Article

Psychological Restorative Potential of a Pilot on-Campus Ecological Wetland in Malaysia

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Abstract: This study examines the perceptions and engagement tendencies of 788 university students, as well as their relationship with psychological distress, with respect to an on-campus ecological wetland. The students' awareness, understanding, perceived importance, satisfaction level, and engagement tendency towards the ecological wetland were evaluated using a structured questionnaire. The psychological symptoms were assessed using the Rosenberg Self-Esteem and depression, anxiety, and stress scales, and the predictors of psychological distress were determined. The majority of the students were actively engaged (62.3%), aware (88.3%), and satisfied (51.0%) with the ecological wetland. Gender, age, educational attainment, engagement, perceived importance, and satisfaction level towards the ecological wetland were the predictors of psychological distress. The results outlined the environmental and mental restorative values of the ecological wetland in mediating psychological distress among the university students. These findings shed light on the necessity of preserving the sustainability and integrity of the on-campus ecological wetland. Longitudinal investigations to explore the restorative values of built environments and psychological wellbeing among high-risk populations are warranted.

Keywords: restoration; built environment; wetland; students; psychological distress

1. Introduction

The psychological restorative effects of natural environments are dominated by two complementary but distinguishable theories. One emphasizes the recovery of the capacity to focus attention, while the other focuses on the reduction of psycho-physiological stress [1]. Accordingly, the attention restoration theory (ART) describes the role of natural environments in enhancing mental functioning through their unique capacity to govern attention, a cognitive resource that is specifically required for effective functioning in contemporary urban societies. It suggests that mental fatigue could be gradually corrected by time spent in—or exposure to—nature. Long-term engagement with natural settings would encourage more effortless brain function and allow the recovery or replenishment of directed attention capacity [2].

On the other hand, the stress recovery theory (SRT) describes the restoration from stress when an individual is confronted with a condition that is perceived as demanding or threatening to their wellbeing. This model was derived with the assumption that aesthetic responses to the visual stimuli of environmental settings would activate psycho-physiological responses and effective recovery from external stress from the perspective of cognitive restoration, physiological restoration, or affective restoration [3]. The joint effects of the environmental setting and the individual's preceding affective/cognitive/physiological state on adaptive responses could vary due to stress and avoidance of restoration and could affect behavior [4].

Although great experimental evidence has demonstrated strong restorative outcomes associated with natural scenes and settings, there are limited studies that have evaluated the relation between built environments and psychological status among university students [5]. The available research focused mainly on the influences of socio-demographic factors, social networks, and interpersonal problems that could be attributed to psychological distress [6,7]. Thus, it is worthwhile to examine the role of restorative environments (in this case, an on-campus ecological wetland) in mediating psychological distress among university students. In this sense, the present work was undertaken to provide a unique insight into university students' perceptions of and engagement with a 20-year-old on-campus ecological wetland in Malaysia. This study evaluated the students' self-rated perceptions (understanding and awareness, perceived importance, and satisfaction) and engagement tendencies towards the ecological wetland. The psychological status, including the depression, anxiety, stress, and self-esteem, among the university students was examined. The relationships between the students' perceptions, engagement tendencies, and psychological distress were explored, and the restorative potential of the ecological wetland was investigated. In this work, three hypotheses were examined. Hypotheses 1 and 2 were tested for the main effects, while Hypothesis 3 was tested for the modulation effects.

Hypothesis 1. *The awareness, perceived importance, satisfaction level, and engagement tendencies with respect to the ecological wetland are satisfactory.*

Hypothesis 2. *The prevalence of psychological distress among university students is high.*

Hypothesis 3. *Socio-demographic profiles, engagement tendencies, and perceived importance are significant predictors for psychological distress, and a higher engagement tendency and perceived importance show a positive influence on the psychological status among the university students.*

2. Materials and Methods

2.1. Study Area

This study was carried out within the engineering campus of Universiti Sains Malaysia (USM), which is populated by 3500 inhabitants. Located at the coordinates 5.1460° N, 100.4929° E in the Nibong Tebal district, Penang Mainland, Malaysia, the campus is predominantly surrounded by palm oil plantation forests, rubber fields, animal husbandry, residential houses, a mosque, and farmlands. With a total area of 1.319 km^2, the major layout includes academic buildings, student hostels, administration blocks, and sport centers.

