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Virtual Tourism Experiences and Mental Restoration

Highlights:

- VR offers a restorative intervention to promote wellbeing within organisations.
- Three-minutes of virtual tourism experiences leads to better concentration at work.
- Organisations can provide VR interventions to foster staff wellbeing.

Abstract:

Virtual reality is providing new opportunities for health and well-being, organisational learning, and tourism management. The study reported in this paper aims to examine whether engaging in a virtual reality tourism experience could function as a restorative intervention strategy to enhance mental well-being of employees in the workplace. The study employs a lab-based pre-post experimental design to test the effectiveness of a virtual reality tourism experience, involving a nature-based marine setting, to enhance mental restoration and reduce mental fatigue. The results show three minutes of a virtual tourism experience can lead to enhanced concentration while boosting the mental well-being of employees, while at the same time, providing destinations with an opportunity to promote 'real' experiences.

Keywords: virtual tourism experiences, virtual reality, mental restoration, well-being

1. INTRODUCTION

The role of tourist experiences in stress reduction has been well established (Packer, 2021), yet one's working environment may limit a worker's ability to take regular vacation leave (Beeton, 2012). Despite the COVID-19 pandemic negatively impacting the tourism industry and people's ability to physically travel (Gössling et al., 2020; UNWTO, 2022), it has awakened people to the possibilities of virtual reality experiences that continue as a result of the pandemic (Lu et al., 2022; Schiopu et al., 2021). Global internet usage has grown rapidly

since the year 2019, with users spending an average 3.27 hours online (Johnson, 2021), while an 85% increase in Explore.org (popular virtual tourism website) usage was reported during the pandemic (Granville, 2020). Since the 1990s, there has been increased blurring of work and non-work lives fuelled by technological innovations and developments in various sectors, including the tourism sector (Merkx & Nawijn, 2021). Adverse consequences of these changes have included reductions in subjective well-being and life satisfaction amongst workers and reduced organisational commitment (Brough & O’Driscoll, 2005; O’Driscoll et al., 2007). A large proportion of society spends a significant amount of time working, and work responsibilities often result in mental fatigue, which is “the consequence of sustained mental effort that requires focused or directed attention” (Kaplan, 1993, p.195). Thus, promoting mental restoration within the workplace is necessary (Gilchrist et al., 2015). Taking vacations has been found to improve cognitive performance (Packer, 2021) and VR experiences of nature improve well-being (Reese et al., 2021). Because VR is increasingly being considered as an intervention to manage stress and promote well-being within the workplace (Adhyaru & Kemp, 2022; Naylor et al., 2019; Naylor et al., 2020), further research into workplace interventions that mitigate the impact of increasing work pressures on employee well-being and productivity is necessary. This study investigates the effectiveness of a short-term intervention in the form of a virtual reality tourism experience in enhancing mental restoration and reducing mental fatigue among university employees. The study is guided by Attention Restoration Theory (Kaplan & Kaplan, 1989), as outlined in the following section.

2. LITERATURE REVIEW

2.1. Attention Restoration and Natural Environments

Directed attention is a central component of effective functioning and enables a person to think clearly, ignore distractions, solve problems, make decisions, prioritise and restrain impulses (Kaplan, 1995). Attention is a significant yet endangered resource within the workplace and one that organisations need to manage and restore (Hartig, 2004). Attention Restoration Theory has been widely used to explain how prolonged mental effort results in mental fatigue, and how certain environments and experiences can facilitate restoration. Restoration is “the process of renewing, recovering, re-establishing physical, psychological and social resources or capabilities diminished in ongoing efforts to meet adaptive demands” (Hartig, 2004, p. 273).

