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Can agency and communion mediate the relationship between nature connectedness and pro-environmental behavior intentions?

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Can Agency and Communion Mediate the Relationship Between Nature Connectedness and Pro-Environmental Behavior Intentions?

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Abstract

The state of our current environment is rapidly declining due to human activity. Therefore, it is imperative to understand ways to promote pro-environmental behavior and what variables may explain this behavior. Previous studies have found that nature connectedness may be one way to increase pro-environmental behaviors and that one's levels of masculinity and femininity may also affect not only how connected to nature one is, but also how often one may engage in sustainable behaviors. However, to date researchers have not examined the effect of agency and communion, values which every person has regardless of gender, on the relationship between nature connectedness and pro-environmental behavior intentions. This study aims to understand how agency and communion can mediate the relationship between nature connectedness and pro-environmental behavior intentions. In the pilot study to determine efficacy of video stimuli, I was able to virtually induce nature connectedness in participants in only 3 minutes. I utilized the same videos for my primary study that examined the mediational effects of agency and communion on the nature connectedness and pro-environmental behavior intentions relationship. Results showed that agency and communion did not mediate the relationship between nature connectedness and pro-environmental behavior intentions and nature connectedness did not have an effect on pro-environmental behavior intentions. However, communion did have a significant direct effect on pro-environmental behavior intentions. The findings provide evidence for studying communal and agentic traits in environmental research and suggest that values such as communion may be useful for encouraging pro-environmental behavior intentions.

Key words: agency, communion, nature connectedness, PEB intentions

Can Agency and Communion Mediate the Relationship Between Nature Connectedness and Pro-Environmental Behavior Intentions?

Increased consumption of non-renewable resources has led to detrimental effects on the environment, such as deforestation, pollution, increased carbon emissions, and biodiversity loss (Hanski, 2008). The world has warmed more than one degree Celsius since the industrial revolution, sea levels have risen, and the world's tropical reefs are at risk of extinction. It is imperative that we begin reducing the negative impact of human activity and move towards a more sustainable relationship with the environment. The present study seeks to investigate the role of nature connectedness, agentic and communal values, and pro-environmental behavioral intentions as a means to fostering environmental sustainability.

Two fields that may provide a solution is eco-psychology and environmental psychology. Eco-psychology aims to place the human psyche back into a natural, ecological context in order to promote a more earth-friendly human nature (Fisher, 2002; Howard, 1997). Historian Theodore Roszak, who outlined and introduced the term ecopsychology in his book *The Voice of the Earth* (1992), identified ecopsychology as an instrument to mend the emotional bond between person and planet. Ecopsychology studies the interrelationship between the human psyche, or the unconscious and conscious aspects of the human mind (Slavin & Kriegman, 1992), and the natural environment in a way that is not clearly discernable through quantitative methods, such as spiritual therapeutic practices, community gardening, or animal-assisted therapy (Stern, 2000; Fisher 2002).

In contrast, environmental psychology examines the relationship between people in their built and natural environment (Stern, 2000). It studies the impact of environmental factors (e.g., noise, urbanization, or pollution) and built infrastructure (e.g., transportation systems, public building designs, offices) on human behavior via traditional scientific methods. Environmental psychology is also concerned with human behavior and how people make decisions, especially decisions regarding pro-environmental behavior, in relation to their environment (Sörqvist, 2016). Environmental psychology seeks to examine and understand this human/nature split while ecopsychology strives to synthesize them (Fisher, 2002). Despite these differences, certain ecopsychology constructs can be studied within environmental psychology and measured quantitively.

Nature Connectedness

Several studies have identified nature connectedness – an individual's subjective connection to nature – as a measure of treating the global environmental crisis (Mayer & Frantz, 2004; Ives et al., 2018; Zylstra et al., 2014; Abson et al., 2017). Nature connectedness has been identified as an ecopsychological construct given that it can be used to expand a sense of self in a natural context (Mayer & Frantz, 2004). When a person is highly connected to nature, they begin to see themselves as a part of nature rather than a separate entity. Implementing and encouraging pro-environmental behavior into the population will also increase environmental sustainability, through behaviors in both the private domain (such as recycling, monitoring home electricity/water use) and public domain (such as participating in environmental causes) (Balundė et al., 2019).

Nature connectedness has been studied extensively in environmental psychology within topics such as stress-related research (Bakir-Demir et al., 2021), urban planning (McEwan et al., 2020), and within reintegration methods for prison populations (Reddon & Durante, 2019). For example, Bakir-Demir et al. (2021) found that participants higher in nature connectedness displayed greater emotion regulation which allowed them to experience lower levels of perceived stress, while Reddon and Durante (2019) outlined the importance of exposing prisoners to nature as means to facilitating a successful reemergence to society.

Nature connectedness is relatively stable over time but is capable of fluctuating if one is exposed to nature (Capaldi et al., 2014). Those who are higher in nature connectedness tend to be more extraverted, agreeable, conscientious, happier, and are more likely to spend time in nature compared to those low on nature connectedness (Nisbet et al., 2009; Capaldi et al., 2014). According to Nisbet et al. (2009), individuals who express these certain personality variables may be higher in nature connectedness and express a nature-related personality, wherein they pursue adventurous outdoor experiences and identify more personally with the environment. The connection between certain personality traits (e.g., conscientiousness, agreeableness, and openness) and nature connectedness may also be mediated by empathy given that empathy involves a shared emotional response that is consistent with the perceived wellbeing and experience of another individual (Berenguer, 2007; Di Fabio & Kenny, 2018).

Furthermore, the biophilia hypothesis posits that humans have an innate desire to connect with nature and other life forms. Therefore, it may be evolutionarily advantageous for human beings to be connected to nature (Kellert & Wilson, 1993).

Being connected to and in tune with nature provided an evolutionary advantage as it allowed our ancestors to find food, water, and avoid predators (Capaldi et al., 2014). Expressing these personality traits (such as being extraverted, agreeable, conscientious, and happier) that align one with nature may have provided an evolutionary advantage throughout time. In addition, possessing these personality traits and thus being more in tune with nature is a main goal of ecopsychology, which aims to intertwine the human psyche with nature. Having a stronger connection to nature also leads to greater concern for the environment and stronger pro-environmental behaviors, which are actions aimed to preserve and sustain the environment and can include recycling, waste avoidance, and energy conservation (Otto & Pensini, 2017). Otto and Pensini (2017) investigated the relationship between participation in nature-based environmental education to pro-environmental behavior, mediated by nature connectedness and environmental knowledge, with 4th to 6th grade students. The researchers found that increased student participation in nature-based environmental education was positively related to greater pro-environmental behaviors and that nature connectedness was a strong predictor of pro-environmental behaviors. Of the two mediators, nature connectedness was the strongest predictor of pro-environmental behaviors and could explain one-third of the variance in pro-environmental behaviors. Therefore, an individual's level of nature connectedness can have a strong impact on promoting environmental sustainability.

While most ecopsychological research is studied qualitatively in therapeutical practices, such as gardening or outdoor therapy sessions (Hegarty, 2010; Conn, 1998), it is possible to study nature connectedness quantitatively. Previous research conducted by has focused on using implicit association tasks (IAT; Schultz et al., 2004) and scales

(e.g., the Inclusion of Nature in Self by Schultz, 2002; Connectedness to Nature Scale by Mayer & Frantz, 2004) to quantitatively measure nature connectedness. Schultz et al., (2004) utilized implicit association tests by having participants match nature words (e.g., animals, trees, or plants) and non-nature, built items (e.g., building, car, city) with self-concept categories such as me (e.g., me, mine, myself) and not me (e.g., other, their, them). They found that their test could quantitatively measure the extent to which participants implicitly associated themselves with nature. The single-item Inclusion of Nature in Self by Schultz (2002) quantifies nature-connectedness by emphasizing one's feeling of inclusion in nature. This single-item scale requires participants to choose from a series of seven paired circles which are labeled "self" and "nature". These pairs of seven circles range from almost separate to nearly completely overlapping. Participants must choose which circle they feel represents their feelings of inclusion in nature best. Similarly, the multi-item Connectedness to Nature Scale (CNS) developed by Mayer and Frantz (2004) quantitatively studies the extent to which an individual feels emotionally connected to the natural world through a series of Likert-scale statements. Therefore, despite being ecopsychological in nature, certain concepts can be studied in a quantitative context.