A national pilot project for an ecological stormwater management system, which integrated the concept of best management practices (BMPs) for urban drainage based on the Urban Stormwater Management manual for Malaysia (MSMA), was adopted on the campus. This bio-ecological drainage system (BIOECODS) was constructed in December 2002 with the major objectives of promoting surface water infiltration and improving water quality on the campus. As an early attempt to overcome the three major environmental challenges in the country—water scarcity, river pollution, and flash floods—the main component of BIOECODS primarily comprises a bio-retention swale, dry, wet, detention, and recreational ponds, and an ecological wetland.

2.2. Ecological Wetland

The on-campus ecological wetland is located in the sub-catchment area of the engineering campus, with a catchment area of 1.214 km^2. The original design concept for the ecological wetland was to create a natural environmental treatment system for water quality improvement. Various tropical wetland species were planted in different macrophyte zones. In the higher marsh areas, subsurface plants—notably, *Eleocharis variegata*, *Eleocharis dulchis*, and *Hanguana malayana*—were the dominant species, while *Lepironia articulata*, *Typha augustifolia*, and *Phragmites karka* (Figure 1) were cultivated in the lower marsh zones to improve stormwater runoff through their capability of providing oxygen

and their tolerance for organic matter. This complex ecosystem also serves as a habitat for freshwater fish (*Oreochromis niloticus*, *Colossoma macropomum*, *Channa micropletis*, and *Barbodes gonionotus*) and bird species (*Egretta intermedia*, *Alcedo atthis*, *Acridotheres tristis*, and *Haliastur indus*). The ecological wetland is surrounded by a recreational pond, recreational amenities and facilities, flowery planting mixes, pedestrian and running paths, garden benches, and wooden booths.
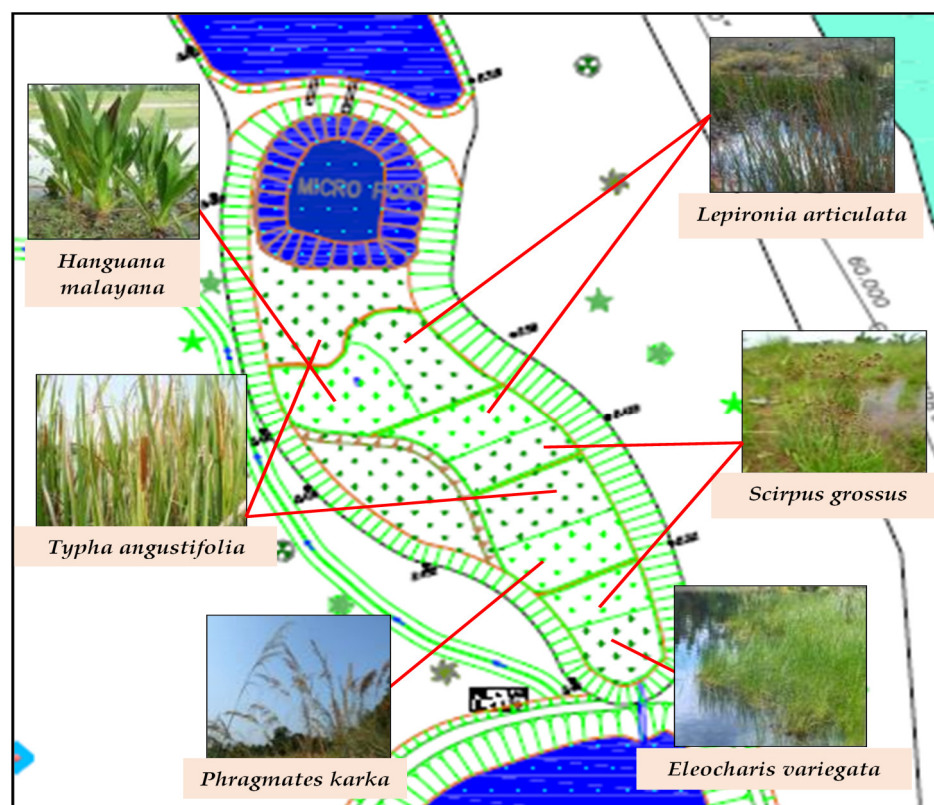

Figure 1. Schematic diagram of the ecological wetland on the engineering campus of Universiti Sains Malaysia. Various tropical wetland species were planted in different macrophyte zones. In the higher marsh areas, subsurface plants—notably, *Eleocharis variegate*, *Eleocharis dulchis*, and *Hanguana malayana*—were the dominant species, while *Lepironia articulata*, *Typha augustifolia*, and *Phragmites karka* were cultivated in the lower marsh zones to improve stormwater runoff through their capability of providing oxygen and their tolerance for organic matter.

