

# THE CONTRIBUTION OF NATURAL ENVIRONMENT RELATED ACTIVITIES TO REDUCING STRESS AMONG VISITORS: A STUDY RELATED TO DIYASARU WETLAND PARK, SRI LANKA

WIJERATHNE D.A.M.Y.R.<sup>1\*</sup> & DHARMASENA S.R.<sup>2</sup>

<sup>1,2</sup>University of Moratuwa, Moratuwa, Sri Lanka,

<sup>1</sup>wijerathnedamyr.21@uom.lk, yasarwijerathne@gmail.com, <sup>2</sup>shameend@uom.lk

---

**Abstract:** Urbanization has led to a significant increase in stress and a decline in mental well-being among city residents. Urban wetland parks, such as Diyasar Park, are increasingly recognized as vital restorative environments that can mitigate these negative effects. This research aims to evaluate the contribution of natural environment-related activities to stress reduction and emotional restoration among urban residents. The study is grounded in key environmental psychology theories, including Stress Reduction Theory (SRT), Attention Restoration Theory (ART) and Perceived Naturalness and Wilderness. Using a quantitative method, quasi-experimental design, the research will collect pre- and post-visit data using standardized questionnaires (PSS) and site observations. The findings are expected to demonstrate that exposure to and interaction with the park's features, particularly its hard landscape elements, significantly improves visitors' psychological well-being. The study's conclusion provides evidence-based recommendations for urban planners and park managers to enhance the restorative potential of urban green and blue spaces.

**Keywords:** *Urbanization, Stress reduction, Urban Wetland parks, Mental health, Environmental psychology*

---

## 1. Introduction

In the contemporary world, urban areas are hubs of economic and social activity, but they also expose residents to high levels of environmental stress, leading to widespread mental fatigue, anxiety, and various health issues. The relentless pace of urban life often results in a disconnect from nature, a vital component for human well-being (Zhuang, 2025). This disconnect is particularly concerning given the growing body of research that highlights the psychological and physiological benefits of interacting with natural environments. The Stress Reduction Theory (SRT) further supports this, positing that exposure to natural landscapes can lead to a reduction in stress through physiological changes and psychological benefits, like a more positive emotional state.

Urban green spaces, particularly urban wetland parks, are increasingly recognized as crucial assets in mitigating the adverse effects of urbanization on mental health. These spaces offer a unique blend of "green" and "blue" elements—vegetation and water—that have been shown to have a powerful restorative effect. Despite the global recognition of these benefits, there is a distinct need for localized research to validate and understand the specific contributions of particular urban green spaces. The existing research provides a strong foundation, but a detailed investigation into a specific urban wetland park is necessary to inform targeted design and management strategies. Therefore, this research focuses on Diyasar Park as a case study.

By examining the contribution of natural environment-related activities to stress reduction among its visitors, this study aims to fill a critical research gap. Specially, the aim of this study is to evaluate the role of natural environment-related activities associated in hard landscape features in stress relief among visitors to urban wetland parks in Sri Lanka. To achieve this, the research is guided by the following specific objectives. First, to measure the change in stress levels among visitors before and after engaging in selected activities at the Urban wetland park; second, to compare the mean change in stress levels across different activity groups to identify which activities are most effective.

To address these objectives, the study poses the research question: How do the levels of stress experienced after engaging in environmental activities related to hard landscape features differ from the levels of stress experienced before?. The findings will not only contribute to the academic discourse on environmental psychology but also provide valuable, evidence-based insights for urban planners and landscape architects on how to maximize the restorative potential of urban green and blue spaces for the health and well-being of city residents.

---

\*Corresponding author: Tel: +94 770244755 Email Address: wijerathnedamyr.21@uom.lk, yasarwijerathne@gmail.com  
DOI: <https://doi.org/10.31705/FARU.2025.69>

## 2. Literature Review

This research is anchored in a robust theoretical framework and supported by a growing body of empirical evidence concerning the relationship between natural environments and human well-being.

### 2.1. THEORETICAL FOUNDATIONS: THE HUMAN-NATURE CONNECTION

The foundation of this research lies in environmental psychology theories that explore the innate human need for nature. Building on this, the Stress Reduction Theory (SRT) argues that exposure to natural environments can lead to a quick reduction in physiological and psychological stress. Complementing this, Attention Restoration Theory (ART), proposed by Stephen and Rachel Kaplan, focuses on the cognitive benefits of nature. It posits that urban environments demand "directed attention"-a form of mental effort that can lead to fatigue-while natural environments are rich in "soft fascination" that allows the mind to rest and restore its capacity for focused attention (Kaplan & Kaplan, 1989).