Pro-Environmental Behaviors

Pro-environmental behaviors (PEBs) are defined as behaviors or actions that benefit the natural environment and the absence of behaviors or actions that harm it (Lange & Dewitte, 2019). This can include behaviors such as recycling, making efforts to reduce one's carbon footprint, being conscious of one's energy consumption, and many more. Given that most environmental issues, such as climate change (Swim et al., 2011),

pollution (Manisalidis et al., 2020), deforestation, and overpopulation (Bologna & Aquino, 2020) are a direct result of human behavior, it is logical that PEBs have shown to be a significantly effective way of increasing environmental sustainability (Steg & Vlek, 2009). There are many factors that influence an individual's level of PEBs, including personal factors such as gender, age, knowledge and education, childhood experiences, political and world views (see reviews by Gifford & Nilsson, 2014; Li et al., 2019; Brough et al., 2016; Otto & Kaiser, 2014), and social factors such as religion, culture, and social class (see review by Gifford & Nilsson, 2014).

According to a review by Li et al. (2019), gender can have an impact on pro-environmental behavior as women tend to embody more cooperative and compassionate traits given their traditional roles as caregivers, which in turn affects their pro-environmental behaviors. Age also has an important role to play given that older people are more likely to engage in pro-environmental behaviors (Wang et al., 2021). Regarding childhood experiences, Palmer (1993) surveyed 232 environmental educators from around the world and found that spending time outdoors as a child was an important factor for developing environmental concern (see reviews by Gifford & Nilsson, 2014). Political views can also influence pro-environmental behaviors. Compared to other adults, conservative white American males tend to exhibit a low level of concern about environmental issues, potentially due to their commitment to both prevent and repeal environmental regulations (McCright & Dunlap, 2012; Gifford & Nilsson, 2014). Liberal democrats, on the other hand, are more likely to support environmental protection and exhibit greater environmental concern (McCright & Dunlap, 2010; Nawrotzki, 2012). In terms of social factors, religion can have a positive impact on pro-environmental

behavior. In a cross-national study, Zemo and Nigus (2020) reported that religion had a positive effect on an individual's willingness to donate money towards environmental causes and increases the likelihood of engaging in environmental protection. Finally, culture can greatly affect pro-environmental behavior. For example, research by McCarty and Shrum (2001) revealed that certain cultural values, such as individualism and collectivism, could mediate beliefs regarding recycling wherein individualism is associated with beliefs regarding the inconvenience of recycling while collectivism is associated with beliefs regarding the importance of recycling.

Previous studies have also shown that pro-environmental behaviors can be influenced by engagement with nature through simple activities, such as watching the sunrise or spending time in nature, and by overall levels of nature connectedness (Richardson et al., 2020; Nisbet et al., 2009). Pro-environmental behaviors can also be influenced by internal and external values. Internal values include constructs such as altruism, environmentalism empathy, and pro-social behavior, while external values include convenience (i.e., convenience of recycling) and social norms (i.e., how normalized recycling or composting is within an individual's day-to-day life) (see reviews by Li et al., 2019). One theory that may help us understand how behaviors can be influenced by certain values and factors is the Theory of Planned Behaviors (Ajzen, 1991).

The Theory of Planned Behaviors (TPB) has been a major informant of pro-environmental behavior research. This theory attempts to predict an individual's intention to perform a behavior based on three important components: attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). A behavior intention is defined as how

willing someone is to perform a behavior. As the strength of the behavior intention increases, the likelihood of the behavior occurring also increases. Attitude refers to an individual's favorable or unfavorable evaluation of the behavior, subjective norms refer to the perceived social pressure in performing the behavior, and perceived behavioral control refers to an individual's perceived ease or difficulty with performing the behavior. In terms of pro-environmental behaviors, attitudes could be understood as how an individual feels about recycling in general, and whether they view it as a positive and worthwhile behavior to engage in. Subjective norms may influence an individual's intention to recycle based on whether people in their social group, such as friends or family, also recycle. Finally, an individual's perceived behavioral control regarding recycling could be influenced by how easy it is for them to recycle. Despite this, behavior intentions do not always lead to actual behavior. Coined the intention-behavior gap, this concept describes why certain behavioral intentions fail to become actions (Faries, 2016). In terms of pro-environmental behavior, factors that can explain the gap between intention and behavioral action can include any of those explained previously, such as internal and external values, attitudes and social norms, and current level of environmental involvement (see review by ElHaffar et al., 2020).

Given how values, social factors and situations, and personal factors can influence the connection between nature connectedness and pro-environmental behaviors, it is worthwhile to examine how certain nature situations (e.g., being surrounded by nature and engaging in nature through nature activities) can activate these certain traits and values, most notably personality traits.

Previous research has found that those with more feminine traits are more likely to engage in pro-environmental behavior and nature connectedness, as well as harbor greater concern for the environment (Brough et al., 2016; Davidson & Freudenburg, 1996; Rosa et al., 2020). However, rather than group these traits in a binary feminine and masculine way, it is worthwhile to consider the implications of agentic and communal traits in nature connectedness and pro-environmental behavior intentions.

Agentic and Communal Values

A large majority of the research involving gender-specific traits and environmental sustainability focus on masculinity and femininity (Rosa et al., 2020; Trelohan, 2021; Brough et al., 2016; Davidson & Freudenburg, 1996). For example, Brough et al. (2016) found that men are less likely to embrace environmentally friendly products and engage in pro-environmental behaviors than women as a result of the Green-Feminine Stereotype, implicitly associating nature and femininity, and gender identity maintenance, which is the degree to which one identifies with masculinity or femininity (Spence, 1984). The Green-Feminine Stereotype postulates that there is a cognitive link between the concepts of greenness and femininity in both men and women. This, as a result, causes men and women to assign femininity to those who engage in pro-environmental behaviors. Simply caring for the environment and engaging in conservation efforts reflect a propensity towards caring and nurturing for others, which are common feminine traits (Brough et al., 2016; Swim et al., 2020).

Similar to the Green-Feminine Stereotype, other studies have also reported an implicit, cognitive association of nature and femininity, such as research conducted by Liu et al. (2019). Liu et al. (2019) had participants complete three implicit association

tests (IAT). The first IAT required participants to pair female/male concepts (Chinese women's names vs men's names) with nature/fabricated concepts (plants, trees, mountain vs building, car, factory). The second IAT had participants complete the first IAT again, and then had participants complete two single-category IATs (SC-IAT) which required participants to pair the same female concepts with the same nature/fabricated concepts, and then pair the same male names with the same nature/fabricated concept. Following this series of implicit association tests, they found that both men and women implicitly agree that women are more closely associated with nature than men. This may be due to a number of factors, such as nature itself being portrayed as feminine in society (e.g., "Mother Nature", "Mother Earth"), nature-based words being feminine in Latin-origin languages (e.g., la nature [French], la naturaleza [Spanish], or la natura [Italian]), or references in literature, art, or mythology that link femininity with nature (e.g., mythological goddesses such as Persephone and Demeter being responsible for the care of the earth; Liu et al., 2019; Nature Being Represented as a Woman, n.d.).

Gender identity maintenance also has a role to play in this association. Given that there exists a cognitive, implicit link between greenness/nature and femininity, men may actively oppose any potential threat to their manhood and will thus avoid pro-environmental behaviors in order to preserve their masculine identity (Brough et al., 2016). This is in line with the precarious manhood hypothesis, which suggests that "manhood" and being a "real man" is a social position that is earned and maintained through public actions (Vandello & Bosson, 2013). Examples of public actions may include playing competitive sports, working a dangerous career, or being head of the household. It is a position that is hard won and easily lost if not regularly maintained.

Conversely, women do not have the same requirements to earn and maintain womanhood status. Womanhood is something innate and present throughout life, unlike the manhood status which must be socially conferred. Furthermore, a woman's status as a "real woman" is not as easily challenged as a man's "real man" status due to womanhood's innate tendencies.

However, no research has been done that explores agentic (i.e., values that are defined as the desire to advance one's status, dominance, or power over others) and communal values (i.e., values that prioritize caring about and cooperating with others) and their relationship with pro-environmental behaviors intentions (Locke, 2015). Hentschel et al. (2019) describe how agentic values are commonly referred to and associated with masculinity, given the overlap between these two terms (e.g., masculinity involves leadership and being more powerful than others, similar to agency). Communal values are also referred to and associated with femininity, as they envelop the same traits found within femininity (e.g., caring for others and putting others before oneself). Men and women both uphold communality stereotypes (wherein men are less communal than women), however stereotypes surrounding agency did not follow a similar path. Male raters describe themselves as being less agentic than female raters described them, while also rating women as being less agentic (specifically, less assertive) than men. Female raters described women equal to men in terms of independence and leadership dimensions, but as less assertive than men. In terms of instrumental competence (such as performance execution or being task-oriented) male and female raters rated the opposite gender equally high. Self-ratings showed that female raters tended to characterize themselves as less agentic than male raters, while male raters characterized themselves as

being less communal than female raters. However, when Hentschel et al. (2019) compared these self-ratings and ratings of men and women, they found that female raters characterized themselves more stereotypically in terms of being less assertive and less competent in leadership than others in their same gender group, while male raters rated themselves less stereotypically and as being more communal.

