

NATURE BASED THERAPEUTIC IMPACT OF BORROWED LANDSCAPE ON THE STRESS REDUCTION OF SECONDARY SCHOOL TEACHERS

WELANGE W.I.M.A.R.^{1*}, CHANDRASEKARA D.P.² & DHARMASENA J.³

^{1, 2, 3} Department of Architecture, University of Moratuwa, Sri Lanka

¹achinirathnemali@gmail.com, ²dpcha@uom.lk, ³jdarch@outlook.com

Abstract: Stress among public secondary school teachers has become a worldwide issue owing far reaching implications. Since the nature has therapeutic effects, incorporating natural borrowed views in to the working places have the ability to reduce stress. With the objective of examining the stress management of public secondary school teachers using natural borrowed views, set in the WP/GM Bandaranayake College, a pilot study was executed among 40 male and female teachers which proved that the majority of both male and female teachers were under stress according to the stress scale. Then, the most preferred views were identified through a structured questionnaire, such as greenery, water and sky. Accordingly, five 3D borrowed views were simulated for the main study, resulting significantly better responses on stress management tests among the participants. The results concluded that female teachers are more stressed than male teachers and both male and female teachers prefer to observe a borrowed view of a combination of natural elements, rather than solely observing each element. Further, it was found that there is no impact of gender towards the therapeutic impact of nature on humans. The findings invite future researches to conduct more studies related stress management and designing healthy working environments.

Keywords: *School landscape, Stress among public secondary school teachers, Therapeutic effect of nature, Borrowed landscape, Stress management.*

1. Introduction

Emotional wellbeing is the key to good physical health. WHO (2011) declared mental fatigue occurred due to stress, as the health epidemic of 21st century. "Stress" includes certain physiological and psychological responses of body towards circumstances where wellbeing is threatened (Faraday, 1982) Thus, maintaining optimal psychological health is essential for a healthy life (Nilson, Sangster, Gallis, & Hartvig, 2011).

The stress occurred due to the occupation is called occupational stress while stress among public secondary school is a worldwide concern without any difference to Sri Lanka. This situation has detrimental effects on both the individual and the future of an entire society too. Within the spectrum of causes contributing to the prevailing stress among teachers, their working environment plays a major role determining their overall state of mental health.

Nature is the essential dose of medicine to the overall physical, psychological and social wellbeing of human beings. Therapeutic quality of nature has the ability to influence overall mental and physical wellbeing (Maller, Townsend, & Prior, 2005). There are three approaches of exposure to nature which serve therapeutic effects on human beings, such as physically being near to nature, visually contacting with nature and engaging activities in nature (Sythser, 2006).

The best way of incorporating contact with nature in to the working environment of teachers is integrating natural views to work station. Having a distant landscape to near proximity is called "borrowed landscape" (Makhzoumi, 2015). Consequently, through this study, the stress management among public secondary school teachers through natural borrowed views is examined. And the importance of good school landscapes and merging natural borrowed views to the working environment of public secondary school teachers is emphasized towards reducing their stress as well as improving the overall health.

1.1. NEED AND OBJECTIVES OF THE STUDY

Limited researches has been conducted in understanding the specific influence of borrowed landscapes, natural elements, contribute towards stress management. Correspondently a significant research gap exists in exploring the therapeutic impact of borrowed landscapes on stress reduction among public secondary school teachers. From the study, it is determined to investigate this novel area with the objectives of,

- To recognize strategies for reducing the occupational stress among public secondary school teachers through landscape interventions.

*Corresponding author: Tel: +94768775072 Email Address: achinirathnemali@gmail.com

DOI: <https://doi.org/10.31705/FARU.2024.16>

- To identify the perception of the teachers towards the outdoor landscape of their working environment and discover a chronological order of the preference and therapeutic effect through natural borrowed views according to a percentage of the comprised natural elements.
- To understand the effect of gender, towards stress reduction among public secondary school teachers through the natural borrowed landscape views.

2. Literature Synthesis

2.1. LANDSCAPE AND HUMAN PERCEPTION

Perception is a process of gathering information through the senses, organizing, and processing which is a dynamic process that occurs between an organism and its surrounding (Kaplan et al., 1989). Human perceptual tools gather, organize, and interpret these encounters so that people can get familiar with their surroundings, form mental representations, and behave appropriately. Hence, personal experience, cultural context, and perceived interpretation are the factors that directly affect human perception (Samuelsson et al., 2018). Accordingly, interactions between a human and a landscape produce the perception towards the landscape (Goldenweiser, 1937). And the perception of an individual towards a place is affected by the characteristics of a place as well (Tyrvaäinen et. al., 2007). Sight is often considered to be the most important sense and accounts for more than 80% of sensory data (Porteous, 1996).

