

RESTORATION EXPERIENCE THROUGH PERCEIVED OPEN SPACE  
QUALITIES AND PERCEIVED RESTORATIVENESS OF STUDENTS IN  
MALAYSIAN UNIVERSITIES

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Dedicated to my beloved family

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## ABSTRACT

Experience of restoration through the application of Perceived Sensory Dimension (PSD) and perceived restorativeness have been shown to reduce stress and improve mental health. Furthermore there are other influential factors on restoration experience such as individual and visit related characteristics as well as need for restoration. However, there is little knowledge on the development of restoration experience model through the impact of PSD and perceived restorativeness that takes into consideration the effects of these influential factors. The research developed a restoration experience model through examining the impact of PSD and perceived restorativeness. In this study, Partial Least Square Structural Equation Model (PLS-SEM) was used to examine the interaction among these parameters that developed the restoration experience. Validity and reliability of measurement of restoration experience through the impact of PSD and perceived restorativeness were conducted using 444 students in Malaysian Universities. The results showed that half of the restoration experience was in cases that had higher interactions with campus open spaces, and nearly half of the restoration experience was in cases with lower interaction with campus open spaces. In the former group, experience of restoration was affected by perception of restorativeness through the impact of PSD. On the contrary, in the latter group, restoration experience was more affected through the impact of PSD than perceived restorativeness. Individual related characteristics and need for restoration could not moderate changes in the restoration experience that might have occurred due to the effect of PSD and perceived restorativeness. These findings showed that the experience of restorative outcomes was dependent on the impact of PSD on perceived restorativeness. The effect of visit related characteristics provided information on specific environmental conditions that create experience of higher restorative outcomes. As a conclusion, the research has illustrated that the design of open spaces can promote mental health with a combination of PSD and perceived restorativeness that can be applied in landscape architecture.

## ABSTRAK

Pengalaman pemulihan melalui penggunaan Perceived Sensory Dimension (PSD) dan tanggapan pemulihan telah ditunjukkan untuk mengurangkan tekanan dan meningkatkan kesihatan mental. Selain itu terdapat faktor lain yang berpengaruh terhadap pemulihan pengalaman seperti sifat keperibadian dan ciri-ciri lawatan berkaitan serta keperluan pemulihan. Walau bagaimanapun, terdapat sedikit pengetahuan tentang perkembangan pengalaman pemulihan melalui kesan model PSD dan pemulihan yang diperlukan dengan mempertimbangkan kesan faktor-faktor yang berpengaruh ini. Kajian ini membangunkan model pengalaman pemulihan melalui kesan PSD dan tanggapan pemulihan. Dalam kajian ini, Model Persamaan Struktur Kuasa dua Terkecil Separa (PLS-SEM) digunakan untuk menilai interaksi antara parameter dalam membangunkan pengalaman pemulihan. Kesahihan dan kebolehpercayaan pengukuran pengalaman pemulihan melalui kesan PSD dan pemulihan yang dilakukan telah dijalankan menggunakan 444 pelajar di universiti di Malaysia. Hasil kajian menunjukkan bahawa separuh daripada pengalaman pemulihan adalah dalam kes-kes yang mempunyai interaksi yang lebih tinggi dengan ruang terbuka kampus, dan hampir separuh daripada pengalaman pemulihan adalah dalam kes-kes dengan interaksi yang lebih rendah dengan ruang terbuka kampus. Berdasarkan kumpulan pertama, pengalaman pemulihan terjejas oleh persepsi pemulihan melalui kesan PSD. Sebaliknya, dalam kumpulan yang kedua, pengalaman pemulihan lebih terjejas melalui kesan PSD berbanding dengan tanggapan pemulihan. Ciri-ciri dan keperluan individu untuk pemulihan tidak boleh menyederhanakan perubahan dalam pengalaman pemulihan yang mungkin berlaku disebabkan oleh kesan PSD dan tanggapan pemulihan. Dapatan ini menunjukkan bahawa hasil pengalaman pemulihan bergantung kepada kesan PSD terhadap tanggapan pemulihan. Kesan ciri-ciri berkaitan lawatan memberikan maklumat tentang keadaan persekitaran khusus yang mewujudkan hasil pengalaman pemulihan yang lebih tinggi. Sebagai kesimpulan, kajian ini telah menggambarkan bahawa reka bentuk ruang terbuka boleh menggalakkan kesihatan mental dengan gabungan PSD dan tanggapan pemulihan yang boleh digunakan dalam seni bina landskap.

