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THE ACCLAIMED LANDSCAPE OF KNOWLEDGE SHARING

"Harmony in Spaces : Blending Heritage, Nature and Design"

E-PROCEEDING

TALKS 2.0

THE ACCLAIMED LANDSCAPE OF KNOWLEDGE SHARING

"Harmony in Spaces : Blending Heritage, Nature and Design"

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REJUVENATING THROUGH PIXELS: THE RESTORATIVE BENEFITS OF VIRTUAL LANDSCAPE SETTINGS

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ABSTRACT

Virtual landscape settings may assist persons by exposing them to landscape healing (video). Such immersion has been shown to have therapeutic effects such as enhanced positive affect, decreased negative affect, and decreased stress. In the current experiment, we examined whether immersion in a computer generated nature setting can produce restorative effects. There were 40 participants was invited to be a volunteer for this study. After that, participants will go through 3 section with different videos to measure their stress level. This questionnaire is done in stages through pre-test and post-test. The results suggest that immersion in virtual landscape settings has similar beneficial effects as exposure to surrogate nature. These results also suggest that virtual can be used as a tool to study and understand restorative effects.

Keywords: *Virtual landscape, mental health, stress reduction, mental restorative*

INTRODUCTION

Many jobs involve a high workload and time pressure, which can lead to shortterm stressful experiences, diminished attention spans, and long-term declines in wellbeing (De Lange, Taris, Kompier, Houtman, & Bongers, 2003). Similar to this, stress is thought to be one of the main causes of the growing global concern over students' mental health (Bayram & Bilgel, 2008). If there are no opportunities for restoration during the working day, the negative effects of stress are likely to cause ongoing difficulties (Lee et al., 2018, Trougakos and Hideg, 2009).

Csikszentmihalyi (2014, p. 3) defines attention as a process that controls the entry of different kinds of information into consciousness. Thus, maintaining focused attention requires constant use, which is taxing (Kahneman, 1973). Recovery from psychological and physiological stress, which can result from attentional fatigue, is referred to as restoration (Ulrich, 1983, Ulrich et al., 1991). While it takes work and drains resources, focused, voluntary attention is essential for sustaining focus on a task (Kaplan, 1995). Conversely, involuntary attention is easily attained and, once activated, permits the recovery of voluntary attention (Kaplan & Kaplan, 1983).

A growing body of research indicates that being in natural environments has positive health effects. (Chen et al., 2018; Yu et al., 2017). Not everyone, though, has unrestricted access to natural environments. Anticipate that simulated natural environments will also benefit mental health, mainly by allowing attentional resources to be recovered and stress levels to be lowered. (Browning et al., 2020a). as explained in Attention Restoration Theory and Stress Recovery Theory According to ART, natural settings are able to elicit involuntary attention and facilitate the restoration of cognitive abilities. And according to SRT, natural environments that are not dangerous have evolved to be favoured. Consequently, they lessen physiological arousal and encourage good affect. (SRT, Ulrich et al., 1991, ART Kaplan and Kaplan, 1989, Berto, 2014).

Developments in virtual reality (VR) have made it possible to simulate outside experiences and scenarios that are health-promoting indoors. Virtual reality (VR) can be defined as virtual environments that are rendered through real-time computational representations, offering one or more

sensory stimulations and being connected to the user's actions. Through a human–machine interface, virtual reality (VR) allows people to engage with virtual environments by mixing input signals with feedback devices. (Burdea and Coiffet, 2003; Gutiérrez et al., 2008).