### 2.2. PSYCHOLOGICAL BENEFITS OF URBAN GREEN AND BLUE SPACES

A wealth of research has established a strong link between urban green spaces and improved mental health. Access to parks, gardens, and green roofs has been consistently associated with reduced stress and anxiety, improved mood, and higher levels of life satisfaction (Gascon et al., 2015). Recent studies have also emphasized the unique and often superior benefits of "blue spaces"-areas featuring inland or coastal water bodies. These spaces are found to be particularly effective in providing a sense of escape and promoting feelings of tranquility and restoration (Völker & Kistemann, 2011). Blue spaces are often considered more restorative than purely green spaces due to their tranquil sounds, dynamic visual qualities and the sense of openness they provide (Völker & Kistemann, 2015). A study in China, for instance, found that urban residents showed a strong preference for landscapes that combine both green and blue elements, as they provided greater emotional and psychological benefits (Zhuang, 2025).

### 2.3. THE ROLE OF URBAN WETLANDS AS RESTORATIVE ENVIRONMENTS

Urban wetlands possess a unique combination of characteristics that make them particularly effective restorative environments. Water-based features; The presence of water is a crucial element. Studies consistently show that "blue spaces" (environments with water) have a particularly strong restorative effect, often surpassing that of traditional green spaces. The visual and auditory cues of water, from the gentle flow to the reflections on the surface, are deeply engaging and promote a sense of tranquillity. Biodiversity and Wildlife; Urban wetlands are biodiversity hotspots, providing habitats for a variety of plant, bird, and animal species. The opportunity to observe wildlife, such as birds or insects, provides a fascinating and engaging experience that can distract from daily stressors. This connection to nature has been linked to improved mood and a stronger sense of well-being. Sensory Engagement; Wetlands offer a rich sensory experience that goes beyond visual cues. The sounds of birds and frogs, the scent of damp earth and vegetation, and the feeling of a cooler, more humid microclimate can all contribute to a feeling of being "away" from the urban bustle. This multi-sensory engagement is a key component of a successful restorative experience. Opportunities for "Being Away" and "Extent"; The restorative qualities of an environment are enhanced by the feeling of being "away" from everyday life. Urban wetlands, even when situated within a city, can provide a sense of escape and a feeling of being in a different, more natural world. Furthermore, their "extent" the feeling of being part of a larger, coherent space contributes to a sense of immersion that is essential for a truly restorative experience.

### 2.4. RESEARCH GAP AND JUSTIFICATION FOR THE CURRENT STUDY

While the existing literature provides a strong foundation for the restorative effects of nature, a significant research gap remains regarding the applicability of these findings outside of Western, developed contexts. There is a distinct lack of empirical evidence from developing countries like Sri Lanka, where rapid, high-density urbanization creates unique environmental stressors that may fundamentally alter the human-nature relationship. Furthermore, current research often treats nature exposure as a monolithic experience, failing to differentiate between the specific psychological contributions of distinct activities-such as the passive observation involved in birdwatching versus the active sensory engagement of visiting a butterfly garden. Consequently, the specific role of "hard landscape features" -the built elements like viewing towers, boardwalks and resting huts that mediate these experiences-remains critically under-researched. Therefore, this research is justified by the need to provide an in-depth, empirical analysis of Diyasaruru Wetland Park. By moving beyond the general claim that "nature is good" this study aims to determine exactly which structured activities associated with specific hard landscape features effectively maximize stress reduction, providing targeted insights for urban planning in tropical, developing cities.

## 3. Methodology

This research will employ a quantitative method approach, combining quantitative data from structured surveys with qualitative data from on-site observations and interviews to provide a comprehensive understanding of the psychological benefits of Diyasaruru Park.

### 3.1. THEORETICAL FRAMEWORK AND MEASUREMENT PARAMETERS

The investigation of stress relief in this study is theoretically grounded in the Stress Reduction Theory (SRT), which posits that exposure to unthreatening natural settings triggers an immediate, involuntary physiological shift toward a calmer, restorative state. To empirically measure this restorative effect, the study utilizes the Perceived Stress Scale (PSS) as the primary investigation parameter, defining the dependent variable as the overall decrease in perceived stress. This parameter is quantified using a 10-item psychometric survey administered through a pre- and post-activity design, capturing the subjective stress levels of visitors immediately before and after their interaction with specific hard landscape features. By calculating the difference between initial and final PSS scores, the research isolates the specific contribution of these environmental interactions to stress reduction, using the reduction in PSS scores as the direct indicator of the physiological and psychological recovery mechanisms proposed by SRT.

### 3.2. VARIABLES AND DEFINITIONS

The Independent Variables are the specific, distinct natural environment-related activities and the associated hard landscape features, which serve as the restorative interventions. Dependent Variable is the Overall Decrease in Perceived Stress (PSS): The primary stress outcome, where a significant reduction was found in all groups. The theoretical framework posits that engaging in natural environment-related activities will lead to a significant reduction in stress and an increase in emotional restoration for urban residents.

### 3.3. RESEARCH DESIGN

The study will follow a quasi-experimental, pre- and post-intervention design. Visitors will be assessed upon entry and again upon exit to measure changes in their psychological state.

### 3.4. STUDY AREA

#### 3.4.1 Overview of the Diyasaruru Wetland Park



Figure 1: Context map of Diyasaruru wetland park  
(Source from Google Earth Pro)

Diyasaruru Wetland Park, located in the Thalawathugoda area of Sri Jayawardenepura, Sri Lanka, is an artificially built urban wetland spanning approximately 60 acres. It was originally a paddy field and dredge material deposit area but was transformed into a wetland during flood management initiatives in 2010. The park features various wetland habitats, including marshes, flooded woodlands, lakes, and ponds.

