1.0 RESEARCH TOPIC

PSYCHO-PHYSIOLOGICAL BENEFITS OF MOUNTAIN LANDSCAPE ENVIRONMENT AS STIMULI FOR DIRECTED ATTENTION RESTORATION AND STRESS MITIGATION

Mountain landscape, restoration, directed attention, stress mitigation.

2. 0 RESEARCH AIM

The aim of this study is to examine the mechanism and intricacies of the link between restorative environments, human response and wellbeing in a natural mountain landscape environment.

3.0 RESEARCH OBJECTIVES

1. To identify the feature(s) of the mountain landscape environment potentially critical to human perception and psycho-physiological response;
2. To investigate the amenity values of the ambient mountain environment conditions on human psycho-physiological wellbeing; and
3. To determine the magnitude to which mountain environments can stimulate human psychological and physiological well-being.

4.0 ASSUMPTION

With reference to the link between nature experience and health outcome, there exist a palpable possibility that a vital aspect of research expansion is in the area of indicators of psycho-physiological states. A basic assumption guiding research in this area relates to how cumulative effects of contact with environment having high restorative qualities can enhance better health benefits than contact with lesser restorative quality (Hartig et al, 2011). Aspects of this

assumption relative to research in mountain environments involve the visual and physical accessibility to a person, psycho-physiological response, interval required for restorative occurrence and the span of time required for cumulative effects of repeated restorative experience to manifest.

5.0 RESEARCH QUESTIONS

1. What feature of the mountain environment yield higher restorative benefits in terms of psycho-physiological wellbeing?
2. What aspects of the ambient mountain environment conditions combine to elicit human psycho-physiological health outcome?
3. What degree would the natural mountain landscape environment influence recovery from directed attention and stress?

6.0 RESEARCH BACKGROUND

Quite a number of research studies have been carried out in the area of effects of nature experience on mental restoration (Ulrich, 1979; Ulrich, 1984; Kaplan, 1992; Hansmann, Hug, and Seeland, 2007; Bratman, Hamilton, and Daily, 2012). A key element of the health benefits of nature may be its stress reducing effect and stress can be accessed from an inexhaustible perspective. Selye (1976) who is widely regarded as the pioneer researcher on biological effects of exposure to stressful stimuli (Neylan, 1998) defined stress as the general response of the body to any demand while a stressor is the stress producing agent. In his research, he described the chronological development of the response to stressors when their activity is prolonged as the general adaptation syndrome (GAS) consisting of the alarm reaction, resistance stage and the exhaustion stage. Burchfield (1979) in establishing the theory of stress response (TSR) which states that all organisms are genetically predisposed to adapt to stress and the physiological pattern of adaptation is similar across species, views stress as anything which enables the transactions of psychological homeostatic processes. He further opined that homeostasis

(Goldstein and kopin, 2007), a complex dynamic state of equilibrium (Chrousos, 2009) is the maintenance of the normal mood state of an individual at rest while stress response is the organisms' relatively non-specific physiological response and the stressor is the specific stimulus in the homeostatic process. Organism herein is referred to as human being.

Hobfoll (1989) in his critique described Selyes' perspective of stress as a way of employing illogical deductive reasoning to depict stress as an outcome of one of the phases of the general adaptation sequence. He proposed a testable and comprehensive resource oriented model of stress named model of conservation of resources (MCR) which stipulates that what actually forms a threatening situation (Cohen, Karmarck and Mermelstein, 1983; Al Kalaldeh and Shosha, 2012) in people is the fear of the potential or actual loss of hitherto retained, protected and built resources. Thus, psychological stress is the reaction to the environment which involves either the threat of a total loss of resources, the actual total loss of resources or the absence of resources hitherto gained. This definition tends to situate the subject of stress in terms of the individuals capacity for achieving and maintaining health. However, Quick, Nelson, Quick, and Orman (2001) refer to stress as "the psycho-physiological response to any demand (stressor) and distress (strain) as a deviation from physiological, psychological, or behavioral health" (pg147). While the definition of stress have been varied over a number of dimension, there seem to be a general consensus among researchers that mental stress results from interactions between persons and their environment that are perceived as straining or exceeding their adaptive capacities and threatening their well-being (Annerstedt, Norman, Boman, Mattson, Grahn, and Wahrborg, 2010).

Health is an all encompassing positive state phenomenon connecting the individual in relation to his or her entire condition which include cultural, social, and environmental aspects (Stigsdotter, Palsdottir, Burls, Chermaz, Ferrini, and Grahn, 2011). In healthcare management, Stress is vital in the consideration of the etiology of diverse common health challenges which include cardiovascular diseases, anxiety disorders, obesity and depression (Jackson, 2003; Grinde & Patil, 2009). There exists a diverse perspective from which the subject of stress and its source is approached and these vary along a number of dimensions (Evangelos & Anastasia, 2004; Wickramasinghe, 2010). A study by Folkman, Lazarus, Gruen, and Delongis (1986) has shown concern about financial security (Hashim and Zhiliang, 2003) were positively associated with

psychological symptoms. Peltzer, Shisana, Zuma, Wyk, and Zungu-Dirwayi (2008) identified job stress (Blix & Lee, 1991; Fielden &Pecker, 1999; Wu, Zhu, Li, Wang, and Wang, 2008; Tsaur & Tang, 2012) and job satisfaction (Chen, Wong, and Yu, 2001;Park & Wilson, 2003; Voight, 2009) to be mutually associated with most stress related illnesses like hypertension, heart disease, stomach ulcer, asthma, mental distress, tobacco and alcohol misuse (Kurina, Schneida, and Whaite, 2004). In addition, stress from teaching methods (Adams, 2001; Zurlo, Pes, and Cooper, 2007) and the educational systems contribute more to stress related illnesses than stress from being in the low social economic status group. Further, urban way of living identified by sedentarism, calorie and fat rich food consumption, less physical activity and the like are associated with increased level of psychosocial stress (Sarka & Mukhopadhyay, 2008). On the whole, researchers have variously tried to conceptualize the negative attributes of stress (e.g. forgetfulness, distractions, mistakes and illness) and also critically assessed the positive aspects of restoration linked to nature (e.g. feeling relaxed, effectiveness, productivity and wellbeing) (Bergdahl and Bergdahl, 2002; Hansmann, Hug, and Seeland, 2007; Tsunetsugu, Lee, Park, Tyrvainen, Kagawa, and Miyazaki, 2013). The apparent detachment of most individuals from nature has however contributed to their diseased state hence the proponents of nature oriented psychotherapy have advanced explanations concerning health effects of natural environments with the intent of linking the man-nature versus healing paradigm.

The knowledge of the existence of stress, stress related diseases and the restorative effects of some environmental components can set a precedence for the mitigation of stress and the activation of restoration (Velarde, Fry, and Tveit, 2007). Physiological processes of the brain activity could be linked to psychological processes of recovery from mental fatigue associated with restoration process (Chang, Hammitt, Chen, Machnik, and Su, 2008). Directed attention phenomenon as described by Kaplan, (1995) plays a major role in human capacity for selectivity in information processing and it is fragile, hence, capable of instigating fatigue and likely to precede incompetence or inappropriate behavior. On the flip side, the consequence of fatigue precedes that an important need for attention restoration in order to facilitate a return to effective functioning state, and this can be achieved through contact with nature (Tennessen and Cimprich, 1995). O'Craven Rosen, Kwong, Treisman, Savoy (1997) asserts that attention enables the processing of vast quantities of information received by the visual system through the

selection of subset of the received information for further processing depending on either the properties of the stimulus or on a voluntary choice by the subject.

According to Herzog, Hayes, Applin, and Weatherly, (2011) restoration of attention capacity is dependent upon the four components of restorative environment as proposed by the attention restoration theory ART-being away which involves being in a setting that is different from everyday fatigue inducing environments, extent which describes any setting that has enough scope and organization to occupy the mind, fascination which specify an environment that evokes effortless attention and compatibility a purpose fit component (Kaplan, 1995; Kaplan, 2001b). ART is one of the fundamental theories linked with the advancement of the kinds of experiences that enables recovery from fatigue arising from directed attention.

The term restoration encompasses the process that facilitates peoples recovery from stress acquired whilst trying to meet demands of everyday life (Hartig, Van den Berg, Hagerhall, Tomalak, Bauer, Hansmann, Ojala, Syngolliton, and Carrus, 2011). While modern day environments are only created to suite everyday living and working which offer less restorative health benefits (Thompson, 2011), nature related environments like forests, wilderness and mountains are considered to possess significantly the possibility of enhancing restoration from stress through passive and active contact. Natural environments play an essential role in human functioning through the process of restorative experiences (Ulrich, 1979; Kaplan, 1992) which can be elicited consciously or unconsciously depending on the active or sensory state of the individual. The characteristic endowments required for restorative experiences abound in natural environments (Kaplan, 1995). Natural environment experience is derived when the individual is within a natural environment while experience of nature is determined by the individual's focus of experience or observation which is neither manmade nor of human origin (Hartig and Evans, 1993).