2.3. Participants and Sample Size Calculation

Students (both undergraduate and postgraduate) from the engineering campus of USM were invited to participate in this study. The participation was voluntary and without monetary rewards, and students with documented psychiatric or/and mental disorders (self-report with medical record), such as schizophrenia, bipolar disorder, post-traumatic stress disorder, and eating disorders, were excluded from this study. The minimum sample size required for the significance level and degree of accuracy of 5% was derived as follows [8]:

$$n = \frac{\chi^2 NP\,(1-P)}{\Delta^2\,(N-1) + \chi^2 P(1-P)} \tag{1}$$

n = Required sample size
χ^2 = Confidence level of 95% (standard value of 3.84)
N = Population size
P = Estimated prevalence
Δ^2 = Precision

with $\chi^2 = 3.84$, $N = 2638$, $P = 0.7$, and $\Delta^2 = 0.05$. The participation of 720 university students was expected, with the assumption that the ratio of male to female students was 1.

2.4. Study Design

The present work was designed as cross-sectional, semi-quantitative research that was aimed at clarifying university students' perceptions and experiences, which were distilled from their descriptions and served as evidence.

2.5. Procedure

Data sampling was conducted from March 2015 to September 2015 by trained project staff. Ethical approval for the research was sought from the Human Research Ethics Committee of Universiti Sains Malaysia (USM) prior to the commencement of the study (Code: USM/JEPeM/269.3(14). Convenience sampling was applied for the subject recruitment. Undergraduate and postgraduate students were approached in the lecture halls, student lounge, cafeteria, library, sport center, and hostels around the campus. They were briefed about the study, and those that agreed to participate gave their consent. Participants were provided with a printed booklet and a series of self-administered questionnaires (see Sections 2.6 and 2.7). The importance of the study, time commitment (30 min), and instructions for answering the questionnaires were highlighted. Participants were requested to submit the filled-out questionnaires to the research center on the same day, and any incomplete data were checked thoroughly.

2.6. Questionnaire Design

The self-administered questionnaire consisted of five major sections (Supplementary Materials S1, Part A):

(a) Demographics, living arrangements, lifestyle practices, and involvement in environmental institutions or organizations.

(b) The awareness and understanding of the ecological wetland, with five question items: (i) existence of the ecological wetland; (ii) role of the ecological wetland in managing stormwater flow; (iii) role of the ecological wetland in preventing and controlling flash floods; (iv) role of the ecological wetland in controlling water pollution; (v) the educational and research aspects of the ecological wetland. The participants rated the extent to which each item fit their feelings, thoughts, and behavior on a 5-point Likert scale.

(c) The tendency for engagement in the ecological wetland. The engagement features referred to activities that involved the ecological wetland. The frequency was defined (more than once per week, once per week, once per month, seldom, or never), and types of activities that were engaged (brisk walks, sightseeing, socializing, observing flora and bird species, picnics, research, and education) were evaluated.

(d) The perceived importance of the ecological wetland was justified in five major aspects: (i) functionality; (ii) environmental; (iii) sociological; (iv) health; (v) personal development, with higher ratings indicating a greater level of importance.

(e) Satisfaction with the constituent elements of the ecological wetland; this involved an evaluation of the functionality, physical environment, social environment, and health improvement. The degrees of satisfaction were defined as satisfied, neutral, or dissatisfied.

2.7. Psychological Assessments

2.7.1. Depression, Anxiety, and Stress Scale-42 (DASS-42)

The DASS-42 (42 items) (Supplementary Materials S1, Part B) is a self-administered scale for the reliable measurement of the negative emotional states of depression, anxiety, and stress, with fourteen items in each subscale [9]. It mainly assesses dysphoria, hopelessness, devaluation of life, self-deprecation, interest/involvement, anhedonia, and inertia, while the anxiety scale evaluates autonomic arousal, skeletal muscle, situational

anxiety, and subjective experience of anxious affect. Meanwhile, the stress scale is specifically applied to examine the levels of chronic non-specific arousal in terms of difficulty in relaxation, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient. The participants rated the degree to which they experienced each state in the previous week by using a four-point severity/frequency scale, and the extent of severity was indicated by a standard severity rating index.

2.7.2. Rosenberg Self-Esteem Scale (RSES)

This self-administered scale consists of 10 statement items and is specifically applied to measure the overall self-esteem by using affirmations of both positive and negative statements [10]. The summed score was determined by the degree of self-esteem, with those who scored below 15 indicating a lower self-esteem (Supplementary Materials S1, Part B).