2.2. OCCUPATIONAL STRESS AMONG PUBLIC SECONDARY SCHOOL TEACHERS AND STRESS MEASUREMENT

2.2.1 Occupational stress among public school teachers

Occupational stress can be interpreted as the behavioral and psychological reactions of an individual which potentially compromise the health, with behavioral and psychophysiological consequences, when the demands of the workplace are incompatible with an individual's abilities, resources, or needs (Trandafir, 2015). Teaching is regarded as one of the most difficult and a stressful career which is becoming even more difficult with the time (Wickramasinghe, Seneviratne, Gunawardana, & Sumathipala, 2022). In the field of education, secondary school teachers have to bear an additional load of responsibility as they have to interact with teenage students (Howard & Bruce Johnson, 2004). An experiment has proven that when it came to interactions with students, colleagues, and workload, female teachers has had much greater levels of occupational stress than the male teachers (C.M.Kokkinos, G. Panayiotou, & A.M. Davazoglou, 2005). Someone who is stressed is one who experiences uncontrollable emotions and as a teacher with a high level of stress, it might bring detrimental impacts on both the individual and the children too (Rupp, 2005).

Among the factors contributing to the occupational stress among the teachers, the working environment of the school landscape that they have deal on a daily basis plays the major role (Jessica L. Grayson & Heather K. Alvarez, 2007). Hence, it is important to find salutogenic approaches to reduce stress in promoting overall health of the teachers (Gorard & C. Taylor, 2004).

2.2.2 Stress measurement

Within the two categories of measuring stress, psychological questionnaires include abstract concepts (Lupien, 2013). Among them, DASS-21 standard questionnaire is used to measure depression, anxiety and stress level of people by three scales according to the responses.

(1) The depression scale	This scale measures depression, negative self-esteem
(2) The anxiety scale	Evaluates situational anxiety, and anxiety experience
(3) The stress scale	Measures negative affection and stress. The assessor asks the subject to consider their recent experiences and choose the response
Items related to Depression	3, 5, 10, 13,16,17,21
Items related to Anxiety	2, 4, 7, 9,15,19,20
Items related to stress-	1, 6,8,11,12,14,18

Figure 1, Self scales of the DASS- 21 Standard Questionnaire

Potential answer	Given mark
Never	0
Sometimes	1
Often	2
Almost always	3

Figure 2, Potential answers and given mark for the questionnaire

Level	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely severe	28+	20+	34+

Figure 3, DASS- 21 Score Interpretation

DASS21		Name:	Date:
Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you <i>over the past week</i> . There are no right or wrong answers. Do not spend too much time on any statement.			
<i>The rating scale is as follows:</i>			
0 Did not apply to me at all			
1 Applied to me to some degree, or some of the time			
2 Applied to me to a considerable degree, or a good part of time			
3 Applied to me very much, or most of the time			
1	I found it hard to wind down	0	1 2 3
2	I was aware of dryness of my mouth	0	1 2 3
3	I couldn't seem to experience any positive feeling at all	0	1 2 3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1 2 3
5	I found it difficult to work up the initiative to do things	0	1 2 3
6	I tended to over-react to situations	0	1 2 3
7	I experienced trembling (eg, in the hands)	0	1 2 3
8	I felt that I was using a lot of nervous energy	0	1 2 3
9	I was worried about situations in which I might panic and make a fool of myself	0	1 2 3
10	I felt that I had nothing to look forward to	0	1 2 3
11	I found myself getting agitated	0	1 2 3
12	I found it difficult to relax	0	1 2 3
13	I felt down-hearted and blue	0	1 2 3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1 2 3
15	I felt I was close to panic	0	1 2 3
16	I was unable to become enthusiastic about anything	0	1 2 3
17	I felt I wasn't worth much as a person	0	1 2 3
18	I felt that I was rather touchy	0	1 2 3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1 2 3
20	I felt scared without any good reason	0	1 2 3
21	I felt that life was meaningless	0	1 2 3

Figure 4, DASS- 21 Standard Questionnaire

2.3. THERAPEUTIC IMPACT OF NATURE AND NATURAL BORROWED LANDSCAPES AS THERAPEUTIC LANDSCAPES TOWARDS STRESS REDUCTION

2.3.1 Therapeutic impact of nature

Wilson & Kellert (1993), introduce “Biophilia hypothesis” claiming that the genetics and evolutionary background play a role in our innate love towards nature, which experienced by all human beings as a universal trait. Interacting with natural environment is therapeutic (Ward Thompson et al., 2016).

According to epidemiological research, contact with blue and green spaces is able to calm the nervous system (T.Takano, K.Nakamura, & M.Watanabe, 2002). At the same time, contact with nature is crucial for promoting health to survive as a species (S.Völker & T.Kistemann, 2015).

