

**EFFECTS OF NATURAL INTERACTION ON BURNOUT AND WELL-BEING IN  
WORKING STUDENTS**

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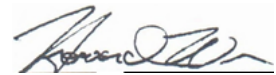
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### **Abstract**

Burnout research supports a negative impact on working people's psychological and physiological health, and it typically manifests from prolonged work strain. There is growing research supporting interacting with natural environments can facilitate restoration and work-stress recovery through decreasing negative feelings associated with acute stress and lowering the physiological effects of arousal. This study aims to 1) establish a relationship between natural interaction and both burnout and well-being; 2) explore differences between interacting with greenspace versus virtual nature regarding burnout and well-being; 3) investigate the influence of physical activity on the relationship between natural interaction and burnout/well being.

Participants (N=48) completed a survey measuring preexisting burnout and well-being measures; after completing the survey, they were randomly assigned to either participate in a greenspace or virtual natural environment for a minimum of 30 minutes a day for one week while completing daily diary surveys reflecting on their experience. After one week of natural interaction, participants retook the survey. Participants in both conditions exhibited lower mean burnout after one week of natural interaction. Condition (greenspace or virtual) and physical activity did not have significant influences on burnout and well-being levels. These results support that interacting with nature can facilitate positive changes in working student burnout levels, establishing natural interaction as a viable tool for burnout intervention programs.

*Keywords:* burnout, work-stress recovery, natural interaction, burnout intervention

### **Effects Of Natural Interaction On Burnout And Well-being In Working Students**

Burnout is a critically important topic in psychological literature, and previous research supports that feelings of burnout can result in psychological distress, like anxiety, depression, lowered self esteem, and substance abuse (Maslach & Leiter, 2006). Burnout is the sustained psychological strain originating from the workplace. Burnout impacts individuals on both a personal level and psychological level, diminishing work productivity, interpersonal relationships at home, and increased health problems (Maslach & Leiter, 2016). The core aspects of burnout are exhaustion, cynicism, and professional inadequacy; exhaustion refers to feelings of depleted mental resources; cynicism refers to overall negative attitudes towards one's job or workplace; professional inadequacy refers to decreased competency and drive (Maslach & Leiter, 2016). Another definition of burnout claims it as "not only a state of emotional, but also physical and mental exhaustion in long-lasting emotionally demanding situations" (Pines et al., 1992). Burnout has a close relationship with workplace behavior, which may predict negative job outcomes like performance deficits, workplace deviance, or lowered job satisfaction (Halbesleben & Buckley, 2004; Maslach et al. 1986). With the core symptom of burnout being emotional exhaustion, it is crucial to restore depleted emotions for the well-being and longevity of workers (Seidler et al. 2014)

Tackling the problem of burnout has gained attention in psychological literature with various intervention programs to prevent or address burnout in affected individuals. Intervention programs are either person-directed, dealing with personal coping skills and increased competence, or organization-directed, aiming to change work procedure (Wendy et al. 2010).

Efforts to decrease burnout are integral to the future of at-risk industries like healthcare, education, and social workers. However, many intervention programs are costly, require health care professionals, counselling, and other therapies, resulting in certain programs being a less accessible option.

Previous research supports that time spent in nature fosters a restorative experience for participants due to natural environments being rich in positive stimuli that shifts mood states from negative to positive (Berto, 2014). The term “nature” refers to the physical features perceived by individuals including flora and fauna, still and running water, air, and weather that are contained in landscape settings (Hartig et al. 2014). The term “natural environment” embodies a natural setting with little or no evidence of human intervention, and while these terms overlap, an individual’s experience of nature involves engaging with natural features and nature processes (Hartig et al. 2014). Natural environments offer an experience to detach workers from their work, which is crucial because individuals that exhibit detachment from work exhibit less job exhaustion (Sonnentag et al. 2010). Previous research provides evidence that feeling recovered after a weekend with high levels of detachment has higher levels of job performance during the week (Binnewies et al. 2010). Natural interaction may provide restoration and detachment from the workplace, which would apply to burnout intervention and work-related stress research. However, no research exists defining nature’s potential role in decreasing burnout.

### **Study Purpose**

The current research aims to use exposure to nature to combat burnout and increase personal well-being. This study explores the effects of natural exposure through both virtual means and greenspace on burnout and well-being. Participants complete burnout and well-being measures as an indicator of the initial experienced burnout. Participants are assigned to one of the two conditions where they either watch nature films or spend time in a greenspace, like a park or nature area, for a minimum of 30 minutes a day over the course of one week. After participants spend time completing one of the conditions, burnout and well-being measures are collected again.

### **Contributions**

The current research builds off existing research by exploring the relationship between natural interaction and burnout, and could provide evidence for a new, accessible approach to burnout intervention and prevention programs. Previous research in environmental psychology provides evidence that natural interaction promotes recovery from physiological arousal and the negative effects of fatigue, while also increasing relaxation, well-being, and positive workplace attitudes, like job satisfaction (Hartig et al. 2014; Bowler et al. 2010). Despite the evidence supporting the positive impacts of nature, no research explores these benefits in their relationship to burnout.