This natural environments are typically distinct from everyday urban settings and are endowed with such fascinating elements like water (Bulut, Karahan, and Sezen, 2010), vegetation, foliage, trees, forests (Hartig et al., 2011) and is also coherent and rich having trails to walk, paths for exploration and provide compatible connections with the settings such as hiking, walking, observation, peaceful meditation (Berto, Baroni, Zainaghi, and Bettella, 2010). Our everyday urban settings are almost devoid of such endowments. However, the visual qualities of the

undulating mountains, captivating grasslands, riveting waterscapes and prominent forest groves of the Obudu mountain resort, Nigeria, coupled with the tangible personal body response I have had through viewing and interacting with nature constitute a great inspiration in the conceptualization of this study. It is therefore pertinent to ask; to what degree would the natural mountain landscape environment influence recovery from directed attention and stress?

7.0 PROBLEM STATEMENT

Several research studies evaluating encounters with wilderness and forest environments have been supportive of the restorative and therapeutic effects of nature (Tsunetsugu et al, 2013; Cole and Hall, 2010; Staats and Hartig, 2004; Kaplan, 1992). Most of the previous research aimed at measuring health outcomes of the experience of natural environments involved participants viewing through a window or viewing nature scenes through video, picture slides and simulations. Ulrich, (1984) determined to ascertain if access of post-surgical patients in a hospital room having a view through the window of natural settings predominantly composed of trees (Hartig, Evans, Jamner, Davis, and Garling, 2003; Donovan, Butry, Michael, Prestemon, Liebhold, Gatziolis, and Mao, 2013) have a more positive effect on the patients emotional states and recovery rate than those with a window view of a built structure essentially made up of a monotonous featureless brick wall. Similarly, Raanaas, Patil, and Hartig (2011) in a longitudinal quasi-experiment comprising three distinct types of window view from patients (undergoing rehabilitation) rooms examined the health benefits of a bedroom window view to natural environments. Though result suggests that view of natural scene have more therapeutic influence on recovery, it is not established if physical contact with a real-life multi-stimulus natural environment will yield faster recovery time for such patients. In a study focusing on people's window views from the confines of their home, Kaplan, (2001) using mail administered survey questionnaire with photo-based visual environment rating examines the content (Tennessen and Cimprich,1995) of the views from a window, the level of preference attached to different views and the relationship between view content, well-being and residential satisfaction. The study supports the hypothesis that a view out of the window affords various opportunities for restoration depending on the view content. Very few of these studies have considered active engagements like walking, running, seating and gardening.

Quasi and real site experiments have tested the suggestion that contact with and experiences of natural environments enhance wellbeing better than experiences of other environments (Hartig et al, 2011). Ulrich, (1979) building on the widely promoted notion that exposure to nature enhances psychological well-being evaluated specifically the effects of visual contact with outdoor environment through an experiment which involve showing color slides of outdoor environments to two groups of mildly stressed subjects. Findings support the opinion that individuals feel significantly better after exposure to nature scenes rather than urban scenes lacking in nature elements. Herzog, Black, Fountaine, and Knotts (1997) also employed the use of questionnaire and picture slide to rate the perceived restorative effects of ordinary natural environments against sports and entertainment environment (Herzog, Chen, and Primeau, 2002). Result show that different kinds of environment evoke varying degrees of the qualities of the features of restorative environment.

These studies have been carried out in confined environments generally to control experimental variables mainly focusing on the sights and not the multi-sensory aspects. To further lend credence to research in the area of restorative environments, Hartig, Korpela, Evans, and Garling (1997) in a multi-dimensional study provided an insight into the means for measuring psychological factors in favour of restorative experiences to aid the design of restorative environments and assist in dilating theoretical account for future research. On-site experiences, video simulations of walk through natural and urban settings and photographic slide simulations of different settings were deployed as a multifaceted methodological strategy to ground a dependable perceived restorativeness scale(PRS).Seemingly following up on past research, Herzog, Maguire, and Nebel (2003) attempts a new approach to the measurement of restorative components of environments by creating and validating several Likert-scale items to measure each of the four components of a restorative environment (see more on restorative components of environments in Kaplan, 1995;Herzog et al., 1997; and Kaplan, 2001b). In the study, color slides of urban and field environments as against forest natural environment (Berto, 2007) is employed as a stimuli for rating the restorative components (Laumann, Garling, and Stomark, 2001) of environments. The reliability and validity test outcomes were generally supportive. In a related study, Van den berg, Koole and Van den wulp (2003) utilized videos of park like forests areas compared to videos of urban dwellings as stimuli (Laumann, Garling, and Stomark, 2003) in order to identify some of the connection between environmental preference and psychological

restoration. Staats, Kievet, and Hartig (2003) also conducted an experiment using participants who viewed slides simulating scenes of a walk (Berman, Jonides, and Kaplan, 2008) through a forest and an urban Centre (Staats and Hartig,2004; Hartig and Staats, 2006) to test the hypotheses about the possibility of restoration through environmental preference. Measured on a three item scale the study builds on a general perception of the environment as nice, pleasant and beautiful irrespective of the activity context. Han (2010) through a study carried out to ascertain the relationship and the differences that exist between scenic beauty, preference and restoration (Purcell, Peron, Berto, 2001; Han, 2007) employed the use of landscape slides as visual stimuli to evaluate the variables of interest for each slide. Natural habitats are rich in sensory attributes and act as a vehicle for information to all human sensory systems-sight, sound, touch, taste and odor. Hence, the drawbacks and methodological limitations in these studies are not farfetched as only the visually represented landscape influence there psycho-physiological assessments.

Very few research in the assessment of nature and human wellbeing relationships have adopted the real site methodology with the combined psycho-physiological mode of measurement. A study by Cole and Hall (2010) provide insights into the possibilities of wilderness contact providing opportunities for stress reduction and restoration of mental fatigue. Using a cross-sectional study design the study tried to evaluate the effect of congestion and length of time spent in the wilderness based on assessments of how much restoration was experienced and the degree to which components of the environment linked to restoration were experienced. Measured using a four page questionnaire after wilderness trips respondents reported substantial reduction in stress and tension coupled with mental restoration. Extending the research that suggests the importance of visual contact with nature as including an array of other benefits besides aesthetics in terms of psychological well-being, Ulrich, (1981) argued that visual exposure to nature environments is more beneficial in a psycho-physiological sense than exposure to environments lacking nature. The study afterwards formed the background for physiological measures in the investigation of exposure to different types of landscape scenes specifically adopting the use of alpha wave amplitude and heart rate (Ulrich, Simons, Losito, Fiorito, Miles, and Zelson, 1991).

Building upon existing research on human physiological responses in natural and urban field settings, Hartig et al., (2003) compared psycho-physiological stress recovery (Berto, 2005) and directed attention (Kaplan, 1992; Kaplan, 1995; Tennessen and Cimprich, 1995; Herzog et al.,

1997; Berto et al. 2010) restoration in both real natural and urban settings using repeated measures of ambulatory blood pressure (ABP), emotion and attention. In order to ascertain the influence of viewing images of natural scenes on human and the psychological response, Chang et al. (2008) analyze the psychological and physiological responses of participants while viewing visual stimuli of wild land scenes. Participants psychological responses were measured by the perceived stress scale (Cohen et al., 1983; Orucu and Demir, 2009; Lee, 2012; Al Kalaldeh and Shosha, 2012) while physiological responses was measured by blood volume pulse (BVP) (Marazziti, Muro and Castrogiovanni, 1992; Sarka and Mukhopadhyay, 2008; Tsunetsugu et al., 2013), electromyography (EMG) and electrocephalography (ECG) (Chang & Chen, 2005). Substantial level of agreement exists between the psychological measures of restorativeness and the three physiological responses. More recently, White (2013) contributing to this body of knowledge manipulated the content of the images by engaging participants in the control group through a slide show with virtual reality while those in the experimental condition actively explored a virtual forest. Physiological responses were also measured using the electrocardiogram (EKG), blood pressure (BP), heart rate (HR) and the respiratory sinus arrhythmia (RSA).The result of this study though largely supportive of the positive relationship between restorative environments and stress recovery suggests that a more realistic and engaging experience could yield better results in terms of recovery intervention.

Findings reveal that there seem to be a paucity and insufficiency of research on real-site nature related environments. Whilst a large body of research has been carried out on the restorative effects of nature in forests and wilderness environments, mountain environments have merely been mentioned. Extensive work remains to be carried out in the investigation of the mechanism and intricacies of the link between restorative environments, human response and wellbeing. A synergetic approach in the measurement of the psycho-physiological response(s) of individuals within a real-life multi- stimulus environment whilst employing both objective and subjective instruments is required to further extend research in the environment and human well-being domain. The Obudu mountain resort, Nigeria, endowed with rich, multi-stimulus landscape elements offers a veritable platform for this study.

8.0 RESEARCH GAP

In order to make a contribution to research in the area of restorative environment and human response, the following gaps have been identified.

I. Previous studies have been done in quasi (confined or laboratory) environments which involved participants viewing through a window or viewing nature scenes through video, picture slides and simulations. This approach is adopted basically to control experimental variables and focus is mainly on the sense of sight not multi-sensory. Thus, stimulating vital senses (smell, sound, touch, sight) which are likely to act as precedence to mental restoration and a balanced physiological experience have not been adequately considered.

