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Psychological restoration experience through the impact of green environments: The effects of perception of stress and stressors

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Abstract

University students demonstrate to be in a great need for psychological and emotional restoration because of the high amount of stress in their academic life. Immediate contact with nature and restoration experience is a solution for the ever increasing problem of stress. Based on theories of restorative environments and supportive landscapes, natural environments help to human psycho-physiological and emotional resources, which are diminishing with excessive stress. However, how the need for restoration can effect on experience of restorative outcomes through impact of perceived environmental qualities and perceived restorativeness have yet to be investigated. Using a sample of Malaysian university students, this study examined the effect of the need for restoration on relationship between environmental qualities, perceived restorativeness and restorative outcomes. Mean analysis (t-test) is based on individual characteristics and relationship between favorite places and restorative outcomes. Through moderation analysis and bootstrapping in PLS-SEM, the effect of perceived stress level on the aforementioned relationships was evaluated. The effect of perceived stress level on restoration experience through the associations of these greenery and restorativeness characteristics were not supported. However, a positive impact on the effect of green landscape qualities on perceived restorativeness has been found. Although impact of perceived open space qualities on perceived restorativeness was supported, when students have highly been confronted with a set of key tensions of university life, the suggested greenery supportive factors have failed to provide significant effect on students after visit feelings of restoration experience.

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Introduction

University students stress and their need for restoration are growing concerns in the context of higher educational level. For many students, attending university is associated with many positive experiences. However, academic workload, conflict in social relationships, inter-personal difficulties, and environmental related problems can be psychologically intense, overwhelming and distressing for most of them (Pozos-Radillo *et al.*, 2014; Lehto *et al.*, 2014). Struggling to function effectively or prolong use of directed attention capacity in performing academic activities lead them to become mentally fatigue and experience too much stress (Felsten, 2009). Extensive need for restoration experience and lack of experiencing restorative outcomes can negatively affect university students' health and well-being.

To cope with that and enhancing the students' psycho-physiological and emotional health and well-being, several methods have been proposed including involvement in leisure activities (Lehto *et al.*, 2014), animal-assisted therapy (Daltry & Mehr, 2015) and use of social support in the context of university campus settings (Rahat & Ilhan, 2016). Tasks without voluntary attention such as visit to campus outdoor spaces, where there is immediate interaction with nature permit an opportunity for students restoration experience. In more recent years, based on Biophilia hypothesis and nature-health related theories of Attention Restoration Theory (ART) and Stress Restoration Theory (SRT), there are valuable studies on the beneficial effect of campus open spaces for university students' health and well-being development (e.g Seitz *et al.*, 2014; Hipp *et al.*, 2016; Lau *et al.*, 2014). Glancing to the natural features through a window view or walking in the campus green spaces provided students with micro-restorative experiences, recovery of capacity of direct attention and improvement of cognitive functionality (Tennessen & Cimprich, 1995; Lethbridge *et al.*, 2005). Moreover, exposure to simulated scenes of campus outdoor space in indoor settings such as lounges and a cafe alleviated students' cognitive fatigue (Felsten, 2009).

In human-environment health related studies, it has been shown that restoration experience can be manifested by visit to favorite places (Korpela *et al.*, 2008), with preference for natural components of vegetation and water (Hartig & Staats, 2005), in environments with perceived restorativeness characteristics (Tyrva¨inen *et al.*, 2014) and in green spaces with Perceived Sensory Dimension (PSD) characteristics (Grahn & Stigsdotter, 2010). It has been highlighted that there is relationship between a person's level of need for restoration and the extent of restoration experienced (Twedt *et al.*, 2016). Experiencing excessive everyday life demands, perceiving stress or more use of directed attentional capacity can be associated with higher need for restoration.

For reflecting the subjects' need for restoration and extent of restorative outcomes by nature intervention, two approaches have been used. In experimental studies, prior to nature treatment, an antecedent mental fatigue or stress induction process was used to deplete subjects' ability to direct attention at the time of their participation in research (Hartig, 2011). In the second approach, self-reported measurement instruments were used to obtain how often a person afflicted by objective stress-related complaints (Grahn & Stigsdotter, 2010), with specific stressful life events (Kanner *et al.*, 1981) or perceive stress-related situations over the preceding weeks or months (Cohen *et al.*, 1983). Mostly the greater scores for restorative outcomes were shown by more fatigued subject's, who were in higher need for restoration (Staats & Hartig, 2004).