Past research has established positive physical and psychological benefits for both virtual and in-person nature experiences. No research compares these different experiences in the context of burnout. The proposed study manipulates the environment of natural interaction

through either virtual or greenspace stimuli in order to provide evidence for existing differences in their effect on burnout and well-being.

Finally, the current study seeks to further research regarding job-stress recovery by analyzing how working individuals exhibit recovery. Through collecting daily diary entries and coding the entries for activity levels, the data should shed light on the role of physical activity to facilitate restoration of depleted psychological resources. This data could provide additional information to predict what stimuli predicts the highest changes in burnout levels.

### **Hypothesis Development**

The Stress Recovery Theory (SRT) suggests that exposure to nature can have restorative effects on psycho-physiological stress levels, producing positive mood changes and reducing negative emotions (Ulrich, 1983; Ulrich et al., 1991). SRT proposed that the positive appraisals of the natural environment lead to the environment having restorative properties for the individuals immersed in it (Ulrich et al. 1991). Previous research supports that certain exposure to the natural environment recovers the physiological symptoms of arousal and the negative emotions associated with acute stress (de Bloom et al. 2014). Building off of this research and expanding from SRT, natural interaction could facilitate restoration effects against burnout and increasing well-being in working people.

One potential mechanism underlying nature's properties as an environment for restoration could be recovery. Recovery is the process where an individual replenishes any depleted resources and functioning returns to a normal state, before any stressors (Sonnentag & Zijlstra, 2006). Previous research supports that time spent in nature fosters a restorative experience for

participants due to natural environments being used as a distraction from negative stimuli, altering attention to inherently positive stimuli (Diette et al., 2003). Ulrich found that hospital patient recovery time was improved, with shorter hospital stays and lower post-surgical complications, when patient's rooms faced trees over a brick wall (1984). Dental clinic patients had improved heart rate and self-reported measures of mood when exposed to natural environments (Heerwagen, 1990). Prisoners in the same jail whose cell overlooked farmland exhibited lower stress symptoms like digestive problems and headaches than prisoners whose cell view consisted of a man-made courtyard (Moore, 1981). The literature suggests physical benefits take place just by looking at nature. Another nature-based restoration theory, Attention Restoration Theory (ART), suggests that exposure to nature can have restorative effects on prefrontal cortex-mediated executive processes involved with advanced cognitive processes like selective attention, problem solving, and multi-tasking (Kaplan, 1995). This theory complements the current study with its support that natural environments provide restoration over urban environments.

Another crucial recovery experience is psychological detachment and refers to workers refraining from work-related activity and thoughts when no longer at work (Sonnentag & Fritz, 2015; Hülshager, Feinholdt & Nübold, 2015 ). Previous research suggests that a lack of detachment is a key aspect to job stressors translating into poor health and decreased well-being (Sonnentag & Fritz, 2015). Natural environments may provide a healthy way for workers to practice detachment from their workplace. One study found a positive relationship between time spent in nature and a lower need to recover from work (Korpela & Kinnunen, 2010). Previous research suggests human-nature interactions restore depleted emotional resources and increases

performance of high-order cognitive processes like attention and self-regulation (Kaplan & Berman, 2010; Ohly et al. 2016). Empirical research supports the beneficial impact of nature, as it facilitates individuals to have a more positive affect state and exhibit less mental fatigue (Berto, 2014). With nature providing opportunities for detachment and job-stress recovery, nature-based immersion could mitigate negative experiences from the workplace.

Very few studies explore the environments best for inducing job-stress recovery (Sonnentag, Venz, & Casper, 2017). However, the existing research supports that natural environments provide recovery potential (Korpela & Kinnunen, 2010), and participants that spend time outdoors after work exhibit job-stress recovery in greenspace over urban space (Tyrväinen et al., 2014). Overall, existing theory and data on the relationship between nature and restoration has provided evidence that exposure to natural stimuli, either virtually through nature films or in real nature, replenishes depleted resources (Sonnentag, Venz & Casper, 2017).

## **Burnout**

Burnout has three main components: exhaustion, cynicism, and professional inadequacy (Maslach & Leiter, 2016). Burnout is associated with mental health problems like depression (Iacovides et al., 1999), anxiety (Richardsen, Burke, & Leiter, 1992), high stress (Cox, Kuk, & Leiter, 1993), along with physical health problems like decreased immunity functioning, sleep disturbance, and neck and back pain (Kim, Ji, & Kao, 2011). Emotional exhaustion is a core aspect of burnout, with individuals suffering from feelings of being drained by interpersonal contact or depleted of emotional resources (Halbeslen & Buckley, 2004). It is widely

acknowledged that emotional exhaustion due to burnout negatively impacts the individual through mental and physical health consequences (Maslach and Goldberg, 1998).

Approaches to decreasing professional inadequacy and cynicism involve changing work patterns (working less, more breaks), developing coping skills (cognitive restructuring), and using social support (Maslach & Leiter, 2016). Because the final aspect of burnout, emotional exhaustion, involves a depletion of psychological resources, it would benefit from a period of restoration (Fritz et al. 2010). With previous literature and the Stress Recovery Theory supporting nature as a restorative environment (Berto, 2014), burned out individuals who interact with nature may utilize the restoration to mitigate the negative symptoms associated with burnout, so the current research proposes the following hypothesis:

*Hypothesis 1a:* Participants that spend time in greenspace (Condition 1) or experience virtual nature (Condition 2) will exhibit a decrease in burnout from pre- to post-study.