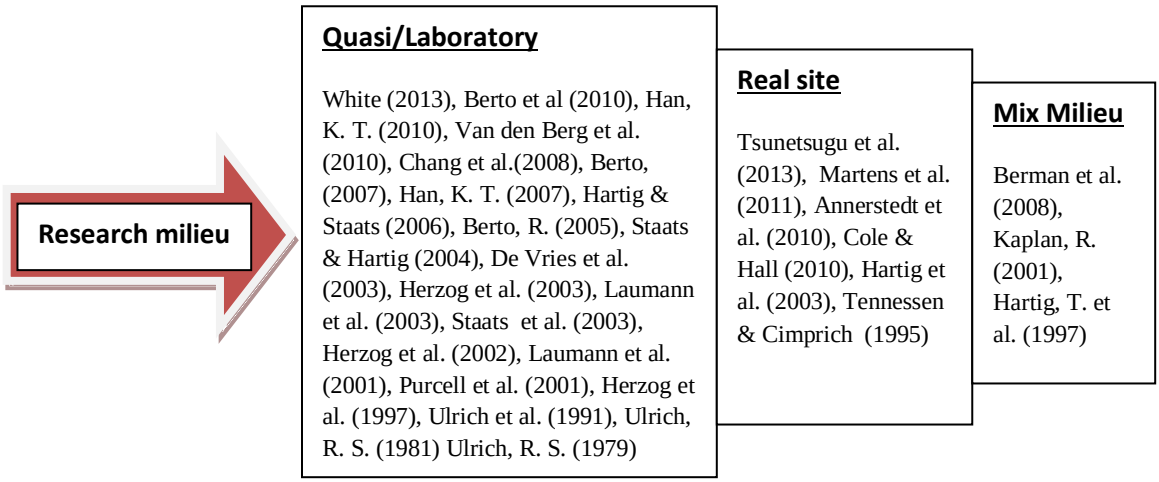

Fig. 1: Roll call of researcher's attempt to study restoration and human response in different environmental situations.

II. Most of the research carried out on real-site nature related environments has been largely done in forests while mountain environments have merely been mentioned as part of picture slides or video simulations. Extensive work remains to be carried out to cover the full range and spatial scale that exists in the mountain environment.

III. A large volume of published studies depended on psychometric self report measures to determine the magnitude of psychological human response to environmental stimuli. These psychometric self-report measures driven by consciousness, observation and mood states may be unable to detect physiological reactions to environmental stimuli (Chang and Chen, 2005). Objective measures of physiological response such as muscle tension,

skin temperature, brain waves (EEG, ECG), hand and finger movements, pupil diameter, blood pressure and heart rate are likely to reduce the chances of subjective bias in the perception and reporting of events. Very few research in the assessment of nature and human wellbeing relationships have adopted a synergetic approach of the mix of real site and psycho-physiological mode of measurement.

Table 1: Findings from previous literatures examining human response to stimuli and wellbeing

S/no.	Author/Year of publication	Research environment	Methods	Measurements
1.	Tsunetsugu et al.(2013)	Real site	4 forested and 4 urban locations	Profiles of mood states scale (POMS). Blood pressure (BP) and Heart rate (HR).
2.	White, (2013)	Laboratory	Slide show with virtual reality forest.	electrocardiogram (EKG), blood (BP), heart rate (HR) and the respiratory sinus arrhythmia (RSA)
3.	Martens et al. (2011)	Real site	Wild and tended urban forests.	Multidimensional scales in a pre-post-treatment setting using questionnaires.
4.	Annerstedt et al. (2010)	Real site	Broad leaved and coniferous forests	Mail administered survey questionnaire
5.	Berto et al (2010)	Laboratory	Picture slide of natural and built environments.	Sustained attention task. (SART), Posner's attention-orienting paradigm, Incidental memory task.
6.	Bulut et al.(2010)	Quasi	Photographic slides of waterscapes.	Scenic beauty estimation (SBE).
7.	Cole & Hall (2010)	Real site	Wilderness	Questionnaire based items
8.	Han, K. T. (2010)	Quasi	Landscape slides as visual stimuli.	Revised perceived restorativeness scale (RPRS), Short version Revised perceived restorativeness scale (SRPRS)
9.	Van den Berg et al. (2010)	Laboratory	Individual level data on health and social demographics	Dutch national survey of general complaints. National land cover classification data base. General health questionnaire. (GHQ)
10.	Van den Berg et al. (2003)	Quasi	Video sights and sounds of park-like forests and dwellings as stimuli.	Profiles of mood states scale (POMS).
11.	Berman et al. (2008)	Real site/Quasi	Walk in the park/pictures slides of urban and natural sites	Digit Span Task, Attention network task, Positive and Negative Affect Schedule (PANAS).
12.	Chang et al.(2008)	Quasi	Viewing visual slides of wild land scenes as stimuli.	Perceived stress scale, blood volume pulse (BVP), electromyography (EMG) and electrocephalography (ECG)
13.	Berto, R. (2007)	Quasi	Picture slide of natural and built environments.	Perceived restorativeness scale (PRS)

14.	Han, K. T. (2007)	Quasi	Picture slides of natural environments (desert, tundra, grassland and forests)	Short version Revised perceived restorativeness scale (SRPRS)
15.	Hartig, & Staats. (2006)	Quasi	Picture slide simulating scenes of progression of a walk through a forest and an urban Centre.	Questionnaire based items
16.	Berto, R. (2005)	Quasi	Photographs of natural built and mix of built and natural.	Sustained attention task.(SART)
17.	Staats, H. &Hartig, T. (2004)	Quasi	Picture slide simulating scenes of forest and urban Centre	Questionnaire based on a three item scale of attractive, pleasant and agreeable.
18.	De Vries et al. (2003)	Laboratory	Individual level data on health and social demographics	Dutch national survey of morbidity and interventions in general practice, Geographic information systems (GIS) data base, Perceived general health (PGH), General health questionnaire.
19.	Hartig et al. (2003)	Real site	Natural and urban field	Ambulatory blood pressure (ABP), Necker cube pattern control task (NCPCT) for attention, Inventory of personal reactions.
20.	Herzog et al. (2003)	Quasi	Color picture slides of urban and field environments as against forest natural environment is employed as a stimulus.	Perceived restorative potential (PRP) scale.
21.	Laumann et al. (2003)	Quasi	Video of natural and urban environments as stimuli.	Posner's attention orienting task and cardiac inter-beat interval (IBI)
22.	Staats et al. (2003)	Quasi	Picture slide simulating scenes of a walk through a forest and an urban Centre.	Questionnaire based on a three item scale of beautiful, nice and pleasant.
23.	Herzog et al. (2002)	Quasi	Picture slides of nature related and entertainment settings.	Questionnaire based 5-point scale items
24.	Kaplan, R. (2001).	Real site/ Quasi	Photo-based views of natural and urban settings.	Mail administered survey questionnaire
25.	Laumann et al. (2001)	Quasi	video simulations of walk through natural and urban settings	Questionnaire based items
26.	Purcell et al. (2001)	Quasi	Landscape slides as visual stimuli.	Perceived restorativeness scale (PRS).
27.	Hartig, T. et al. (1997)	Real site/ Quasi	On-site experiences, video simulations of walk through natural and urban settings and photographic slide simulations	Perceived restorativeness scale (PRS), Zuckerman's inventory of personal reactions (ZIPERS), Kuller's semantic scale.
28.	Herzog et al. (1997)	Quasi	Picture slide of ordinary natural environments against sports and entertainment environment.	Questionnaire
29.	Tennessen &Cimprich, (1995)	Real site	Window views of natural and urban settings.	Digit span forward (DSF) and backward (DSB) test, symbol digit modalities test (SDMT), Necker cube pattern control test (NCPC), attention function index (AFI), Profile of mood states scale (POMS).

30.	Ulrich et al. (1991)	Quasi	video simulations of natural and urban	Heart rate (HR), muscle tension, skin conductance and pulse transit time. Affective states ratings. Zuckerman's inventory of personal reactions (ZIPERS).
31.	Ulrich, R. S. (1981).	Quasi	Color slides as simulations of real visual environments.	Semantic scales questionnaire, Zuckerman's inventory of personal reactions (ZIPERS), Alpha wave amplitude, and heart rate.
32.	Ulrich, R. S. (1979)	Quasi	Color slides of outdoor environments.	Zuckerman's inventory of personal reactions (ZIPERS).

8.0 THEORETICAL FRAMEWORK

Recent research on the effects of nature experience has been mostly guided by three theories similar in view of the restorative qualities of nature but divergent on the specification of precursory condition and restorative process. The stress restoration theory (SRT), aesthetic-affective theory (AAT) and attention restoration theory (ART). The approach of these theories has its roots in evolution and affirms that humans are adapted through evolution to function optimally in natural environments and that the quality of restoration varies with environments (Stigsdotter et al. 2011). This evolutionary opinion which is grounded in the notion of biophilia has been a worthy encouragement for current human-nature relations research and debate despite numerous criticisms and evidential shortcomings (Hartig et al. 2011).