In comparison with refreshed people, those individuals who had greater need for restoration reported greater attentional recovery and favorable attitudes after nature experience (Hartig & Staats, 2005; Staats *et al.*, 2003). The study by Korpela *et al.* (2008) showed that individuals with higher need for mental restoration (more worries about their work, money and more perceived stress) have stronger psychological restoration after spending time in restorative settings.

Research in higher educational settings has highlighted the potential of campus open spaces for students by stress alleviation through experience of restoration (Lau *et al.*, 2014). The effects of campus greenery and perceived restorativeness for improvement of students' quality of life were highlighted (Hipp *et al.*, 2016). For stress alleviation, university students' preferred open spaces with features of man-made environments and exclusively natural areas (Seitz *et al.*, 2014). In Malekinezhad & Lamit (2017) a structural model was developed to explain the association of campus open space qualities on students' restoration experience through the mediating effect of perceived restorativeness characteristics. However, there are few studies that investigate the degree of students' need for restoration, the level of stress that they perceive, in examining the effect of campus open space qualities, restorativeness experiences and restorative outcomes. When exploring the effect of campus outdoor spaces, it is important to investigate to what extent restoration experience depends on effect of need for restoration. Therefore, the aim of this study is to examine how university students with different needs of restoration experience restoration by the associations of perceiving green space related qualities and restorativeness characteristics.

Materials and methods

Participants

The data was conducted in five Malaysian Research Universities (MRUs) among a random sample of university students. Number of participants after screening data is 444. Frequency analysis on the collected data shows a uniform distribution of respondents in all five universities with 2/3rd female and 1/3rd male respondents. Majority of the respondents are single, Malaysian students, studying full-time, living inside the campus and are under the age of 30.

Mesaurement Instruments

The questionnaire was about students' background characteristics, their need for restoration, perceived campus qualities, perceived restorativeness characteristics and restoration experience. The questions on students' background characteristics were their gender, marital status, nationality, enrollment and living. Students need for restoration was measured by identification of the stressors and measurement of perceived stress level. Stressors were measured by Student Stress Survey (SSS) in identification of the four major aspects of academic life stressors such as academic, environmental, intrapersonal and interpersonal related problems (Ross *et al.*, 1999).

The original SSS scale contains 40 items. In this study, to reduce the students burden, it involved a single item question to determine whether or not each of these four events had been a part of their campus life during the current semester. Perceived Stress Scale (PSS-10 items) is the scale that was used in measurement of students perception of stress.

It is empirically validated by the population of university students (Cohen *et al.*, 1983) and its psychometric properties mostly endorsed with this sample (Lee, 2012). The suggested response categories for stressors and stress level were 'never', 'almost never', 'sometimes', 'fairly often', 'very often'. Using these two scales allows for the measurement of university students' perception of stress, as well as understanding, which specific stressors may be greater source of stress among university students. Students perception of campus greenery qualities was measured through PSD items, which were addressed in previous studies (e.g. Grahn & Stigsdotter, 2010). Restorative Components Scale (RCS-22 items) was used in assessment of perceived restorativeness characteristics (Laumann *et al.*, 2001).

Assessment of restoration experience was by Restorative Outcome Scale (ROS-6 items), which has been used in visit to favorite places (Korpela *et al.*, 2008). The measures of perceived restorativeness and restoration experience were based on 7-points response categories of 'not at all' to 'completely' and measures of perceived campus qualities using PSDs were based on 7-points response categories of 'totally disagree' to 'totally agree'.

Results and discussion

The analysis of need for restoration is consisted of two parts. The first one is referred to the process of t-test analysis, which is for students' stressors and perceived stress level. The second part is analyzing the effect of perceived stress level on the relationship between perceived campus qualities, perceived restorativeness characteristics and restoration experience. Both of these parts are discussed as follows.

The t-test analysis in Table 1 shows the significance of relationship between measurement of stressors, perceived stress level and student' background characteristics. There are five grouping variables in these tables to show the individual characteristics of the research participants. The first grouping variable is 'gender', which shows no significant difference between the male and female students with regards to their perceived stress level. However, the female students reported significant higher average of need for restoration (3.46) in comparison to the male students (3.28), in experiencing of 'academic stressors'. No significant difference between the average of need for restoration among males and females have been observed in 'intrapersonal stressors' and 'interpersonal stressors'.

The next grouping variable is 'marital status'. As shown in Table 1, no significant difference between the mean values of need for restoration for single and married students have been found. While, in the measurement of perceived stress lower scores.

Were reported for married subjects (Lee, 2012), the need for restoration experience was not significantly different among married and single university students.