### **Natural Environments and Well-being**

In addition to burnout, the current research investigates the implications of nature on well-being, which predicts working individual's quality of life. Hedonic well-being refers to emotional well-being that consists of positive emotions, low feelings of negative emotion, and satisfaction in life (Capaldi et al. 2015). Previous research supports that contact with nature promotes positive emotional states (Capaldi et al. 2015). For example, brief walks in natural environments can lead to an increased mood (Mayer et al. 2009). Systematic reviews support the benefits of nature and added benefits to exercise outdoors on mental well-being (Bowler et al. 2010; Thompson-Coon et al. 2011). Bowler's meta-analysis synthesized data from twenty-five

studies that compare health and well-being and natural environments (2010). The overall results support natural interaction as having a direct, positive benefit on well-being. One study looked at the impact of nature on stress with 7 minutes of restoration after 2 hours of working (Jahncke et al. 2011). The participants who watched the movie with sounds of water self reported having higher energy than participants who listened to nothing or office noises. The current research provides additional data for changes in well-being due to purposeful natural interaction by exploring the following hypothesis:

*Hypothesis 1b:* Participants that spend time in greenspace (Condition 1) or experience virtual nature (Condition 2) will exhibit an increase in levels of well-being from pre- to post-study.

### **Wilderness Level**

Previous studies vary in their investigations of human-nature interactions and experiences differ with some taking place on virtual settings (such as images on computer screens) and some on real settings (such as man-made greenspace or forests), while engagement with nature ranges from passive (such as looking at a computer screen) to active (such as walking or gardening) (Ohly et al. 2016). Evidence supports benefits through increased well-being after virtual interactions with nature, such as viewing images and videos (Capaldi et al. 2015). While virtual experiences can benefit individuals, an even greater mood boost takes place when individuals experience real nature (Capaldi et al. 2015). Real nature produces greater benefits in mood than virtual experiences due to the facilitation of exercise, a social aspect, and the ability to recover from mental fatigue (Mayer et al. 2009). While real nature is preferred and results in larger

changes for healthcare purposes compared to virtual means, virtual reality is a viable alternative for improvements to psychological health when real-world interaction is not possible (White et al. 2018). However, different levels of nature immersion result in different degrees of psychological changes, suggesting that if nature does impact burnout, the type of nature interaction would also impact the degree of improvements (Mayer et al. 2009).

No research exists investigating the differences in burnout changes between virtual and greenspace nature. This study measures burnout levels and well-being at different levels of wilderness immersion (either virtual or greenspace) in an effort to establish the various psychological effects associated with different methods of interacting with nature. The current research proposes the following hypothesis:

*Hypothesis 2a:* Participants that spend time in greenspace (Condition 1) will exhibit a larger change in burnout from pre- to post-study compared to viewing nature (Condition 2).

*Hypothesis 2b:* Participants that spend time in greenspace (Condition 1) will exhibit a larger change in well-being from pre- to post-study compared to viewing nature (Condition 2).

### **Physical Activity during Natural Interaction**

Previous research concludes that there exists increases in positive emotions and decreases in negative emotions through nature, but no research explores the mechanisms behind these benefits (Mayer et al. 2009). In order to explore the driving forces behind existing relationships between nature and burnout/well-being, I argue that physical activity plays a key role in influencing the levels of both burnout and well-being. Interacting with nature in a greenspace

may lead to individuals exercising more than if they were not to visit that greenspace as it allows for more physical activity like running and walking and encourages outdoor activity due to the aesthetic appealing environment. In the current study, there is an expected difference in physical activity levels between the greenspace and virtual conditions. In order to assess the degree of physical activity's differences between conditions, this research proposes:

*Hypothesis 3a:* Greenspace (Condition 1) will result in more physical activity than the virtual condition (Condition 2).

Previous literature supports the benefits associated with green exercise, a term used to explain the experience of being active outside (Barton & Pretty, 2010). Exercising in nature constitutes a prolonged positive benefit regarding psychological well-being that includes greater feelings of revival, improved self-esteem, and lower scores for tension and depression (Gladwell et al. 2013). Green exercise quickly improves mood, with evidence to support that only five minutes of physical activity results in participants exhibiting the largest impact on their mood state (Barton & Pretty, 2010). Furthermore, growing empirical evidence looks at physical exercise as a viable way of decreasing burnout (Naczenski et al. 2017). Physical activity may enhance changes in burnout due to greater feelings of positive affect, exercise-induced endorphins, and improvements to subjective energy levels upon green exercise (Coon et al., 2011). Potential mechanisms behind the psychological side effects of exercise include its facilitation of detachment from work and helping working individuals disengage from extended periods of stress responses (Naczenski et al. 2017). Natural interaction, specifically in the greenspace condition, may inherently increase physical activity, which in turn leads to decreased burnout and increased well-being. Based on the known benefits of physical activity and its

potential role in influencing the effect of nature on burnout and well-being, the current study proposes the following hypotheses:

*Hypothesis 3b:* Participants that are more physically active will have lower burnout.

