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The Psychological Effects of Park Therapy Components on Campus Landscape Preferences

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ABSTRACT

COVID-19 has doubled the prevalence of mental health problems among young adults. In Indonesia, it extends the vulnerability of families, increases economic uncertainty, interrupts food security, and affects psychological well-being. Accordingly, this research examined the correlation between psychological effects and preferred landscape elements. Experiments were conducted in a campus park, arboretum, and a road. Participants captured attractive views during the walk using the Visitor-Employed Photography method and evaluated psychological effects using the Profile of Mood States (POMS) and the State-Trait Anxiety Inventory (STAI) pre-and post-walking. Google Cloud Vision API was used to get the image annotation keywords. The results indicated a correlation between psychological effects and preferred landscape elements. Park therapy components, including plant, flower, and sky, were negatively correlated with negative moods and anxiety levels. These findings presented scientific evidence for the psychological relaxation outcome of walking and prominent components of park therapy to support therapeutic campus greenspace planning.

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1. Introduction

The COVID-19 global pandemic impacted Indonesia in the early 2020s, where health and human services and agriculture growth have emerged. In contrast, information and communication, as well as utilities, had the highest growth rates (Asian Development Bank, 2022). The mental health of youth (15-24 years) has deteriorated significantly in the past couple of years. In most countries, mental health problems have become twice as prevalent among this age group as they were in the past due to the COVID-19 pandemic, such as depression and anxiety symptoms. Many factors contribute to mental health deterioration, including disruptions in healthcare services, school closings, and a job market crisis that disproportionately affects young people (OECD, 2021). According to a study on family resilience during the COVID-19 outbreak in Indonesia, respondents were

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concerned about losing/death of family members (74%), family finances (60.2%), children's futures (58.1%), and own death (56.7%) (Sunarti et al., 2022). Young people have the potential to influence change in the development and promotion of mental health and well-being (MHWB) programs (Raviola et al., 2019). Previous research has proven that mental health is closely associated with human physical health. Due to the benefits of exposure to the natural environment, campus green space is a valuable resource for students' daily living routines, working, and learning. Shinrin-yoku (forest bathing) is one of the most cost-effective methods of getting in touch with nature (Park et al., 2007, 2010; Tsunetsugu et al., 2007). Research has shown that walking in forests and urban parks for 15 minutes improved mood, reduced anxiety (Song et al., 2013, 2014), increased meditation and attention (Hassan et al., 2018), lowered pulse rate, diastolic blood pressure, and LF/(LF+HF) components of heart rate variability (Park et al., 2010) and reduced salivary cortisol levels (Tsunetsugu et al., 2007).

Increasing access and awareness of green spaces and enhancing the quality and quantity of green spaces could be beneficial for stress reduction in university settings (Holt et al., 2019; Seitz et al., 2014). Eckbo (1964) stated that green space is a tool in campus life. It accommodates various disciplines' learning activities, social communication, and reciprocal relationships. Also, it provides a place for recreation and rest, promotes mental well-being, and awakens positive emotions (Foellmer et al., 2021). A well-designed campus environment is important for the educational mission and users' mental well-being. Therefore, physical, social, symbolic, and experienced spaces should be created to create a therapeutic landscape (Völker & Kistemann, 2015). The Dramaga Campus, IPB University, Bogor, West Java, Indonesia, which is designated as the green campus, is expected to shape the behaviour of the academic community to be green, active, and energy-efficient. While there are many parks at IPB University, there has been no active movement or health promotion to use parks to enhance the mental health and well-being of the young academic community. In this regard, it would be worthwhile to examine the health and well-being of students on campus (Elsadek et al., 2019; Foellmer et al., 2021; Ghorbanzadeh, 2019; Guo et al., 2020). Campus planning should emphasize potential effects on disparities in students' satisfaction, well-being, and academic success (Foellmer et al., 2021).

