Virtual Nature Environments Effects on Students' Stress Level

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Abstract- The Malaysian's Ministry of Health has revealed that mental health problems among Malaysian students are worsening where from one in 10 individuals in 2011 to one in five in 2016. Studies have shown that viewing photographs and videos of nature scenes can promote significant reductions in physiological stress and virtual environments provided a more dynamic alternative with greater ecological validity, which is, approximating the real-life situation. This paper attempts to test the effects of simulation of virtual nature environment (VNE) towards one of the emotion state that is tension. This study applied self-administered questionnaire survey method named Profile of Mood State (POMS) and these were distributed to 24 selected respondents who were second year Bachelor in Landscape Architecture students at Universiti Putra Malaysia. Questionnaire surveys were used to identify the moods of the students, pre and post the VNE treatment, which were later analyzed using the paired T-Test of Statistical Package for Social Science Version 20 to measure its significant difference of mean score. The results have shown that VNE provided positive differences toward students' stress level in improving their mood- from negative emotions to positive emotions. In conclusion, this research provided potentials in contributing to the knowledge base of VNE so that it can be implemented in university settings in order to raise the mental health awareness, especially in a Malaysian context.

Index Terms-, mental health, restorative environment, Profile of Mood States (POMS)

I. INTRODUCTION

Mental health or psychological well-being is a condition in which the person recognizes his or her capacity, can cope to the worriness of life, can work profitably and can give a commitment to the network [14]. In addition, by year 2020, the mental health issue is expected to increase by 15%. Mental health problems may conduct to common social problems that always happen in Malaysia, such as anxiousity depression, lack of sleep, poor academic performance, and the reluctance to join the community (Bernama, 2013). A study by Zivin et al. (2009) proved that these mental health problems within students are growing yearly. This statement has been supported by statistics from the Ministry of Health Malaysia, which revealed a deteriorating state of mental health problems among Malaysian students, from one in 10 individuals in 2011 to one in five in 2016. According to Mohamad (2016), the major cause of mental health problems among students was anxiety and depression, also considering the misuse of drugs. Anxiety contributed to the fear of examinations that instill worry in students.

Uehara et al., (2010) stated that, in the preparations of their professional careers, university students must adapt to their various psychosocial changes, in addition to address their academic and also social demands. The strong demand for academic performance lead to a stressful environment, which can risk the physical and mental health of the students if it is left untreated. A survey by the Ministry of Health Malaysia through The National Health and Morbidity Survey III (NHMS III) reported that Malaysians youth in the 16–24 year age group had the highest percentage of acute and chronic suicidal ideation (10.0% and 26.0%, respectively) compared to other age groups. Depression, anxiety and stress are the common psychological problems among students [5].

Simulations of virtual nature environment (VNE) in a particular set ups where more complicated research methods may function under controlled conditions; it might be able to explore how VNE functions in conducing stress recovery. On the other side, this research will examine the physiological responses especially in emotions that affected by VNE when students interact with it. Therefore, we would like to confirm if the effects of VNE are same with the effects of an actual environment.

The virtual nature environment (VNE) scenes would be more effective in improving mood, especially after the stressful event. Taking all the research done and benefits that VNE could provide, this paper has come out with one questions; what is the effect of virtual nature environment in reducing university students' stress level. As for this paper, tension will be highlighted as one subscale taken from mood states. There are six mood states in total, but for this paper it focuses on tension.

II.   LITERATURE REVIEW

The survey made by American College Health Association (2006) found that survey of university students, the main problem that encounter among university students was academic stress. This kind of stress affected their academic performances. The first few years entering university can be a tough experience for university students. They have to learn how to handle their emotions so that they will not interfere with any mental health problem. Stress is a feeling that come naturally which designated to assist an individual to cope with their demanding and crucial situations. In United States, about 55% students reported that the biggest issue they had in the university is the challenge to get better results in academics.