*Hypothesis 3c:* Participants that are more physically active will have higher well-being.

## **Method**

### **Participants**

The participants consisted of enrolled students who worked a minimum of 5 hours per week and currently lived in the United States. Participants signed up for the study through the Georgia Institute of Technology SONA in order to receive extra credit for psychology courses or completed the study on a volunteer basis. Of the 63 participants who completed the baseline, only 48 completed the post test and completed the daily diary entries tracking their participation; participants who did not complete the post-test or did not complete at least 3 diary entries were excluded from analyses. The sample consisted of 16 male and 31 female participants, ranging in age from 18 - 34, with one participant preferring not to report gender ( $M = 20.5$ ,  $SD = 2.4$ ). 36% of participants were third years in college ( $M = 2.8$ ,  $SD = 1.2$ ). Participants' work hours ranged from 5 - 40 ( $M = 14.3$ ,  $SD = 9$ ).

### **Measures**

#### ***Burnout***

Burnout levels were obtained using Shirom-Melamed Burnout Measure (Shirom & Melamed, 2006). The Shirom-Melamed Burnout Measure (SMBM) measured burnout through measuring physical fatigue, cognitive weariness, and emotional exhaustion. A sample item from the SMBM was “*I feel physically drained.*” There were 14 items and were scored on a 7 point

scale from *Never* to *Always*. All the items are averaged together, and higher average scores indicated greater burnout. This measure was administered during the baseline and post-study test. Chronbach's alpha for the baseline burnout measure was .61, and alpha for post-test burnout measure was .63.

### ***Well-being***

Overall well-being scores were obtained using Ryff's Psychological Scale of Well-being (Ryff, 1989). A condensed 14 items per scale version of this measure was used as it fits the theoretical definition with fewer questions (Ryff & Essex, 1992). This scale included personal growth, positive relationships, self acceptance, autonomy, and environmental mastery. A sample item from this measure was "*When I look at the story of my life, I am pleased with how things have turned out so far.*" Participants completed responses to statement items on a scale from *Disagree Strongly* (1) to *Agree Strongly* (7). An average of the items was computed and higher scores indicated higher well-being. This measure was administered before and after the week-long study. Chronbach's alpha for baseline well-being was .69 and was .71 for post-test well-being.

### ***Physical Activity***

After each nature experience, participants completed a survey describing the level of physical activity that took place. Measures for participant's activity levels provided data on individual activity levels across conditions. Physical activity was averaged across the week for each participant to provide a single measured score indicating the average level of physical activity engaged in during the virtual or greenspace time. The question is phrased as the following:

1. *How physically active were these activities on a scale from 1-5?*

- i. *1: Not active at all*
- ii. *3: Moderately active*
- iii. *5: Very active*

### ***Time in Nature***

In order to quantify time spent engaging with the natural environment, participants are asked the number of hours an individual spends outside or watching nature films. This data is collected in each diary entry to ensure each condition manipulation takes place.

### **Design**

This study uses a pre-post (mixed effects) experimental design. The manipulated between subjects factor is nature exposure. There are two levels for this factor, virtual and greenspace. Participants in the greenspace condition are asked to spend at least 30 more minutes a day outside in parks or other nature areas than they typically spend for one week. Participants in the virtual condition must watch a nature film or show for at least 30 minutes, with both visual and auditory stimuli, to control for the sensory experiences of interacting with real nature.

The dependent variables are burnout and well-being, which should change between pre and post test and are measured through Ryff's Psychological Scale of well-being and the Oldenburg Burnout Inventory. The dependent variables are within subjects. For Hypotheses 3, physical activity is averaged between subjects.

### **Procedure**

Participants are given informed consent before the pre-test survey and the survey is administered online through Qualtrics. After participants agree to participate in the study, an

eligibility screening ensures each participant is employed, actively enrolled in classes, and works for a minimum of 5 hours. Each participant completes a 20 minute pre-study survey measuring baseline burnout, well-being, and nature relatedness. This baseline measure is the control data for each participant. Participants are randomly assigned to either the virtual or greenspace condition. In each condition, participants are instructed to spend a minimum of 30 minutes per day more than usual outside in a greenspace (condition 1) or watching nature films (condition 2) for one week. Previous research supports that changes in well-being exist at a minimum of 30 minutes a day, but allowing participants to spend more time if they choose caters to the schedules of working individuals (Hamann & Ivztan, 2016). Previous burnout intervention programs also suggest that allowing burnt out individuals the freedom to choose their free time activities is beneficial (Sonnestag, Vinz, & Casper, 2017; Stigsdotter et al. 2011). Another study found that nature involvement over a two week span increased participant well-being (Passmore & Howell, 2014), so building off this research to provide evidence for benefits after one week would show effects in a shorter time period. Every day after interacting with nature, participants complete a short diary entry regarding the content of the experience and the degree of physical activity. The diary is accessible through a link participants can access at any time and is also emailed to participants each day. The daily diary survey can be filled out in 5 minutes or less. At the end of the one week trial period, a 10-20 minute post-study survey measuring burnout, well-being, and nature relatedness was collected.