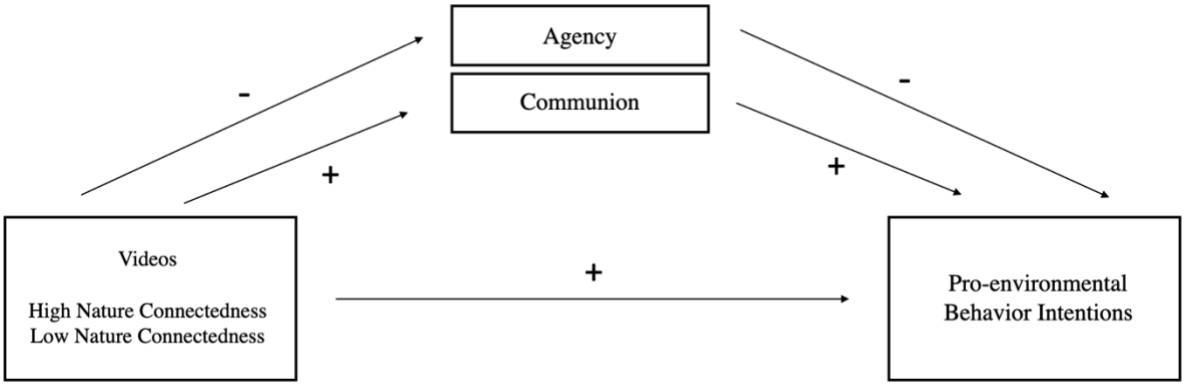
Whereas women and men regarded themselves as stereotypically agentic or communal in original research conducted several years ago, it appears that these current stereotypes are shifting to view women as more competent in leadership and independence aspects. Given these differences in rating between men and women and self-characterizations, it is worthwhile to instead explore the agentic and communal traits that everyone possesses, regardless of gender.

Past literature suggests that women tend to harbor greater concern for the environment due to being socialized from a young age to care for others and engage in more altruistic behaviors (Trelohan, 2021, Brough et al., 2016, Davidson & Freudenburg, 1996). According to Rosa et. al. (2020), women are also more connected to nature than men, possibly due to their propensity for prosocial behaviors, which are behaviors intended to benefit others (Eisenberg, 1982). Therefore, it is reasonable to believe that those with higher communal values (regardless of gender) will be more likely to engage in pro-environmental behaviors and possess greater concern for the environment. Using these agentic and communal values as a mediator between nature connectedness and pro-environmental behavior intentions will help humanity further understand how we can increase an individual's willingness towards pro-environmental behaviors. I predicted that agentic and communal values could mediate the relationship between nature

connectedness and pro-environmental behavior intentions. Specifically, I expected that individuals higher in nature connectedness would have higher communal values which would then lead to higher pro-environmental behavior intentions. Conversely, individuals lower in nature connectedness would have greater agentic values which would then lead to lower pro-environmental behavior intentions (see Figure 1).

Figure 1

Agency and Communion Mediation



Note. Mediation figure detailing how agency and communion mediate the relationship between nature connectedness and pro-environmental behavior intentions. Those who receive the low nature connectedness video will feel more agentic, which will then lead to decreased pro-environmental behavior intentions. Those who receive the high nature connectedness video will feel more communal, which will then lead to increased pro-environmental behavior intentions.

Pilot Study Method

I first conducted a pilot study to determine if my visual stimuli were effective at influencing one's level of nature connectedness. The visual stimuli included a ten-minute

and three-minute version of an urban walk taken in first person-perspective in on 8th avenue in New York City, New York, USA (Walk Ride Fly, 2020; see Appendix A). This video was taken September 23, 2020 around 4:30 pm. The three-minute version contained the first three minutes of the ten-minute version. The visual stimuli also included a ten-minute and three-minute version of a nature walk taken in first person-perspective on Baker River Trail, Chain Lake Trail in Washington State, USA uploaded in October, 2019 (4k Relaxation Channel, 2019; see Appendix A). The forestry and plant life in the nature walk video was specifically chosen to match the type of forestry and plant life that one may see in Shenandoah Park, Virginia, USA, which is a national park that many JMU students frequent. The audio for the urban video featured typical city sounds, such as traffic noise, people talking, construction work, or sirens and alarms. The audio for the nature video consisted of bird chirping, the leaves crunching as the person walked, or the wind moving the trees. The time of year, weather conditions, and perspective for both videos were matched to be as similar as possible. It was important to test the effectiveness of video length, as previous research has found that ten minutes was a sufficient amount of time to induce nature connectedness (Mayer et al., 2009), however I wanted to investigate if shorter videos would suffice for the following main thesis study. Therefore, I utilized a 2(video length: 3 minutes, 10 minutes) x 2(video type: nature, urban) between-subjects design. I randomly assigned participants to view either a nature video or an urban video. Participants were then randomly assigned to view either a long video (10-minutes) or short video (3-minutes). The results from this study were used to determine if my videos appropriately induced nature connectedness, and which video length was appropriate for the main study.

Participants

I utilized JMU's participant pool to recruit the participants. This participant pool, organized by Sona Systems Software, allows JMU students to sign up for various psychological studies in return for class credit. Students who signed up for this study received one credit towards their required class credit.

I conducted an a-priori power analysis using G*Power Analysis (Faul et al., 2007) and a t-test to test the difference between two independent means, with a small to medium effect size (d = 0.3, power = 0.8). The power analysis revealed that the study required a total sample size of 278.

For this survey, I recruited 380 adult (18 and older) students. However, following the manipulation check (see Appendix G) and excluding those who failed the manipulation check or did not complete the study, the final sample size consisted of 324 participants. Even after dropping participants, the study cells were relatively even across video type (nature n = 158; urban n = 166) and video length (long video n = 155; short video n = 169). The majority of the participants were White (n = 291), followed by Latinx (n = 17), Black or African American (n = 15), East Asian (n = 11), Native Hawaiian or Pacific Islander (n = 5), South Asian (n = 4), American Indian or Alaskan Native (n = 1), and "An option that was not listed" (n = 3). Participants could also select more than one racial/ethnic identity. My sample included 252 women, 70 men, 1 genderqueer individual, and 1 non-binary person. One person did not report their gender.

Procedure and Materials

The survey was conducted online on Qualtrics. The cover story explained that the study examined how people pay attention to videos. Participants were randomly assigned

to one of two groups: the urban or the nature video group (see Appendix A). Next, participants randomly received either the long version of the video stimuli (10-minutes) or the shortened version (3-minutes). The videos were presented at a height of 550 pixels and at a width of 850 pixels on the screen. Participants received instructions to imagine themselves in this environment as much as possible and were asked to wear headphones or watch the videos with audio in a quiet setting. The page showing the video had a timer not visible to the participants that did not allow the participants to advance to the next page until enough time had passed (135 seconds for the 3-minute video and 450 seconds for the 10-minute video). This measure ensured the participants viewed the videos in full.

Participants in both groups first answered a manipulation check to make sure they attenuated to the video correctly (see Appendix G). They then completed the 13-item Connectedness to Nature Scale (State) (CNS; Mayer et al., 2009; see Appendix B; *Chronbach's* α = .87). Sample items from this scale includes statements such as "Right now, I'm feeling a sense of oneness with the natural world around me" and "Presently, I feel like I am a part of the web of life". This survey is composed on a seven-point Likert Scale (1 = *strongly disagree* to 7 = *strongly agree*). The general trait version of this survey (Mayer & Frantz, 2004) has proven to be is a valid and reliable measure of nature connectedness as shown by previous research studies (Navarro et al., 2017). Participants were then asked a few demographic questions (see Appendix H), before completing the survey, viewing the debriefing form (see Appendix I) and being granted their credit via Sona Systems Software.