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## LIST OF ABBREVIATIONS

ART	-	Attention Restoration Theory
AVE	-	Average Variance Extractor
CB-SEM	-	Co-variance-based Structural Equation Modeling
DAF	-	Directed Attentional Fatigue
MGA	-	Multi-Group Analysis
MRU	-	Malaysian Research University
PDRQ	-	Perceived Destination Restorative Quality
PLS-SEM	-	Partial Least Square Structural Equation Model
POSQ	-	Perceived Open Space Quality
PR	-	Perceived Restorativeness
PRCQ	-	Perceived Restorative Characteristics Questionnaire
PRCS-C	-	Perceived Restorative Components Scale for Children
PRS	-	Perceived Restorativeness Scale
PSD	-	Perceived Sensory Dimension
PSS	-	Perceived Stress Scale
RCS	-	Restorative Components Scale
RE	-	Restoration Experience
ROS	-	Restoration Outcome Scale
RS	-	Restorative Scale
RSS	-	Restorative State Scale
SET	-	Supportive Environment Theory
SRPRS	-	Short-version Revised Perceived Restorativeness Scale
SRRS	-	Short-version Revised Restoration Scale
SRT	-	Stress Recovery Theory



SSS	-	Student Stress Survey
UKM	-	Universiti Kebangsaan Malaysia
UM	-	University Malaya
UPM	-	Universiti Putra Malaysia
USM	-	Universiti Sains Malaysia
UTM	-	University Teknologi Malaysia
VAF	-	Variance Accounted For
VIF	-	Variance Inflation Factor
WHO	-	World Health Organization

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## CHAPTER 1

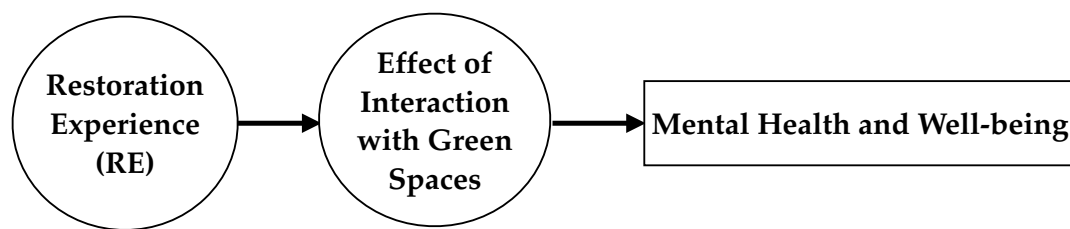
### INTRODUCTION

#### 1.1 Overview

Stress and mental fatigue become the greatest risk factor for human health in all over the world (Triguero-Mas *et al.*, 2017) and in Malaysia as well (Vaez and Juhari, 2017). It is expected that during sustained stress our body reactions become dysfunctional and causing harmful diseases (Grahn and Stigsdotter, 2010). If people neglect restoration from stress, it eventually can have deleterious consequences for their health and well-being (Hartig and Staats, 2005).

During recent years, psychological and emotional restoration experience through contact with nature has become an approach to cope with stress and mental fatigue. Interaction with green spaces reduces stress and increases mental health and psychological well-being (Figure 1.1). In contact with natural open spaces, the process of restoration experience is regaining the psychological and emotional resources that are diminished in performing daily life activities (Hartig and Staats, 2005; Han, 2007).