2.8. Statistical Analysis

Three types of data analysis were adopted. Firstly, descriptive statistics were used to analyze the demographic characteristics, awareness and understanding, engagement tendency, perceived importance, satisfaction level, and various psychological parameters. Secondly, categorical regressions were performed to identify the relative contributions of different factors to psychological distress. The descriptions of all of the independent variables of the regression model are shown in Supplementary Materials S2. The variance explained by R^2 was examined, in addition to the predictors of psychological distress in this model. Finally, the relationship of the engagement tendency and perceived importance (the independent variables) with the extent of psychological distress was examined through an analysis of variance (ANOVA) in a generalized linear model (GLM) with the use of Bonferroni adjustment for all pairwise comparisons. The statistical analysis was conducted using the SPSS version 17.0 software (SPSS, Chicago, IL, USA), with the significance defined as $p < 0.05$.

3. Results

3.1. Participants

A total of 788 students (response rate = 84.9%) participated in the study (42.9% for men and 57.1% for women), with a mean age (SD) of 23.0 ± 5.4 years. The female students were older ($t = -3.07$, $p < 0.01$), and they showed lower odds of staying in the hostels (*OR* = 0.69, $p < 0.05$). Meanwhile, the male students had a three-fold (95% CI = 1.75–4.64) higher participation rate in environmental organizations (Table 1).

3.2. Participants' Awareness and Understanding of the Ecological Wetland

The participants considered themselves highly environmentally aware with the existence of this on-campus ecological wetland, with 88.9% and 87.6% levels of awareness among the male and female students, respectively. Similarly, 83.9% and 80.2% of the male and female students were familiar with the concept and operation of the ecological wetland, and the mean cumulative points for understanding were not statistically different. However, 18.0% of students were unaware of the distinct concept and functions of the ecological wetland.

Table 1. Baseline characteristics of the participants.

Characteristic	*n*	Male (*n* = 338)	Female (*n* = 450)	OR (95% CI)	*p*
Educational attainment					
Undergraduate	605	286 (47.3)	319 (52.7)	2.26 (1.58–3.23)	<0.0001 ***
Postgraduate	183	52 (28.4)	131 (71.6)		
Marital status					
Single	747	325 (43.5)	422 (56.5)	1.66 (0.85–3.25)	0.14
Married	41	13 (31.7)	28 (68.3)		
Living arrangements					
Hostel	578	234 (40.5)	344 (59.5)	0.69 (0.51–0.95)	0.02 *
Outside of campus	210	104 (49.5)	106 (50.5)		
Involvement in environmental institutions					
Yes	79	52 (65.8)	27 (34.2)	2.85 (1.75–4.64)	<0.0001 ***
No	709	286 (40.3)	423 (59.7)		
Age	788	21.9 ± 2.2	22.5 ± 2.8		0.003 **

Student's *t*-test or χ^2 test was used. Data are presented as numbers (%) or means ± S.D. * Significant at $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.3. Participants' Perceived Importance of and Satisfaction Level with the Ecological Wetland

In descending order, the physical environment, health improvement, and stimulation of the social interactions were identified as the main factors of the perceived importance of the ecological wetland. Specifically, the majority of the students (54.9%) perceived that the ecological wetland played a key role in improving the physical environment, enhancing the biodiversity of the flora and bird species (55.1%), serving as a new habitat for wildlife (41.2%), increasing the amenity values (57.8%), and providing an aesthetic site for sightseeing (65.4%). In a wider context, 44.5% of the participants perceived that the ecological wetland constituted an important asset of improvement to their health, whereas 51.7%, 43.2%, and 38.5% of the students pointed out its feasibility for recreation and leisure, stress relief, and better quality of life, respectively. Additionally, 33.7% of the respondents enjoyed a wider social connection (32.5%), moments of gathering (38.7%), and conversation sessions (29.8%) with their friends or family members, while only 9.0% of them ranked the ecological wetland as a unique tool for research development and educational purposes.

During the data entry, students who answered with satisfaction levels that were 'somewhat satisfied' and 'satisfied' were pooled and re-categorized as 'satisfied'. Similarly, those who gave ratings of 'somewhat dissatisfied' and 'dissatisfied' were merged and re-coded as 'dissatisfied', and the category of 'neither satisfied nor dissatisfied' was re-coded as 'neutral'. The collected results revealed that 54.3% of the university students were satisfied with the ecological wetland, with one-third of them (34.2%) rating it as neutral, while only 11.5% of them were dissatisfied with the current ecological wetland.