2.3.2 Natural borrowed landscapes as therapeutic landscapes towards stress reduction

Borrowed landscape is the term for the concept of incorporating a backdrop view into another landscape (Compton, 2004; Lee & Cheon, 2007; Makhzoumi, 2015; Oh, 2013). It serves as a tool for bringing distant perspective in to human perception while playing a crucial role in building relationship between physical world and mental world of human (Du, & Sun, 2012).

Trees, grass, bushes, lakes and no sign of human influence are the characteristics of natural views whereas buildings, streets and other human influenced environments are the characteristics of manmade views. For people indoors, window views encourage recuperation and stress levels can be decreased by observing nature from a distant (Lau et al., 2014). For people outdoors, window views encourage recuperation and stress levels can be decreased by observing nature from a distant (Lau et al., 2014). It has been proven that in education, having natural views around them are able to serve a significant positive impact on both the educator and the learners (Lindemann-Mattheies et al., 2021).

3. Theoretical Framework

3.1. RELATED THEORIES

3.1.1 Attention restoration theory

According to Kaplan (1995), spending time in nature serves psychological therapeutic benefits and reduces people's mental fatigue while improving their cognitive health. And he presents four restorative qualities of the environment.

Table 1, Restorative qualities

Restorative quality	Description
1. Being away	Moving to a new location increases the likelihood that one will be able to think on other things as it is a mental and physical change
2. Extent	The space should be sufficiently large to provide both scope and connectivity. The only factor is the actual size.
3. Compatibility	The demands and preference of the user are supported by the environment's content. Specifically, harmony between the individual's preference, the environment's requirements and the qualities of the environment.
4. Fascination	Venues that offer multiple processes that people find captivating along with interesting things or stimuli that attract and hold attention.

3.1.2 Restorative and therapeutic design parameters of nature

Natural elements of nature can be incorporated to designs as restorative design parameters such as trees, water features, lawns, views, interconnected open spaces etc. (Nousianen, Heikki Lindroos, & Petri Heino, 2016).

3.1.3 Stress reduction theory

The healing power of nature has therapeutic effects and exposure natural settings promote psychological well-being and provide relief from the strains of daily life (Ulrich, Robert, Barbara, Evelyn, Mark, & Michael, 1991).

3.1.4 Biophilic hypothesis

Biophilia hypothesis refers to the innate relationship of humans towards nature (Wilson, 1984). And Biophilic design approaches are able to approach serve therapeutic attributes to the user (Kellert, Judith H. Heerwagen, & Martin L. Mador, 2008).