In view of the foregoing, Joye and van den Berg (2011) critically investigated the assumption that human restorative responses occasioned by contact with natural elements and settings are mainly adaptive character believed to have its origins from our species' long evolutionary trend in natural environments. From their analysis of the SRT's psycho-evolutionary framework, neither current empirical evidence nor conceptual arguments provide any strong support for the hypotheses of responses to nature as an age long adaptive trend. Hartig et al (2011) suggest that these assumptions of adaptive trend mainly relies on the consideration that throughout the period of our specie's evolution, humans coexisted in close association with the natural environment. The fundamental idea behind SRT however, is that an encounter with most unthreatening natural environment by stressed individuals would yield restorative benefits while many urban environment will mitigate recovery (Ulrich et al. 1991). Its focus is mainly on the emotional and physiological stress reduction benefits derivable through contact with natural environments. Thus, the proof of these human innate affiliations with nature draws from research showing

enhanced psychological wellbeing upon exposure to natural features and environment (Hartmann 2012; Han 2010; Kaplan and Kaplan 2011; Lohr and Pearson-Mims 2006; Hartig et al. 2003).

A second theory also inspired by the biophilia hypotheses is the AAT. Ulrich (1986) asserts that visual contact with most natural settings by a stressed individual is likely to foster positive feelings (emotions), hold interest and mitigate stressful thoughts resulting in recuperation. Aesthetic and affective responses are related to visual perceptions of natural environments. This notion seems a bit contrived because human perception of the environment is not restricted to vision alone but multi-sensory (Ulrich 1983). While the normal approach to perception involves the detection of a single aspect of an object in the environment by sensory mechanisms, environmental perception is concerned with a more holistic process of cognition, affect, interpretation and valuation (Fisher, Bell, and Baum 1984). Several studies attesting to the conceptualization of human nature relationship have been carried out with their main focus being on people's affective responses to nature and natural landscapes (e.g., Martens, Gutscher, and Bauer, 2011; Gullone, 2000). There exist however, an inherent readiness to react to aspects of nature in reducing or inducing stress aesthetically through our senses and our most primitive emotions (Stigsdotter et al. 2011).

Through a wilderness study, Kaplan (1992) suggests that natural environments play an essential role in human functioning through the process of restorative experience. This analogy which shares similarities with the SRT in terms of the restorative qualities of nature established the ART. Following this line of thought, Kaplan tried to emphasize that asides having a special connection to natural experience, restorative experiences are an important means of mitigating mental fatigue. He advocates that to understand the components of restorative environment namely; being away, extent, fascination and compatibility, it is necessary to assay the thought process that occur within this restorative settings with a view to differentiate it from everyday thought process. This thought process was identified in terms of two themes suggesting that; people's behavioral trends follow a pattern of the world that is etched in their mind and running that pattern effortlessly ensures the restfulness of that part of the mind that readily becomes fatigued. The ability to analyze problems and proffer solutions is one of the major accomplishments of the human mind thus ART is an advancement of the kinds of experiences that enables recovery from fatigue arising from directed attention (Kaplan, 1995).

Kaplan (1995) further crystallized the components of ART by proposing an integrative framework that subsumes both directed attention and stress in the larger context of people-environment fit relationship. He maintained that fascination is a major component of a restorative environment and can either derive from process (like rising early to catch a glimpse of a special featured animal or bird) or content (extremes of size) which can be described along two aspects of fascination. These aspects include; hard fascination, like watching auto racing and soft fascination (Adevi and Lieberg, 2012) like, walking in a natural environment (Scopelliti and Giuliani 2004). While Berto et al. (2010) hypothesize that performing an attention-orienting task in a state of attention fatigue costs less in a high fascination than in a low fascination condition, Joye, Pals, Steg, and Evans (2013) identified three core dimensions commonly attributed to the constructs of fascination within the framework of ART. These dimensions are considered (a) to indicate an attention bias towards natural environment stimuli (b) to be a relatively effortless attention which ensures that expended resources during the engagement of directed attention is not completely stressed and can be recharged slowly, and (c) to have a positive affective synthesis by being an aesthetically pleasurable experience.

Other components of ART as identified by Kaplan (1992) include being away which involves novelty and escape (Herzog et al. 2003). Novelty is the perception of the physical settings and activities within it as different from the usual while escape is the complete psychological and physiological feeling of detachment from habitual routines, situations and everyday environments (Chang et al. 2008). Extent is related to the physical or conceptual distance to a boundary. Kaplan (2001b) suggests that it is the sense of extent that determines the magnitude of that distance and how it is filled mentally. Further, for an environment to have extent it must be rich in content which is coherent enough to enhance feelings and must possess enough scope in terms of sights, experience and thoughts (Herzog et al. 1997; Berto et al. 2010). Lastly, compatibility can be described as a situation where the environment fits with and support personal intention and inclination. It is the synergetic interaction between what an individual wants to do (preference), must do (activity) and can do (action) (Staats et al. 2003; Herzog et al 2011). Over the last two decades however, ART has become a fulcrum used to explore and substantiate the claims of the benefits of contact with natural environment (Hartig et al. 1997; Joye et al. 2013).

9.0 UNDERPINNING

The philosophy behind ART which critically examined the restorative needs of humans and the distinction of environments in terms of restorativeness informed its choice as underpinning for this study. With ART, human restoration study can be situated within an autonomic mode. Its main aspect is the in-depth analysis of restoration in terms of four conceptual components of a restorative environment. These properties are not of environment only but also of a person environment interaction. However, in each of these components, the environmental configurations that are likely to contribute to restorative experience can be identified (Kaplan 2001b).

These four components (being away, extent, fascination and compatibility) is regarded by researchers evaluating encounters with natural environments as being supportive of restorative and therapeutic effects on humans . It is therefore hoped that the extension of research in this area with the use of the mountain environment, study population, measures and research designs would enrich the body of knowledge.

10.0 SCOPE AND RESEARCH LIMITATION

The focus of this study is on the psycho-physiological benefits of mountain landscape environment as stimuli for restoration of directed attention and stress mitigation. Natural habitats are known to be rich in sensory attributes and acts as a vehicle for information to all human sensory systems-sight, sound, touch, taste and odor. The Obudu Mountain resort with its characteristic plant materials, non-threatening wildlife (birds, squirrels, and butterflies), sights and sounds of moving water, views to the horizon, fountains and pools serving as habitat for fish and water lilies makes it a worthy choice for this study. It will however be compared with selected urban environments were study samples will originate from. There will be an active engagement of samples with the earlier stated environmental cues. However, this engagement will be short-lived since the period of contact with nature in this case would be within four days. The use of a real natural mountain environment instead of quasi though novel would be a courageous attempt given the procedural complexities and resources involved.

People are ceaselessly involved in perceiving, evaluating and allocating meaning to live events. This perceptions and evaluations allocate meanings to the environment which can be seen as vehicles for the processes of healing. The study will engage measures that involve the psycho-physiological processes underlying the pathways that link potential benefits of restorative environments and human response.

12.0 SIGNIFICANCE OF THE RESEARCH

Research into the psycho-physiological factors affecting stress and mental wellbeing have been actively conducted mainly in the global north countries like the United States of America, Switzerland, Sweden and Greece by various researchers (Kaplan, 1992; Kaplan, 1995; Herzog et al, 2003; Hansmann et al, 2007; Annerstedt et al, 2010). The global south (Sarkar and Mukhopadhyay, 2008; Chang et al, 2008; Tsunetsugu et al, 2013) especially Africa have recorded quite a few number of research in this context. Thus, it has become necessary to experiment with samples from this region in order to add to the existing body of knowledge which supports the link between restorative environments, human response and wellbeing. This would further substantiate claims of the universality of restorative responses.

A large percentage of these studies have been carried out within a small scope of landscape types. Given the multi-stimulus nature of Obudu mountain resort, engaging samples using more objective direct measures of psycho-physiological wellbeing like blood volume pulse (BVP) and heart rate variability (HRV) is likely to yield positive results and offer enough justification for landscape planners and architects for further nature related interventions. Policy makers, designers and developers within the locus of creating buildings and cities would eventually refer to available evidence pertaining to the potentials of mountain environments as a promoter of mental wellbeing.

13.0 RESEARCH PARADIGM AND DESIGN

Research paradigm involves the philosophical dimensions comprising the basic beliefs and assumptions about the world and technical dimensions comprising the methods and technique adopted when conducting a research (McGregor and Murnane 2010). Paramount to this study is the examination of the link between restorative environments, human response and wellbeing in a natural mountain landscape environment. Thus the school of thought that will reflect a process of scenic-quality assessment and the determination of the causes that influence effects or outcomes is most appropriate. Psychophysical, experiential and post-positivistic paradigm forms a tripartite support with which this study will be situated.

In evaluating scenic or visual landscape quality in a real environment, the psychophysical and experiential paradigm is considered. While the psychophysical paradigm focus on a population's preference for specific landscape qualities mainly consisting physical attributes in the landscape, the experiential paradigm is hinged on landscape values based on the people's interaction with the landscape (Deming and Swaffield, 2011). Post-positivism involves the development of numeric measures along the line of cause and effect, reduction of research to specific variables, hypothesis and questions, measurement and observation, and testing of theories (Creswell 2003). This position is sometimes referred to as scientific, quantitative or empirical research method.