Spending time in a restorative environment can help a worker to recover from mental fatigue, restore cognitive performance (Berman et al., 2008; Gill et al., 2017) and promote recovery from stress (Ulrich et al., 1991). A restorative environment permits directed attention to rest (Berto, 2005) as it enables a person to be physically or psychologically away from the normal routine, with their mind occupied by the scope, size and structure of the environment attracting and holding their attention (Berto, 2005). Benefits from spending time in a restorative environment include clearing the mind of cognitive noise, recovering the ability to direct attention, and reflecting on immediate issues and longer-term priorities (Kaplan & Kaplan, 1989). The term *micro-restorative experiences* was coined by Kaplan (1993) to suggest that even small and brief opportunities to disconnect (such as looking out a window at nature) are beneficial to workers. Organisations that acknowledge the value of and provide regular access to restorative environments are likely to improve employee well-being, performance and effectiveness (Hernandez, 2007; Kahn et al., 2008; Kaplan, 1993; Nie et al., 2021; Sadick & Kamardeen, 2020).

Natural environments are among the most restorative (Berto, 2014; Herzog et al., 2003), although restoration has also been demonstrated in environments such as museums (Kaplan et

al., 1993), monasteries (Ouelette et al., 2005), and spiritual retreats (Gill et al., 2019). A significant amount of literature on restoration has focused on forests (Belinis et al., 2018), wilderness areas (Atchley et al., 2012) and other natural green spaces (Buchecker & Degenhardt, 2015). Studies have also found that water is particularly effective in enhancing restoration (Karmanov & Hamel, 2008; Völker & Kistermann, 2011; White et al., 2010). Qui et al. (2021) therefore concluded that restoration is the result of human-nature interactions with restorative benefits including physical and psychological health, psychosocial development and spiritual uplifting. With the impacts of COVID-19 severely limiting tourism experiences however, it is necessary to explore whether simulated virtual nature-based experiences provide similar restorative outcomes for workers.

2.2. Virtual Reality

Virtual Reality (VR) as a key element of Information and Communication Technologies has been defined by Guttentag (2010, p. 638) as “the use of a computer-generated 3D environment – called a ‘virtual environment’ (VE) – that one can navigate and possibly interact with, resulting in real-time simulation of one or more of the user’s five senses”. Semi-immersive devices have also emerged, such as those that focus on environments in virtual 3D reconstructions of destinations (Beck et al., 2019). VR has many practical applications for the tourism industry. VR allows for the creation of navigable virtual environments in future tourism developments (Guttentag, 2010), and VR has also been used in marketing to provide extensive sensory information to prospective tourists (Beck et al., 2019).

The use of VR tourism experiences to enhance mental restoration is a fairly new line of inquiry (Mattila et al., 2020). Preliminary VR research has been conducted on the effects of virtual nature on mental and psychophysiological restoration (Chung et al., 2018; Gao et al., 2019; Mattila et al., 2020). A few studies of green spaces such as forest environments and

urban parks have demonstrated virtual environments to be equally restorative (Luo et al., 2022; Mattila et al., 2020). Although virtual green spaces have been examined, virtual blue spaces (such as underwater virtual marine environments) have not yet received attention in tourism research – a knowledge gap this study addresses.

3. STUDY AIM AND SAMPLE

A lab-based pre-post experimental design has been implemented to test the following hypotheses:

H1. A virtual marine tourism experience will enhance restorative mental state in the workplace.

H2. A virtual marine tourism experience will reduce mental fatigue in the workplace.

The study also aimed to examine whether the time since one's last holiday had any bearing on the worker's restorative mental state, prior to (pre-phase) and following exposure (post-phase) to a VR experience.