3.2. THEORITICAL FRAMEWORK

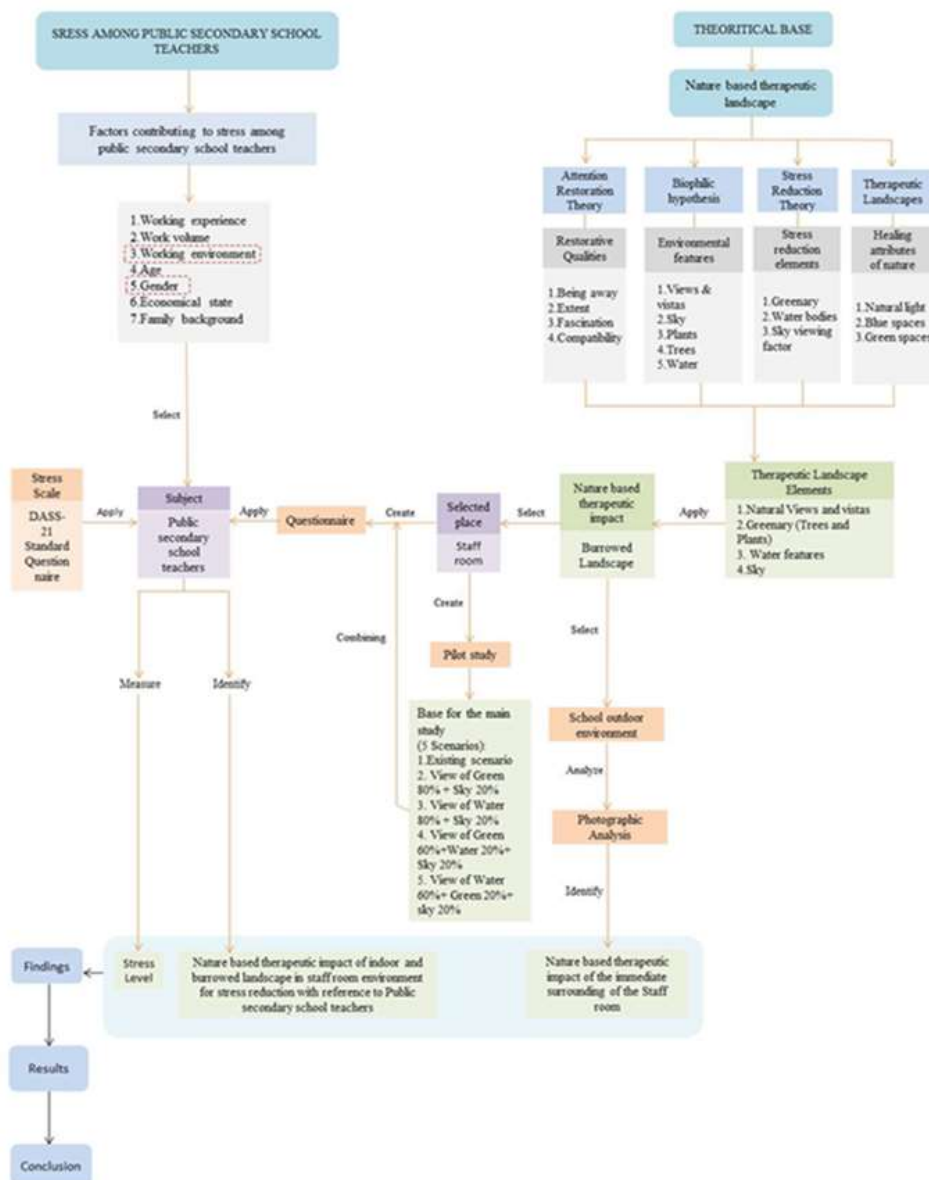


Figure 5, Theoretical framework

4. Methodology

A mixed method was used to conduct the study which includes two folds such as literature survey and a case study survey. Through the literature survey, data, theories and arguments were carried out related to the occupational stress among the public secondary school teachers and nature based therapeutic impact of borrowed landscape on stress reduction.

The case study survey was conducted in order to gather deep, contextual and practical insights to the study. The collected data was analyzed and discussed to synthesis the conclusion of the study.

4.1. CASE STUDY

WP/GM Bandaranayke College, Gampaha was selected as the school landscape and as a space where teachers spend their time the most besides the class room, the main staff room of the school was selected. The selected staff room is located in the middle of the school encompassed with several buildings. 30-35 teachers could be observed each time, spending time in this room.

Although the room has few windows, the natural light coming inside the room and the natural ventilation is inadequate. And also a large school building stands right in front of the staff room cadging the view of the windows. For the study, 40 random participants including 20 female and 20 male teachers were selected who were spending time in the staff room.

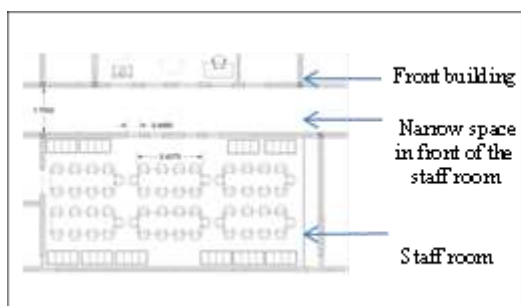


Figure 6, Plan view of the staff room



Figure 7, Existing Window and the immediate front of the Staff Room

4.2. DATA COLLECTING INSTRUMENTS

Onsite observations, structured interviews, photographic analysis, personalized questionnaire including a pilot study and a main study were conducted to gather data.

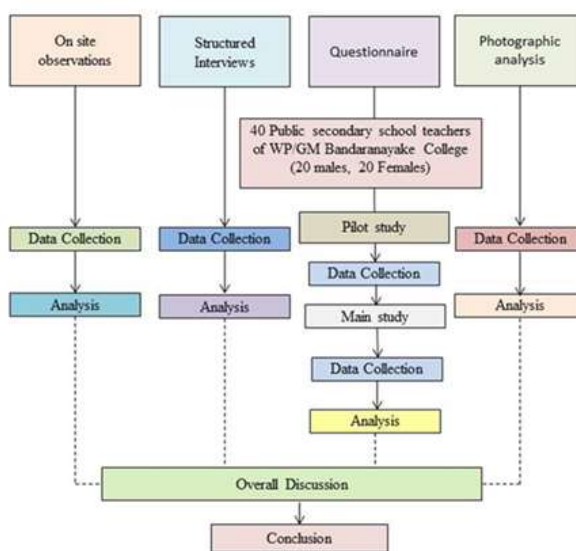


Figure 8, Process of data collection

4.2.1. Experimental setup created to introduce borrowed landscape scenarios for the main questionnaire

According to the findings gathered from the literature survey it was mentioned that natural blue green spaces serves therapeutic impacts on human beings as well as viewing natural elements provide psychological relaxation and immune function recovery on people who are under stress.

Through the pilot study and onsite observations, the most preferred natural elements were identified and that knowledge was incorporated generating 3D simulated borrowed landscape scenarios for the main study.