Diyasaruru Park serves as a biodiversity hotspot and flood detention area, helping to absorb floodwaters and protect the nearby Parliament area from inundation. The park houses over 230 species, including more than 80 wetland bird species (with migratory birds among them), numerous fish species (including endemic ones), butterflies, dragonflies, mammals like the endangered fishing cat (*Prionailurus viverrinus*) and otter, reptiles, and unique plants.

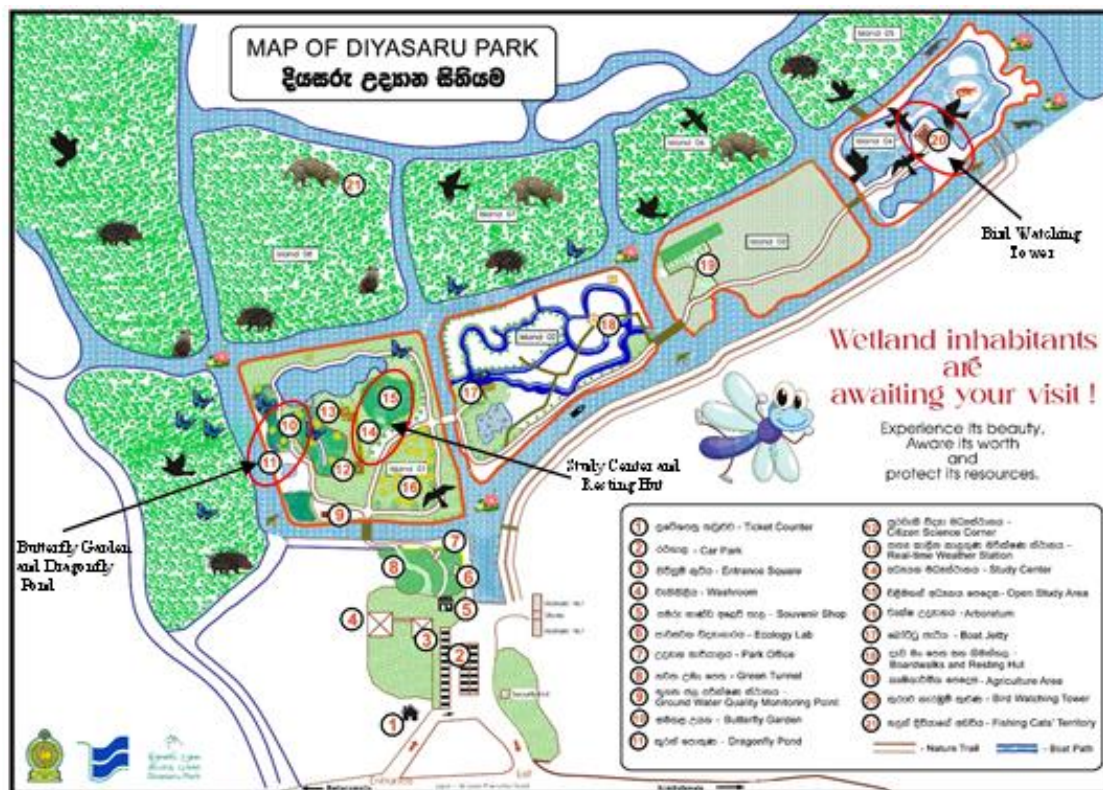


Figure 2: Design Layout of Diyasaru wetland park  
(Source: Diyasaru Wetland Park official web site (Map Image – Diyasarupark))

Visitors to the park can enjoy activities such as bird watching from towers and hides, butterfly watching, walking along boardwalks, educational tours, and boat rides through the artificial canals. The park also includes facilities like an ecological laboratory, organic agriculture area, study center, picnic spots, and observation decks. It is open to the public six days a week from 6 a.m. to 6 p.m.

The name "Diyasaru" means "rich in water" in Sinhala, reflecting the park's vital role in wetland conservation and urban biodiversity.

### 3.4.2 Identifying man-made landscape features that allow visitors to engage in activities related to the natural environment

The man-made hard landscape features in Diyasaru Wetland Park include:

- Boardwalks for walking through the wetland areas
- Bird watching towers and bird hides for observation
- Viewing towers
- Two large huts near the entrance used as study centers and for group sessions
- An ecology laboratory for soil and water quality testing
- Plant nursery and organic agricultural area
- Butterfly Garden and Dragonfly Pond
- Signage panels for self-guided studies

These constructed features facilitate visitor movement, education, and wildlife observation within the wetland environment of the park.