4. METHOD

4.1. Lab Procedure

Three days prior to undertaking the VR experience, participants were required to complete a pre-test online questionnaire that assessed their mental state via a series of items that measured restorative mental state and fatigue. The three-day gap was to avoid the potential priming effect that may occur if pre- and post-test questionnaires using identical scales are completed within a short time frame. The VR experience, which lasted 3 minutes, took place in a university research laboratory. Acknowledging the risk of motion sickness, participants were offered the option to wear an anti-motion sickness wrist band while participating in the VR. Participants then completed a post-test online questionnaire that contained the same

instruments to measure their post-experience restorative state and fatigue. Demographic data were collected as well as information about their most recent leave. A control group (N=20) completed only the post-test survey to assure the effectiveness of the intervention and further control for any priming effect that may have taken place among treatment participants. One sample t-tests revealed no significant differences between the mean scores representing RMS and Mental Fatigue between the two groups suggesting that the post-test results were not influenced by the fact that the respondents had completed these same scales in their pre-test. Details regarding the VR footage and the instruments used in this experiment are as follows.

4.2. Virtual Reality Footage

The VR footage was delivered using Oculus Rift VR Goggles. The VR clip enabled participants to virtually experience swimming with dolphins. This clip was selected due to the previously determined nexus between what is referred to as ‘blue space’ or aquatic environments and mental well-being (see for example: Gao et al., 2019; White et al., 2010). This clip had been already produced and readily available to the researchers via video sharing platform YouTube (VIEMR, 2016). The clip was deemed fit for purpose due to its short duration and non-threatening nature. The clip had sound effects similar to what one would hear when diving in the ocean with dolphins. The results revealed that 73% of participants felt content and tranquil after participating in the VR experience which was reassuring to the researchers that the chosen stimulus was effective in inducing this intended state.

4.3. Mental Restoration Scale

The Relaxed Mental State (RMS) scale (Gill et al., 2017) was a self-report measure used in the pre-test and post-test to gauge participants’ experiences of mental restoration. It consists of nine statements in total, with six items from the Restored Mental State Scale (Packer & Bond, 2010) measuring physical and mental dimensions of relaxation (e.g. “I now feel calm, I now feel thoughtful, I now feel positive”) supplemented with an additional three items from

the Swedish Occupational Fatigue Inventory (Ashberg et al., 1997) to measure mental fatigue (e.g. “I now feel exhausted, I now feel uninterested”). Each of the nine items was rated on a 7-point scale (1 = not at all and 7 = completely).

5. RESULTS

Seventy-five workers aged over 18 years participated in the pre and post phases of the study. Just over half (53%) were aged between 18 and 30 years, while 38% were aged between 31 and 50, with a small percentage over 51 years of age. The study appealed to females more so than males with females representing 71% of overall participants. Higher degree research students comprised 41% of the sample, while 31% were university academics and 28% professional university staff, in full-time and part-time employment.

This study employed existing scales for the pre and post measurement of the variables of interest. The RMS and Mental Fatigue scales have been proven as valid, stable and reliable measurement tools within a similar context however, Cronbach’s alpha was requested for each of the dimensions to ensure reliability and consistency across the pre and post phases of the study. The results of these reliability analyses are presented below in Table 1. Composite variables were computed accordingly and items were reverse coded as per instructions from the originators.

Table 1. Cronbach Alphas for pre and post Measurement Tools

Scale	Cronbach Alpha Pre-Test	Cronbach Alpha Post-test
Restorative Mental State	.838	.838
Mental Fatigue	.729	.643

5.1. The Effect of a VR Experience on Restorative Mental State and Fatigue

A paired samples t-test was performed to reveal the change that occurred in the variables of interest as a result of the VR experience. As illustrated in Tables 2 below, following the VR

exposure participants reported a significant increase in mental restorative state ($t(74) = -4.889, p = .000$) while we see a slight decline in fatigue, which was not significant ($t(74) = .201, p = .841$)

Table 2. Sample means representing pre and post test scores

	Variable	Mean	Standard Deviation	Mean Standard Error
Pair 1	Restorative Mental State Pre	4.34	.943	.108
	Restorative Mental State Post	4.92	.887	.102
Pair 2	Fatigued Pre	4.02	1.210	.139
	Fatigued Post	3.96	1.842	.213