Participants are compensated with a maximum of four hours of extra credit on SONA for completing the study. Participants earned .5 hours of extra credit for each diary entry after completing 30 minutes of natural interaction. Participants earned .5 hours of extra credit for

completing both the baseline and post-test with the credit being withheld until both tests have been completed. If a participant completed only the baseline test without completing any diary entries, no credit was awarded. In addition, there is a drawing for a \$10 Amazon gift card and each completed diary entry corresponds to another entry into the drawing.

### **Statistical Analysis**

A manipulation check across conditions was analyzed using an independent samples t-test to ensure participants spent time interacting with their designated condition and that the manipulation worked. Hypothesis 1a uses a paired-samples t-test to assess changes in burnout from pre to post test and Hypothesis 1b uses a paired-samples t-test to assess well-being levels for all participants from pre to post test. Hypothesis 2a and 2b used a Mixed Effects ANOVA to analyze any differences in change in burnout between the greenspace and virtual conditions. An independent samples t-test tested Hypothesis 3a to analyze if there is a significantly higher physical activity in greenspace (Condition 1) over virtual (Condition 2). A Mixed Effects ANOVA was utilized for Hypothesis 3b and 3c in order to find significant effects of physical activity on the change in burnout and well-being measures.

### **Results**

Analyses focus on participants' burnout, well-being, and activity depending on survey and the level of nature interaction. Descriptive statistics for hypothesis variables are found in Table 1. Reverse coded data was recoded so that when a higher score was entered, it indicated a higher score for the construct. All items were inspected through histograms and to ensure normality, and Cronbach's alpha was computed for each construct to measure internal consistency. As seen in Figure 1, a correlation matrix was constructed to visualize correlations among the variables used

in data analysis. In order to ensure the condition manipulation worked, an independent samples t-test showed that time in greenspace differed between participants assigned to the greenspace condition ( $M = 70.3$ ) and virtual ( $M = 42.2$ ),  $t(47) = 4.92$ ,  $p < .001$ . Another independent samples t-test showed that time watching virtual nature was significant different between participants in the greenspace condition ( $M = 12.8$ ) and virtual ( $M = 30.7$ ),  $t(47) = -5.29$ ,  $p < .001$ . This supports that the manipulation worked because each condition participated in their designated natural interaction.

Hypothesis 1 investigates participant's change in burnout and well-being between the baseline and post-test. A paired samples t-test showed that the participants had lower average burnout after the study ( $M = 3.4$ ,  $SD = 0.9$ ) than before the study ( $M = 3.7$ ,  $SD = 0.9$ ),  $t(47) = 2.39$ ,  $p < .05$ . However, there was not a significant difference regarding well-being levels before the study ( $M = 5.4$ ,  $SD = 0.7$ ) and after the study ( $M = 5.4$ ,  $SD = 0.7$ ),  $t(47) = -0.56$ ,  $p = 0.58$ . This indicates that working individuals experienced lower burnout levels when exposed to nature compared to their levels before any, or little, natural interaction. However, there is not sufficient evidence that well-being levels were impacted by interacting with natural environments. Therefore, Hypothesis 1a was supported, but Hypothesis 1b was not.

Hypothesis 2 explores participants' changes in well-being and burnout depending on their condition. A survey (Pre, Post) by condition (Virtual, Greenspace) mixed effects ANOVA was performed in R. There were significant main effects for burnout,  $F(1,47) = 5.71$ ,  $p < .05$ . However, there was not a significant interaction between condition and survey time,  $F(1,47) = 1.54$ ,  $p = 0.22$ . There were no significant main effects for well-being,  $F(1, 47) = 0.36$ ,  $p = 0.55$ . There was not a significant interaction between the two conditions and pre-post test scores for

well-being,  $F(1, 47) = 0.15, p = 0.70$ . However, despite the interaction not being significant, I plotted the interaction results. As seen in Figure 2, The burnout interaction plot is trending towards the hypothesized relationship where greenspace exhibits a larger decrease in burnout compared to virtual. After plotting the well-being interaction plot, this plot also trends towards the hypothesized relationship, as shown in Figure 3. The well-being interaction plot shows the greenspace condition increasing well-being measures at a greater rate than the virtual condition from baseline to post-test, but there is no interaction. Both conditions exhibited a larger change in burnout between baseline and post-test, with burnout measures being lower than baseline measures.