Pilot Study Results

Manipulation Check

Following the completion of the video, participants were asked to select one of four photos that matched the video condition they saw in order to determine if they attenuated to the video properly (see Appendix G), χ^2 (2, N = 331) = 321.1, p < .001. After analyzing the data, the majority of participants who watched the nature video to completion (n = 163) selected the correct nature photo (n = 160, image D), with two participants incorrectly selecting the matching image from the urban condition (image A) and one participant selecting the image from a different urban setting entirely (image C). Of the participants in the urban condition who watched the video to completion (n = 168), the majority selected the correct urban video (n = 167) with only one participant selecting the incorrect urban image (image C), χ^2 (1, N = 324) = 321.0, p < .001. The data was then trimmed to include only those who completed the study and selected the correct manipulation check image per their video condition.

Nature Connectedness

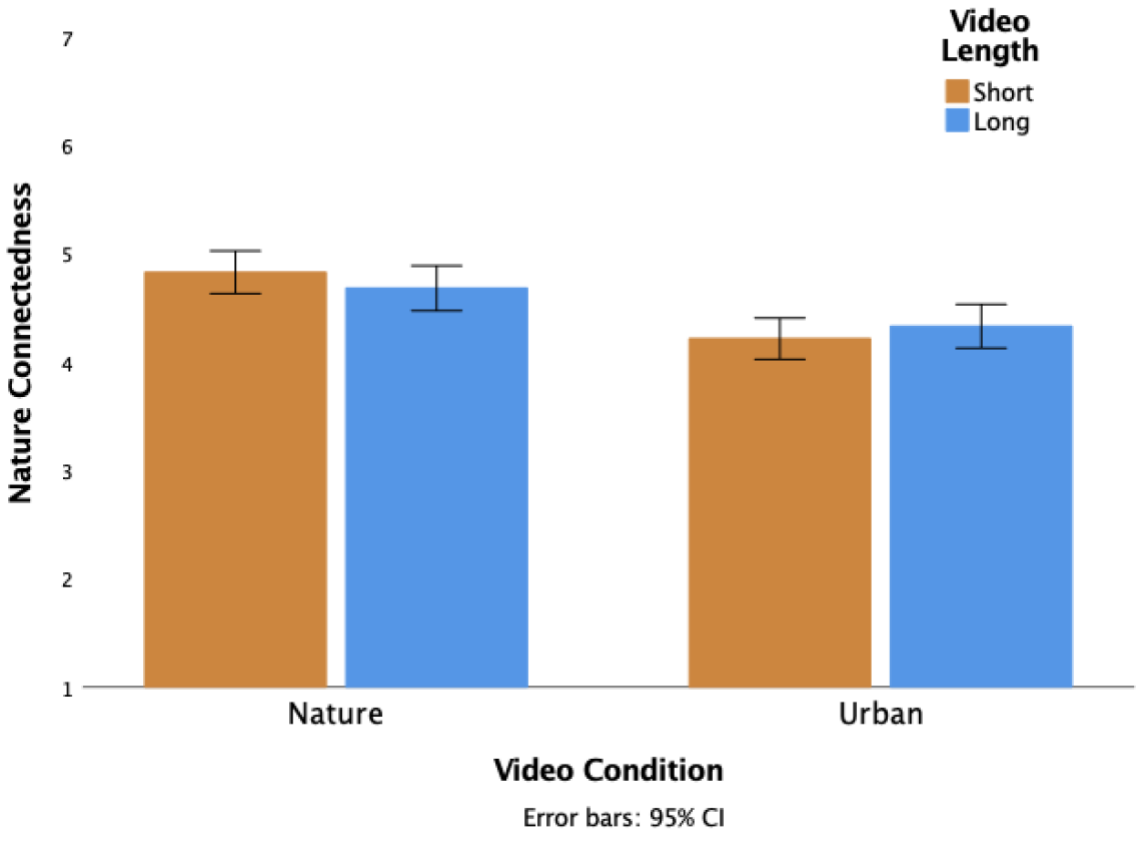
A 2 x 2 between subjects ANOVA revealed a main effect of video type, F(1, 320) = 20.69, p < .001. Participants who viewed a nature video (M = 4.76, SD = 0.84) had greater nature connectedness scores than participants who viewed an urban video (M = 4.29, SD = 0.94).

There was no main effect of length of video, F(1, 320) = 0.03, p = .86. Participants who viewed a longer 10-minute video (M = 4.53, SD = 0.93) had equal nature connectedness scores compared to participants who viewed a shorter 3-minute video (M = 4.51, SD = 0.91).

The interaction between video type and length of video was not significant, $F(1, 320) = 2.55$, $p = .11$. Those in the nature condition who watched a short video ($M = 4.82$, $SD = 0.79$) had similar nature connectedness scores to those who watched the long video ($M = 4.68$, $SD = 0.89$). Similarly, those in the urban condition who watched a short video ($M = 4.21$, $SD = 0.93$) reported similar nature connectedness scores to those who watched a long video ($M = 4.39$, $SD = 0.95$) (see Figure 2).

Figure 2

Nature Connectedness Based on Video Length and Condition



Note. The effect of video type and length of video on nature connectedness

Pilot Study Discussion

Based on the results of this pilot study, the nature video proved to be effective at increasing nature connectedness. Therefore, it was deemed appropriate to use the selected videos for the following primary study that examined the mediating effects of agency and communion on nature connectedness and pro-environmental behavior intentions. Because neither video length nor the video length by type of video interaction effect was significant, it was also possible to utilize the shorter, 3-minute videos for the following primary study.

Primary Study Method

Participants

For this study, I recruited 321 adult (18 and older) students. After excluding those with unreliable responses (either those with joke responses or finished the study in under 8 minutes) and those who did not complete the study, the final sample size consisted of 288 participants. The majority of the participants were White (n = 246), followed by Black or African American (n =19), Latinx (n = 18), East Asian (n = 15), South Asian (n = 11), American Indian or Alaskan Native (n = 4), Native Hawaiian or Pacific Islander (n = 1), and “An option that was not listed” (n = 6). Participants could select more than one racial/ethnic identity and could write in their gender identity. My sample included 182 women, 103 men, 2 nonbinary individuals, and one person who listed themselves as “other”.

I utilized JMU’s participant pool to recruit the participants. This participant pool, organized by Sona Systems Software, allows JMU students to sign up for various

psychological studies in return for class credit. Students who signed up for this study received one credit towards their required class credit.

The participants were randomly assigned to the nature (n = 144) or urban (n = 144) video condition.

At the end of the study, I conducted a post-hoc analysis using the Monte Carlo Power Analysis for Indirect Effects (Schoemann et al., 2017). The power analysis revealed that the study was severely underpowered and had a 24% chance of finding a significant effect of the mediational pathway with the observed sample size. In order to obtain a reasonable effect size, the study required 3x the participants I had in my study. Limitations of this are stated in the discussion section.

Procedure

In-Person Study

Due to pressures on the participant pool, I moved data collection online approximately two weeks into data collection while still holding in-person study sessions. Similar to the pilot study, participants could complete the study online without needing to come into the lab. An anti-requisite was created on JMU Sona's website that prevented participants for signing up for both the online version and the in-person version. Participants that had completed the pilot study in the previous semester were also excluded.

Room set-up. The in-person study was conducted in person in Miller 1227 (n = 23). Prior to bringing in participants to each session, researchers loaded the study from Qualtrics onto each computer, checked to make sure the audio was working properly, and prepared the research documents (study log, script, and debriefing forms). Computer

stations were on separate desks, with large dividers separating the participants from one another to ensure that they could not view others' screens. On the desks were Dell monitors (23" wide, 20" length), keyboards, a mouse, and headphones.

Researchers ran a maximum of three participants for each session. Once participants were seated, researchers read the cover story to the participants and explained that the study examined how people pay attention to videos. Researchers entered a participant ID number for each participant on the survey. Participants then completed the informed consent survey on the computer before beginning the study.

Video conditions. The survey randomly assigned participants to one of two conditions: the urban or the nature video condition (see Appendix A). Because my pilot study determined that the three-minute nature video proved to be effective at increasing nature connectedness, I reused the same nature and urban video for the primary study. The videos were presented at a height of 550 pixels and at a width of 850 pixels on the screen. Participants received instructions to imagine themselves in this environment as much as possible and were asked to wear headphones when watching the video. The page showing the video had a timer not visible to the participants that did not allow the participants to advance to the next page until enough time had passed (135 seconds). This measure ensured the participants viewed the videos in full.

Agency and Communion. After watching the video (Appendix A) and doing the manipulation check (Appendix G), participants then completed several scales. Participants completed a modified 24-item Personal Attributes Questionnaire (PAQ; Spence et al., 1974; Ward et al., 2010; *Chronbach's* α = .62; see Appendix B) to measure their agentic (AGC), communal (COMM), and emotional vulnerability (EMV) values

composed on a five-point Likert Scale. There were eight items for each value. Each item contrasted itself at each end (*e.g. Very submissive – Very dominant*) or presents its opposite (*e.g. Not at all independent – Very independent*) (Ward et al., 2010). Participants were asked to rate themselves on how they feel in this very moment.