Naturally, minimal stress also considered as good, especially for university students. This has been confirmed by a study from Dusselier et al., (2005) which stated that stress may become a push factor for students to work harder and do their best. Stress also increases their adrenalin and encourage them to react better in any conditions, thus, their academic performances will be enhanced especially during crucial time as examinations. University students reported that they were being pressured, if compared their school days [11].

Godderidge (2013) found that negative emotions such as depression, anxiety, confusion and tension are the most frequent among university students in United Kingdom. Transition phase from home to university brings a lot of challenges in a students' new life. This included the process of moving to hostels, which they had to leave their families and friends, making new friends, surviving with limited expanses hence they have to learn how to manage their own commitment and try to cope with projects and assignments, study for examinations, especially for the bachelor level students. Leys (2015) said that design school students merely affected by stress which it may lead to lack of sleep. He also mentioned that huge amount of stress may affect physically and emotionally such as depression and anxiety, heavy sweating, increase in heartbeat or even worse, suffocation in breathing.

Association Press (2009) in New York has reported that more than half of the students (53%) did not mingle with their friends on any events when they were stressed out. This can be proved when the approaching of the deadline of submission for the studio. On this moment, students work very hard twenty four hours non-stop; this involving facing computer from day and night, not having proper meal and not having a healthy lifestyle such as strolling in the park. This can be worse if they facing a multiple events at one particular moment, such as the burden of assignments, tests and examinations.

By constructing a model of nature environment where complicated research techniques would work under certain situation that has been controlled, it may certainly comprehend what are the components of nature that are helpful in recovery of stress. According to Annerstedt (2013), the study on the physiological mechanisms can be done when there is interaction of humans with nature.

Virtual nature environments (VNE) has a great impact in influencing restorative environment, and if it is achieved, they will conduct a better interaction between the users (e.g. virtual environment navigation and exploration) and they can adapt the scenery on their daily lives. With these kinds of innovations, there will be no surprises that VNE in restorative environment will become alternative besides the real green nature.

A lot of great discoveries were found whilst conducting the literature, one of it was the significant absence of related studies, and exploration of VNE for university students, to be exact students whom are under pressure especially when their post-examination.

III.   METHODOLOGY

The respondent completed the POMS inventory [8] twice. It was used to measure mood states right after they finished their exams and another inventory was done after they watched the VNE videos. Before the experiment started, instructions on how to complete the POMS test were given. Responses were provided with a simple five-point scale ranging from zero to four ('Not at all' to 'Extremely') for emotion - tension. This five-point scale were used because a few studies have suggested that a five point scales increase response rates and response quality in addition to being less confusing and helped in reducing respondents' "frustration level" [3].

The VNE consisted of green scenery such as the forest with the bird chirping sounds, together with waterfall and its sound effects. POMS (tension mood profiling) were expected to be a worthwhile exercise with students' emotions, so a range of measurement issues must be addressed. However the most critical consideration were the mood that has been evaluated by its mean.

The paired sample *t*-test, was used in the analysis, T-test is a statistical procedure used to determine whether the difference of mean between two sets of observations is zero. In a paired sample *t*-test, each subject or entity was measured twice, resulting in *pairs* of observations. Common applications of the paired sample *t*-test include case-control studies or repeated-measures designs [10]. Since

the study involved a pre and post treatment which consisted of two readings, thus the analysis chosen was paired sample t-test, in order to test the correlations between two readings. The significant level was set at p < 0.05.

IV. FINDINGS

A total of 24 students of the second year students of Landscape Architecture course, Universiti Putra Malaysia, Malaysia has been selected for this experiment. Demographics and self-rated questions on the respondents formed the first part of POMS. This was carried out in order to know their gender, age, and three self-rated questions; "How do you describe your health?", "Describe you current stress level", and "Have you encounter any Virtual Reality exposure?". These were adapted by a study by Annerstedt et. al. (2013) who has stated that for general health the replies, they were arranged from 1 to 5 with "very bad", "bad", "fair", "good" or "very good", in accordance with recommendations from WHO (1996) and Robine et al., (2013).