In order to examine the influence of physical activity on the relationship between natural interaction and burnout/well-being, a difference in physical activity levels between the natural interaction conditions must be confirmed. An independent samples t-test was performed comparing physical activity levels between greenspace and virtual conditions. There were significantly different activity levels in greenspace ( $M = 3.1$ ) over virtual ( $M = 2.2$ ),  $t(47) = 8.95, p < .05$ . Hypothesis 3a was supported. A burnout by physical activity mixed effects ANOVA and a well-being by physical activity repeated measures ANOVA were performed to analyze a difference in activity levels contributing to a larger change in burnout and well-being. There was a simple main effect showing a significant change in burnout pre and post test measures,  $F(1, 47) = 5.60, p < .05$ . There was not a significant influence of activity on the change in burnout,  $F(1,47) = 1.81, p = 0.18$ . Finally, the interaction between physical activity and pre-post test was not significant,  $F(1, 47) = .054, p = 0.82$ . In order to investigate if physical activity influenced participant change in well-being, a well-being by physical activity mixed

effects ANOVA showed that there were no main effects for activity,  $F(1, 47) = .06, p = .81$ . Also, there were no main effects for survey,  $F(1, 47) = .32, p = .57$ . There was not a significant interaction between condition and survey,  $F(1, 47) = 2.9, p = .09$ . These conclusions do not support that physical activity impacts the change in burnout and well-being levels, so Hypothesis 3b and 3c are not supported.

### **Discussion**

Taking into consideration the known effects of nature on both physical and psychological health, scholars have begun to explore the extent of natural interaction as a method to mitigate the negative impacts of burnout and work-related stress. The findings show a significant difference in burnout levels between baseline and post-test; there was not a significant difference in well-being levels between baseline and post-test. These results create the first link between natural interaction and burnout in the literature. While the results for well-being were not significant, previous meta analyses have concluded that nature has a positive impact on well-being (Bowler, 2010); additionally, the mean well-being was increased between the baseline and posttest, so with more participants the results may align with previous literature. Finally, to speculate on a potential explanatory factor, we investigated the role of physical activity. There was a difference in physical activity levels between the greenspace and virtual condition, meaning people were more active in the greenspace condition; however, there was not a significant interaction between activity and condition, meaning activity did not play a role in the differences in burnout and well-being measures. Besides physical activity, other influences inherent to the study's design could have facilitated the negative relationship between natural

interaction and burnout, such as reflection, socialization with others, and mindfulness, but these potential mechanisms were not measured.

### **Implications**

The implications for this research apply to advancing the health and well-being of working students. Because the results show a difference in burnout between the baseline and post-test, working students who spend time either in a greenspace or virtual nature exhibited a decrease in burnout after only one week. This suggests that burnt out working students could take 30 minutes out of their day to spend time with nature and decrease their feelings of burnout. Because greenspace is a generally accessible environment, these findings allow for anyone to help themselves mitigate burnout and improve their psychological health.

Additionally, this is the first study that explores the relationship between burnout and natural interactions. Because this foundational link is supported by the results, future studies can apply this finding to future research investigating further technicalities and causes of nature decreasing burnout. The ultimate application of this finding applies to burnout intervention programs, where future studies can create more concrete guidelines for utilizing nature as a burnout intervention tool. Interacting with nature could revolutionize burnout intervention programs, because nature is accessible and low cost for both employers seeking to decrease burnout in their employees and for employees trying to mitigate their own burnout symptoms.

In conclusion with previous research, our burnout results support Ulrich's Stress Recovery Theory (SRT). This theory proposes that exposure to nature elicits restoration for the negative symptoms associated with stress (Ulrich et al., 1991). Because the findings of this research support that working students who interacted with nature for one week exhibited lower burnout,

it relates to the SRT's core idea that nature facilitates the restoration of drained resources (Ulrich et al., 1991). This theory may provide the reasoning behind the findings of this study as the positive experience with nature leads to positive mood changes and reduced negative emotions along with restoration, which could influence participant's burnout measures. The results also relate to psychological detachment as working individuals are able to exhibit recovery outside (de Bloom et al. 2014). Aligning with stress recovery research, this study relates to previous work that provides evidence that after visiting forest environments, participants self-report feeling happier, more relaxed, and peaceful than those who did not interact with nature (Dolling, et al., 2017).

While the significant burnout results align with SRT, the non-significant well-being results contradict the ideas behind SRT. This most likely can be explained from the current research's low N and lack of power as the hypothesized relationship between nature and well-being has already been supported by meta-analyses to have a positive relationship (Bowler, 2010). Because the well-being results are trending towards the hypotheses, but are not significant, a replication of this study could provide more clarity for this contradiction.

Finally, physical activity was not significant and did not trend toward the hypotheses. This contradicts the growing literature on the long-term positive impacts of green exercise, which refers to being physically active in a natural environment; research exploring green exercise supports that physical activity in nature improves well-being after five minutes with higher self-esteem and lower feelings of depression, so it was hypothesized that this could explain lower burnout measures (Gladwell et al. 2013). Other parts of the study may accurately explain the relationship between natural interaction and burnout. For example, reflecting on the experience

of natural interaction in either condition could elicit mindfulness and appreciation for nature. Because participants needed to complete a daily diary entry, this daily reflection could have provided a positive effect. Additionally, many participants self-reported doing their natural interaction with other people, like family and friends. Socializing with other people could have led to improved burnout levels. While physical activity can not explain the negative relationship between natural interaction and burnout, other aspects of the study design may provide an alternative explanation to participant's lowered burnout measures.