There have only been two studies that we are aware of that looked at VR's potential to enhance mental health in this demographic. A two-week VR intervention featuring travel imagery and the same imagery shown on televisions did not significantly alter the mood, perceived well-being, or happiness of sixty-three residents of assisted living communities in the United States, according to a study (Lin et al., 2018). Prepost surveys revealed a decrease in negative emotions and an increase in positive emotions following the experience. The lack of physiological measurements of physical conditions, such as heart rate and blood pressure, and the failure to blind participants or researchers to experimental treatments to prevent social desirability bias limit both studies, despite the encouraging results regarding the therapeutic potential of VR for seniors. (Joseph et al., 2020) Furthermore, the psychological effects of various VR content types were not compared in these studies, which may have contributed to the observed changes rather than the VR content itself. Therefore, a critical next step in the investigation of VR as a therapeutic intervention for seniors is methodical reviews of the content presented to participants. (Gaboda et al., 2011).

However, The current study aims to examine in our understanding the effects of virtual natural settings on nature. Specifically, we evaluated the psychophysiological effects of rehabilitation in a virtual natural setting (experimental condition) on 30 volunteers. We use a white screen based computer-generated system to provide high visual quality, ease of use and capabilities that will facilitate the future distribution of VR as a therapeutic intervention and tool for health promotion.

LITERATURE REVIEW

Nature As a Restorative Environment

Nowadays, a large number of people reside in urban areas (Cohen,

2006; Ritchie & Roser, 2018). There are undoubtedly a number of benefits to living in a city as opposed to a rural one, including easy access to resources for entertainment, healthcare, and education. But there are drawbacks as well, such as a higher chance of depression and chronic stress (Romans et al., 2011, Gidlow et al., 2016; Lederbogen et al., 2011). People have long held the intuitive belief that being in nature helps ease some of the negative effects of living in an urban environment. Studies in fields including environmental psychology, public health, and outdoor recreation have provided scientific validation for this intuition (Collado et al., 2017; Hartig, 2021; Martin et al., 2020).

Most research on the beneficial effects of children's exposure to nature has been done in the field of psychological restoration studies. The evidence that is currently available indicates that children who are exposed to nature have improved mood are better able to focus (Oh et al., 2019) and feel that they have opportunities to escape the stresses and demands of everyday life (Li et al., 2018 ; Oh et al., 2019 ;Bagot et al., 2015). Even though research on the advantages of children's interactions with nature for mental health has been conducted (Tillmann et al., 2018), there is currently inconclusive empirical evidence that nature exposure is restorative for children and adolescents. This systematic review's objective is to fill this gap in the literature.

Theory in Restorative Enviroment

The two most popular theories to explain restorative experiences are Stress Recovery Theory (Ulrich, 1983, Ulrich et al., 1991) and Attention Restoration Theory (ART; Kaplan and Kaplan, 1989, Kaplan, 1995, Kaplan and Berman, 2010). The former stems from the immediate affective responses to nature and the evolutionary psychology of the human species (Ulrich, 1983, Ulrich et al., 1991). The latter emphasizes the benefits to cognition that come from interacting with natural environments, with a focus on directed attention fatigue (Kaplan, 1995, Kaplan and Berman, 2010, Kaplan and Kaplan, 1989). The study's theoretical framework, ART, was chosen because it outlines the qualities of restorative natural environments. States like vitality and positive mood states (Bowler et al., 2010, Hartig et al., 1991, Ryan et al., 2010, Ryan and Frederick, 1997), as well as states like relaxation, calmness, and focus (Hartig et al., 1997, Staats et al., 2003),

are examples of how restoration manifests itself. ART is used to explain these positive changes, and environmental psychologists have developed multiple scales to evaluate these restorative outcomes in the context of natural environments (Kaplan & Kaplan, 1989). According to ART-based research, restoration occurs when a person interacts with their surroundings and has restorative experiences. These consist of coherence, being away, compatibility, and fascination—four perceived dimensions (Hartig et al., 1997, Hauru et al., 2012, Laumann et al., 2001).

Stress Recovery Theory

The findings of empirical research on how natural environments affect human emotion, attention, and stress are supported by biophilia, ART, and SRT. These theories examine the relationship between humans and nature that is primarily psychological, with physiological effects like stress-related physical symptoms emerging as a byproduct. The psychological effects of nature on people have been the subject of a substantial body of research to date, which has been collected in publications by authors like (Gaekwad et al. (2022), Gillis and Gatersleben (2015), Berto (2014) and Bowler et al. (2010)).