Table 1: Demographics of the respondents from the Second Year Bachelor in Landscape Architecture *n=24*

Demographic	Respondents	Percentage (%)
Gender	Male	29
	Female	71
Age	20	42
	21	38
	22	4
	23	8
	24	8
How do you describe your health? (scale 1 to 5 as "very bad", "bad", "fair", "good" or "very good")	Very bad	0
	Bad	21
	Fair	4
	Good	33
	Very Good	38
Describe you current stress level.	1	4
	2	16
	3	38
(scale 1 to 5 as "very bad", "bad", "fair", "good" or "very good")	4	38
	5	4
Do you have any experience with Virtual Reality?	Yes	21
	No	79

According to Table 1, the data on the demographic were summarized into percentages. There were 24 respondents participated in this experiment, with 79% were females and 21% were males. All of the respondents were on their early twenties with the higher percentage of 20 years old (42%), followed by 21 years old (38%). Based on the self-rated questions of "How do you describe your health?" respondent's highest score was on the 5th scale (38%) which was 'very good'. Meanwhile, respondents also describes their current stress level on the 3rd ('fair') and 4th ('good') scale at 38%. That was the highest percentage. Majority of the respondents have no experience on Virtual Reality(79%).

The analysis in this paper focused on examining POMS results per tension sub-scale before and after VNE experience, by comparing both measurements with one another. The mean difference between the sample and the known value of the population means has been recorded for each POMS tension subscales. This implies that the results were compared to see whether statistically significant differences existed. To examine the effects of VNE experience towards students' emotions, paired T-Test was conducted. The paired T-Test including the all subscales, for before and after the VNE experience. For all comparisons, p<0.05 was used to establish statistical significance.

Table 2 shows that subscale for tension included tense, on edge, uneasy, restless, nervous and anxious has no significant differences in scores when comparing the results of the pre and post the VNE experience. Overall, tension scores were higher before the VNE experience, with the mean of 2.916. The scores after the VNE experience were 59% (Table 2). Tension level was lowest on the *nervous* scale. Meanwhile, the highest score was *restless* with 3.29. The respondents felt restless after they immediately came out from the examination hall. This is in accordance to Thomas (2014) who stated that as examination period descends, many students are filled with anxiety, worry, fear, procrastination and panic.
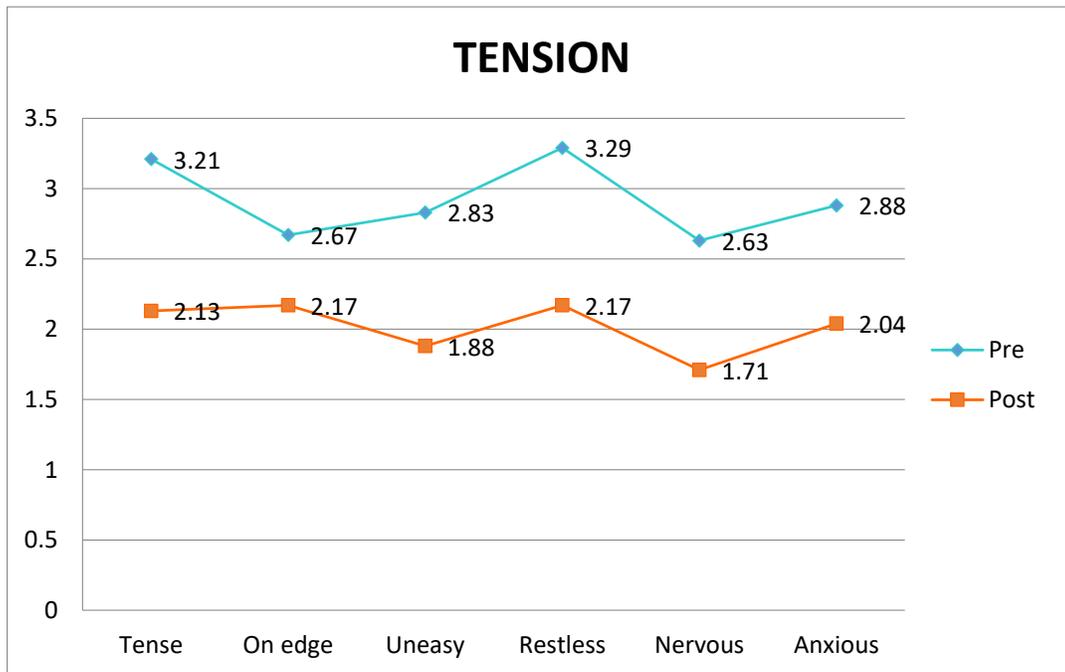
Figure 1: Tension score