Scenario 1 – Existing scenario

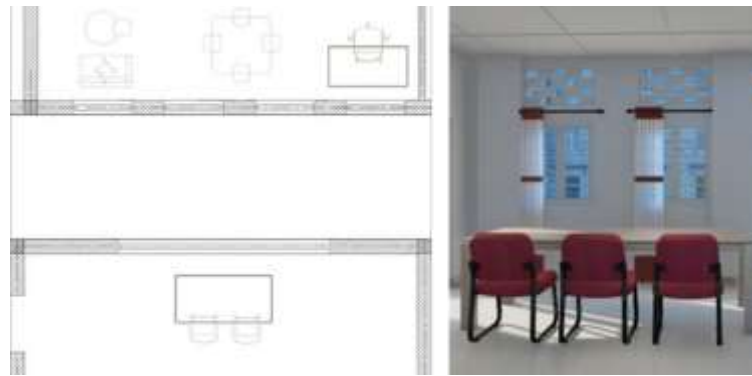


Figure 9, Existing plan view and the 3D simulated existing view from the staff room

Scenario 2- View of Green 80% + Sky 20%



Figure 10, 3D simulated borrowed landscape of greenery

Scenario 3- View of Water 80% + Sky 20%



Figure 11, 3D simulated borrowed landscape of Water 80% + Sky 20%

Scenario 4- View of Green 60%+Water 20%+ Sky 20%



Figure 12, 3D simulated borrowed landscape of Water 60% + Green 20% + Sky 20%

Scenario 5- View of Water 60%+ Green 20%+ sky 20%



Figure 13, 3D simulated borrowed landscape of Water 60% + Green 20% + Sky 20%

4.2.2. Scoring procedure for measuring stress through Likert scale

The level of stress among the teachers is measured using the dass-21 standard questionnaire. The spectrum scaling used in Likert scale and scoring given according to the preference is determined by

Table 2, Likert Scale

Preferred answer (x)	Strongly agree (x ₁)	Agree (x ₂)	Neutral (x ₃)	Disagree (x ₄)	Strongly disagree (x ₅)
Likert Numbering (x)	1	2	3	4	5
Score (m)	5	4	3	2	1

Table 3, Symbols of the scoring equation

Number of respondents	n
Number of respondents preferred answer	n _x
Mark for the preferred answer	m _x
Total mark for the preferred answer	f _x
Mean value	S

Table 4, Equation of the total score

Step 1: $f_x = n_x \times m_x$
Step 2: Total mark for all preferred answers = $f_{x1} + f_{x2} + f_{x3} + f_{x4} + f_{x5}$
Step 3: $S = (f_{x1} + f_{x2} + f_{x3} + f_{x4} + f_{x5}) / n$

5. Findings and Discussion

Through the photographic analysis, the existing immediate environment of the selected staff room of the school landscape was analyzed. Since the staff room is encompassed by a cluster of buildings, the immediate surrounding indicates a compacted environment owing to few open spaces. Due to the current situation, the teachers inside the staff room are limited to gaze at a rigid monotonous nearby building facade through the windows offering them no exposure to the natural environment demonstrating grey interior and exterior connection which is not good for their mental wellbeing.

And also through the on-site interviews it was discovered that they were carrying out lot of work load due to the mid-term paper marking. The average time a teachers gets spend the time in the staff room was around 3-5 hours. And their

opinion towards the immediate surrounding was not good and preferred more natural views while suggesting larger windows with glass.