3.4. Participants' Engagement Tendencies

Figure 2 shows the students' tendencies for engagement with the ecological wetland according to gender. A total of 17.4% of the respondents visited the ecological wetland more than once a week, 44.9% and 24.0% of them visited once weekly and monthly, and 13.7% of them had never visited the wetland. The result implied that gender disparity was not significantly associated with the frequency of visiting. Observing wildlife, flora, and bird species (*n* = 105), socializing and gathering (*n* = 75), and sightseeing (*n* = 58) were the routine (at least once per week) activities for the male students, while more female students preferred to observe the wildlife, flora, and bird species (*n* = 128), socialize and gather (*n* = 101), and enjoy brisk walking (*n* = 74) during their visits.
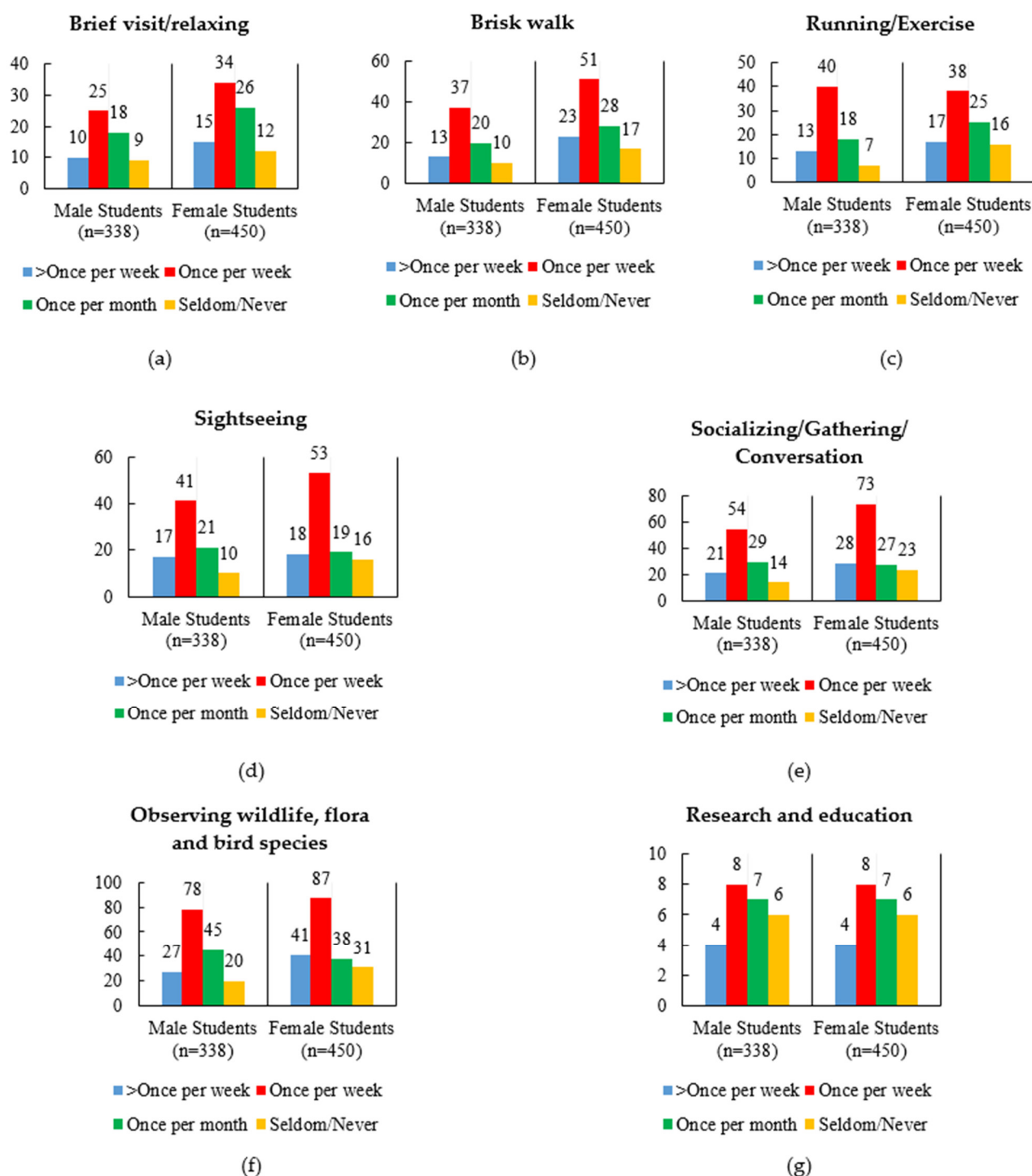
Figure 2. Engagement tendencies and participation in activities: (**a**) brief visits/relaxing; (**b**) brisk walk; (**c**) running/exercise; (**d**) sightseeing; (**e**) socializing/gathering/conversation; (**f**) observing wildlife, flora, and bird species; (**g**) research and education.