The premise of stress recovery theory is that people who are under a lot of stress can benefit most from looking at images of nature. This theory was supported by empirical research from Ulrich, 1979, Ulrich, 1981 that showed watching natural scenes lowered arousal more quickly and significantly. The idea that affect comes before cognition was also incorporated into the SRT response framework studied in Ulrich, 1983, Ulrich, 1986, Zajonc, 1984. The framework is noteworthy for its ability to explain the affective and arousal state prior to exposure as well as the impact of learned behaviours on cognitive processes. According to the SRT response framework, experience and culture have an impact on the post-cognitive state, whereas psychoevolutionary theory explains the pre-cognition affective reaction.

Immersion and Presence in Virtual Reality

Two fundamental ideas in VR research are presence and immersion. Immersion can be characterized as the degree to which computer screens

can provide a comprehensive, wide-ranging, realistic, and colorful illusion of reality (Slater & Wilbur, 1997). De Kort, Meijnders, Sponselee, and IJsselsteijn (2006)) contend that immersion increases the restorative potential of a mediated environment based on a comparison of screen sizes depicting natural environments. According to Palanica et al. (2019), due to its enhanced immersive quality, three- dimensional virtual reality technology that portrays a natural setting fosters a higher degree of creative thinking compared to two-dimensional videos. In contrast, presence pertains to the personal experience of "being there" while utilizing an IT system (Biocca and Levy, 1995, Lombard and Ditton, 1997, Slater and Wilbur, 1997). According to Riecke and Schulte-Pelkum, 2015, Smyth et al., 2015, it is thought that a high sense of presence in a VR system enhances task performance, for example, by assisting the user in focusing and becoming more involved in the task.

This study advances our knowledge of attention restoration and the capacity of a virtual reality application to produce restoration through the use of a forest environment's visual, spatial, and auditory elements. We measured changes in the vitality, mood, and restoration outcomes of VR users before and after the break to determine how restoration states change when people take a break in a VR forest environment.

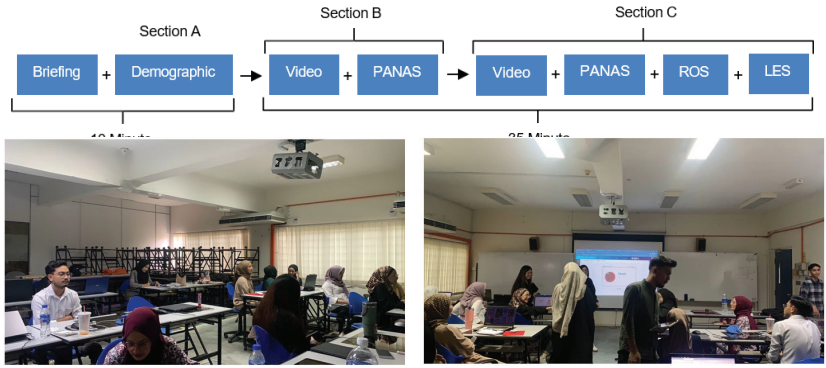
METHODOLOGY

40 participant was invited from the online platform announcement to be a volunteer to take the test and period of the announcement is from October to November (1 month). The study conducted in a public university located in UiTM Perak Branch, Seri Iskandar and the target undergraduate student to be a participant. Data was collect in January 2024 (1 week) and its take 45 minute to finish, 10 minute briefing and 35 minute will be continue with experiment. Before taking a survey, the participant was brief the questionnaire consist to 3 section. Section A is about demographic participant, section B will be shown a negative impact video and the participant will have to answer the question of section B which is Positive and Negative Affect Scale (PANAS) was developed by (Watson, Clark, & Tellegen, 1988), and for a section C will be shown a video towards forest restorative and the participant will have to answer the question of section

C which is Positive and Negative Affect Scale (PANAS) was developed by (Watson, Clark, & Tellegen, 1988), Restorative Outcome Scale (ROS) was developed by Korpela et al.'s (2008), and Landscape Element Scale (LES) that was conducted using self-administrated questionnaire using Google form.