A research design establishes specific procedures involved in the research process of data collection, analysis and interpretation. This study is designed as a cross-sectional study employing quantitative approach. A cross-sectional study measures current attitudes, actions or practice and also requires short period to administer the survey and collect information (Creswell, 2012). In order to accomplish the aim and objectives of this study, answer the research questions and fill the knowledge gap, a battery of research designs will be engaged. To this end, this study will utilize survey and experimental design that can validate the causal link between restorative environments and their effects on human response and well-being. Experimental research design seeks to ascertain and measure the degree to which an intervention (treatment) affect outcome measures either in a laboratory or field research setting (Groat, 2002). Environmental preference is closely related to restoration and is accessed by the presence of attributes within the environment that is perceived by the individual as having a potential functional significance (Van den berg et al. 2003). Objective 1 of this study seeks to identify the features (e.g. fountains, water bodies, vegetation and plant material) of the mountain

environment that can yield higher restorative benefits in terms of preference. Observational and survey protocols will be applied to generate data based on populations preference for specific landscape quality and values through interaction with the landscape.

The quality of the environment that enhance mental wellbeing relate strongly to sensory stimulation in terms of sight, smell, touch, taste, and sound (Cooper, Boyko and Codinhoto, 2009). Objective 2 pertains to the influence of the quality of the ambient mountain environment on human psycho-physiological health outcome. Experimental survey will be used to measure attributes of the ambient environment which include noise, air quality, temperature, humidity, pressure and altitude. This involves an exclusively instrumented measure with exact calibration (Groat, 2002) of the ambient environmental outcome variables.

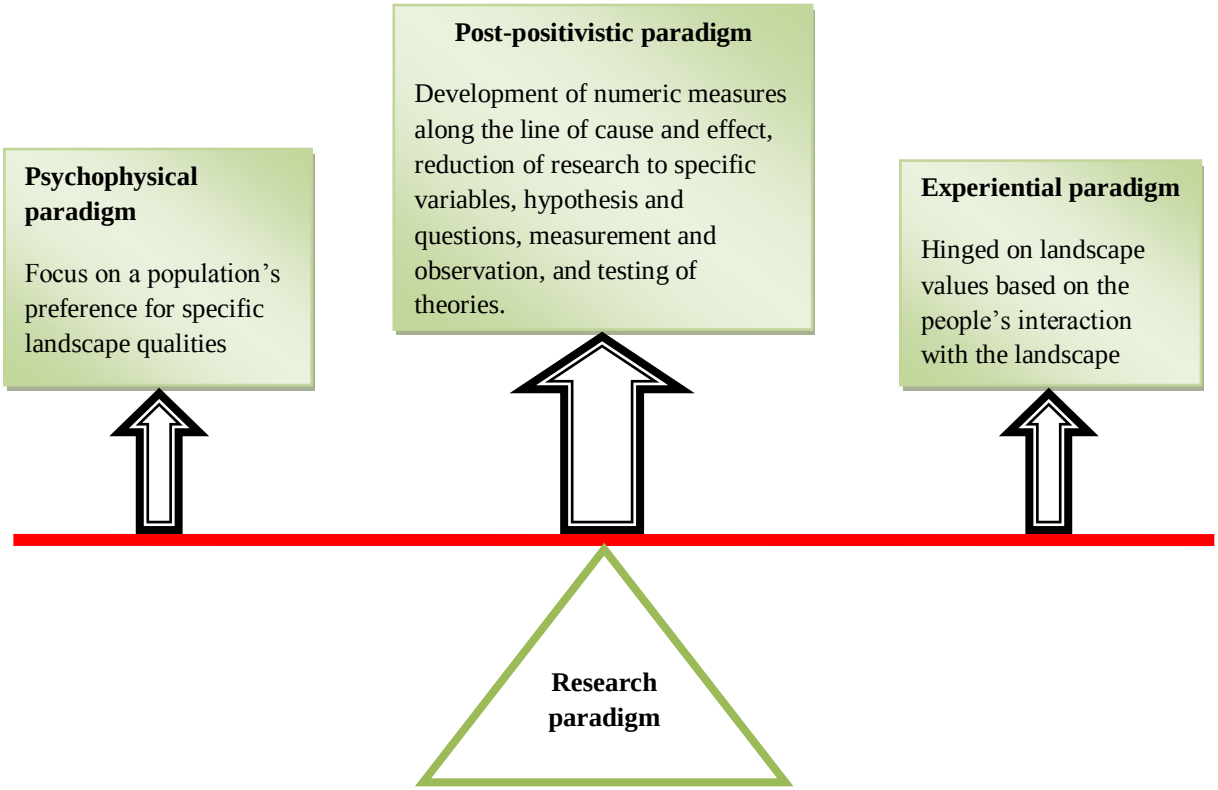

Fig. 2: Research paradigm showing philosophical dimensions comprising the basic beliefs and assumptions about the world and technical dimensions.

Finding and Engaging samples in a control experiment using more objective direct measures of psycho-physiological wellbeing like blood pressure (BP) and heart rate variability (HRV) may

likely be difficult. In the case of Objective 3, to determine the magnitude to which the mountain environments can stimulate human psycho-physiological wellbeing, the within-group experimental design would be applied. This will entail using interrupted time series design consisting of only one group studied over a period of time with multiple pretests and posttest (outcome) measures interrupted by administering interventions (Creswell, 2012).

13.1 DATA COLLECTION

The major entity or unit of analysis and focus across the questions this study strives to answer is the human being. Due to the nature of this study in terms of objective measures of physiological response such as blood pressure and heart rate, the non-probability convenience sampling will be utilized. Willing participants will be selected based on availability and convenience. They will be pooled across different job sectors in order to consider the workplace as a stress factor across industry and institutions. According to Creswell (2012) a rough estimate of sample size in each group in an experiment is approximately fifteen participants and thirty for a correlational study that relates variables. Because of the limited number of participants who may be conveniently available thirty five participants are therefore anticipated to be sufficient for this within group experimental study.

To determine the data collection strategy for this study, the variables in each research question will be identified and established. Research Question 1 will try to measure what feature of the mountain environment yield higher restorative benefits in terms of psycho-physiological wellbeing? Ulrich (1986) relates human aesthetic and affective responses to visual perceptions of natural environments. The psycho-physiological approach of data collection is based on the conceptualization of scenic beauty as a product of interaction between the environments physical features, human perception and judgmental processes (Brown and Daniel, 1984). The variables involved include human wellbeing in terms of preference (dependent variable) and environmental features (independent variables) like fountain, water bodies, vegetation, and plant material. To measure the perceived scenic quality of the mountain environment in terms of preference, the scenic beauty evaluation (SBE) instrument will be employed. This method has been variously utilized in mainly water landscapes (Bulut et al., 2010) and forest environments

(Liao and Nogami, 2000). Selected landscape areas are represented through photos to observers who rate each scene independently using scaled questionnaire.

Research Question 2 is designed to collect data pertaining to the quality of the ambient mountain environment as it relates to human wellbeing. The variables to be measured include noise, air quality, temperature, humidity, pressure and altitude (measured variables). Estech SD800 model data logger will be used to measure air quality (carbon dioxide), humidity and ambient temperature. To provide objective measurement of noise pressure levels the Estech 407750 sound level meter with personal computer (PC) interface will be used. Recommended for field use, both devices are highly rated for their accuracy and meet the American national standards institute (ANSI) and the international electrotechnical commission (IEC) type 2 standards. To measure altitude, the Germine etrex 30 handheld global positioning systems (GPS) barometric altimeter will be utilized.

Research question 3 is designed to collect data on the degree to which the natural mountain landscape environment can influence recovery from directed attention and stress. Human responses to the environment will be measured in terms of the constructs of three target variables; subjective psychological measures of perceived stress (outcome variable) and perceived restoration (predictor variable), and physiological measures involving blood pressure and heart rate (measured variable). Psychological responses which will represent the stress level (pretest) of participants prior to natural mountain environment treatment will be measured using the perceived stress scale (PSS) as developed by Cohen et al. (1983). The extensive use of the PSS by researchers (Kurina et al. 2004; Andreou et al. 2011; Leiker et al. 2012) as a tool to evaluate a person's appraisal of global stress in their life attest to its reliability and validity.

Subjective psychological measures of restoration will be measured by the perceived restorativeness scale (PRS) predictor variable consisting four set of the attention restoration components construct which describes being away, extent, fascination and compatibility (Hartig et al. 1997). Measured on a 5 point rating scale (1= strongly disagree; 5= strongly agree) Participants will score items of each of the four predictor variables based on their experience and perception of the mountain environment. This tool will be used to access posttest emotional and attention restoration. Converging research studies using the PRS have shown its reliability and

validity as a tool for measuring subjective experience and perception of the restorative potentials of the natural environment (Purcell et al. 2001; Berto, 2007; Chang et al. 2008).