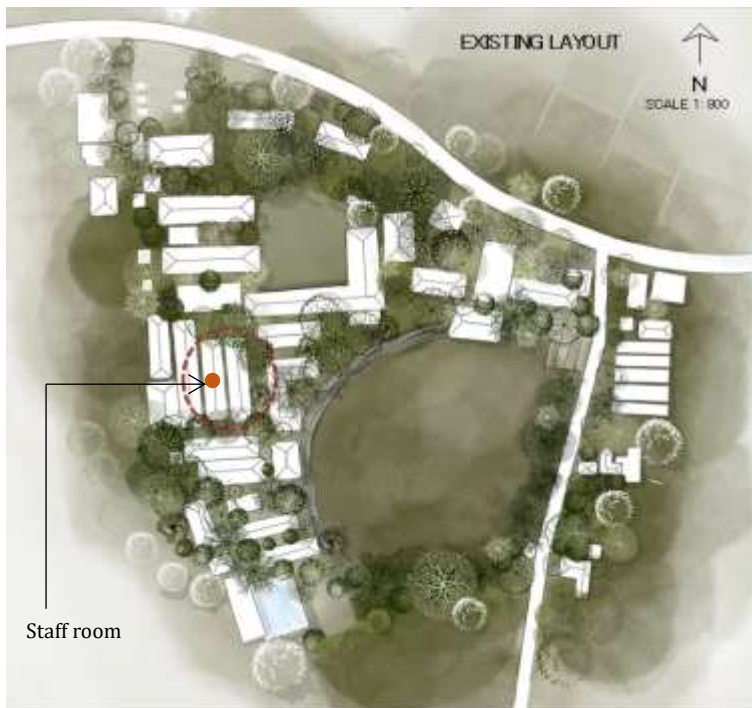


Figure 14, Existing Layout of WP/GM Bandaranayke College, Gampaha



Figure 15, Immediate building in front



Figure 16, The view directed to the Fazard

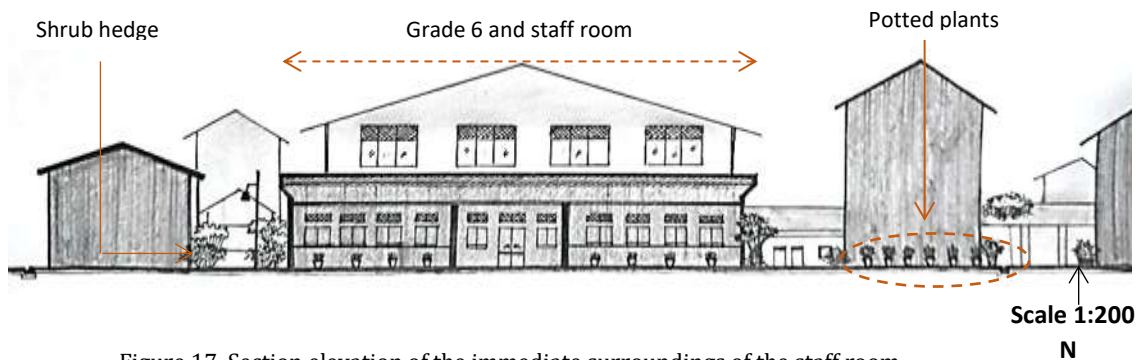


Figure 17, Section elevation of the immediate surroundings of the staff room

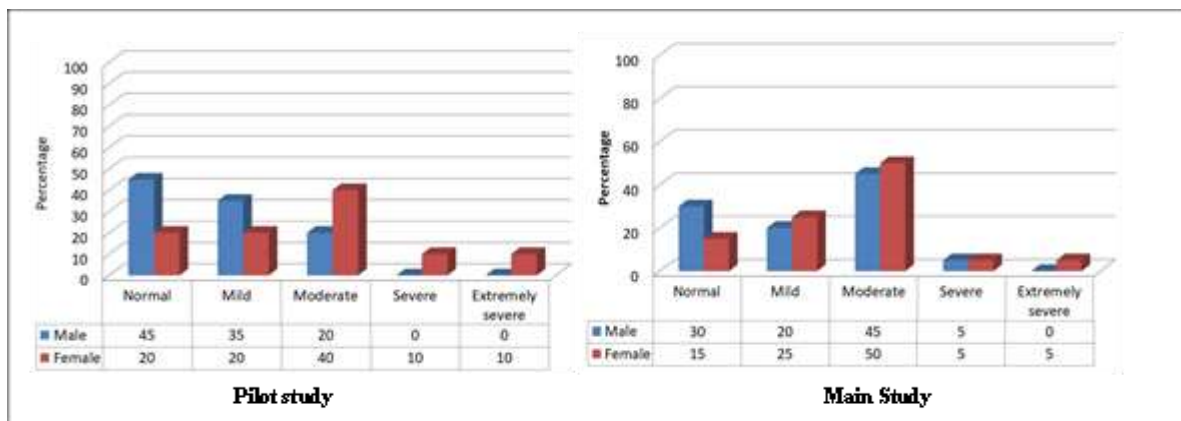


Figure 18, Measured Stress among the teachers

It was initially measured by the pilot study that majority including both male and female teachers, have exceeded the normal level on stress scale and most of them are in mild, moderate, severe and extremely severe stress levels. Questionnaire given as the pilot study helped to build the main study and to measure the stress level of the teachers. There, it was found that the majority of both male and female teachers were under stress with the majority being female teachers. Both male and female teachers showed low satisfaction towards the existing view. Further they were reluctant to see built environment

through windows. Within the average 4 hour time they spend in the staff room majority of them prefer to stay close to the window. They believed that contacting with natural environment is supportive towards stress recovery while showing high preference towards viewing greenery, natural water features and sky as borrowed views.