Table 2: Tension score

Mood	Mean	Standard deviation	Mean difference	p-Value
Tense- Pre	3.21	0.833	-1.08	0.000
Tense- Post	2.13	1.035		
On-edge - Pre	2.67	0.761	-0.5	0.037
On-edge - Post	2.17	1.049		
Uneasy - Pre	2.83	1.007	-0.95	0.002
Uneasy - Post	1.88	1.154		
Restless - Pre	3.29	1.160	-1.12	0.002
Restless - Post	2.17	1.129		
Nervous - Pre	2.63	1.056	-1.46	0.000
Nervous - Post	1.17	0.908		
Anxious - Pre	2.88	1.076	-0.84	0.000
Anxious – Post	2.04	0.955		

$p = <0.05$

Tense showed significant differences ($p = .000$), more intense for the pre VNE ($M = 3.21$) than for the post VNE ($M = 2.13$). Regarding the situations, the students who has been treated with VNE, the average mean for *on-edge* subscale was significantly lower ($M = 2.17$), than for those who not having their VNE treatment ($M = 2.67$; $p =.0.037$). This same factor for *uneasy* showed for the students with experience decrease the values at the end of the session ($M = 1.88$), with respect to the start ($M = 2.83$; $p =0.002$).
Meanwhile, for *restless* the mean were higher ($M = 3.29$) before the VNE experience, compared to the post of VNE experience ($M = 2.17$; $p = 0.002$). In addition, for *nervous* subscale, the mean were higher ($M = 2.63$) before the VNE experience, compared to the post of VNE experience ($M = 1.17$; $p = 0.000$). The situations goes the same with *anxious* among the students, whereas it decreases in term of the mean with mean of 2.88 to 2.04 with $p=0.000$.

Table 2 shown the sufficient evidence to conclude that there was a significant difference between pre and post for tension subscales; tense, on-edge, uneasy, restless, nervous and anxious. Those pairing were recorded at p<0.05 as shown in the table. This can be concluding that the respondents have improved their emotion from pre to post VNE experience. Furthermore, the mean difference between both pairing (pre and post VNE) showed negative value which means it decreases in mean value. The results indicated that it is the important to have a system of support, especially during strenuous periods like the final exams. This system of support could be in the form of VNE experiences, which was proven by the decrease amount of mean.

V. CONCLUSION

These results indicated that natural scenes delivered via VR may provide relaxation and restoration both objectively and subjectively after a stressful experience. The findings have identified that the VNE provided a good impact toward students' tensions. VNE helps them improve their tensions- from pre and post VNE. VNE experience is effective in reducing negativity and improving moods relatively in tensions especially after a stressful event. Majority of students had difficulties to explore green nature areas as due to many constraints especially in term of costs, available time and accessibility. For those affected by these kinds of situations, VNE may be a way to improve mental health outcomes. This research has provided some valuable information in the study on the effect of virtual reality towards restorative environments at university settings in Malaysia. This study has achieved its aim and objectives to investigate the impact of virtual nature environments towards university students in Malaysia. This study was also driven by the intention to establish VNE as an alternative method for university students to cope with their negative emotions. In addition, this research may have contributed to the knowledge base on the possibility on having VNE implemented in university settings.

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