3.5. Psychological Distress

The prevalence of depression, anxiety, stress, and low self-esteem among the university students was 50.0%, 40.0%, 26.6%, and 13.8%, respectively. The female students had a higher likelihood of showing depressive symptomatology (χ^2 = 31.52; *OR* = 2.271; 95% CI = 1.702–3.030; *p* < 0.0001) and stress (χ^2 = 3.87; *OR* = 1.384; 95% CI = 1.000–1.914; *p* < 0.05). However, the female students were confronted with a lower tendency (43%) toward low self-esteem (χ^2 = 7.63; *OR* = 0.566; 95% CI = 0.377–0.851; *p* < 0.01).

3.6. Participants' Characteristics in Relation to Their Psychological Status

The results of the regression model are presented in Table 2. Age revealed a significant negative sign for all three of the psychological distress indicators: depression ($R^2 = 0.035$; $\beta = -0.187$), anxiety ($R^2 = 0.013$; $\beta = -0.114$), and stress ($R^2 = 0.246$; $\beta = -0.214$). This finding implied that psychological distress was predominant among the younger students as compared to their older counterparts. In addition, being female was an important predictor for depressive symptomatology ($R^2 = 0.031$; $\beta = 0.177$), anxiety ($R^2 = 0.015$; $\beta = 0.123$), and stress ($R^2 = 0.012$; $\beta = 0.109$) as compared with the male students. Similarly, education indicated a significant and positive sign for anxiety symptoms ($R^2 = 0.013$; $\beta = 0.114$), which suggested that higher educational levels presented higher degrees of anxiety symptomatology.

Table 2. Regression analysis with the degree of psychological distress related to demographics, engagement tendencies, perceived importance, and satisfaction.

Variables	Depression	Anxiety	Stress	Self-Esteem
Female	0.177 (0.031) ***	0.123 (0.015) ***	0.109 (0.012) **	−0.031 (0.001)
Age	−0.187 (0.035) ***	−0.114 (0.013) ***	−0.214 (0.046) ***	0.041 (0.002)
Educational attainment	0.042 (0.002)	0.114 (0.013) ***	0.068 (0.005)	−0.066 (0.004)
Engagement tendency	−0.505 (0.459) ***	−0.623 (0.035) ***	−1.084 (0.050) ***	1.618 (0.002) ***
Perceived importance	−0.668 (0.447) ***	−0.262 (0.069) ***	−0.430 (0.185) ***	0.290 (0.084) ***
Satisfaction	−0.089 (0.008) ***	−0.231 (0.053) ***	0.203 (0.041) ***	0.185 (0.034) ***

Results are presented as standardized coefficients (R^2). ** $p < 0.01$, *** $p < 0.0001$.

3.7. Engagement Tendency, Perceived Importance, and Satisfaction

The engagement tendency, perceived importance, and satisfaction towards the ecological wetland were important predictors for depression, anxiety, and stress (negative signs) ($p < 0.0001$), as well as self-esteem (positive sign) ($p < 0.0001$), in the regression model. The strongest prediction was found between the extent of depression and engagement tendency ($R^2 = 0.459$; $\beta = -0.505$), as well as perceived importance ($R^2 = 0.447$; $\beta = -0.668$).

3.8. Relationship of the Engagement Tendency and Perceived Importance with the Psychological Symptoms

Significant and strong relationships were found between the engagement tendency and perceived importance and the psychological distress (Table 3). Students who visited the ecological wetland more frequently presented significantly lower scores for depression ($F = 24.32$; $p < 0.0001$), anxiety ($F = 21.93$; $p < 0.0001$), and stress ($F = 24.25$; $p < 0.0001$). This result illustrated that university students with a higher tendency for engagement with the ecological wetland had relatively lower psychological distress. Similarly, the indicators of psychological distress ($F = 222.542$, $p < 0.0001$ for depression; $F = 16.04$, $p < 0.0001$ for anxiety; $F = 50.55$, $p < 0.0001$ for stress; $F = 35.88$, $p < 0.0001$ for self-esteem) decreased drastically among the university students who perceived the importance of the ecological wetland. These results firmly support the hypothesis that the psychological status among the university students would vary as a function of the engagement tendency and perceived importance with respect to the ecological wetland.

Table 3. The associations of the engagement tendency and perceived importance with psychological distress.