### 3.5 SELECTION OF THE LANDSCAPE FEATURES RELEVANT TO ENVIRONMENTAL ACTIVITIES

The selection of the 'butterfly garden and dragonfly pond', 'the study area and resting hut' and 'the bird watching tower' was guided by their ability to harmoniously integrate ecological enhancement with recreational functionality. Each site serves a dual purpose, they showcase features that actively support the wetland's biodiversity such as specialized micro-habitats for insects and unobtrusive vantage points for wildlife observation-while simultaneously addressing the innate desire of visitors for accessible, comfortable, and meaningful engagement with nature. This approach prioritizes locations that are proven to be high-value visitor destinations, offering opportunities for rest, learning, and photography, thereby ensuring the infrastructure not only protects the environment but also provides a deeply satisfying experience for the public.

### 3.5.1 Butterfly Garden and Dragonfly Pond

The inclusion of a butterfly garden and dragonfly pond serves multiple important ecological and educational purposes. Butterflies and dragonflies act as bioindicators of environmental health, so creating habitats specifically for them promotes biodiversity and ecological balance within the park. These features engage visitors by offering direct interaction with living nature, increasing environmental awareness and fostering a sense of stewardship. Additionally, the aesthetic appeal of vibrant butterflies and dragonflies enhances visitor satisfaction and draws diverse user groups, including families and naturalists. The pond also contributes to microhabitat diversity, supporting other aquatic life and adding complexity to the landscape. Thus, this feature aligns with conservation goals and passive educational strategies while enriching the visitor experience in a meaningful way.

### 3.5.2 Study Area and Resting Huts

The study area and resting huts are vital for accommodating visitor needs related to comfort, accessibility, and prolonged engagement with the park. Parks function not only as recreational spaces but also as learning environments; the study area encourages educational activities such as reading, research, and group learning sessions, thereby catering to students, researchers, and casual learners. Resting huts address physical demands by providing shade and relaxation spots, which are essential for inclusivity, ensuring that elderly visitors, young children, and those with mobility challenges can comfortably explore the park. These features promote mental well-being by supporting contemplative and social interactions, thus enhancing the overall user experience and increasing the duration and quality of park visits.

### 3.5.3 Bird Watching Tower

Bird watching is a popular recreational and educational activity that encourages appreciation of local wildlife and ecosystems. The bird watching tower is strategically chosen to provide an unobstructed, elevated perspective that increases the chances of spotting diverse bird species, many of which may be elusive at ground level. This feature advances ecological education by encouraging visitors to observe and learn about avian behavior and habitat requirements, contributing to conservation awareness. Its inclusion also diversifies the range of recreational opportunities offered by the park, attracting birders, photographers, and nature enthusiasts. By facilitating responsible wildlife observation while minimizing disturbance, the tower supports both ecosystem preservation and visitor engagement goals.

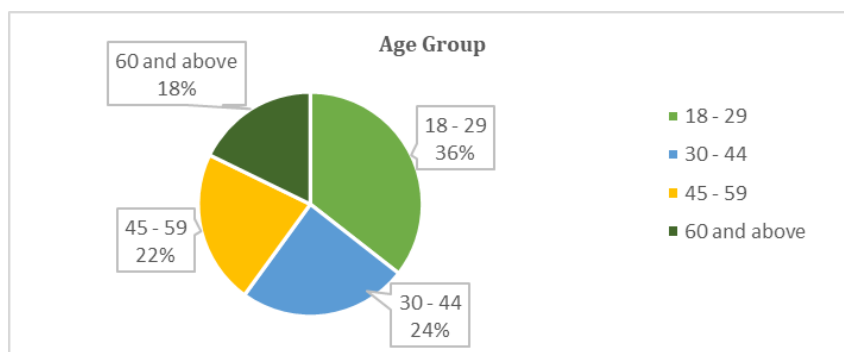
## 4. Findings and Analysis

### 4.1. SAMPLING

The target population for this study comprised visitors to Diyasaru Wetland Park who engaged with hard landscape features during their visit. To capture a representative range of visitor interactions and stress reduction experiences, purposive sampling was employed. Visitors were approached at various hard landscape elements such as seating areas, pathways, viewing platforms, and interactive spaces. A total of 45 visitors participated in the study. The sample size was determined based on typical visitation rates and practical constraints, ensuring sufficient data to identify meaningful patterns in activity engagement and stress responses. Inclusion criteria required participants to be adults aged 18 and above who voluntarily engaged with at least one hard landscape feature during their park visit. Excluded were visitors who did not interact with these features or were in transit without stopping. Sampling was conducted over 2 weeks in month of August, during weekdays and weekends, between 4-5 hours during 9.00am to 4.00pm, to capture both peak and off-peak periods. This timing allowed an analysis of visitor behavior across different contexts and crowd densities. While purposive sampling allowed focus on the relevant user group, limitations regarding the generalizability of findings to all visitors of Diyasaru Wetland Park are acknowledged.

#### 4.1.1 Findings from the Questionnaire - Demographic Information

The demographic findings show that the largest age group surveyed was 18-29 years old (36%), followed by 30-44 (24%), 45-59 (22%), and 60 and above (18%). The gender distribution was nearly even, with 53% male and 47% female participants. Occupationally, government sector employees formed the largest group (33%), followed by private sector employees (24%), self-employed individuals (14%), and retired individuals (14%). The majority of visitors (58%) reported visiting the park occasionally, less than once a month.