Table 1. Mean analysis of Need for Restoration items against individual characteristics.

Variables	Group	Perceived Stress Level	Academic Stressors	Environmental Stressors	Intrapersonal Stressors	Interpersonal Stressors
Gender	Male	3.01	3.28*	3.01	3.02	2.72
	Female	3.12	3.46*	3.13	3.08	2.82
Marital Status	Single	3.09	3.40	3.10	3.07	2.79
	Married	3.01	3.43	2.90	3.00	2.70
Nationality	Malaysian	3.10*	3.42	3.11*	3.08	2.80
	Other	2.88*	3.23	2.83*	2.89	2.57
Enrolment	Part-time	2.81*	3.05*	2.81	2.81	2.57
	Full-time	3.10*	3.42*	3.11	3.08	2.80
Living	On-campus	3.10	3.43	3.12	3.05	2.78
	Off-campus	3.05	3.29	2.99	3.10	2.80

Two-tailed tests show 10% (*), 5% (**) and 1% (***) significance levels.

The third grouping variable is 'nationality' of the participants. Local students reported significant higher average level of perceived stress level (3.10) compared to international students (2.88). In experiencing stressful events, they scored 'environmental stressors' (3.11) higher compared to international students (2.83).

However, in this study, higher experience of stress in local students might be due to their educational level. So, they are likely to be confronted with multiple new situations as a part of their enrollment in undergraduate level (Tennessen & Cimprich, 1995). While, international students have higher average of education and experience to handle campus life challenges.

Next grouping variable is type of students' 'enrollment'. As shown in Table 1, full-time students demonstrated significant higher average of perceived stress level (3.10) in comparison to part-time students (2.81). Part-time students, also shows significant lower 'academic stressors (3.05) compared to full-time students (3.42). Being a full-time student is associated with a greater stressful feelings such as doing too many things at once, not enough time and lot of responsibilities (Jogaratnam & Buchanan, 2004). This should be the reason, why full-time students experience more 'academic stressors than part-time students.

The last grouping variable is the 'living location of students. Based on the results that is presented in

Table 1, there is no significant difference among students' living on-campus with those living off-campus and their need for restoration. Living situation such as on-campus dormitory and off-campus residency can be another large cause of stress for university students. Because both students need to move away from their home and start a new lifestyle. However, this study was not found significant differences in need for restoration level among students who are living on-campus and off-campus.

The next step in t-test analysis is to identify the association between favorite campus place and perceived stress level. As shown in Table 2, those who have identified their favorite places in campus, reported significant higher level of stress (3.03) in comparison with those who prefer places with natural elements of water and vegetation (2.81). This is similar with was reported from earlier studies as open spaces with abundant vegetation increase positive outcomes in compare with environments with lower amount of greenery levels (Van den Berg *et al.*, 2014).

In addition, greenery and water are significant natural features for improvement of students' quality of life (Hipp *et al.*, 2016), restoration of mental fatigue (Felsten, 2009) and increasing of their direct attentional capacity (Tennessen & Cimprich, 1995). Therefore, those students with visitation of campus places with more experience of natural elements perceived more restorative outcomes and reported lower perceived stress level.

Table 2. Mean analysis of perceived stress level based on the preferred favorite place.

	N	Mean	Std. Deviation	Std. Error Mean
Built-up Elements	154	3.03**	0.64	0.05
Natural elements	112	2.81**	0.58	0.06

Two-tailed tests show 10% (*), 5% (**) and 1% (***) significance levels.

Table 3 presents the results of t-test analysis among the restorative outcomes variables and students perceived stress level. As shown, among three variables of restoration experience, only in the 'attention restoration' mean of stress level is significantly different.

It has been found that students who reported higher 'attention restoration' in their favorite place, has significantly lower stress level (2.65) in comparison to those who not (2.93). Referring to Kaplan's theory of restorative environments (ART), in natural environments, which are rich in providing 'soft fascination' experiences like clouds, sunsets or movement of leaves, direct attention has a chance to relax. Relying on involuntary attention needs less sustain use of mental effort.

Therefore, in campus open spaces, students effortless attention by many fascinating objects was leaded to experience of restorative outcomes and lower scores on ratings of PSS.

Table 3. Mean analysis of restoration experience based on the stress level.