Psychological Symptoms	*F* Statistic	Engagement Level			
		Seldom/Never	Once per Month	Once per Week	>Once per Week
Depression	24.32	11.3 (10.4–12.2) [a]	10.9 (10.5–11.4) [a]	8.3 (7.8–8.8) [b]	10.0 (9.2–10.7) [a]
Anxiety	21.93	5.7 (5.1–6.3) [a]	7.0 (6.7–7.3) [b]	5.5 (5.2–5.8) [a]	5.0 (4.5–5.5) [a]
Stress	24.25	14.9 (14.1–15.8) [a]	12.4 (11.9–12.8) [b]	10.8 (10.4–11.3) [b]	11.8 (11.0–12.5) [b]
Self-esteem	1.031	18.3 (17.3–19.2)	18.6 (18.2–19.2)	18.3 (17.7–18.7)	17.9 (17.0–18.7)

	F Statistic	Perceived Importance				
		Not Important at All	Less Important	Neutral	Important	Very Important
Depression	222.542	17.0 (15.9–18.1) [a]	12.5 (11.7–13.3) [b]	12.0 (11.7–12.3) [b]	6.3 (5.9–6.6) [c]	6.0 (5.4–6.7) [c]
Anxiety	16.04	7.1 (6.0–8.1) [a]	7.0 (6.3–7.8) [a]	6.5 (6.2–6.8) [a]	5.5 (5.1–5.8) [b]	4.3 (3.7–4.9) [b]
Stress	50.55	17.0 (15.6–18.4) [a]	14.0 (13.0–15.0) [b]	13.1 (12.7–13.4) [b]	10.0 (9.5–10.4) [c]	9.6 (8.8–10.4) [c]
Self-esteem	35.88	15.3 (13.8–16.9) [a]	17.5 (16.4–18.6) [a]	17.1 (16.7–17.5) [a]	20.8 (20.3–21.3) [b]	18.9 (18.0–19.8) [c]

Data are presented as means (95% CI). Values in the same row that do not share the same superscript letter are significantly different.

4. Discussion

This was a pilot study examining university students' perceptions, engagement tendencies, and perceived importance with respect to an on-campus ecological wetland in Malaysia and their combinative associations with psychological symptoms. As such, this sample group represented a unique community character as compared to those in other population- and community-based studies. An initial finding of this work was the high level of awareness and degree of understanding of the wetland's concept. This result was not surprising given that the ecological wetland is a specific feature of the campus landscape.

Approximately 60% of the university students visited the ecological wetland at least once a week. It appeared that the university students expressed a preference for approaching environmental scenery, participation in social interactions, and practice of light exercise/training during their visits. This was applicable for those who appreciated, perceived the importance of, and were satisfied with the on-campus wetland. The results suggested the feasibility of the ecological wetland as a destination for mind relaxation and recreational or sport activities due to its existing physical environment and suggested an indirect value in engagement in human relationships. In parallel, the importance of the ecological wetland for promoting the physical and social environment, interpersonal interactions, and long-term improvement of health was highlighted [11]. Given the beneficial aspects of the ecological wetland, there are probable implications for the introduction of good monitoring strategies for the on-campus wetland, and an elucidation of the necessity of preserving the sustainability of its green assets has to be undertaken.

A number of instructive findings about the predictors of psychological distress in this study were noteworthy. The prevalence of psychological distress was apparently higher in the current study compared to in previous research conducted in Turkey (46.3%) [12], Nigeria (8.3%) [13], Iran (28.0%) [14], and the United States (46.6%) [15]. The variability of the findings among the listed studies could be attributed to differences in participants' backgrounds, the study design, types of psychological tests, operational diagnostic criteria, and geographical boundaries within the regions. Moreover, female students showed a higher tendency toward being affected by depression, anxiety, and stress. This result provided an insight into a gender-specific role in determining psychological health among the university students. Rivera-Medina and colleagues [16] proposed that a contribution from a difference in metric equivalence across gender resulted in the above findings. Age was another predictor of psychological distress, where psychological symptoms were more predominant among younger students. The study conducted by Bíró et al. [17] reported that the proportion of freshmen (younger) who suffered from psychological

distress was almost three times greater than the proportion of final-year (older) students. The authors considered these younger students to be less mature, well prepared, or ready when confronted with different challenges. The present work also demonstrated that higher educational attainment was a significant predictor of anxiety, where postgraduate students would perceive a higher level of anxiety. This finding was contradictory with that of previous research carried out by Brännlund and Hammarström [18], which suggested that higher educational attainment was positively related to lower psychological distress. However, the role of educational attainment as a predictive factor has not been verified and is not conclusive, and further investigations are necessary.