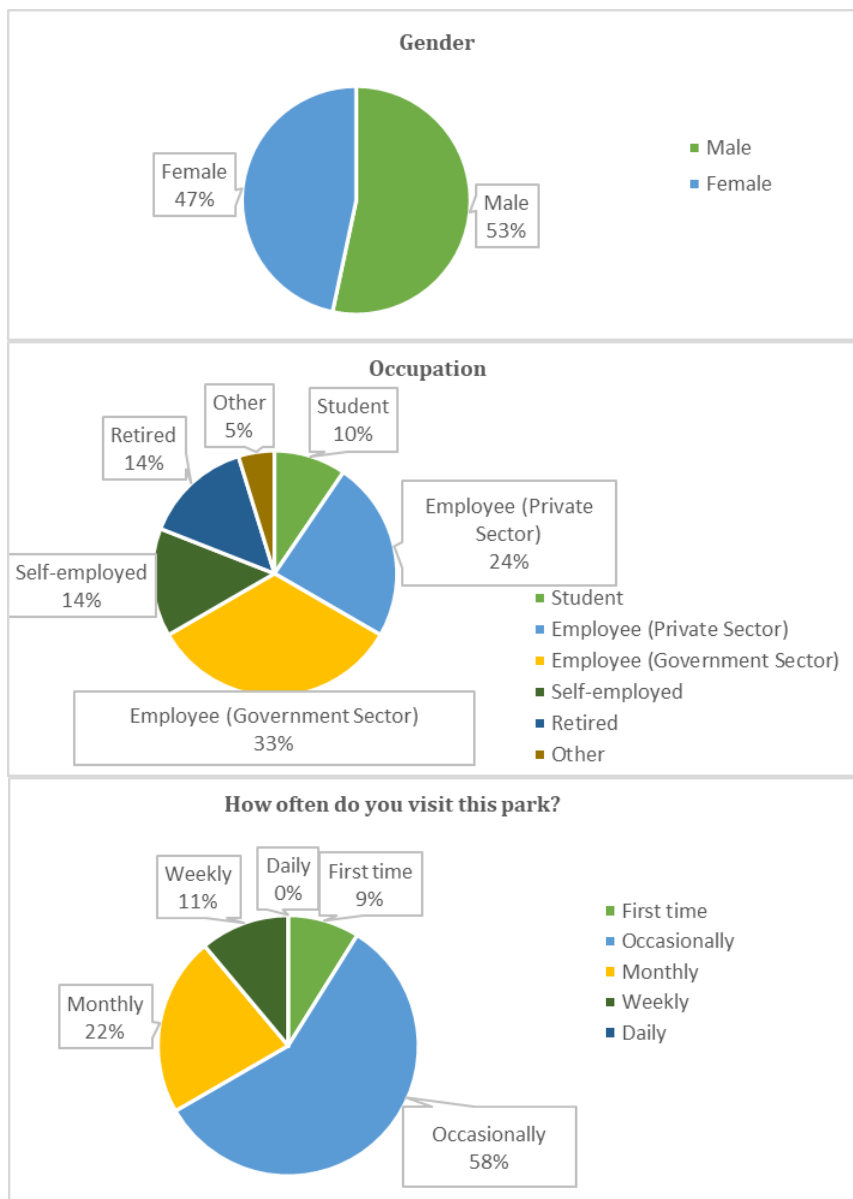


Figure 3: Pie Charts of demographic information

#### 4.2. QUANTITATIVE DATA ANALYSIS

Data were collected using quantitative methods, including questionnaire surveys and post questionnaire interviews, focusing on the psychological healing benefits of the visitors, including stress reduction, emotional restoration, mood enhancement, and overall satisfaction. This was distributed to the visitors as a paper-based questionnaire as well as an online questionnaire. The questionnaire was based on the Perceived Stress Scale (PSS). The collected data was first entered into an Excel sheet, and Microsoft Excel 2022 was used for analysis. Excel was chosen for its suitability in mathematical and logical data processing, as well as its ease of updating.

##### 4.2.1 Introduction of Perceived stress scale (PSS)

The Perceived Stress Scale (PSS) can be used to measure how stress levels change after visitors engage in specific activities within an urban wetland park. This is done by comparing a participant's initial mean PSS score (before the activities) to their score after completing each activity. Mean scores were calculated using Excel formulas.

**Baseline Measurement:** Upon entering the park, each participant completes the PSS questionnaire to establish their initial stress level ( $PSS_{initial}$ ).

**Activity Engagement:**

- Group 1: Activities associated with Butterfly Garden and Dragonfly Pond
- Group 2: Activities associated with Study center and Resting hut
- Group 3: Activities associated with Bird watching tower

Post-Activity Measurement: Immediately after their assigned activity, participants complete the PSS again to determine their post-activity stress level (PSS<sub>final</sub>).

Data Analysis: The change in perceived stress is calculated for each individual by subtracting their final score from their initial score (Change<sub>PSS</sub> = PSS<sub>initial</sub> – PSS<sub>final</sub>). A positive value indicates a decrease in stress. The mean change in stress is then calculated for each of the three groups.