To study the effect of green spaces on restoration experience, two approaches have been taken by researchers (Figure 1.2). First, assessment of physical landscape design features. Second, measurement of perceived green space qualities. The later is more advocated when mental health promoting effect of green spaces is under investigation (Francis *et al.*, 2012). The focus of this study is on restoration experiences through the effect of perceived open space qualities. The aim is to identify the factors that impact on experiencing of restorative outcomes and addressing how the extent of restoration experience depends on the effect of these factors, with university students



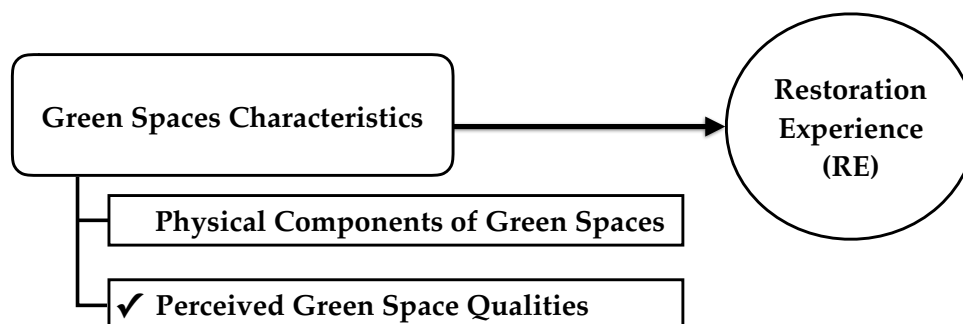
**Figure 1.1:** Restoration experience promotes mental health through effect of interaction with green spaces

population, in the context of campus open spaces.

## 1.2 Background of Study

The study of restoration experience in exposure to nature has been developed with different objectives and measurement methodological approaches. A considerable amount of research showed that visual exposure to nature (e.g. pictures, plants), in indoor settings, provides opportunities for restoration from stress and mental fatigue (e.g. van den Berg *et al.*, 2014; Felsten, 2009). A number of studies have shown that visit to real natural open spaces such as urban green spaces, urban parks and forests increases restoration experiences (e.g. White *et al.*, 2013; Korpela *et al.*, 2014).

Some of these studies, through experimental design approaches, have been concerned with actual short-term beneficial effects of nature experience. In these studies, the positive outcomes of nature experience have been supported by monitoring changes in human psychological, physiological and emotional systems from tension towards positive states (e.g. Triguero-Mas *et al.*, 2017). Another group of researchers through longitudinal or cross-sectional design approaches, have focused on longer-time effects of nature experience. Mostly, the focus of these studies is on subjective psychological and emotional restorative outcomes such as attention restoration, clearing thoughts, self confidence and vitality feelings in visit to natural environments (e.g. Korpela *et al.*, 2008, 2014). In the first group of studies, the beneficial effects of contact with nature is supported through providing actual evidences by tracking the short-term outcomes of nature contact. While, the latter group has been concerned

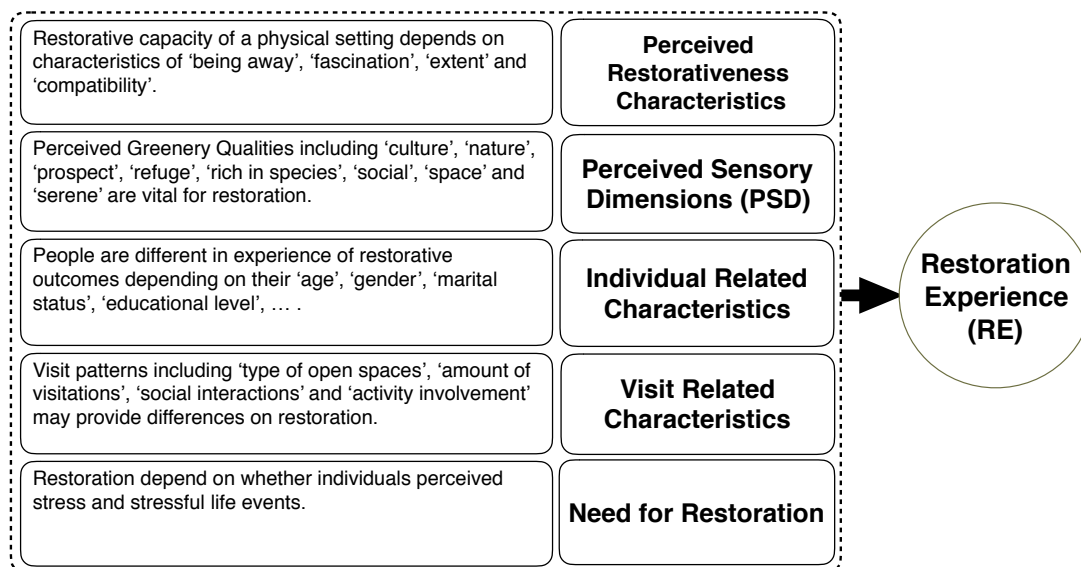


**Figure 1.2:** Approaches in examining the effect of green space characteristics on restoration experience

with the longer-time restorative outcomes of contact with natural open spaces.