Students who were satisfied with, more frequently visited, and appreciated the importance of the ecological wetland showed better psychological health. This on-campus wetland that was designed specifically for ecological reasons could serve as an important restorative environment by mediating mental health among the university students. It provides scenic fields with a waterside, wooded areas, bushes, rocks, built-up green spaces, and a variety of glorious plants for sightseeing. As such, students would appreciate the integration of greenery into the university environment [19]. Although the ultimate mechanism by which the ecological wetland facilitates a better psychological status is not fully understood, Abraham and coworkers [20] suggested that the role of the physical attributes of the natural environment and the types of activities in which people engage can influence the possibilities for psychological restoration [21]. Pretty and colleagues [22] also supported the synergistic effect of green exercise in significantly improving the self-esteem and mood among healthy adults, regardless of the level of intensity, duration, or type of green activities involved, while sightseeing was found to be advantageous for the enhancement of self-esteem. Therefore, the environmental stimuli provided by the on-campus ecological wetland could be a potential restorative tool for improving the psychological distress among the university students. Giusti and Samuelsson [23] suggested that synergistic compatibility between environmental attitudes and healthy ecosystems could trigger restorative processes. Such an interaction, which is known as generative compatibility, reveals a valuable leverage point for transforming towards ecologically sustainable and healthy urban systems.

Another finding of this work was the tendency for engagement through a series of social gatherings and activities on the ecological wetland. Staats and Hartig [24] demonstrated the encouraging impact of company on perceived psychological restoration in natural settings. This is particularly true because environmental engagement activities often involve improvements in social networking and feelings of connectivity and companionship [25]. These benefits could be important in solving internal conflicts and providing practical guidance and critical feedback in complex social situations [26]. This is because open communication and mutual engagement among peers could encourage internal emotional sharing and prevent psychological distress. Geng and colleagues [27] further ascertained the positive role played by connections with nature in promoting positive environmental behavior and in the development of pro-environmental behavior.

There were several strengths of this research. First, it was an early study that specifically investigated the relationship between university students' perceptions of and engagement with an on-campus ecological wetland and demonstrated the restorative effects of the built environment on psychological wellbeing, thereby bridging the research gap in the pool of currently available data. It also contributes to the existing knowledge by widening the literature on the potentially health-enhancing types of natural areas. Second, the results were acquired from a representative sample size, which yielded a higher reliability and allowed a direct extrapolation to the university students at large. The findings also outlined several implications for the community. The prevalence of psychological distress was found to be surprisingly high among the university students, which indicated a pressing need to further investigate the etiology and identify those at risk. The findings provided evidence that the presence of the ecological wetland ('hard') could serve as a mental health

platform ('soft') for the university students, and improvement of the steps taken to preserve its sustainability should be empowered.

5. Limitations

Although a positive relationship between psychological restoration and the ecological wetland was found, the cross-sectional design did not show bidirectionality in these associations. The inherent bias in convenience sampling means that the sample is unlikely to be representative of the population being studied. Correlations between restorative environments, social relations, and mental health have been proposed; however, a deeper investigation that examines the interconnections between these parameters is recommended. In addition, there could be some other confounding and key factors affecting the results. For example, students with problems with psychological distress could be proactive in seeking assistance from health professionals. It is also possible that the degree of depression, anxiety, stress, and self-esteem among the university students could influence their interest in and engagement with the ecological wetland. The unmeasured covariates, such as the personality traits of the subjects, were not taken into account. Lastly, the current questionnaire has not been empirically validated. This innovation can be tested in a scholarly way by using a research method with an empirical survey for better interpretation of the data. Future research that involves a larger sample size and the integration of specific psychological evaluations would be a prominent strategy for further improving these findings.

6. Conclusions

Psychological distress is highly prevalent among university students, and the findings reinforced the compelling need for effective measures and preventive strategies. The majority of the students showed positive perceptions, engagement tendencies, and perceived importance with respect to the ecological wetland, and these were positively correlated with psychological symptoms. The findings revealed that the ecological wetland not only has potential for water quality improvement, biodiversity conservation, and stormwater storage, but also provides a natural psychologically restorative setting for its visitors. A longitudinal study that further explores the tendency for engagement with the ecological wetland and psychological wellbeing among university students is recommended. Ultimately, an integrated approach, which would require full participation and commitment from top management in involvement, should be systematically pursued to emphasize the psychological problems and to preserve the sustainability of the ecological wetland. Ultimately, the restorative benefits of nature exposure support people's wellbeing, and ecological sustainability is an urgent priority.

Conflicts of Interest: The authors declare no conflict of interest.

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