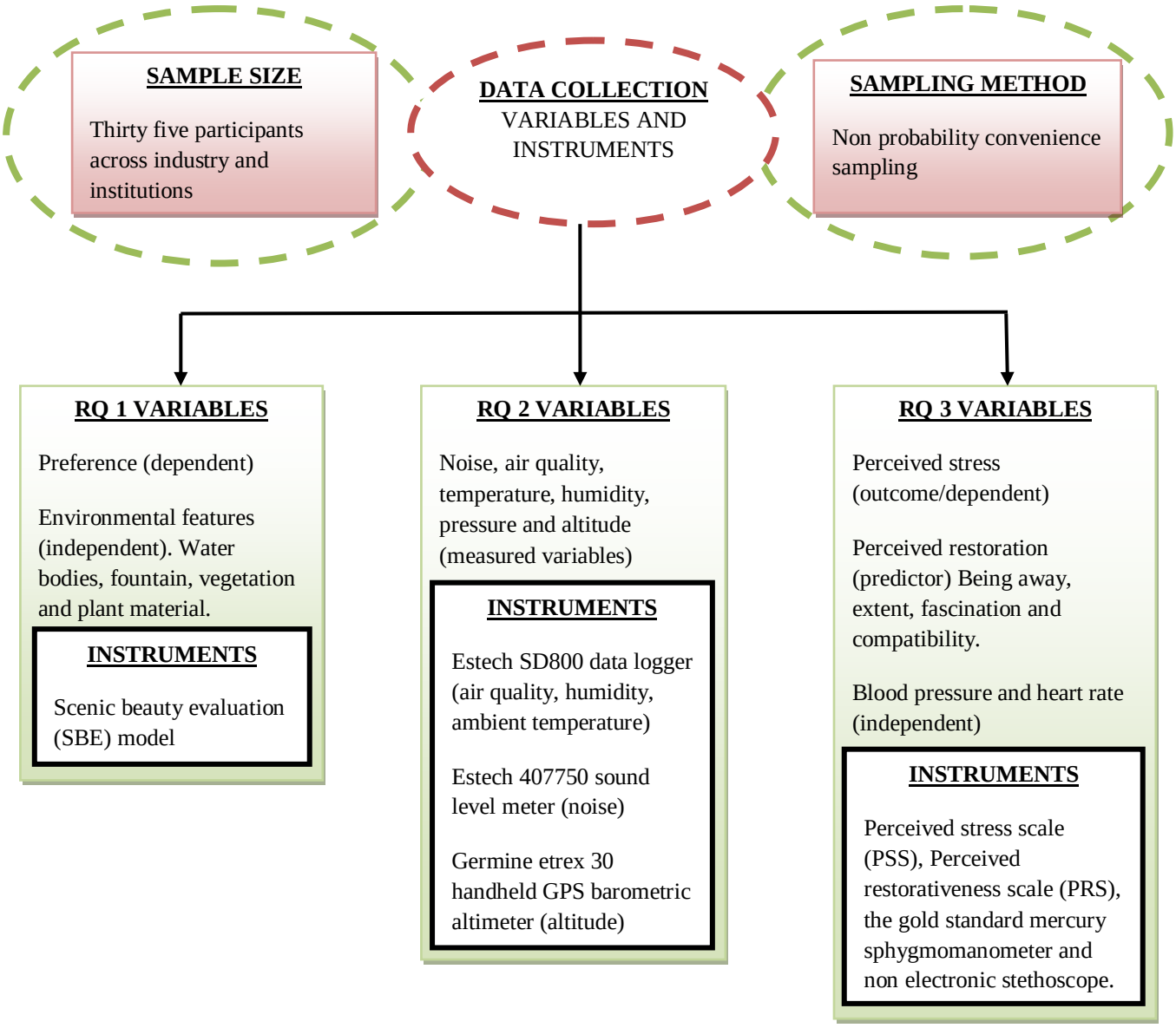

Fig 3: Schematic diagram of data collection strategies.

Through experimental research design objective physiological measures will be utilized to ascertain and measure the degree to which an intervention (treatment) affects human wellbeing in a mountain environment. Three measured variables will be considered in this case. Multiple pretest and posttest measures of Systolic blood pressure (SBP), diastolic blood pressure (DSP)

and heart rate variability will be carried out. The gold standard mercury sphygmomanometer device and a non-electronic stethoscope will be employed to measure SBP and DSP while the palpation method will be used to measure heart rate. Studies have demonstrated that the gold standard mercury sphygmomanometer device is more accurate than automated pressure monitors and traditional aneroid manometers (Basak and Karazeybek, 1999; Nelson, Kennedy, Regnerus, and Schwenile, 2008).

13.2 EXPERIMENTATION AND EXPECTED FINDINGS

This section report findings of the exploratory study of Obudu mountain resort carried out within the month of August 2013. The study was aimed at gathering data to test the constructs of the ART as it pertains to mountain environments and also to ascertain the applicability of the psycho-physiological instruments.

One aspect of the study involved fourteen participants co-opted using the non-probability convenience sampling method. Participants were in contact with the mountain environment for three days within which individual physiological measures of blood pressure and heart rate were recorded consecutively. Results as shown in Figure 4 indicate a mean difference in readings of the systolic/diastolic blood pressure and heart rate. While the mean systolic blood pressure varied at 123mm Hg (day 1), 118mm Hg (day 2), and 116mm Hg (day 3), mean diastolic blood recorded 83mm Hg (day 1), 78mm Hg (day 2), and 75mm Hg (day 3). Mean heart rate readings were 88bpm, 78bpm, and 78bpm for the three consecutive days.

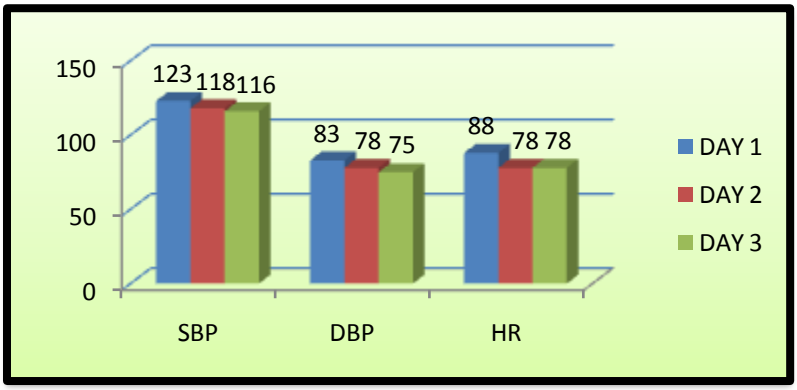

Fig 4: Systolic/diastolic blood pressure and heart rate readings of participants for the three consecutive days.

Table 1 shows systolic and diastolic blood pressure categories as defined by the American heart association (AHA). The category ranged from normal, high blood pressure to hypertensive crisis. Though Physiological responses of participants BP and HR largely support the positive relationship between restorative environments and stress reduction, this study is deficient in terms of experimentation. Pretest protocols were not observed before intervention was encountered in the mountain resort thus subjecting the study to experimental bias and results obtained may be skewed. Hence, further studies would seek to engage the full measure of pretest, intervention and posttest protocols.

Table 2: Systolic and Diastolic blood pressure categories

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (Upper)		DIASTOLIC mm Hg (Lower)
Normal	Less than 120	and	Less than 80
Pre-hypertension	120-139	or	80-89
High blood pressure (hypertension) stage 1	140-159	or	90-99
High blood pressure (hypertension) stage 2	**160 or higher**	or	**100 or above**
Hypertensive crisis (Emergency care needed)	**Higher than 180**	or	**Higher than 110**

Source: Adopted from American Heart Association (www.heart.org)

The second aspect of the exploratory study involved subjective psychological measures of perceived stress and perceived restorativeness. Twenty two (12 males, 9 females, 1 missing) respondents were randomly co-opted at the study site. Their perception of stress was measured using the Perceived Stress Scale (PSS) as a primary psychological stress instrument while there perceived restoration was measured using the Perceived Restorativeness Scale (PRS). The 14 item Cohen et al. (1983) version of perceived stress scale was utilized with a little revision on the construct of a few. Participants scored the 14 items 5 point rating scale (1= never; 5=very often) based on their feelings and thoughts in the last month. The perceived restorativeness scale (Hartig et al, 1997) consist of four set of the attention restoration components which describes being away, extent, fascination and compatibility. Participants scored items of the four variables on a 5 point rating scale (1= strongly disagree; 5= strongly agree) based on their perception and experience of the natural mountain resort environment.

The PSS and PRS Internal consistency reliability test shows acceptable coefficient alpha across the scores except for two items with low coefficient alpha that were manipulated. The result of Pearson correlation coefficients show that PSS is significantly related to fascination and age while being away, extent, compatibility and length of days were not significant. However, there is the likelihood of bias arising from individuals subjective perception since the PSS was administered on site and not before intervention as the case may be. The number of respondents may also add to the bias in results obtained. On the whole, further study will administer the PSS in a pre-intervention scenario and also take into cognizance the use of more respondents in the determination of perceived stress and perceived restoration.

13.2.1 EXPECTED FINDINGS

Barring every other extraneous force it is expected that short term effects of contact with a natural mountain environment will yield experienced restorative outcome. In addition, the immediate short term changes in the psychological mood states and physiological changes of an individual will demonstrate that given a multi-stimulus mountain environment conditions, one can effectively experience reduced acute stress of various intensities.

REFERENCES

Adams, E. (2001). A proposed causal model of vocational teacher stress. Vocational education and training, 53(2), 223-246.