### **Limitations and Future Directions**

Because the study had two treatment conditions, there was no true control where an individual did not interact with nature. This limits the possible inferences made regarding the results because the two treatment conditions were compared against each other and not a control, which would allow more firm conclusions regarding nature causing lower burnout. Because the study design utilizes a between subjects pre- to post-test, strong inferences can be made regarding change in individuals with individual differences controlled for. However, the changes in participant burnout cannot be pinpointed to solely natural interaction as both groups interacted with nature. The change in burnout could be attributed to a byproduct of being in the study, like reflecting on your daily experience or going outside after months of being inside due to Covid.

Another limitation was uncompleted diary entries. Because the diary entries tracked participant's self reported participation in the study, if an entry was not filled out for the day, it was difficult to discern whether the participant completed their task or not. It is assumed that a missed diary entry corresponds to a missed day of participation. The largest drawback to this

study lies in a low N. While correlations and trends align with the hypotheses, there is not enough power to support statistical significance for many of the hypotheses.

Future directions for this study could implement specific times to spend time in nature to maximize detachment. This study allows freedom of a 30 minutes minimum a day, but allows for more time if possible. Future studies could manipulate time intervals (i.e. 5 minutes, 15 minutes, 50 minutes) to find trends supporting how long specific time periods provide the most work-related recovery. The largest contribution for a future direction would involve a longitudinal study examining the long term effects of nature's impact on burnout and well-being. A longitudinal study measuring well-being and burnout while utilizing a growth curve analysis will be beneficial in applying research to burnout intervention programs with more specific trends to create guidelines. Because growth curve analyses estimate growth over time, burnout and well-being measures can be measured over time, helping to establish a more solid understanding of the long-term effects of interacting with nature. Also, because growth curve analyses typically investigate between-person differences on a longitudinal level, the trajectory characteristics of people's natural interactions can be measured to show any potential linear, curvilinear, or other relationships.

### **Conclusion**

The current research investigates natural interaction through greenspace or virtual nature in order to combat feelings of burnout and increase personal well-being. This study's results show lowered burnout levels after one week of natural interaction. This leads to the idea that using both physical and virtual nature can be used as a means to detach from work, provide opportunities for increased physical activity, and facilitate improved psychological health. The

data found in the study support the trend that interacting with nature has positive impacts, providing a foundation for future research to elaborate upon in order to provide an accessible burnout intervention strategy to improve physical and psychological wellness in working people.

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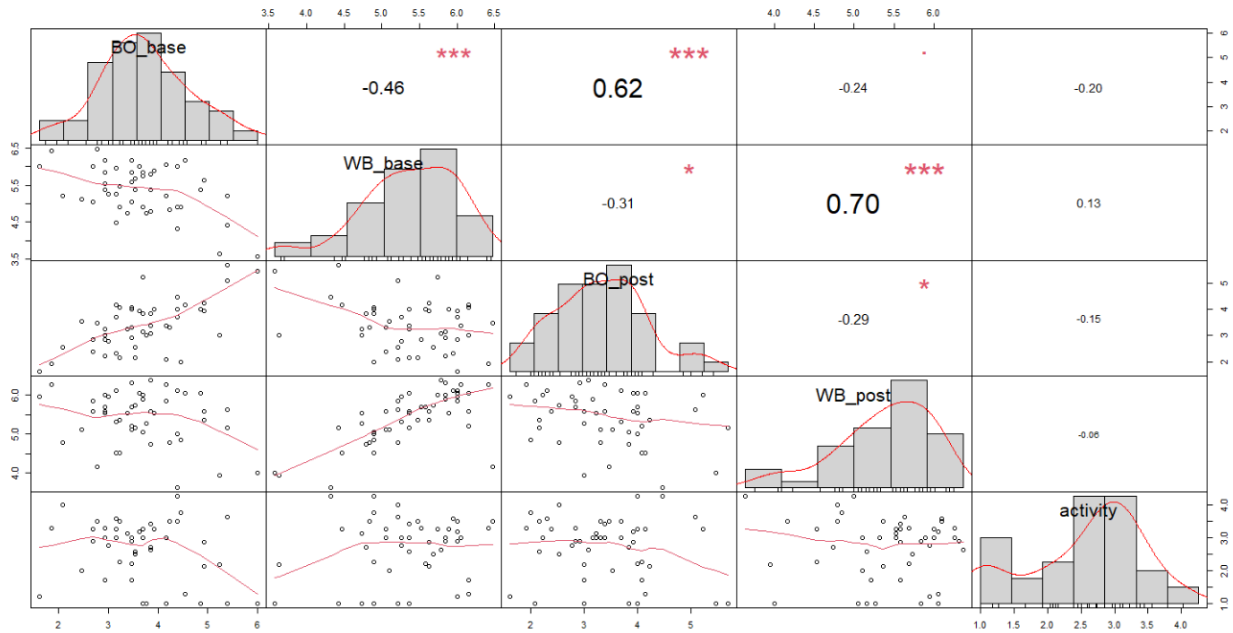
**Appendix****Table 1***Descriptive Statistics for Hypothesis Variables as a Function of Survey*

| Variable             | <i>M</i> | <i>SD</i> |
|----------------------|----------|-----------|
| Burnout baseline     | 3.7      | 0.9       |
| Burnout post-test    | 3.4      | 0.9       |
| Well-being baseline  | 5.4      | 0.6       |
| Well-being post-test | 5.4      | 0.7       |
| Activity             | 2.7      | 0.9       |

*Note.* *M* and *SD* represent mean and standard deviation. Activity was averaged across both conditions (greenspace and virtual).