4.2.2 Figuring the PSS Score

Determining respondent’s PSS score by following these directions. The questionnaire based on PSS consists of 10 questions ranging from question number 01 to 10. First, reverse respondent’s scores for questions 4, 5, 7, and 8. On these 4 questions, change the scores like this: 0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0. Now add up respondents’ scores for each item to get a total. (Respondent’s total score is \_\_\_\_\_.) Individual scores on the PSS can range from 0 to 45 with higher scores indicating higher perceived stress.

- Scores ranging from 0-13 would be considered low stress.
- Scores ranging from 14-26 would be considered moderate stress.
- Scores ranging from 27-40 would be considered high perceived stress.

Above PSS score calculation method adapted from, (Cohen, n.d.). The following steps were used to calculate the changes of PSS (Perceived Stress Scale) scores.

4.2.3 Representing the Changes of PSS Scores

First, organized data in an excel spreadsheet and need columns for the initial PSS scores and the final PSS scores for each participant. Then create a new column to calculate the change in score. To get the “Change in PSS” for each participant, subtract the final PSS score from the initial PSS score. Need to arrange the calculated Change in PSS data into separate columns for each group. This makes it easy for Excel to create a distinct box plot for each activity.

Figure 4 below illustrates the changes in the PSS scores of respondents.

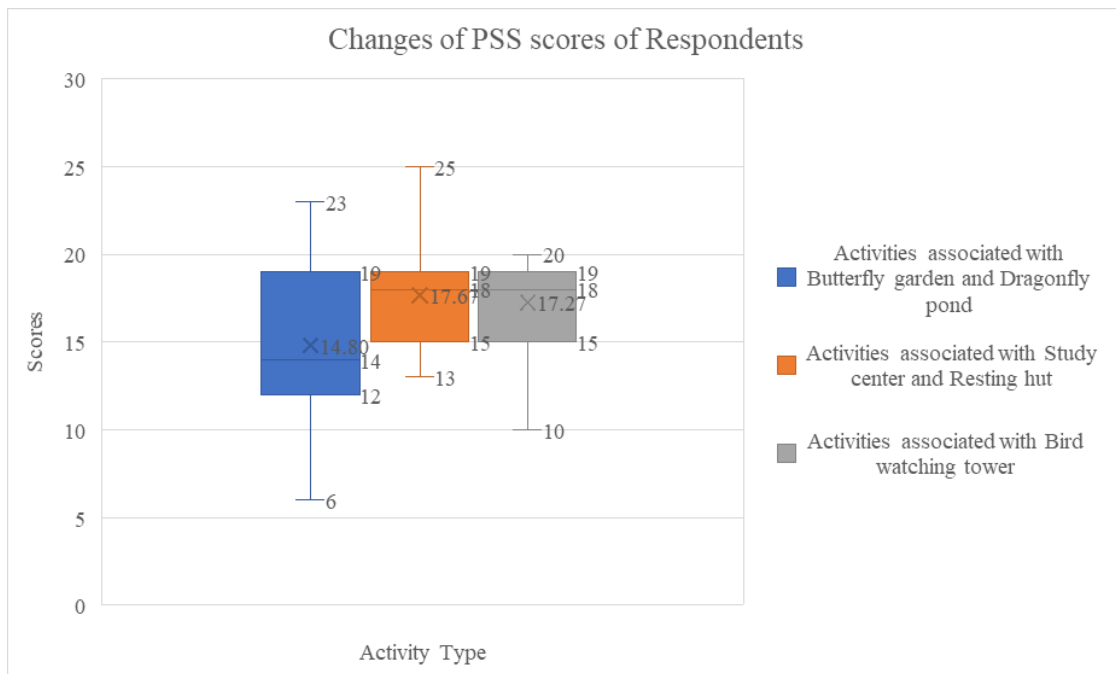


Figure 4: Changes of PSS scores of respondents

In the above graph (Figure 4), blue Box Plot represents "Activities associated with Butterfly Garden and Dragonfly Pond." The median score is approximately 15, indicated by the horizontal line within the box. The interquartile range (IQR), represented by the height of the box, is from about 12 to 19. The whiskers extend from a minimum score of around 6 to a maximum of about 23.

Orange Box Plot represents "Activities associated with Study center and Resting hut." The median score is roughly 17, slightly higher than the blue box plot. The IQR ranges from approximately 16 to 19. The whiskers span from a minimum score of about 13 to a maximum of around 25.

Gray Box Plot represents "Activities associated with Bird watching tower." The median score is approximately 18, similar to the orange box plot. The IQR is from about 15 to 19. The whiskers extend from a minimum score of roughly 10 to a maximum of about 20.

The graph shows that the median scores for all three activity types are fairly close, clustering between 15 and 18. The "Activities associated with Study center and Resting hut" and "Activities associated with Bird watching tower" have slightly higher median scores and more compact distributions (smaller boxes) compared to the "Activities associated with Butterfly Garden and Dragonfly Pond." This suggests less variability in the central scores for the study center and bird watching tower activities. The "Activities associated with Butterfly Garden and Dragonfly Pond" shows the widest range of scores, with a larger spread in its data, indicated by the longer whiskers.