Forest and park therapy studies have been proven from the stimulus carried out in the laboratory (Jo et al., 2019) and on-site surveys (Park et al., 2010, 2011; Pratiwi et al., 2020). In the era of technology disruption, the usage of virtual stimuli (Benzina et al., 2019; Guo et al., 2020) and cloud computing were applied for landscape planning or evaluation (Richards et al., 2018; Urech et al., 2020; Włodarczyk-Marciniak et al., 2020). Landscape preference is yet to be evaluated through forest and park therapy programs. Human landscape preferences are believed to be associated with their moods (Gao et al., 2019; Li et al., 2021; Pratiwi et al., 2020). Furthermore, Luo et al. (2022) suggest that adding elements desired by individuals to resting environments may result in a generalized healthy environment setting, such as lush greenery, water bodies, and meadows. Spatial arrangement and the type of environment should be considered to improve the restorative quality of urban environments and satisfy the recreational demands of residents on a greater scale (Gao et al., 2019). In the previous research, we found that walking in the campus park and arboretum resulted in lower and decreased heart rate and decreased negative emotion and anxiety status (Pratiwi & Sulistyantara, 2021). However, no study has declared what kind of park elements are needed to improve psychological benefits. This present study was designed to provide such evidence to be considered in guidelines of landscape planning to support an active and healthy academic community. This study examined the correlation between the psychological effects and preferred landscape elements. Our study hypothesized that landscape preferences shown by the captured photographs would correlate with decreased psychological responses of negative moods and state anxiety.

2. Materials and Methods

2.1 Experiment Sites

The experiment was carried out from August to September 2021 in the green space of the Dramaga campus of IPB University, Bogor, Indonesia, with the Academic Event Plaza and Arboretum as the experimental site (Figure 1) and the Jalan Raya Dramaga as the control site (Figure 2). IPB University has been recognized as a Biodiversity Campus since 2011. Among the green spaces at IPB, there was a lake, a forest, an arboretum, and a plantation. In contrast, blue spaces are characterized by lakes and three rivers throughout the campus, contributing to a high diversity of habitats. A green campus must maintain biodiversity to provide a convenient environment for the campus academic community (Satria et al., 2021). Academic Event Plaza (AEP) park is one symbolic place on the IPB University campus. It becomes an axis line that connects Graha Widya Wisuda (graduation hall) and the Rectorate building as generators of axial motion and unifying elements (Simonds and Starke, 2013). AEP serves recreation, education, and socialization place for students, lecturers, and staff, especially during big events such as graduation and student orientation. Arboretum holds documented collections of plants and landscaped gardens. The managing institution creates resources for scientific research, education and outreach programs, public displays, garden specimens and technologies for biodiversity conservation, plant production and services based on plants (Kuzevanov, 2013). The existence of this arboretum on the IPB University campus has a very high role as an absorber of air pollution. The arboretum as a green belt between the densely populated off-campus area and busy transportation routes with the area within the campus is supported by a high level of vegetation diversity and a site condition close to natural. The comfort created by this arboretum not only has a positive effect on the environment but can also increase the productivity of the IPB academic community. The students usually access this arboretum during practicum hours, weekend physical activity, and organizational activity. Therefore, it is necessary to examine user preferences in campus landscape planning and design to improve the health benefits and aesthetic and thermal comfort. The criteria for site selection for the experiment are 1) length of 1 trip of at least 400 m; 2) flat slope; 3) well-managed circulation (Pratiwi et al., 2020; Song et al., 2013, 2014, 2019). The walking distance on the walking courses at AEP, arboretum, and Jalan Raya Dramaga are 815.36 m (round trip), 1.18 km (round trip), and 740.92 m (round trip), respectively.

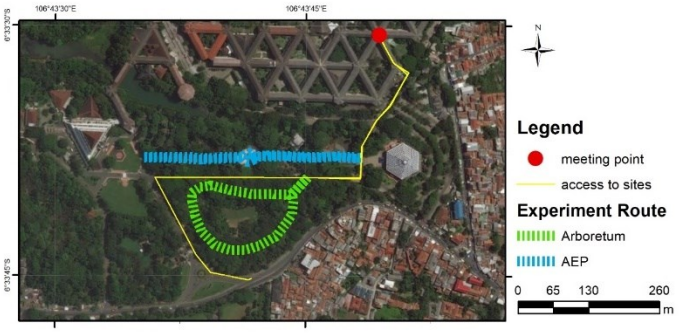

Figure 1. Experimental Route.

Figure 2. Control Route.

2.2 Participants

The subjects were selected through snowball sampling through 10 key informants from various faculties. The participants were recruited in the following steps: 1) posters and Google Forms distribution through social media, Whatsapp; 2) explanation of research procedures and delivery of experiment schedules with Zoom meetings. They have been informed about what activities will be carried out, the types of questionnaires, the incentives they will receive, and the detailed research protocol. This research protocol was inspected by the doctor in charge of the research from the IPB University Polyclinic. The eligibility criteria for experimental participants were: (1) IPB students aged 19-27 years, (2) students living in Bogor and its surroundings, (3) not being treated for cardiovascular disease and hypertension, and (4) in a healthy condition, walk for 20 minutes or more without a problem. The consideration in the selection of participants was IPB University students because they were the primary users of the campus landscape who lived close to campus. It is consistent with the previous study that local communities play a role and participate in structuring the urban landscape (Amen, 2022; Amen & Nia, 2018; Pratiwi et al., 2014, 2020; Pratiwi & Furuya, 2019). A total of 32 student participants lived in the City and