The relationship between exposure to nature and restoration experience is discussed through Biophilia hypothesis, Stress Recovery Theory (SRT), Attention Restoration Theory (ART) and Supportive Environment Theory (SET). Through these underpinning theories, studies have provided evidences of what is happening between nature and human in the process of restoration experience. The research based on Biophilia hypothesis suggests that nature is life-sustaining (Davis and Gatersleben, 2013) and positive restorative outcomes occur due to human evolutionary connectedness to natural components (Bratman *et al.*, 2015; Nisbet *et al.*, 2011). Through SRT, studies showed that contact with natural elements including trees, lawns, flowering plants and water emerges restoration through stress recovery (Ulrich *et al.*, 1991; Korpela *et al.*, 2008). Researches based on ART show that in contact with natural environments, experience of restorativeness characteristics is influential in recovery of mental fatigue and experience of psychological restoration (Nordh *et al.*, 2009b). In SET, perception of greenery related qualities are optimal in supporting of restoration experience and mental health (Grahn and Stigsdotter, 2010; Stigsdotter *et al.*, 2017b). Upon these prominent theories, the potential contribution of natural open spaces has been supported, as a buffer in relieving stress and mental fatigue related symptoms.

In literature, there are a broad number of studies providing evidences that contact with nature is beneficial for stress reduction and improvement of human health and well-being. However, there are other group of studies that went further from just



**Figure 1.3:** Influential factors on restoration experience in direct interaction with green spaces

addressing whether contact with nature is beneficial for stress reduction or not. They focused on the aspects that may be influential on the extent of restoration experience in visit to natural open spaces.

In visit to open spaces, the psychological and emotional restorative outcomes seem to be influenced by a number of factors (Figure 1.3). Perception of green spaces is important in evaluating of beneficial outcomes (Kothencz *et al.*, 2017). For example, it showed that visual perception of physical components of designed landscapes have great possibility in reduction of stress and mental fatigue (Nordh *et al.*, 2009b, 2011). Perceived level of naturalness and biodiversity have also proved to have positive effect on people emotional well-being and improvement of the quality of life (Marselle *et al.*, 2016; Hipp *et al.*, 2016). Other researchers showed that perceived greenery qualities such as Perceived Sensory Dimensions (PSDs) are vital to emerge restoration and maintain mental health (Grahn and Stigsdotter, 2010; Stoltz *et al.*, 2016).

In addition, it has been shown that in visit to green spaces, the achievement of restoration experience is likely to be influenced by personal background of visitors, type of usage pattern and level of need for restoration (Johnsen, 2013; White *et al.*, 2013; Korpela *et al.*, 2008). Therefore, although visit to green spaces is associated with