4.2.4 Changes of Mean PSS Scores of Activity Types

Calculating the PSS score for each respondent: The PSS score of each respondent was determined individually based on their responses. Summing the PSS scores: The total PSS scores of the 15 respondents in each group were calculated. Calculating the PSS average score: The total PSS scores were divided by the number of respondents (15) to obtain the PSS average score. This procedure was performed for all 3 groups.

Table 1 below shows changes in mean PSS scores of activity types.

Table 1: Changes of Mean PSS Scores of activity types

Group	N	Mean PSS <sub>initial</sub>	Mean PSS <sub>final</sub>	Mean Change (PSS <sub>initial</sub> – PSS <sub>final</sub> )
Activities associated with Butterfly Garden and Dragonfly Pond	15	26.47	11.67	+14.8
Activities associated with Study center and Resting hut	15	28.87	11.2	+17.67
Activities associated with Bird watching tower	15	29	11.73	+17.27

Above (Table 1) shows Study center and Resting hut related group showed the largest mean decrease in perceived stress, with an average change of +17.67. This suggests that activities associated with study center and resting hut was the most effective activity for stress reduction among the three.

Bird watching tower related group also showed a substantial decrease in stress, with a mean change of +17.27.

While Butterfly Garden and Dragonfly Pond related group did experience a decrease in stress (mean change of +14.8), it was the least effective compared to the other two activities.

A one-way ANOVA could be used to statistically determine if the differences in mean stress reduction among the three groups are significant. The results would likely show a statistically significant difference, confirming that engaging in certain activities in the wetland park has a greater impact on stress reduction than others.

4.2.5 One-way Analysis of Variance (ANOVA) for Perceived stress scale (PSS)

One-way Analysis of Variance (ANOVA) is a statistical test used to determine if there are any statistically significant differences between the means of three or more independent groups. The test is called "one-way" because it involves a single independent variable, also known as a factor, with at least three different levels or groups.

The fundamental principle behind ANOVA is to compare the variability between the group means to the variability within each group. If the variability between the groups is significantly larger than the variability within the groups, it suggests that the groups are indeed from different populations and their means are not all equal.

The one-way ANOVA follows a structured hypothesis testing process:

- 1) Formulate Hypotheses: Null Hypothesis (H0)- States that the means of all groups are equal. For example, H0:  $\mu_1 = \mu_2 = \mu_3$ , Alternative Hypothesis (Ha)- States that at least one group mean is different from the others.
- 2) Calculate the F-statistic: The ANOVA test produces an F-statistic, which is the ratio of the variance between the group means to the variance within the groups. A larger F-statistic indicates a greater difference between the group means relative to the variation within the groups.

- 3) Determine the p-value: The F-statistic is used to calculate a p-value. This p-value represents the probability of observing the data's mean differences by random chance if the null hypothesis were true.
- 4) Make a Decision: The p-value is less than a chosen significance level (commonly  $\alpha=0.05$ ), you reject the null hypothesis. This means there is statistically significant evidence to conclude that not all group means are equal. If the p-value is greater than the significance level, you fail to reject the null hypothesis. You do not have sufficient evidence to conclude that the means are different. It's important to note that a significant ANOVA result only tells you that at least one group mean is different, but it doesn't specify which one. To identify the specific groups that are different from each other, you would need to perform post hoc tests (e.g., Tukey's HSD).

The below (Table 2) shows analysis of variance (ANOVA) was conducted to compare the means of three groups. The goal was to see if there's a statistically significant difference in the average values among these groups.

Table 2: Summary of ANOVA Single Factor for PSS

Groups	Count	Sum	Average	Variance
Activities associated with Butterfly Garden and Dragonfly Pond	15	222	14.8	19.6
Activities associated with Study center and Resting hut	15	265	17.66667	10.52381
Activities associated with Bird watching tower	15	259	17.26667	7.495238

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	72.31111	2	36.15556	2.883291	0.067085	3.219942
Within Groups	526.6667	42	12.53968			
Total	598.9778	44				

P-value: The p-value is 0.067085.

Significance Level (often 0.05): The standard significance level is typically  $\alpha=0.05$ .

F-statistic and F-critical: The calculated F-statistic is 2.883291, while the critical F value is 3.219942.

Since the p-value (0.067) is greater than the typical significance level of 0.05, we fail to reject the null hypothesis.

There is no statistically significant difference between the means of the three activity groups at the 0.05 significance level. This means that, based on the data, the observed differences in the averages of the groups are likely due to random chance and not a true effect.

This conclusion is also supported by the fact that the calculated F-statistic (2.88) is less than the critical F-value (3.22). If the F-statistic had been greater than the F-critical value, it would have led to the rejection of the null hypothesis.