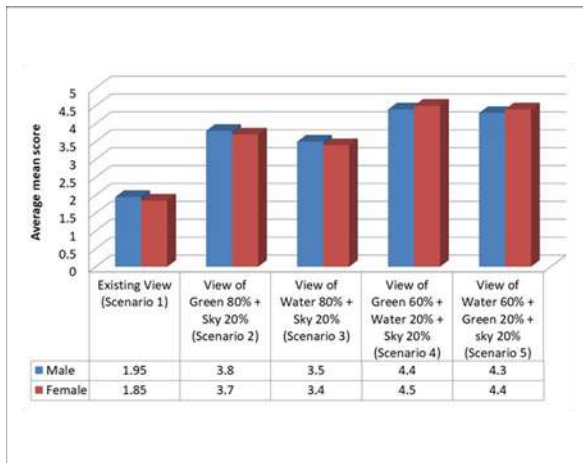


Figure 19, Preference towards the 5 scenarios

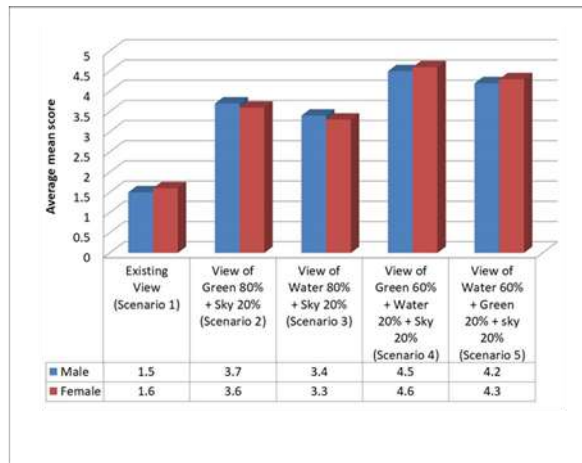


Figure 20, Supportiveness towards stress recovery

After conducting the pilot study the main study was executed. There, again the stress level of the participants were tested and found that they have exceeded the normal level on stress scale and most of them are in mild, moderate, severe and extremely severe stress levels. Given the simulated scenarios through the main study (five design interventions), the impact of natural borrowed views towards stress management was tested.

The results demonstrated that both male and female teachers have shown the highest preferences and the supportiveness towards the stress recovery in scenario 4 (View of greenery 60%+ water 20%+ sky 20%) and conversely, in scenario 1 which illustrated the existing situation.

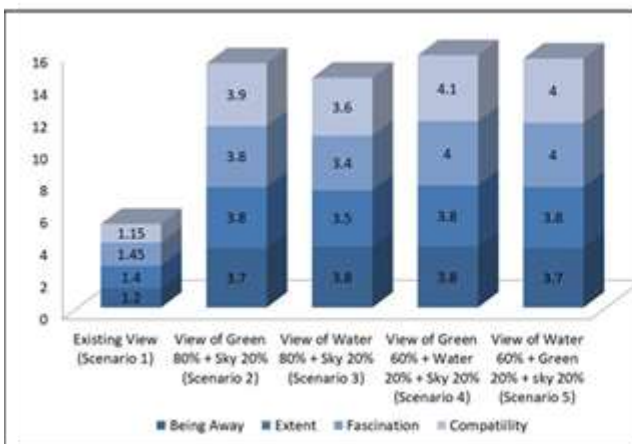


Figure 21, Therapeutic quality assessment of 5 scenarios among males

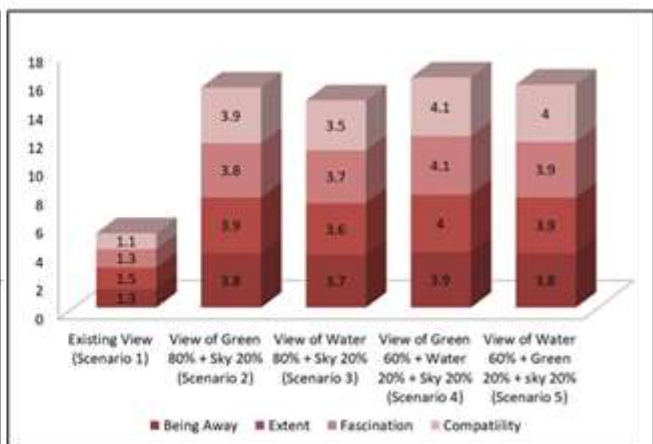


Figure 22, Therapeutic quality assessment of 5 scenarios among females

The data gathered conveyed that teachers prefer to see a combination of greenery, water and sky rather than solely seeing greenery or water as a borrowed view through the windows. In addition they believe that combination of greenery, sky and water serve the highest therapeutic effect, than seeing these elements solely. Further, within a combination of greenery, water and sky, male and female teachers prefer to view high percentage of greenery (scenario 4- View of greenery 60%+ water 20%+ sky 20%) as they have shown the highest response to scenario 4. It depicts that among all other view they prefer and believe that a view comprised of green 60%+ water 20%+ sky 20% will bring them more therapeutic effect which has also proven by literature.