Originally, this scale was designed by Spence et al. (1974) to measure an individual's trait level of masculinity and femininity, wherein certain items were rated as masculine (M), feminine (F), and masculine-feminine (M-F). For this study, I modified the way I rated the items to represent Ward et al. (2010)'s agentic and communal values scale. Ward et al. (2010) also coded the original M-F values as emotional vulnerability given that certain items (such as excitability and one's capacity for their feelings to be hurt) represent emotional vulnerability better than a range of masculinity and femininity. Previous studies have modified the PAQ for agentic and communal items to provide a better fit for the scales (Helgeson & Fritz, 1999; Ward et al., 2010).

To determine the factor loadings of the items, I ran a principal component analysis with varimax rotation, which revealed that only 7 items adequately loaded with an Eigenvalue above .4 for the agency portion of the scale (*Chronbach's* α = .74) and only 6 items adequately loaded with an Eigenvalue above 0.4 for the communion portion of the scale (*Chronbach's* α = .75). I retained only these items for the remainder of the analyses (see Table 1). Because I was interested in agency and communion, the emotional vulnerability items were omitted from analysis, except for item 4 (*Very submissive – Very dominant*), as this was reported to be agentic in nature by the original creator of the scale (Spence & Helmreich, 1978), and item 13 (*Indifferent to others'*

approval – Highly needful of others' approval) as this item loaded on the agentic component (see Table 1).

Table 1

Factor Loadings from Principal Component Analysis of PAQ Items

Retained Items	PAQ	Component 1 AGC	Component 2 COMM
19. Not at all self-confident – Very self-confident	M	**.770**	.025
20. Feels very inferior – Feels very superior	M	**.762**	-.065
16. Can make decisions easily – Has difficulty making decisions	M	**.606**	-.160
13. Indifferent to others' approval – Highly needful of others' approval	MF	**.544**	.10
4. Very submissive – Very dominant	MF	**.468**	-.039
17. Gives up very easily – Never gives up easily	M	**.449**	.304
24. Goes to pieces under pressure – Stands up well under pressure	M	**.407**	.022
9. Not at all helpful to others – Very helpful to others	F	.058	**.710**
12. Not at all kind – Very kind	F	.099	**.690**
21. Not at all understanding of others – Very understanding of others	F	-.020	**.675**
7. Not at all able to devote self completely to others – able to devote self completely to others	F	-.106	**.658**
15. Not at all aware of feelings of others – Very aware of feelings of others	F	-.300	**.650**
22. Very cold in relations with others – very warm in relations with others	F	.265	**.515**

Note. The PAQ (Personal Attributes Questionnaire) column displays how this scale was scored for the original version of the scale. Items with eigenvalues below 0.4 were omitted. AGC = Agency; COMM = Communion; M = Masculinity; F = Femininity; MF = Masculinity – Femininity; AGC = Agency.

Pro-environmental Behavioral Intentions (PEBI). Participants were also assessed on their pro-environmental behavior intentions. I modified a scale by Markle (2013; *Chronbach's α* = .89; Appendix C) to reflect future intentions rather than current behaviors. This 19-item survey is composed on a five-point Likert Scale (1 = *strongly disagree* to 5 = *strongly agree*). This included items that cover pro-environmental behaviors such as conservation, environmental citizenship, food, and transportation.

Covariates. Participants were then surveyed on potential covariates (e.g., nature connectedness and current engagement in PEBs) that I will use for future exploratory analysis. They completed the 13-item Connectedness to Nature Scale (State) (CNS; Mayer et al., 2009; *Chronbach's α* = .83; Appendix D). I also asked participants to rate their current engagement in pro-environmental behaviors. I used the original Markle (2013) pro-environmental behavior scale for this part of the study (*Chronbach's α* = .73; Appendix E). I also utilized the one item Inclusion of Nature in self (INS; Shultz, 2002; Appendix F), which assessed participant's nature-connectedness by emphasizing their feeling of self and inclusion in nature. After completing the scales, participants were asked a few demographic questions at the conclusion of the study (Appendix H).

After alerting the researcher that they had completed the study participants were given a debriefing form (see Appendix J) and thanked.

Online study

To help mitigate the lack of sign-ups I experienced with the in-person study, I also offered sessions for participants to take the survey online (n = 265). Participants for the online version took the same survey as the in-person participants on Qualtrics, which

meant they received the same informed consent forms, video conditions (Appendix A), and manipulation checks (Appendix G). They also completed the same scales: the Personal Attributes Questionnaire (modified for intention; Spence, 1974; PAQ; *Chronbach's α* = .62; Appendix B), the Pro-Environmental Behavior Scale (modified for intention; Markle, 2013; PEBS; *Chronbach's α* = .89; Appendix C), the Inclusion of Nature Scale (Schultz, 2002; INS; Appendix F), the Connectedness to Nature Scale (State; CNS; Mayer et al., 2009; *Chronbach's α* = .83; Appendix D), and the original Pro-Environmental Behavior Scale (Markle, 2013; *Chronbach's α* = .72; Appendix E). All scales were found to be reliable in our sample. Participants were asked the same demographic questions (Appendix H), received the same debriefing form (Appendix J), and were granted the same amount of credit as the in-person study.

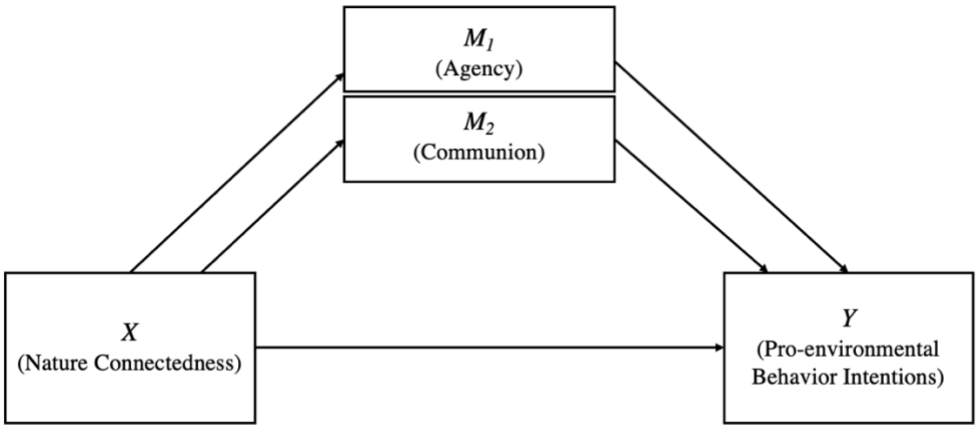
Primary Study Results

Manipulation Check

Following the completion of the video, participants were asked to select one of four photos that matched the video condition they saw in order to determine if they attenuated to the video properly (Appendix G), χ^2 (1, N = 288) = 288.00, $p < .001$. After analyzing the data, all participants who watched the nature video to completion (n = 144) selected the correct nature photo (image D). Of the participants in the urban condition who watched the video (n = 144), all participants selected the correct urban image (image A).

Figure 3

Hayes' (2017) Simple Mediation Model 4



Note. This model details how *X* (nature connectedness) affects *Y* (pro-environmental behavior intentions) with influences from mediators M_1 (agency) and M_2 (communion).

PROCESS Mediation Analysis

For my analysis, I used the Hayes' (model 4; 2017) PROCESS macro within SPSS to look for indirect effects (i.e., a mediation analysis) with two independent mediators for this study. This model (see Figure 3) includes two antecedent variables (*X*) and (*M*) and two consequent variables (*M*) and (*Y*), wherein *X* influences *Y* and *M*, and *M* influences *Y.* The primary pathway is the direct effect pathway of *X* on *Y*, and the second pathway to *X* from *Y* passes through *M*, otherwise known as the indirect pathway. Because *X* influences *M* which then influences *Y*, this indirect pathway shows how *X* influences *Y*. In a simple mediation analysis, *M* represents the mediator variable and provides further evidence on "how" *X* influences *Y*. Within *M*, more than one mediator can exist. Because there is reason to believe that there are multiple mechanisms at work within these personality variables (i.e., agency and communion) it is necessary to

estimate a model that demonstrates how these processes work simultaneously to affect nature connectedness (Hayes, 2017). The statistical bootstrapping technique was used within the mediation analysis. Bootstrapping does not make assumptions about the distribution of the dependent variable (Cohen, 2013). According to Hayes (2017), bootstrapping also allows one to create an empirically derived representation of the indirect effect's (i.e., agency and communion) sampling distribution. This empirical representation is then used to construct the confidence interval.