Figure 1. Before and after the experiment

Flow chart for data collection:



RESULT & DISCUSSION

Section A: Demographic

A total of 40 participant, 57.5%(n=23) for females and 42.5%(n=17) for males, with the majority of age range, 15%(n=6) for 18-20 followed by 75%(n=75) for 21-23 and 10%(n=4) for 24-26. Those participants mostly from College of Built Environment Studies and Technology. Level education of participant is 67.5%(n=27) from degree and the rest is from diploma with 32.5%(n=13).

Section B: Positive and Negative Affect Scale (PANAS)

Positive Affect Schedule (%)

I feel…	Very sligthly	A little	Moderately	Quite A bit	Extremely

Enthuasiastic	40%	50%	10%	-	-
Interested	70%	30%	-	-	-
Strong	50%	42.5%	7.5%	-	-
Excited	45%	37.5%	17.5%	-	-
Proud	22.5%	72.5%	5%	-	-
Attentive	20%	42.5%	25%	12.5%	-
Inspired	50%	45%	5%	-	-
Determined	70%	30%	-	-	-
Alert	22.5%	52.5	25%	-	-
Active	25%	22.5	37.5	15%	-

Table 1 - Show the data of the percentage of positive affect volunteers toward the video negative impact

Based on table 1 positive affect towards video negative impact, 100%(n=40) of the volunteers did not have any feeling extremely out of the 10 feelings listed as positive affect towards video negative impact. Based on the observation of the volunteers' feelings, they were not positive towards the negative impact video that was shown.

Negative Affect Schedule (%)

Table 2. Show the data of the percentage of negative affect volunteers toward the negative video impact

I feel…	Very sligthly	A little	Moderately	Quite A bit	Extremely
Distressed	-	-	-	52.5%	47.5%
Upset	-	-	25%	27.5%	47.5%
Guilty	-	-	42.5%	35%	22.5
Scared	-	-	5%	45%	50%
Hostile	-	-	22.5%	75.5%	5%
Irritable	-	-	-	70%	30%
Ashamed	-	-	62.5%	37.5%	12.5%
Nervous	-	15%	37.5%	22.5%	25%
Jittery	-	-	45%	37.5%	17.5%
Afraid	-	-	7.5%	42.5%	50%

Based on table 2 negative affect towards video negative impact, 100%(n=40) of the volunteers did not have any feeling very sligthly out of the 10 feelings listed as negative affect towards video negative impact.

Based on the observation of the volunteers' feelings, they were extremely feel negative towards the negative impact video that was shown.

Section C: Positive and Negative Affect Scale (PANAS) + Restorative Outcome Scale (ROS) + Landscape Element Scale (LES)

Positive Affect Schedule (%)

Table 3. Show the data of the percentage of positive affect volunteers toward forest restorative video

I feel…	Very sligthly	A little	Moderately	Quite A bit	Extremely
Enthuasiastic	-	-	42.5%	35%	22.5
Interested	-	-	-	52.5%	47.5%
Strong	-	-	45%	37.5%	17.5%
Excited	-	-	22.5%	75.5%	5%
Proud	-	-	-	70%	30%
Attentive	-	-	-	52.5%	47.5%
Inspired	-	-	25%	27.5%	47.5%
Determined	-	-	5%	45%	50%
Alert	-	-	7.5%	42.5%	50%
Active	-	-	25%	27.5%	47.5%

Based on table 3 positive affect towards forest restorative video, the observation of the volunteers' feelings from the schedule, they were more towards moderately,quite a bit and extremly and that means they a feel more positive towards the video that was shown.