Restoration Experience	Stress Level	N	Mean	Std. Deviation	Std. Error Mean
Clearing Thoughts	>= 3.00	242	3.79	0.767	0.05
	< 3.00	202	3.85	0.799	0.06
Attention Restoration	>= 3.00	242	2.65*	1.296	0.08
	< 3.00	202	2.93*	1.322	0.09
Relaxation and Calmness	>= 3.00	242	3.65	0.66	0.04
	< 3.00	202	3.74	0.76	0.05

Two-tailed tests show 10% (*), 5% (**) and 1% (***) significance levels.

The next analysis is for perceived stress level. The analysis of this part was done by moderation analysis and bootstrapping in the Partial Least Squares Structural Equation Modeling (PLS-SEM) (Hair *et al.*, 2016). It enables to analysis whether students restoration experience on university campus open

spaces through impact of perceived campus qualities and perceived restorativeness characteristics depends on students high and low levels of stress perception. The result by this step is presented in Table 4.

Table 4. Analysis of Perceived Stress Level on Restoration Experience through Impact of Perceived Campus Qualities and Perceived Restorativeness.

Link	Path Coefficient	STDEV	t-value	p-values
Perceived Campus Qualities -> Restoration Experience	-0.027	0.031	0.889	0.374
Perceived restorativeness -> Restoration Experience	-0.047	0.030	1.544	0.123
Perceived Campus Qualities -> Perceived restorativeness	0.105**	0.033	3.207	0.001

Two-tailed tests show 10% (*), 5% (**) and 1% (***) significance levels.

As it shows, the effect of perceived stress level was not significant on impact of perceived campus qualities and restoration experience. In actual restoration experience studies, the effect of nature contact on stress alleviating is demonstrated when respondents experienced acute stressful symptoms (Hartig & Staats, 2006; Twedt *et al.*, 2016; Nordh *et al.*, 2009). In these studies, researchers have shown that contact with restorative settings very rapidly displaced negative affects to positive feelings. Contrary with the Felsten (2009)'s work that show nature contact influenced on university students mental fatigue restoration after an stress induction process, this study found that experience of campus qualities could not increase restoration experience when students were dealing with high stressful campus-life events.

Moreover, the effect of perceived stress level was not significant on relationship between perceived restorativeness and restoration experience. Research based on ART and experimental approaches have shown that when respondents were in mentally fatigued conditions, contact with potential restorative environments was leaded to the beneficial related outcomes (e.g. Korpela *et al.*, 2014). However, in this study, perceived restorativeness did not impact on students psychological restoration, when they faced with sever campus life related stressors.

The variable of perceived stress level only has significant effect on relationship between perceived campus qualities and perceived restorativeness. It is consistent with Peschardt & Stigsdotter (2013) that showed the relationship between perceived sensory qualities of PSD and perceived restorativeness of urban small parks for most stressed users. In this paper, however, perception of campus open space qualities served restorativeness experiences, but it could not permit restorative outcomes.

Based on Supportive Environment Theory (SET), when people feel more life pressures, they are in greater need for salutogenic environments (Adevi, 2012). The individuals preferences and their need for supportive environments can be changed based on their mind ability and how fragile ones can be (Adevi, 2012). It seems that when individuals feel more pressures, they have greater need to find supportive environments for recovery process (Adevi, 2012). But, in the stressful situations, people may have lack of ability to experience the beneficial properties that environment offer to them to maintain their health (Grahn *et al.*, 2010). When people are not in severe stressful conditions, most kinds of environments contribute to their feelings of pleasures and when they are in stress, the same environment cannot proceed the same positive outcomes (Grahn *et al.*, 2010). Being in long period of stress, may reduce individual's ability to find self-regulation in natural environments, which is a supportive element of stress restoration and health development (Adevi, 2012). Because, in perceiving long-time stress, "stress hormones cause them to stop listening to basic instincts concerning self-preservation" (Grahn *et al.*, 2010).

That might be why experience of campus greenery qualities that was highly supported for human health could not significantly lead to students restoration experiences.

Conclusion

This study investigated the extent to which students' need for restoration can effect on their psychological health development in the context of university campus through the impact of perceived campus qualities and restorativeness characteristics. The most reported stressors have been identified as academic related problems for female and full-time students and the environmental related problems for local students. It is congruent with the idea that suggested importance of campus open spaces as restorative settings offering opportunities for stress-alleviating experiences and mental restoration. Contact with campus favorite places with presence of natural elements can very displace cognitive fatigue to the state of recovery. However, it supports their role aiding in short-term effect of stress, not when students facing with a set of different stressful campus life events. High stress level is afforded poor exploration of campus open space qualities, which might be a supportive approach in students' restoration experience.

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