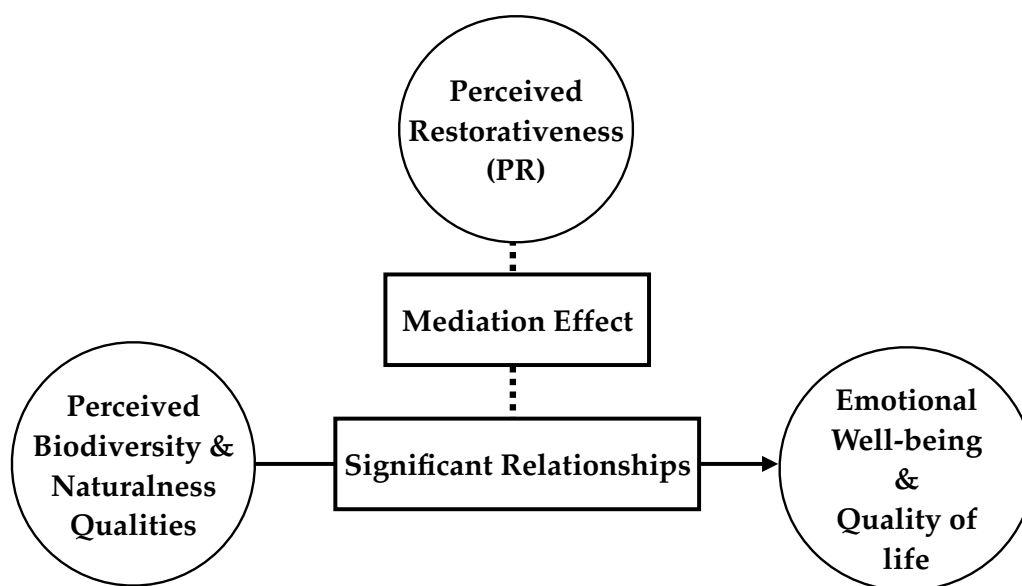
beneficial outcomes, in itself, it is important to determine how restoration experience is related to the impact of perception of open space qualities. Moreover, how in visit to open spaces, the extent of restoration experience depends on the effect of users demographics, visit related characteristics and level of need for restoration.

### **1.3 Research Gap**

It has been shown that perceived open space qualities of PSD has impact on restoration experience (Memari *et al.*, 2017; Stoltz *et al.*, 2016). However, it has left an important gap in relation with their effect on psychological and emotional restoration experience in direct interaction with green open spaces. Although, understanding the significance of measurement variables of perceived open space qualities urged by many studies (e.g. Marselle *et al.*, 2016), there are few to take the approach for examining the association of PSDs with psychological and emotional restoration experience.

In direct interaction with green spaces, moreover the impact of PSD, there are other influential factors on restoration experience like personal characteristics of respondents, visit related characteristics and level of need for restoration experience. The most cited visit related variables are type of open spaces, amount of visitations, level of social interaction and type of performed activities in visitations (Korpela *et al.*, 2010; White *et al.*, 2013; van den Berg *et al.*, 2014; Tyrväinen *et al.*, 2014). Need for restoration reflects the extent of a person stressful life events and perception of stress. Measurement of the need for restoration is a common methodological approach in the restorative studies as individuals are different in their resources and abilities (Korpela *et al.*, 2008). The research gap is understanding how restoration experience is developed through integration of these influential factors.

To understand how interaction with green spaces developed restorative outcomes, researchers carry on classical statistical analysis, which is based on understanding the cause-and-effect to identify what cause the outcomes (Hair *et al.*, 2016; Gefen *et al.*, 2000). While, the contemporary statistical approaches through modelling techniques introduce the methodology of multivariate variables

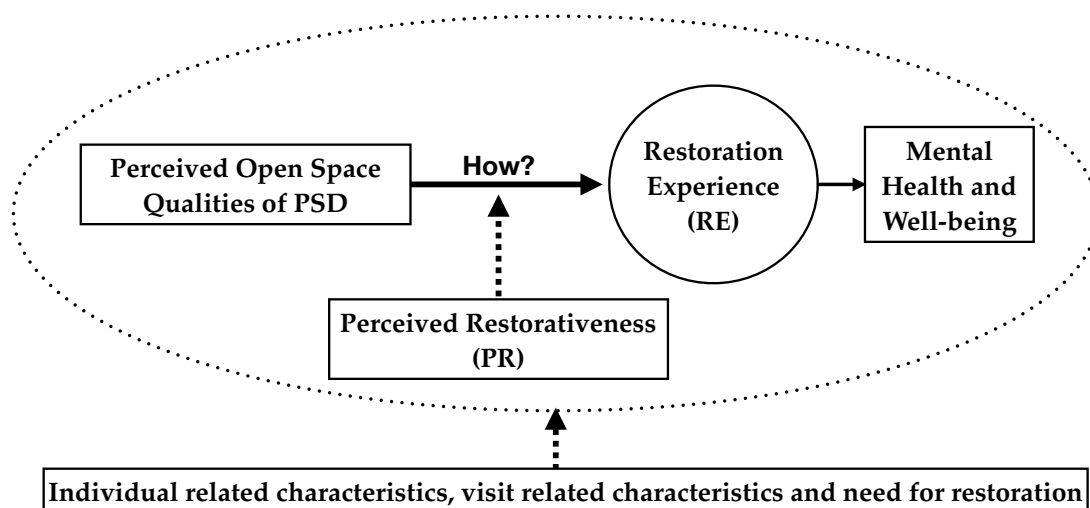


**Figure 1.4:** Mediation effect of perceived restorativeness in relationship between perceived environmental qualities and positive outcomes (Hipp *et al.*, 2016; Marselle *et al.*, 2016)