Negative Affect Schedule (%)

Table 4. Show the data of the percentage of negative affect volunteers toward forest restorative video

I feel…	Very sligthly	A little	Moderately	Quite A bit	Extremely
Distressed	50%	45%	5%	-	-
Upset	70%	30%	-	-	-
Guilty	50%	45%	5%	-	-
Scared	70%	30%	-	-	-
Hostile	22.5%	52.5	25%	-	-
Irritable	50%	45%	5%	-	-

Ashamed	60%	40%	-	-	-
Nervous	50%	45%	5%	-	-
Jittery	22.5%	52.5	25%	-	-
Afraid	40%	50%	10%	-	-

Based on table 4 negative affect towards forest restorative video, the observation of the volunteers' feelings from the schedule, they were the negative feelings within them have decreased when they see the video shown.

Restroration Outcome Scale (%)

Table 5 - Show the data of the percentage about the volunteer's feelings after watching the forest restorative video

I feel…	Very sligthly	A little	Moderately	Quite A bit	Extremely
Restorated and relaxed	-	-	-	52.5%	47.5%
Calm	-	-	-	70%	30%
Enthuasiasm and energy for my day routines	-	-	42.5%	35%	22.5
Focused and alert	-	-	7.5%	42.5%	50%
Forget everyday worries	-	-	25%	27.5%	47.5%
My thounhts are clear	-	-	-	60%	40%

Based on table 5 the result of forest restorative video more to positive feelings result and can change the feelings of the volunteers from extremely negative to positive. This means that this study has succeeded in reducing stress volunteer towards restorative effect video.

Landscape Element Scale (%)

Table 6 - Show the data of the percentage of rate scale element in the forest restorative video

Landscape element	Disagree	Neutral	Agree	Strongly agree	
Mountains	-	5%	45%	50%	

Tree canopy	-	-	40%	60%	
Forest floor	-	20%	50%	30%	
Tree trunks	17.5%	25%	35%	22.5	
Forest edge	-	22.5%	52.5	25%	
Rivers	-	-	22.5%	77.5%	
Waterfall	-	-	12.5%	87.5%	
Wetland	-	5%	16%	55%	
Rock	-	35%	42.5%	22.5	
Moss	-	10%	50%	40%	

Based on table 5 the result of rate scale for landscape element in forest restorative video that the highest rate is waterfall with 87.5%(n=35) of the volunteer and followed by the river as athe second highest rate with 77..5%(n=31) of volunteer. Based on observation, elements related to water sources such as waterfall and river are more able to give peace to the participants for this study.

CONCLUSIONS

In conclusion, the virtual restorative forest effect has proven to be a promising and innovative approach in alleviating stress and promoting overall well-being. Through immersive technologies and carefully designed virtual environments, individuals can experience the therapeutic benefits typically associated with natural settings. The evidence suggests that exposure to virtual restorative forests can lead to significant reductions in stress levels, providing a convenient and accessible solution for those unable to access physical green spaces regularly.

The positive impact of virtual restorative forests on mental health, stress reduction, and overall well-being is supported by emerging research. These digital environments provide a unique blend of relaxation, sensory engagement, and a connection to nature that can help alleviate the pressures of modern living. Moreover, the accessibility of virtual platforms ensures that a wider population can reap these benefits, irrespective of geographical location or physical limitations.

This virtual experience opens up new possibilities for incorporating

nature-based interventions into daily routines, especially in urban environments where access to natural settings may be limited. The positive impact on stress reduction highlights the potential of virtual restorative forests as a valuable tool in mental health and well-being practices. As technology continues to advance, further research and development in this field may uncover additional ways to enhance the effectiveness of virtual environments for stress relief, offering individuals an alternative and convenient means to nurture their mental health. In this study it has been proven that virtual restorative can be used as stress reduction for 40 participants involved.

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