**Figure 1**

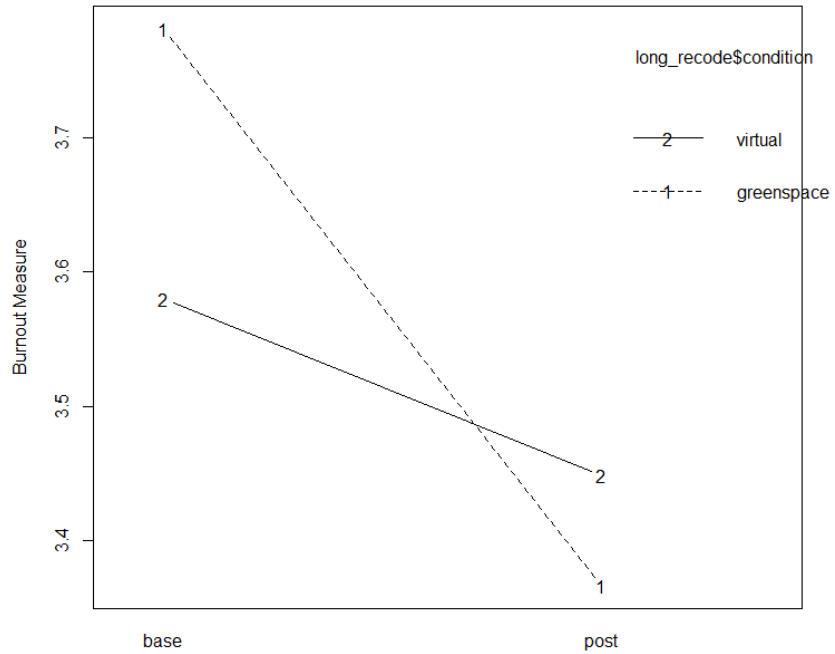
*Correlation Matrix for Burnout Baseline (BO\_base) and Post-test (BO\_post) Measures, Well-being Baseline (WB\_base) and Post-test (WB\_post) Measures, and Physical Activity (activity)*



*Note.* There exist significant, positive correlations between burnout baseline and post-test along with well-being baseline and post-test. There are no significant correlations with physical activity. Also, the distributions of all variables are relatively normal with burnout baseline and well-being post-test exhibiting minor skewing.

**Figure 2**

*Mean Burnout Measures Across Condition (greenspace and virtual) and Survey (baseline and post-test)*

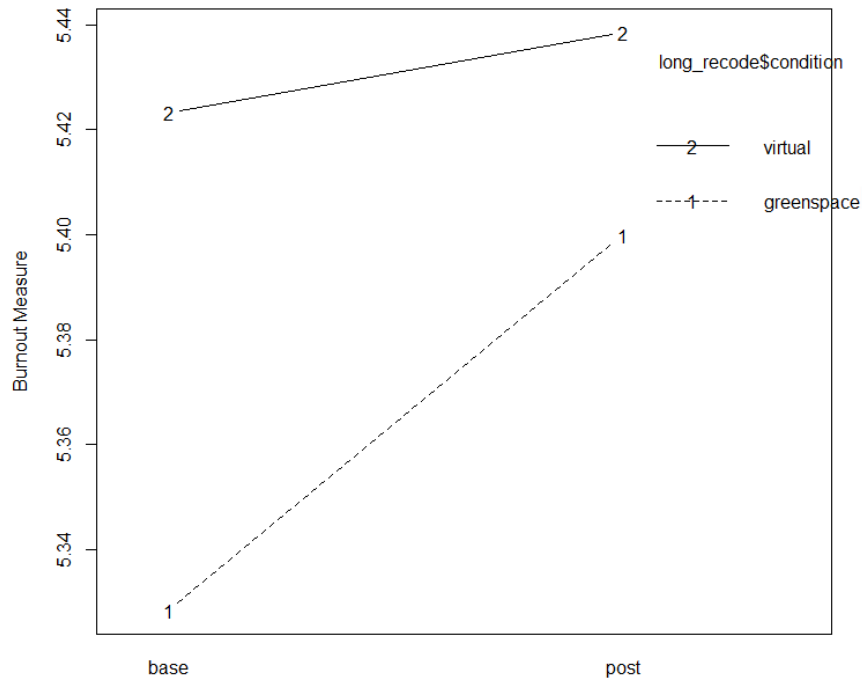


*Note.* There exists an interaction between condition and survey for average burnout measures.

Additionally, there is a larger difference in burnout measures for the participants in the greenspace condition over the virtual condition.

**Figure 3**

*Mean Well-being Measures Across Condition (greenspace and virtual) and Survey (baseline and post-test)*



*Note.* There does not exist an interaction between condition and survey for well-being measures.

Wellbeing does exhibit a larger change in the greenspace condition over the virtual condition.