#### 4.3. DISCUSSION

The PSS results conclusively demonstrate that all three tested activities within the urban wetland park are effective in reducing participant stress, aligning with established theories on the restorative benefits of nature exposure. However, a comparative analysis of the mean stress reduction scores revealed a clear hierarchy of efficacy: the Study Center and Resting Hut activity recorded the highest mean decrease in perceived stress (+17.67), narrowly surpassing the Bird Watching Tower activity (+17.27). In contrast, the Butterfly Garden and Dragonfly Pond activity, while successful, yielded the lowest mean change (+14.80), indicating variability in the degree of psychological restoration achieved across different interventions.

The difference in effectiveness is attributed to the distinct mechanisms employed by each activity. The superior performance of the Study Center and Resting Hut is linked to the provision of a passive, enclosed refuge, which facilitates deep, uninterrupted stress recovery and a sense of safety. Similarly, the Bird Tower's success is explained by the contemplative, focused attention required for bird watching, which leverages the restorative effects of "soft fascination." Conversely, the comparatively lower efficacy of the Butterfly Garden is theorized to stem from the higher interactive or mental demands of the activity, which may introduce minor cognitive effort that slightly impedes full restoration. Therefore, the findings suggest that for maximizing immediate psychological benefits, urban green space design should prioritize

elements that support passive resting, refuge-seeking, and focused, contemplative engagement with the natural environment.

This study is subject to several limitations that should be considered when interpreting the findings. A primary limitation concerns the scope of the statistical analysis regarding participant demographics. Although demographic variables such as age, gender, and occupation were documented during the data collection phase, they were not included in the final analysis. Consequently, this study does not account for how these socio-demographic factors might moderate the relationship between nature-based activities and stress reduction, potentially masking variations in how different subgroups (e.g., different age cohorts or occupational sectors) experience restorative environments.

Furthermore, the research was conducted with a relatively small sample size ( $n=45$ ) and was restricted to a single study site, Diyasaru Wetland Park, which limits the generalizability of the results to the broader population or other urban wetland contexts. Additionally, the study relied exclusively on self-reported psychometric measures (PSS) without corroborating physiological data (such as heart rate or cortisol levels), making the results subject to response bias. Finally, the cross-sectional, pre- and post-test design captures only the immediate, acute effects of nature exposure, precluding conclusions regarding the long-term benefits of these activities on chronic stress.

## 5. Conclusions

In conclusion, this research would strongly affirm that urban wetland parks, with Diyasaru Park serving as a prime example, are invaluable assets for promoting the psychological well-being of urban populations. The study would provide compelling evidence that engaging in natural environment-related activities within these spaces significantly contributes to stress reduction, mood enhancement, and overall emotional restoration. The key findings would highlight that the psychological benefits are not uniform across all features of the park. The positive influence of dynamic water elements and accessible observation points would demonstrate that intentional landscape design can greatly amplify the restorative effects. This would underscore the importance of designing urban green spaces that facilitate specific, engaging interactions with nature, rather than simply providing open land. The study would conclude that Diyasaru Park serves as a powerful testament to the theories of Biophilia, SRT, and ART in a local context. The findings would have significant implications for urban planners, landscape architects, and policymakers, providing a strong evidence-based argument for the preservation, enhancement, and development of similar urban wetland parks as a public health strategy to combat the mounting mental health challenges of urban life.

## 6. References

- Carter, M. (2015). Wetlands and Health: How do Urban Wetlands Contribute to Community Wellbeing? In C. M. Finlayson, P. Horwitz, & P. Weinstein (Eds.), *Wetlands and Human Health* (Vol. 5, pp. 149–167). Springer Netherlands. [https://doi.org/10.1007/978-94-017-9609-5\\_8](https://doi.org/10.1007/978-94-017-9609-5_8)
- Gascon, M., Triguero-Mas, M., Martínez, D., Dadvand, P., Forn, J., Plasència, A., & Nieuwenhuijsen, M. (2015). Mental Health Benefits of Long-Term Exposure to Residential Green and Blue Spaces: A Systematic Review. *International Journal of Environmental Research and Public Health*, *12*(4), 4354–4379. <https://doi.org/10.3390/ijerph120404354>
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge Univ. Press.
- Kondo, M., Fluehr, J., McKeon, T., & Branas, C. (2018). Urban Green Space and Its Impact on Human Health. *International Journal of Environmental Research and Public Health*, *15*(3), 445. <https://doi.org/10.3390/ijerph15030445>
- Völker, S., & Kistemann, T. (2011). The impact of blue space on human health and well-being – Salutogenetic health effects of inland surface waters: A review. *International Journal of Hygiene and Environmental Health*, *214*(6), 449–460. <https://doi.org/10.1016/j.ijheh.2011.05.001>
- Völker, S., & Kistemann, T. (2015). Developing the urban blue: Comparative health responses to blue and green urban open spaces in Germany. *Health & Place*, *35*, 196–205. <https://doi.org/10.1016/j.healthplace.2014.10.015>
- Zhuang, X. (2025). Exploring the restorative effects of urban blue-green spaces on human psychology: A case study of Qingdao city, China. *Journal of Asian Architecture and Building Engineering*, 1–22. <https://doi.org/10.1080/13467581.2025.2518340>