Counter to predictions, there was no direct effect of video condition on agency or communion (see Table 2) and the video condition had no direct effect on PEB intentions (see Table 2), though there was a marginally positive relationship, wherein the nature video resulted in marginally greater PEB intentions than the urban video.

As predicted, there was a significant direct effect of communion on PEB intentions (see Table 2). Those higher in communion had greater pro-environmental behavior intentions. There was no direct effect for agency on PEB intentions (counter to predictions), wherein I predicted that those higher in agency would have lower PEB intentions.

Finally, there were no indirect effects of nature connectedness on PEBI through communion nor agency (counter to predictions; see Table 2).

Table 2

Hayes' Process Macro (model 4) Mediation Analysis

Description of Estimated Path	t-value	Sig.	Coeff. (SE)	95% CIs LL / UL
Direct Effects on Mediators				
Video Condition → Agency	1.05	.30	.08 (.08)	-.07 / .23
Video Condition → Communion	1.50	.14	.11 (.07)	-.03 / .25
Direct Effects on Outcome				
Video Condition → PEBI	1.87	.07	.15 (.08)	-.01 / .31
Agency → PEBI	-.31	.76	-.02 (.06)	-.14 / .10
Communion → PEBI	2.75	.01*	.18 (.07)	.05 / .31
Indirect Effects (Mediation)				
Video Condition → Agency→ PEBI	-	-	-.00 (.01)	-.02 / .01
Video Condition → Communion→ PEBI	-	-	-.02 (.02)	-.01 / .06

Note. Items with * are significant ($p < .05$; confidence intervals do not contain 0). PEBI = Pro-environmental Behavior Intentions

Discussion

My hypothesis that agency and communion could mediate the relationship on nature connectedness and pro-environmental behavior intentions was not supported. However, the analysis indicated some slight support for nature connectedness having a marginally positive affect on PEB intentions, but the relationship was not statistically significant. Previous studies have found that nature connectedness is positively related to pro-environmental behaviors (Martin et al., 2020; Arendt & Matthes, 2014), however, these are actual behaviors, while I studied behavioral intent. A study by Baird et al. (2020) examined nature connectedness and pro-environmental behavior intentions in participants who had recently completed an outdoor experiential course in the Rocky Mountains. Similar to how my study lacked a relationship between nature connectedness and pro-environmental behavior intent, the surveys administered by Baird et al. (2020) revealed that only 10% of the participants who expressed a connection to nature also

presented a clear intention for pro-environmental behaviors. The fact that I was unable to find support for nature connectedness having a relationship with PEB intentions may be due to the intention-behavior gap, which describes why certain behavioral intentions fail to turn into actions (Faries, 2016). As mentioned previously, factors that can explain the gap between pro-environmental intention and pro-environmental behavioral action may be internal and external values, attitudes and social norms, and current level of environmental involvement (see review by ElHaffar et al., 2020). People may intend to change their behavior but do not follow through with it (Faries, 2016). Furthermore, my sample composed entirely of college students, which may explain the issue with intention. College students may be limited in how easily they can implement certain pro-environmental behaviors and may feel that they have less control when it comes to implementing these behaviors. For example, in a study examining environmental intention and pro-environmental behavior on waste sorting, Wang and Mangmeechai (2020) found that behavioral control was one of the most influential variables for behavioral intention and intent implementation. They suggested that actual behavioral control can be improved through knowledge and skills, as well as through government policy to encourage pro-environmental behavior. As the majority my sample was composed of first years, they may feel that they cannot make better environmental choices due to living on campus. For example, they may be unable to lessen their meat intake due to limited options at the campus dining halls or unable to control the heating/air conditioning in their dorm room. I hope to utilize the potential explanatory covariate of current pro-environmental behavior in a future study to further understand this gap between actual behavior and intention.

I also found a significantly positive relationship between communion and PEB intentions, wherein greater communion entailed greater PEB intentions. This could be incredibly beneficial to improving the state of the planet, as those with greater communal self-perceptions may be more encouraged to protect the Earth and value the interdependence of organisms. Though no other studies to date have researched the effects of agency and communion on PEB intentions, this is consistent with previous findings of femininity and masculinity (as agency is similar to masculinity and communion is similar to femininity) and a person's willingness to engage in PEBs (Brough et al., 2016). For example, Brough et al. (2016) conducted seven studies that provided evidence that men's willingness to engage in PEBs can be affected by their levels of masculinity, while women overall are more likely to embrace PEBs. These findings show that it is important to act on and encourage communal values, such as supporting interdependence and altruistic values, to promote environmentally-friendly behaviors. It further provides evidence for the importance of studying non-gendered values such as agency and communion, as all genders can uphold communality and agentic values, and they can change overtime (Hentschel et al., 2019). As women grow more confident in typically masculine/agentic roles such as leadership and management, men grow more confident in typically feminine/communal roles such as caretakers and nurturers, and new understandings of gender identities emerge, it will be worthwhile to study how these values grow and change in a communal and agentic perspective, regardless of gender or masculinity and femininity.

Furthermore, my video from the pilot study was successful at inducing nature connectedness in participants, and the analyses showed that even a 3-minute video was

sufficient time for inducing nature connectedness. Previous studies have utilized 10-minute nature-walk videos (Mayer et al., 2009) to effectively induce nature connectedness. The finding that a simple 3-minute nature walk video can effectively induce nature connectedness could be beneficial to promoting sustainability and encouraging efforts to save the planet.

Limitations

A major limitation to this study is that it was underpowered. I ran a post-hoc Monte Carlo Power Analysis for Indirect Effects (Schoemann et al., 2017) to determine if my sample was effective at producing a moderate power but found that the study was underpowered and only had a 24% chance of finding a significant effect of the mediational pathway with the observed sample size. I was estimating a moderate effect, however the data showed that they were smaller effects than anticipated. It is likely that the study would require 3x the participants to find any powered effects. Therefore, though I did find that communion was related to PEB intentions, this finding must be taken with a grain of salt as the study was underpowered.

Another limitation of this study was the fact that I had to move it online only a few weeks into data collection. The lack of sign-ups may be due to effects of COVID-19, as participants may not want to sign up for in-person studies due to health risks and therefore prefer online ones or may prefer the ease that comes with online studies. While it was not ideal to switch modalities mid-study, it was necessary for the continuation of the study and to meet a reasonable sample size. Online studies, while convenient and more efficient than in-person studies, come at a hefty risk of a lack of control over the

experiment (Palan & Schitter, 2018). Participants may not be giving their full attention to the study, may be distracted, or may speed through the study. Even though I kept participants from clicking through the video before it was complete by delaying the next page button until the video was nearly finished, some participants still sped through the survey and had to be omitted if they completed the survey in under 8 minutes (3 minutes for the video and 5 minutes for the remainder of the survey, respectively). One way to address this limitation for a web-based study would be to provide prompting messages that encourage participants to take their time and read carefully when they've answered a question too quickly. Conrad et al (2017) utilized prompted messages that would remind the participant to read carefully and take their time if participants were responding faster than a minimal response time threshold (350 milliseconds per word). Their results showed that their prompts were effective at slowing down response time.

Finally, there may be potential operational confounds with the nature videos. The nature videos, because they were originally intended to be meditational by the 4k Relaxation Channel (2019), may be manipulating how stressed or relaxed a person is more than agency and communion. Perhaps utilizing a nature-based documentary that specifically shows organisms working in harmony together (communion) or shows how independent some organisms can be (agency) would be more effective at tapping into agency and communion. I intended for the urban video to remind participants of their independence and disconnection with others through a walkthrough in the busy streets of New York, while the nature video would remind participants of their connection to nature and potential connection to others, but the fact that the videos were meditational in essence may have interrupted any connection to agency and communion. They were still

effective at inducing nature connectedness as seen in the pilot study but were not effective at inducing feelings of agency or communion.

Future Directions

Future research would hopefully investigate this phenomenon with a larger sample size to ensure the study is powered enough, as well as through in-person data collection. It may also be interesting to investigate different nature videos (such as the ones utilized in this study or nature-based documentaries) to see how they affect the mediational value of agency and communion on nature connectedness. Because communion still significantly correlated with PEB intentions, it would be worthwhile for the research to continue to investigate this relationship and further understand how communion works to increase PEB intentions. Future research should also investigate the phenomenon of a short 3-minute video being effective to induce nature connectedness in participants. This would allow future research to collect more data in a short amount of time and may contribute to other research regarding attention spans. If 3 minutes are sufficient to induce nature connectedness or other phenomena in individuals, this may have significant implications for future methodology involving video media. Though the main hypotheses were not supported, the finding that a 3-minute video was sufficient to induce nature connectedness and communion was significantly related to pro-environmental behavior intentions has important implications for further environmental sustainability research and the future of our planet.