relationships. The modelling provides sufficient assessment techniques including mediation and moderation effect tests to understand how and why some conditions may deliver specific outcomes in a particular population sub-group (Urbach and Ahlemann, 2010; Gefen *et al.*, 2000). However, there are few studies that developed such comprehensive model and provided in-depth analysis of restoration experience in visit to open spaces through incorporate of all the addressed influential factors.

In order to explain how restoration experience is related to perceived open space qualities of PSD, through modelling approach, Based on Attention Restoration Theory (ART), researchers suggested that in exposure to natural environments, positive outcomes may be mediated by the impact of perceived restorativeness characteristics (Figure 1.4). Such mediation effect of perceived restorativeness was addressed in justification of the association between environmental qualities and emotional well-being and the quality of life (Hipp *et al.*, 2016; Marselle *et al.*, 2016). However, whether perceived restorativeness has a mediating effect on the association of perceived open space qualities of PSD and experiencing of psychological and emotional restorative outcomes in direct interaction with green spaces is unknown





**Figure 1.5:** Association between PSD and restoration experience and mediation effect of perceived restorativeness

(Figure 1.5).

#### 1.4 Problem Statement

Contact with open spaces is one of the coping approaches for stress alleviation through development of psychological and emotional restoration experience. Qualities of green space environments may have substantial values for developing the restoration experience. In visiting an environment with qualities of a green space, the outcome of restoration experience is influenced by several other factors. Personal factors of visitors, visit related characteristics and need for restoration are among the most influential parameters on experiencing of restorative outcomes.

Based on ART, a physical setting that permits perceived restorativeness characteristics could promote psychological and emotional restoration experience. The role of perceived restorativeness in relation between perceived open space qualities and restoration experience is called as a mediator in the model. Although the mediating effect of perceived restorativeness has been highlighted before, it has not been studied in relation between perceived open space qualities of PSD and psychological and emotional restoration experience. In conclusion, there is lack of

research in understanding how restoration experience is influenced by perceived open space qualities based on several influencing factors. One of the best candidates to provide such an explanation is perceived restorativeness. However, there are few studies to investigate its role in this relation.

At present, in Malaysia, especially in research universities, the issue of students stress is a growing area of research (Amran *et al.*, 2014; Panatik *et al.*, 2012). However, it is not clear yet, which perceived open space qualities or perceived restorativeness characteristics are actually relevant for university students psychological and emotional restoration experience in direct interaction with campus outdoor open spaces. Indeed, the influence of personal characteristics, visitation patterns and level of need for restoration has not been explored in relation with restoration experience with a sample of university students and especially in the context of campus open spaces. Therefore, the research problem which this study is based upon is:

How to investigate the development of psychological and emotional restoration experience model through the impact of perceived open space qualities of PSD and perceived restorativeness, considering the effects of personal related characteristics, visit related characteristics and need for restoration, using students in Malaysian universities?

## 1.5 Research Hypotheses

This study is based on several hypotheses as follows. The validity of these hypotheses have been analysed and discussed in following chapters.

- (i) **Hypothesis 1:** The perceived open space qualities of PSD has positive relationship with psychological and emotional restoration experience (*H1*).
- (ii) **Hypothesis 2:** The perceived open space qualities of PSD has positive relationship with perceived restorativeness (*H2*).

- (iii) **Hypothesis 3:** The perceived restorativeness has positive relationship with psychological and emotional restoration experience (*H3*).
- (iv) **Hypothesis 4:** The perceived restorativeness is the mediator effect variable in the relationship between perceived open space qualities of PSD and psychological and emotional restoration experience (*H4*).