It demonstrated that within a combination of greenery, water and sky, viewing greater percentage of greenery have more therapeutic impact in them than viewing more percentage of water (scenario 5). Further, they prefer to see greenery and have more therapeutic impact seeing greenery (scenario 2) when compared with solely seeing water (scenario 3). Thus, they have believed that watching a view of greenery and sky than watching a view with water and sky serves more therapeutic impact on them.

As well as the above charts illustrates that natural views with nature base elements have impacted on both male and female teachers equally. As they have conveyed equal mean average scores for each of these factors, it ultimately depict that there is no bias of gender, when it comes to therapeutic impact on human beings by nature towards stress management.

The overall analysis emphasized how natural borrowed views are supportive towards stress management among public secondary school teachers and it suggests considering thoroughly about the immediate surroundings, views and natural exposure when designing school landscapes.

6. Conclusion

Among the factors contributing to the occupational stress among public secondary school teachers, the working environment of the teachers plays a major role. Existing literature emphasizes the therapeutic effects of natural environment towards physical and psychological healing as a way of stress reduction.

With the aim of examining the stress management among public secondary school teachers with relation to observing natural borrowed landscapes in indoor working environments, WP/GM Bandaranayake College, was selected to conduct the study with randomly selected 40 participants within the staff room.

Through a pilot study the stress levels were measured the stress using DASS-21 scale and it was revealed that majority of both male and female teachers were having higher stress levels. Then the most preferred natural elements as therapeutic elements, were identified (greenery, water features and sky).

Through that knowledge the main study was conducted by simulating five 3d natural borrowed views differentiating the percentage of each factor, as the view through the staff room window including the existing view. Such as the borrowed view of 80% Greenery + 20% Sky (Scenario 2), view of 80% Water + 20% Sky (scenario 3), view of 60% Greenery + 20% Water + 20% sky (scenario 4), 60% Greenery + 20% Water+ 20% sky (scenario 5). And then the 5 scenarios were tested for stress management.

The results concluded that the prevailing stress among female teachers is higher than male teachers. Moreover, they believed that the existing view serves less therapeutic effect and they preferred to have contact with natural environment when they spend time in the staff room.

The two views comprised of a combination of greenery, water and sky were resulted with the highest mean average scores for the preference and stress management by the respondents (scenario 4 & 5). It emphasizes that they prefer to see a combination of greenery, water and sky rather than solely seeing each of these elements. Among them, the highest preference is received by the view with highest greenery (scenario 4) than the view with more percentage of water (scenario 5) while they also have believed that it serves the highest therapeutic effects towards stress management. Further, they prefer and believe that seeing greenery has more therapeutic impact (scenario 2) when compared with solely seeing water (scenario 3) towards stress management.

And among all, the view comprised with only water and sky has received the lowest preference and responses for stress releasing effect, apart from the existing view. And majority of males preferred the view of water and sky than female teachers and believed that it helps in reducing stress.

Additionally the results demonstrated that there is no any gender difference towards preference and stress releasing effect by nature. Hence, the study concludes that having natural borrowed views at the indoor working environment is an excellent way of contacting with nature while working, and it has therapeutic effects on users which is capable of reducing the stress of an individual.

So the study recommends to further consideration and wider incorporation of nature based borrowed views in the field of landscape architecture, when designing indoor spaces towards the stress management of the users, particularly in working environments of public secondary school teachers rather than just concentrating on the physical construction of the space.

7. Acknowledgement

I express my gratitude towards Dr. D.P. Chandrasekara, the Vice Chancellor of University of Moratuwa, who guided me through the whole endeavor, being my supervisor.

Further, extend my sincere thank towards our coordinators of the research, Archt. Janaka Dharmasena and Dr. Gamini Wijesundara for the continuously monitoring us and providing valuable comments from the initial day which helped me to develop my study step by step

In addition it is my responsibility to convey my appreciation to Prof. Shirani Balasooruya, L. Archt. Sewwandika Suvimali and L. Archt. Chathuri Gunarathne for being very supportive and motivating us. As well as I would like to thank Mrs. Malkanthi and the staff at the Landscape Unit of University of Moratuwa.

8. References

- A.C.Lee, H.C.Jordan, & J. Horsley. (2015). Value of urban green spaces in promoting healthy living and wellbeing, Prospects for planning. *Risk Manag. Healthc. Policy*.
- Aldwin, C. (2007). *Stress, Coping and Development*. The Guilford Press.
- Bellini, D., Ramac, T., & Bonaiuto, M. (2001). The Restorative Effect of the Environment on Organizational Cynicism and Work Engagement. *Journal of Human Resource and Sustainability Studies*.
- Craig, C. J. (2013). Life on school landscapes: teachers' experiences, relationships and emotions. *Advances in research on teaching* (pp. 99–117).
- Makhzoumi. (2015). The Analysis of the Japanese "Borrowed Landscape". Traditional Japanese architecture.