three friends talking to a spirit.”

3 All variables + striking details

PP36 “Runs in the forest”

1 AI guess

PP44 “Mountains of transformation”

3 All variables + striking details