## 1.6 Research Questions

There are four main questions in this study as follows;

1. Can the developed model explain psychological and emotional restoration experience through the impact of perceived open space qualities of PSD and perceived restorativeness?
2. What are the key indicators of PSD and perceived restorativeness, which influence on psychological and emotional restoration experience model?
3. How the personal and visit related characteristics affect on the development of psychological and emotional restoration experience through influencing on the impact of perceived open space qualities and perceived restorativeness?
4. How the need for restoration influences on the associations between perceived open space qualities and perceived restorativeness and psychological and emotional restoration experience, across students with different visit related characteristics?

## 1.7 Research Aim

In accordance with the literature on the beneficial effect of nature, the aim of this study is to investigate the subjective restoration experience in nature visitation through the impact of perceived open space quality and perceived restorativeness. Through multi-dimensional analysis, it estimates the effect of other influential variables on the proposed relationships.

## **1.8 Research Objectives**

Aligned with four research questions in this study, four research objectives are developed and presented as follows;

1. To develop and validate a model that explain psychological and emotional restoration experience through the impact of perceived open space qualities of PSD and perceived restorativeness.
2. To identify the significant measurable indicators of PSD and perceived restorativeness, which influence on psychological and emotional restoration experience.
3. To audit differences in the development of psychological and emotional restoration experience through the impact of perceived open space qualities and perceived restorativeness based on the effects of personal characteristics of students and visit related characteristics.
4. To establish the extent to which need for restoration affects psychological and emotional restoration experience through the impact of perceived open space qualities and perceived restorativeness, across students with different visit related characteristics.

## **1.9 Research Scope**

The scope of this study is as follows:

- (i) Participants of this study are university students including local and international, undergraduate and postgraduate students from five Malaysian Research Universities (MRU) as University of Malaya (UM), Universiti Teknologi Malaysia (UTM), Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM) and Universiti Sains Malaysia (USM).
- (ii) Selection of campus outdoor open spaces is based on most visited favourite places.

- (iii) Assessment of restoration experience is based on subjective psychological and emotional restorative outcomes of everyday interaction with natural elements rather than actual restorative outcomes.
- (iv) Need for restoration is based on self-report responses on stressful events and perception of stress.

### **1.10 The Significance of Research**

The intention of this study is to provide information on the association between perceived open space qualities of PSD, perceived restorativeness and restoration experience. The first significant factor of the study lies in distinction between perceived restorativeness and restoration experience. Using suitable supports, it describes perceived restorativeness as perception towards the environment and restoration experience as the psychological process and outcome.

Another significant factor in this study is using PSD as a reliable and valid measure of perceived open spaces qualities, which enables understanding the link between perception of green spaces and restoration experience. Moreover, it measured PSDs from the perspective of subjective approach which is based on users' perception rather than experts' objective evaluation of open space qualities. It contributes to knowledge on the significant impact of each experienced quality in association with perceived restorativeness and restoration experience.

In spite of extreme attempts on restorative effect of urban open spaces, this study contributes to support the restorative possibility of university campus outdoor open spaces through empirical data analysis. University students are found with sustain mental effort and several stressful campus life events. The results of this study adds extra supports to the claims given in literature review on restoration effects of campus open spaces for university students. It provides insights on evaluation and prioritisation of perceived open spaces qualities that support university students restoration experiences in use of these areas.

Moreover, the findings of this study is beneficial in understanding the students personal characteristics, campus usage patterns, need for restoration and design aspect of campus open spaces, which has been less considered in relation with restoration experience. Involvement of such variables is likely to create more meaningful predictors of restoration experience for university students in the context of campus. Till now, the restoration effect of campus open spaces, though to be beneficial for university students' mental health development, has not been established.

Finally, the main significance of this study is the usage of a suitable methodology and an appropriate analysis method. Using PLS-SEM analysis enables this study to visually show the relationships between defined independent and dependent variables. In addition, it shows how and why an impact on dependent variable is happening (mediation effect analysis) and how other independent variables could affect on relationship between independent and dependent variables (moderation effect analysis). One highly admired feature of PLS-SEM is statistically confirmation on reliability and validity of measurement model and hypothesised relationships between latent construct variables.