5.2. Time since Last Holiday, Demographics and Mental Restorative State and Fatigue

To explore whether any differences existed between one's mental well-being and the time since their last holiday, an ANOVA was performed on the pre-test scores as well as the gain scores that were calculated to represent the change in one's RMS and fatigue. There was no significant difference between the extent to which participants experienced fatigue, $F(4,70), p = .732$ and RMS, $F(4,70) = .800, p = .529$ and their last holiday – suggesting that holiday recency has no bearing on well-being in the workplace. Similarly, ANOVA and an independent groups t-test revealed no differences between age segments, occupation and gender in terms of participants' RMS or fatigue prior to or following the VR experience. This outcome suggests that these demographic characteristics had no bearing on how the VR experience in this study impacted the participants' well-being.

6. DISCUSSION

The results of the study provide insight into the effectiveness of a virtual tourism experience in enhancing employees' restorative mental state in the workplace. While an intervention may not be effective in reducing fatigue, the enhancement of one's RMS is still beneficial for

both well-being and workplace productivity. The study demonstrates that just three minutes of a virtual tourism experience featuring a marine environment can lead to increased concentration while enhancing the mental well-being of employees who may be unable to take holidays in the short term or engage in regular restorative practices that involve lengthy time commitments.

The findings offer support for the restorative power of natural environments, aligning with previous studies that have demonstrated the relationship between nature and mental well-being (Karmanov & Hamel, 2008; Volker & Kistermann, 2011; White et al., 2010). White et al. (2010) acknowledge that the reasons for the restorative effect of natural environments are unclear but suggest three potential explanations. Firstly, visual properties of the natural environment (e.g. the reflection of light) can be restorative. Secondly, natural environments are associated with restorative sounds, for example breaking of waves. Thirdly, the sensation of being immersed in water is associated with a drop in stress levels. It appears that the restorative effects of an immersive experience will not discriminate in terms of age, gender or occupation; hence one can expect such an experience to have a restorative effect regardless of these characteristics.

In this study, a VR experience did not reduce mental fatigue. This finding is not dissimilar to the study of Gao et al. (2019) that explored the effects of a VR experience that included grey spaces (open land), blue spaces (water) and green spaces (parkland) on mental restoration among other states and found no significant difference in attentional fatigue following participants' VR experience. It may be that the virtual activity itself (swimming with dolphins) possibly required significant cognitive processing or mental effort that was not accounted for in this study. We recommend that future research explore the effectiveness of different VR stimuli that requires varying levels of mental processing in reducing mental fatigue in the workplace. Testing also needs to control for different times of day, for example,

people may feel more fatigued by the end of the working day as opposed to first thing in the morning.

7. IMPLICATIONS AND CONCLUSIONS

This study proposes a new intervention to promote mental restoration in the workplace that may serve as a short-term solution for those who are unable to take a physical restorative break. The investigation extends knowledge of attention restoration by demonstrating that such a state can be achieved within the workplace setting through the use of VR, which in turn enhances efficiency and employee well-being. While the researchers are not suggesting that such experiences should serve as a substitute for physical, non-virtual tourism, a VR facility may be beneficial when leave provisions have been exhausted or when taking leave may not be a viable option. With employees in diverse work sectors engaging in remote work following the pandemic, future research could explore the effectiveness of VR interventions for such workers building on prior studies (Adhyaru & Kemp, 2022).

Overall, the study extends the discussion of VR tourism experiences (Guo et al., 2021) by examining virtual blue spaces in the current context. The study adds to the growing body of knowledge of VR's restorative effects in the workplace (Naylor et al., 2020) by showing three minutes of a virtual tourism experience can lead to enhanced concentration among employees, enhancing their mental well-being. Future research could focus on how long the restorative effects are endured through a longitudinal study while comparing a VR experience with other interventions known for their restorative benefits and how a VR experience can generate future visitation to the featured destination. The study was limited to a university work setting. Research on other workplaces is needed to enhance the generalisability of the conclusions.

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