Adevi, A. A. & Lieberg, M. (2012). Stress rehabilitation through garden therapy: A care giver perspective on factors considered most essential to the recovery process. Urban Forestry and Urban Greening, 11, 51-58.

Al Kalaldeh M. T. & Abu Shosha G. M. (2012). Application of the perceived stress scale in health care studies: an analysis of literature. Academic research, 4(4), 45-50.

Andreou, E., Alexopoulos, E. C., Lionis, C., Varvogli, L., Gnardellis, C., Chrousos, G. P., & Darviri, C. (2011). Perceived stress scale: Reliability and Validity Study in Greece. Environmental Research and Public Health, 8, 3287-3298.

Annersted, M., Norman, J., Boman, M., Mattsson, L., Grahn, P., & Wahrborg, P. (2010). Finding stress relief in a forest. Ecological bulletins, 53, 33-42.

Basak, O. and Karazeybek, S. (1999). Accuracy of sphygmomanometers. Tr. J. of medical sciences, 29, 487-491.

Bergdahl, J., & Bergdahl, M. (2002). Perceived stress in adults: prevalence and association of depression, anxiety and medication in a Swedish population. Stress and health, 18,235-241.

Berman, M. G., Jonides, J. and Kaplan, S. (2008). The cognitive benefits of interacting with nature. Psychological science, 19 (12), 1207-1212.

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. Environmental psychology, 25, 249-259.

Berto, R. (2007). Assessing the restorative value of the environment: a study on the elderly in comparison with young adults and adolescents. International journal of psychology, 42:5, 331-341.

Berto, R., Baroni, M.R.,Zainaghi, A., & Bettella, S. (2010). An exploratory study of the effect of high and low fascination environments on attentional fatigue.Environmental psychology, 30, 494-500.

Blix, A. G., & Lee, J. W. (1991). Occupational stress among university administrators. Research in higher education, 32(3).

Bratman, G. N., Hamilton, J. P., & Daily, G. C. (2012). The impacts of nature experience on human cognitive function and mental health. Ann. N. Y. Acad. Sci. 1249, 118-136.

Brown, T. C., & Daniel, T. C. (1984). Modeling forest scenic beauty: concepts and application to Ponderosa pine. U.S. Dep. Agric. Forest Service Research Paper RM-256, Rocky Mountain Forest and Range Experience Station Ft. Collins, Colorado.

Bulut, Z., Karahan,F., &Sezen, I. (2010). Determining visual beauties of natural waterscapes: a case study of Tortum valley.Scientific research and essay, 5:2, 170-182.

Burchfield, S. R. (1979). The stress response: a new perspective. Psychosomatic medicine, 41 (8), 661-672.

Chang, C. Y., Hammitt, W. E., Chen, P. K., Machnik, L., & Su, W. C. (2008). Psychophysiological responses and restorative values of natural environments in Taiwan. Landscape and urban planning, 85, 79-84.

Chang, C. Y. & Chen, P. K. (2005). Human response to window views and indoor plants in the workplace. Hortscience, 40 (5), 1354-1359.

Chen,W., Wong, T., & Yu, T. (2001). Reliability and validity of the occupational stress scale for chinese off-shore oil installation workers. Stress and health, 17, 175-183.

Cohen, S., Karmarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. Health and social behavior, 24, 385-396.

Cole, D.N., & Hall, T.E. (2010).Experiencing the restorative components of wilderness environments: Does congestion interfere and does length of exposure matter. Environment and Behavior, 42:6,806-823.

Cooper, R., Boyco, C., & Codinhoto, R. (2009). The effects of the physical environment on mental wellbeing. In: Cooper, C. L., Field, J., Goswami, U., Jenkins, R., & Sahakian, B. J. (Eds.), Mental capital and wellbeing. USA, Wiley-Blackwell. pp. 967-1006.

Creswell, J. W. (2003). Research design: Qualitative, quantitative and mixed method approaches. London, Sage publications.

Creswell, J. W. (2012). Educational Research: Planning, conducting, and evaluating quantitative and Qualitative research. (4th ed). USA: Pearson Education Inc.

Chrousos, G.P. (2009). Stress and disorders of the stress system. Nat. Rev. Endocrinol, 5, 374-381.

De Vries, S., Verheij, R.A., Groenewegen, P.P., & Spreeuwenberg, P. (2003).Natural environments-healthy environments? An exploratory analysis of the relationship between green space and health. Environment and planning, 35, 1717-1731.

Deming, M. E., & Swaffield, S. (2011). Landscape Architecture Research: Inquiry, strategy, design. New Jersey, NJ: John Wiley & Sons, Inc.

Donovan, G. H., Butry, D. T., Michael, Y. L., Prestemon, J. P., Liebhold, A. M., Gatziolis, D., and Mao, M. Y. (2013). The relationship between trees and human health. Am. J. prev. med., 44 (2), 139-145.

Evangelos, C .K., & Anastasia K. (2004). The stress process, self-efficacy expectations, and psychological health. Personality and individual differences, 37, 1033-1043.

Fielden, S. L., & Pecker, C. J. (1999). Work stress and hospital doctors: a comparative study. Stress medicine, 15, 137-141.

Fisher, J. D., Bell, P. A. & Baum, A. (1984). Environmental psychology. New York: Holt, Rinehart and Winston.

Folkman, S., Lazarus, R. S., Gruen, R. J. and Delongis, A. (1986). Appraisal, Coping, Health status and Psychological symptoms. Personality and Social Psychology, 50, (3), 571-579.

Goldstein, D. S. & Kopin, I. J. (2007). Evolution of concepts of stress. Stress, 10, (2), 109-120.

Grinde, B., & Patil, G. G. (2009). Biophilia: Does visual contact with nature impact on health and well-being? Int. J. Environ. Res. Public health, 6, 2332-2343.

Groat, L. (2002). Experimental and quasi experimental research. In: Groat, L., & Wang, D. (Eds), Architectural research methods. Canada, John Wiley and sons, Inc.

Gullone, E. (2000). The biophilia hypothesis and life in the 21st century: Increasing mental health or increasing pathology? Journal of happiness studies, 1, 293-321.

Han, K. T. (2007). Responses to six major terrestrial biomes in terms of scenic beauty, preference and restorativeness. Environment and Behaviour, 39: 4,529-556.

Han, K. T. (2010). An exploration of relationships among the responses to natural scenes: Scenic beauty, preference, and restoration. Environment and Behaviour, 43:2, 243-270.

Hansmann, R., Hug, S., & Seeland, K. (2007). Restoration and stress relief through physical activities in forests and parks. Urban forestry and urban greening, 6, 213-225.

Hartig, T., Evans, G. W. (1993). Psychological foundations of nature experience. In: Garling, T., and Golledge, R. G. (eds). Behaviour and environment: Psychological and geographical approaches. Netherlands, Elsevier Science Publishers B. V. 427-457.

Hartig, T., Korpela, K., Evans, G. W., &Garling, T. (1997).A measure of restorative quality in environments. Scandinavian housing and planning research. 14:4, 175-194.

Hartig, T., Evans, G.W., Jamner, L.D., Davis, D.S., & Garling, T. (2003). Tracking restoration in natural and urban field settings. Environmental psychology, 23, 109-123.

Hartig, T. & Staats, H. (2006). The need for psychological restoration as a determinant of environmental preference. Environmental psychology, 26, 215-226.

Hartig, T., Van den Berg, A. E., Hagerhall, C. M., Tomalak, M., Bauer, N., Hansmann, R., Ojala, A., Syngolliton, E., & Carrus, G. (2011). Health benefits of nature experience: psychological, social, and cultural processes. In: Nilsson, K., Sangster, M., Gallis, C., Hartig, T., Vries de, S., Seeland, K., & Schipperrijn (eds.), Forests, trees and human health. Springer Science Business and Media. Dordrecht. pp. 127-168.

Hartmann, P. (2012). Emotional responses to nature in advertising and real nature. In: Eisend M. et al. (eds.) Advances in advertising research (vol III). Gabler Verlag/Springer Fachmedian Wiesbaden.

Hashim, I. H., and Zhiliang, Y. (2003). Cultural and gender differences in perceiving stressors: A cross-cultural investigation of African and western students in Chinese colleges. Stress and Health, 19, 217-225.

Herzog,T. R., Black, A. M., Fountaine, K. A., & Knotts, D. J. (1997). Reflections and attentional recovery as distinctive benefits of restorative environments. Environmental psychology, 17, 165-170.

Herzog, T. R., Chen, H. C., & Primeau, J. S. (2002). Perception of the restorative potential of natural and other settings. Environmental Psychology, 22, 295-306.

Herzog, T. R., Maguire,C. P., & Nebel, M.B. (2003). Accessing the restorative components of environments. Environmental psychology, 23, 159-170.

Herzog, T. R., Hayes, L. J., Applin, R. C. & Weatherly, A. M. (2011) Compatibility: An experimental demonstration. Environment and Behavior, 43 (1), 90-105.

Hobfoll, S.E. (1989). Conservation of resources: A new attempt at conceptualizing stress. American psychologist, 44 (3), 513-524.

Jackson, L. E. (2003).The relationship of urban design to human health and condition. Landscape and urban planning, 64, 191-200.