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Appendix A

Video Stimuli

This appendix consists of links to the video stimuli used in the pilot study. The nature walk videos were trimmed from an original nature hike from 4k Relaxation Channel (2019) on YouTube. The urban walk videos were trimmed from an original video from Walk, Ride, Fly (2020) on YouTube.

Nature Walk Video (3 minutes): https://www.youtube.com/watch?v=s_hl0jwUvBo

Nature Walk Video (10 minutes): https://youtu.be/fxKoU5ep0Qs

Urban Walk Video (3 minutes): https://www.youtube.com/embed/TK2xJ1xn3go

Urban Walk Video (10 minutes): https://youtu.be/VlNNnCanBxU

Appendix B

Personal Attributes Questionnaire [Modified] (PAQ; Spence et al., 1974; Ward et al., 2010)

The items below inquire about how you feel in this moment. Each item consists of a PAIR of characteristics, with the numbers 1-5 in between. For example,

Not at all artistic 1 2 3 4 5 Very artistic

Each pair describes contradictory characteristics - that is, you cannot feel both at the same time, such as very artistic and not at all artistic.

The numbers form a scale between the two extremes. You are to choose a number which describes where YOU fall on the scale in this moment. For example, if you think that you have no artistic ability, you would choose 1. If you think that you are pretty good, you might choose 5. If you are only medium, you might choose 3, and so forth.

EMV	1. Not at all aggressive	1	2	3	4	5	Very aggressive*
AGC	2. Not at all independent	1	2	3	4	5	Very independent*
COM	3. Not at all emotional	1	2	3	4	5	Very emotional*
EMV	4. Very submissive	1	2	3	4	5	Very dominant*
EMV	5. Not at all excitable in a major crisis*	1	2	3	4	5	Very excitable in a major crisis
AGC	6. Very passive	1	2	3	4	5	Very active*
COM	7. Not at all able to devote self completely to others	1	2	3	4	5	Able to devote self completely to others*
COM	8. Very rough	1	2	3	4	5	Very gentle*
COM	9. Not at all helpful to others	1	2	3	4	5	Very helpful to others*
AGC	10. Not at all competitive	1	2	3	4	5	Very competitive*
EMV	11. Very home oriented	1	2	3	4	5	Very worldly*
COM	12. Not at all kind	1	2	3	4	5	Very kind*
EMV	13. Indifferent to others' approval*	1	2	3	4	5	Highly needful of others' approval
EMV	14. Feelings not easily hurt*	1	2	3	4	5	Feelings easily hurt
COM	15. Not at all aware of feelings of others	1	2	3	4	5	Very aware of feelings of others*
AGC	16. Can make decisions easily*	1	2	3	4	5	Has difficulty making decisions

AGC	17. Gives up very easily	1	2	3	4	5	Never gives up easily*
EMV	18. Never cries*	1	2	3	4	5	Cries very easily
AGC	19. Not at all self-confident	1	2	3	4	5	Very self-confident*
AGC	20. Feels very inferior*	1	2	3	4	5	Feels very superior
COM	21. Not at all understanding of others	1	2	3	4	5	Very understanding of others*
COM	22. Very cold relations with others	1	2	3	4	5	Very warm relations with others*
EMV	23. Very little need for for security*	1	2	3	4	5	Very strong need for security
AGC	24. Goes to pieces under pressure	1	2	3	4	5	Stands up well under pressure*

The scale to which each item is assigned is indicated by AGC (Agency), COM (Communion) and EMV (Emotional Vulnerability)

Items with an asterisk indicate the extreme agentic response for the AGC and EMV scales and the extreme communion response for the COM scale. Each extreme agentic response on the AGC and EMV scales and the extreme communion response on the COM scale are scored 4, the next most extreme scored 3, etc.

Appendix C

Pro-environmental Behavior Scale [Modified for intention] (Markle, 2013)

Please answer each of these questions in terms of the way you feel in the present moment. There are no right or wrong answers. Using the following scale, please rate how much you agree with each statement.

1	2	3	4	5
Strongly Disagree		*Neutral*		*Strongly Agree*

Conservation

I plan to be more proactive about turning off the lights when leaving a room.
I intend to use standby modes of my appliances or electronic devices more often.
I plan to cut down on heating or air conditioning to limit energy use.
I plan to turn off the TV when leaving a room.
I intend to limit my time in the shower in order to conserve water.
I intend to wait until I have a full load to use the washing machine or dishwasher.
I intend to wash my clothes on a colder temperature.

Environmental citizenship

In the future, I intend to become a member of an environmental, conservation, or wildlife protection group.
In the future, I intend to contribute money to an environmental, conservation, or wildlife protection group.
In the future, I plan to watch more television programs, movies, or internet videos about environmental issues.
In the future, I plan to talk to others about their environmental behavior.
In the future, I plan to increase the amount of organically grown fruits and vegetables I consume.
In the future, I plan to purchase an environmentally-friendly vehicle.

Food

In the future, I intend to decrease the amount of beef I consume.

In the future, I intend to decrease the amount of pork I consume.

In the future, I intend to decrease the amount of poultry I consume.

Transportation

I plan to carpool more often.
I plan to use public transportation more often.
I plan to walk or cycle instead of driving more often.

Appendix D

Connectedness to Nature Scale (State) (Mayer et al., 2009)

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	2	3	4	5	6	7
Strongly Disagree			*Neutral*			*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 as 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 to be part of a 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 if humans' place on earth right now, I consider them to be the most valuable species in nature.

____ 13. At the 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 E

Pro-environmental Behavior Scale (Markle, 2013)

Conservation

How often do you turn off the lights when leaving a room?[a]

How often do you switch off standby modes of appliances or electronic devices?[a]

How often do you cut down on heating or air conditioning to limit energy use?[a]

How often do you turn off the TV when leaving a room?[a]

How often do you limit your time in the shower in order to conserve water?[a]

How often do you wait until you have a full load to use the washing machine or dishwasher?[a] At which temperature do you wash most of your clothes?[b]

Environmental citizenship

Are you currently a member of any environmental, conservation, or wildlife protection group?[c]

During the past year have you contributed money to an environmental, conservation, or wildlife protection group?[c]

How frequently do you watch television programs, movies, or internet videos about environmental issues?[d]

How often do you talk to others about their environmental behavior?[d]

During the past year have you increased the amount of organically grown fruits and vegetables you consume?[c]

Please answer the following question based on the vehicle you drive most often: approximately how many miles per gallon does the vehicle get?[e]

Food

During the past year have you decreased the amount of beef you consume?[f]

During the past year have you decreased the amount of pork you consume?[f]

During the past year have you decreased the amount of poultry you consume?[f]

Transportation

During the past year how often have you car-pooled?[g]

During the past year how often have you used public transportation?[g]

During the past year how often have you walked or cycled instead of driving?[g]

[a] These items used a 5 point “never”(1), “rarely”(2), “sometimes”(3), “usually”(4), “always”(5) Likert scale

[b] These items used a 3 point “hot” (1), “warm” (3), “cold” (5) Likert scale

[c] Values: “no”(1), “yes” (5)

[d] These items used a 5 point “never”(1), “rarely”(2), “sometimes”(3), “often”(4), “constantly” (5) Likert scale [e] Values: “24 or less”(1), “25–29”(1), “30–34”(1), “35–39”(1), “40 or more”(5)