### **1.11 Study Limitation**

This study uses a comprehensive research method and analysis to find information on which specific environmental conditions create experience of restorative outcomes. It examines the impact of perceived green space qualities and restorativeness potential of campus open spaces on university students restoration experience. There is some limitations in this study. First of all, the research measures need for restoration of students at one point in time only. Through a longitudinal approach, it can obtain data from the same group of students, repeatedly over time, by monitoring changes in measurement of the need for restoration and restorative outcomes, in order to gain knowledge on the beneficial impact of contact with open spaces over time. In examining the beneficial effect of campus open spaces, this study only deals with university students psychological and emotional restoration experience in the context of campus open spaces. While, it would provide more knowledge if it

give useful information about the impacts of perceived qualities on other aspects of students' health and well-being (e.g. social and physical).

### 1.12 Keywords Definition

- (i) **Restoration Experience:** Restoration experience has been defined as “moving from a depleted state to a restored state” (Johnsen, 2013). It is the renewal of human psychological, physiological and emotional capacities from a negative state to its original state (Herzog and Rector, 2008). There are two approaches in measurement of restoration. One is actual restoration experience in interaction with green spaces, which focuses on short-term restorative effects of nature experience. Second is measurement of subjective psychological and emotional restorative outcomes of everyday interaction with natural elements (Korpela *et al.*, 2008).
- (ii) **Perceived Sensory Dimension (PSD):** It is the latest version of green space qualities which has been developed by (Grahn *et al.*, 2010) and involved eight perceived quality of ‘serene’, ‘space’, ‘culture’, ‘nature’, ‘refuge’, ‘prospect’, ‘rich in species’ and ‘social’. PSD is based on Supportive Environment Theory (SET) and Gibsons ecological approach to perception. In SET, the suggestion is green spaces contain a set of characteristics that are supportive for restoration experience and mental health development (Grahn *et al.*, 2010). Based on Gibsons Ecological Approach to Perception, landscape perception is the consequence of perception-action process, which involves movements of entire body and combination of multi-sensory system (Grahn *et al.*, 2010).
- (iii) **Perceived Restorativeness:** Perceived restorativeness is a suggested term, which is developed in ART framework. It describes the potential of a setting where it may facilitate reduction of stress and mental fatigue (Han, 2010). Based on ART, the environments that possesses four restorative characteristics of ‘being away’, ‘fascination’, ‘extent’ and ‘compatibility’ permit the basic requirement for restoration experience (Wilkie and Stavridou, 2013; Kaplan, 1995). Subjective experience of restorativeness capacity of green spaces is a necessary condition for experience of restorative outcomes (Kaplan, 2001b).

### 1.13 Thesis Organisation

This research is presented in six chapters as follows:

- (i) **Chapter 1:** It presents an introduction to the research, highlights research gap, Hypotheses, research questions and research objectives.
- (ii) **Chapter 2:** It is a review of literature about the benefits of contact with nature on restoration experience, theories of restorative environments, identifying the relevant perceived environmental qualities for restoration experience, description on Structural Equation Modelling (SEM), explanation on relevant measurement methodologies in assessment of study variables, justifying on university students as a vulnerable group experiencing high stress and campus outdoor space as an immediate restorative setting.
- (iii) **Chapter 3:** It presents the research methodology, which involves discussion on study design, the approaches in data collection, study area, sampling, steps in analysing data by PLS-SEM and description of study proposed model.
- (iv) **Chapter 4:** In this chapter, the PLS-SEM analysis result is presented by tables and figures.
- (v) **Chapter 5:** It contains the discussion on findings.
- (vi) **Chapter 6:** Finally, in chapter 6, the conclusion of the thesis is presented with practical contributions and implications, limitation of research and some suggestions for future works.

### 1.14 Summary

This chapter describes the contact with nature as one of the suggested approaches in coping with stress and mental fatigue. It briefly introduces the theoretical background on relationship between contact with nature and restoration experience. In visits to natural environments, the experience of restoration can significantly be associated with the impact of several influential factors. Through these justifications, it presents the research gap and problem statement. The research



hypotheses, research questions and research objectives are presented in this chapter. Moreover, the research contributions, scope and claims on significance of this study are discussed in Chapter 1.

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