Joye, Y. & Van Den Berg, A. E. (2011). Is love for green in our genes? A critical analysis of evolutionary assumptions in restorative environments research. Urban Forestry and Urban Greening, 10, 261-268.

Joye, Y., Pals, R., Steg, L. & Evans, B. L. (2013). New methods for assessing the fascinating nature of nature experiences. PLosONE, 8 (7). E65332.

Kaplan, S. (1992). The restorative environment: nature and human experience. In: Relf, D. (Ed.) The role of horticulture in human well-being and social development (pp. 134). Portland, Oregon: Timber press

Kaplan, S. (1995). The restorative benefits of nature: towards an integrative framework. Environmental psychology, 15, 169-182.

Kaplan, R. (2001). The nature of the view from home: psychological benefits. Environment and behavior, vol. 33, no. 4, 507-542.

Kaplan, S. (2001b). Meditation, restoration and the management of mental fatigue. Environment and behavior, 33(4), 480-506.

Kaplan, R. & Kaplan, S. (2011). Well-being, reasonableness, and the natural environment. Applied Psychology: Health and well-being, 3 (3), 304-321.

Karademas, E. C., & Kalantzi-Azizi, A. (2004). The stress process, self-efficacy expectations, and psychological health. Personality and individual differences, 37, 1033-1043.

Kurina, L. M., Schneider, B., & Waite, L. J. (2004). Stress, symptoms of depression and anxiety, and cortisol patterns in working parents. Stress and health, 20, 53-63.

Lafortezza, R., Carrus,G., Sanesi, G., & Davies, C. (2009). Benefits and well-being perceived by people visiting green spaces in periods of heat stress. Urban forestry and urban green, 8, 97-108.

Laumann, K., Garling,T., & Stormark, K. M. (2001). Rating scale measures of restorative components of environments. Environmental psychology, 21, 31-44.

Laumann, K., Garling,T., & Stormark, K. M. (2003). Selective attention and heart rate responses to natural and urban environments. Environmental psychology, 23, 125-134.

Lee, E. H. (2012). Review of the psychometric evidence of the perceived stress scale. Asian nursing research, 6, 121-127.

Leiker, C. B., Kostick, M., Lei, M., McPherson, S., Roper, V., Hoekstra, T., & Wright, B. (2012). Measurement invariance of the perceived stress scale and latent mean difference across gender and time. Stress health, Doi: 10.1002/smi. 2463.

Liao, W., and Nogami, K. (2000). A fuzzy-logic-based expert system for near-view scenic beauty evaluation of Hinoki forest. Journal of forest research, 5, 139-144.

Lohr, V. I. & Pearson-Mims, C. H. (2006). Responses to scenes with spreading rounded, and conical tree forms. Environment and Behaviour, 38 (5), 667-688.

Lottrup, L.,Grahn, P.,& Stigsdotter, U.K. (2013). Workplace greenery and perceived level of stress: Benefits of access to a green outdoor environment at the workplace. Landscape and urban planning, 110, 5-11.

Marazziti, D., Muro, A. D., & Castrogiovanni, P. (1992). Psychological stress and body temperature changes in humans. Psychology and behavior, 52, 393-395.

Martens,D., Gutscher, H., & Bauer, N. (2011). Walking in the wild and tended urban forests: the impact on psychological well-being. Environmental psychology, 31, 36-44.

McGregor, S. L. T., & Murnane, J. A. (2010). Paradigm, methodology and method: Intellectual integrity in consumer scholarship. International journal of consumer studies, 34 (4), 419-427.

Nelson, D., Kennedy, B., Regnerus, C., and Schwenile, A. (2008). Accuracy of the automated blood pressure monitores. Journal of dental hygiene, 82 (4).

Neylan, T. C. (1998). Hans Selye and the field of stress research. Neuropsychiatry Classics, 10 (2), 230-231.

O'Craven, K. M., Rosen, B. R., Kwong, K. K., Treisman, A., & Savoy, R. L. (1997). Voluntary attention modulates Fmri activity in human MT-MST. Neuron, 18, 591-598.

Orucu, M. C., & Demir, A. (2009). Psychometric evaluation of perceived stress scale for Turkish university students. Stress and health, 25, 103-109.

Park, K. O., & Wilson, M. G. (2003). Psychosocial work environments and psychological strain among Korean factory workers. Stress and health, 19, 173-179.

Peltzer, k.,Shisana, O., Zuma, K., Wyk, B. V., & Zungu-Dirwayi, N.(2008).Job stress,job satisfaction and stress-related illness among south African educators. Stress and health, 25, 247-257.

Purcell, T., Peron, E., & Berto, R. (2001). Why do preferences differ between scene types. Environment and Behaviour, vol. 33, no. 93.

Quick, J. C., Nelson, D. L., Quick, J. D., & Orman, D. K. (2001). An isomorphic theory of stress: the dynamics of person-environment fit. Stress and health, 17, 147-157.

Raanaas, R. K., Patil, G. G., & Hartig, T. (2011). Health benefits of a view of nature through the window: a quasi experiment study of patients in a residential rehabilitation centre. Clinical rehabilitation, 26 (1), 21-32.

Sarka, S., & Mukhopadhyay, B. (2008). Perceived psychosocial stress and cardiovascular risk:observations among the Bhutias of Sikkim,India. Stress and health, 24, 23-34.

Scopelliti, M. & Giuliani, M. V. (2004). Choosing restorative environment across the lifespan: A matter of place experience. Environmental Psychology, 24, 423-437.

Selye, H. (1976). Forty years of stress research: Principal remaining problems and misconceptions. Canadian medical association journal, 115 (1), 53-56.

Staats, H., Kievet, A. & Hartig, T. (2003). Where to recover from attentional fatigue: An expectancy-value analysis of environmental preference. Environmental Psychology, 23, 147-157.

Staats, H. & Hartig, T. (2004). Alone or with a friend: A social context for psychological restoration and environmental preferences. Environmental psychology, 24, 199-211.

Stigsdotter, U. K., Palsdottir, A. M., Burls, A., Chermaz, A., Ferrini, F., & Grahn, P. (2011). Nature-based therapeutic interventions. In: Nilsson, K., Sangster, M., Gallis, C., Hartig, T., Vries de, S., Seeland, K., & Schipperrijn (eds.), Forests, trees and human health. Springer Science Business and Media. Dordrecht. pp. 309-342.

Tennessen, C. M., & Cimprich, B. (1995). Views to nature: Effects on attention. Environmental psychology, 15, 77-85.

Thompson, C. W. (2011). Linking landscape and health: the recurring theme. Landscape and urban planning, 99, 187-195.

Tsaur, S. H., & Tang, Y. Y. (2012). Job stress and well-being of female employees in hospitality: the role of regulatory leisure coping styles. Hospitality management, 31, 1038-1044.

Tsunetsugu, Y., Lee, J., Park, B., Tyrvainen, L., Kagawa, T., & Miyazaki, Y. (2013). Physiological and psychological effects of viewing urban forests landscapes assessed by multiple measurements.Landscape and urban planning, 113, 90-93.

Ulrich, R. S. (1979). Visual landscapes and psychological well-being. Landscape research, 4:1,17-23.

Ulrich, R. S. (1981). Natural versus urban scenes: Some psychophysiological effects. Environment and Behaviour, 13:5,523-556.

Ulrich, R. S. (1983). Aesthetic and affective response to natural environment. In Altman, I. & Whlwill, J. F. (eds). Behaviour and the natural environment. Springer US, 6, 85-125. Doi: 10. 1007/978-1-4613-3539-9_4.

Ulrich, R. S. (1984). View through a window may influence recovery from stress. Science, 224 (4647), 420-421.

Ulrich, R. S. (1986). Human responses to vegetation and landscapes. Landscape and urban planning, 13, 29-44.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A. & Zelson, M. (1991). Stress recovery during exposure to natural and urban environment. Environmental Psychology, 11, 201-230.

Van den berg, A. E., Koole, S. L., & Van den Wulp, N. Y. (2003). Environmental preference and restoration: (How) are they related? Environmental psychology, 23, 135-146.

Van den berg, A.E., Maas, J., Verheij, R.A., & Groenewegen, P.P. (2010). Green space as a buffer between stressfull life events and health. Social science and medicine, 70, 1203-1210.

Velarde, M. D., Fry, G. & Tveit, M. (2007). Health effects of viewing landscapes-landscape types in environmental psychology. Urban forestry and urban greening, 6, 199-212.

Voight, M. (2009). Sources of stress and coping strategies of US soccer officials. Stress and health, 25, 91-101.

White, K. E. (2013). The role of nature in physiological recovery from stress: A critical examination of restorative environments theory. Graduate school thesis and dissertations. Retrieved from http://scholarcommons.usf.edu/etd/4791.

Wickramasinghe, V. (2010). Work-related dimensions and job stress; the moderating effect of coping strategies. Stress and health, 26, 417-429.

Wu, S., Zhu, W., Li, H., Wang, Z., & Wang, M.(2008). Relationship between job burnout and occupational stress among doctors in China. Stress and health, 24, 143-149.

Zurlo, M. C., Pes, D., & Cooper, L. (2007). Stress in teaching: a study of occupational stress and its determinants among Italian school teachers. Stress and health, 23, 231-241.