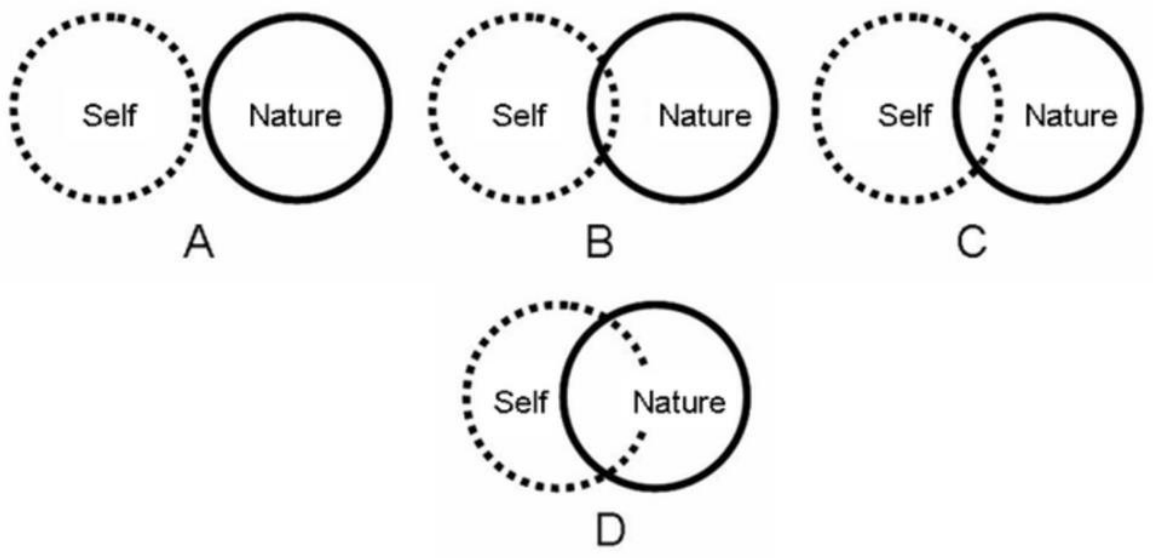
[f] Values: “no”(1), “yes”(5), “I do not eat beef/pork/poultry”(5)

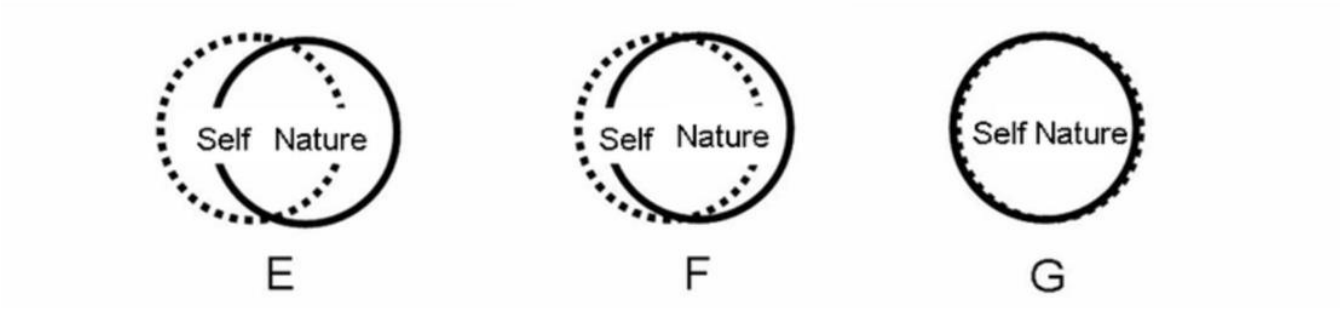
[g] These items used a 3 point “never”(1), “occasionally”(3), “frequently”(5) Likert scale

Appendix F

Inclusion of Nature in Self (Shultz, 2002)

Please choose from the pictures below which describes your relationship with the natural environment. How interconnected are you with nature?





Appendix G

Manipulation Checks

Please choose which of the following images most closely match the video you just watched.

A

B

C

D

Appendix H

Demographic Questions

1. What is your gender? [free response]
2. What is your age? [free response]
3. What is your race or ethnicity (you may select more than one option)?
    - American Indian or Alaska Native
    - East Asian
    - South Asian
    - Native Hawaiian or Pacific Islander
    - Black or African American
    - White
    - Latinx
    - An option that was not listed
4. What are your political views on SOCIAL ISSUES?
    - Strongly liberal
    - Slightly liberal
    - Moderate
    - Slightly conservative
    - Strongly conservative
5. If you answered MODERATE would you say that you lean liberal or lean conservative?
    - Lean liberal
    - Lean conservative
    - I said I was liberal
    - I said I was conservative
6. What is your year in school?
    - 1st year
    - 2nd year
    - 3rd year
    - 4th+ year
    - Graduate student
7. What is your country/region of primary citizenship? [drop down of countries/regions to choose from]

Appendix I

Pilot Study Debriefing Form

You have now completed the survey. Thank you for your participation. At this time we would like to share with you some more information regarding this study.

Debriefing Form

The present study is part of a body of research that explores how people connect to nature. Previous research has found that people are able to connect to nature by being within nature, engaging in nature contexts with virtual reality, and watching nature videos. These videos were part of a pilot study to determine if our selection of videos had an effect on nature connectedness and what video duration would be appropriate for a future test involving nature connectedness.

In this study, everyone watched a video that was designed to either induce or reduce nature connectedness by watching a walk-through of a nature setting or a walk-through of an urban setting. Participants were randomly assigned to receive either the short video (3 minutes) or long video (10 minutes) and then were randomly assigned again to receive either the nature video or the urban video. Participants then completed the 13-item Connectedness to Nature Scale (State) that is designed to assess one's level of nature connection in the present moment, as well as demographic questions. We will test whether these videos had an effect on nature connectedness and which duration of the video stimuli was most effective in order to determine if these videos are appropriate for a future study.

If you have additional questions, please contact the researcher (Juno Wild, Department of Graduate Psychology, James Madison University, wildjr@dukes.jmu.edu, 703.269.8759) or the faculty advisor (Kala Melchiori, Department of Psychology, James Madison University, melchikj@jmu.edu, 540.568.3177).

If you would like to download or print this debriefing form, please copy the link below: https://docs.google.com/document/d/1d3j3h2LISt61NRGnmGiCm48Nol6WGn8MfFhiDdgTOxA/edit?usp=sharing

For more information, please read:

Mayer, F.S., Frantz C.M. (2004). The Connectedness to Nature Scale: A measure of individuals' feeling in community with nature. Journal of Environmental Psychology, 24(4), 503-515.

Mayer F.S., Frantz C.M., Bruehlman-Senecal E., Dolliver K. (2009). Why is nature beneficial?: The role of connectedness to nature. Environment and Behavior, 41(5), 607-643.

Appendix J

Primary Study Debriefing Form

You have now finished the survey. Thank you for your participation. At this time we would like to share some information regarding the study with you.

Debriefing Form

The present study is part of a body of research that explores different ways of promoting environmental sustainability. Previous research has identified many ways of promoting environmental sustainability, using measures such as nature connectedness, pro-environmental behaviors, and understanding certain internal variables. Previous research by Nisbet et al. (2009) has also shown that there is a relationship between one's level of nature connectedness and pro-environmental behaviors. However, few studies focus on certain internal variables that may mediate this relationship. The present study tests if one's level of agency (i.e., values such as power and dominance) and communion (i.e., values such as caring for and cooperating with others) can explain the relationship between an individual's level of nature connectedness and their pro-environmental behavior intentions.

In this study, everyone watched a video that was designed to either induce or reduce nature connectedness by watching a walk-through of a nature setting or a walk-through of an urban setting. Participants were randomly assigned to receive either the nature video or the urban video. Participants then completed the Personal Attributes Questionnaire (Spence, 1974) that we modified for state feelings and the PEB scale by Markle (2013) modified for intention. Covariates, such as nature connectedness and current pro-environmental behaviors, were assessed using the Connectedness to Nature Scale by Mayer and Frantz (2009), and then the original PEB scale by Markle (2013) that measures an individual's current engagement in PEB. Participants also completed the Inclusion of Nature in Self (Schultz, 2002) scale to assess nature connectedness. Finally, participants were asked a manipulation check question to assess if they paid attention to the video and a few demographic questions.

We will test whether one's levels of agency and communion are able to provide further explanation on the relationship between nature connectedness and pro-environmental behavior intentions. This will aid our current understanding of how we can promote environmental sustainability and make strides towards protecting our planet.

If you have additional questions, please contact the researcher (Juno Wild, Department of Graduate Psychology, James Madison University, wildjr@dukes.jmu.edu, 703.269.8759) or the faculty advisor (Kala Melchiori, Department of Psychology, James Madison University, melchikj@jmu.edu, 540.568.3177).

If you would like to download this form, please follow this link: https://docs.google.com/document/d/1-e1IFX6KB2rXSbtjTSMU71LmoW_wsst2wZqhljCmEQU/edit?usp=sharing

For more information, please read:

Locke, K. D. (2015). Agentic and communal social motives. Social and Personality Psychology Compass, 9(10), 525–538. https://doi.org/10.1111/spc3.12201

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

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The Nature Relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. Environment and Behavior, 41(5), 715–740. https://doi.org/10.1177/0013916508318748