Regency of Bogor. Several previous studies with a sample size of 9-19 participants have demonstrated significant results (Lee et al., 2009, 2015; Ochiai et al., 2015; Park et al., 2009; Pratiwi et al., 2019, 2020; Song et al., 2013, 2014, 2017; Takayama et al., 2017). Thus, 32 subjects were sufficient to produce significant results in the experiment. Eight males and twenty-four females (mean age, 21.5 ± 2.3 years) participated in the park therapy experiment. The experimental procedures follow the regulations of the Research Ethics Commission Involving Human Subjects, IPB University (Number: 456/IT3.KEPMSM-IPB/SK/2021).

2.3 Experimental Design

Thirty-two participants were divided into two groups (park and road) in one day. Each group consists of 2 participants. Each participant is only allowed to participate in the experiment once. Before the experiment, participants were required to conduct a health check by the medical team at the polyclinic. Then the participants brought their health certificates on the day of the experiment. All participants assembled in the meeting room, and then all staff conducted screening by 1) measuring body temperature (no fever at 38 °C and 2) checking general health conditions (no cough, runny nose, or shortness of breath). Then participants filled out and signed the consent form. Participants received explanations and finished questionnaires to evaluate their moods and anxiety state before experimenting. Each participant walked on a predetermined course during the experiment while photographing impressive landscape elements for 15 minutes. The participants later returned to the break room to finish the questionnaires. In this experiment, a washout period of at least 30 minutes was considered sufficient to negate the interventions applied in the previous research (Pratiwi et al., 2019, 2020; Song et al., 2013; Elsadek et al., 2019). During the experiment, the health protocol to prevent the transmission of Covid-19, participants were required to 1) wear a mask, 2) keep a distance, 3) not smoke, 4) not eat, and 5) not drink drinks containing caffeine, during experiments (walking and filling out the questionnaires).

2.4 Research Tool and Materials

Participants were asked to complete the Profile of Mood States (POMS) and the State-Trait Anxiety Inventory (STAI) before and after the experiment. An evaluation of the mood state was conducted using the POMS, which consists of 35 questions covering six subscales: "anger-hostility" (A-H), "confusion-bewilderment" (C-B), "depression-dejection" (D-D), "fatigue-inertia" (F-I), "tension-anxiety" (T-A), and "vigor-activity". (V-A). A Likert scale with five points ranged from 0 (not at all) to 4 (extremely). A total mood disturbance score (TMD) was generated based on the after formulas: A-H + C-B + D-D + F-I + T-A - V-A (Konuma et al., 2015; Lin et al., 2014). An evaluation of the current state of anxiety was conducted using the STAI state-anxiety scale after exposure to greenspace consisting of 20 questions. The scale used was 4 Likert scales starting from 1 (not at all) to 4 (very much so) (Fernández-Blázquez et al., 2015; Julian, 2011).
The Visitor-Employed Photography (VEP) method was utilized to collect photographs at the experimental site. VEP is an effective method that quickly measures on-site and real-time responses (Oku & Fukamachi, 2006). The photographs were taken with an iPhone with GPS (Geographical Positioning System) function and Bluetooth connection provided by researchers. Next, the photographs were sent to the Google Cloud Vision API software to get image annotation keywords (Dutta et al., 2018; Richards et al., 2018; Shi, 2020). Finally, the landscape preferences questionnaire consisted of questions regarding preferred view, landscape elements, and their reasons for each site delivered to the subjects (Hadi et al., 2017, 2018). A landscape preferences questionnaire was used to evaluate the subject's most preferred scenery and landscape elements in each site and describe why they chose those scenery and landscape elements.

2.5 Analysis Methods

The analysis method included correlation analysis between psychological responses and preferred landscape elements, as reported in previous research that physiological and psychological responses were correlated with park therapy imagery (Pratiwi et al., 2020). The data analysis procedure is depicted in Figure 3.

2.5.1 Correlation analysis of preferred landscape elements in the three locations

The first stage is to analyze the consistency of the appearance of landscape elements on the two experimental and one control sites detected with the Google Image API and through a manual questionnaire with correlation analysis. Spearman correlation was employed to analyze the correlation between preferred landscape elements of the experimental location.

2.5.2. Correlation analysis of psychological responses and preferred landscape elements

The following analysis stage is to formulate park therapy components into a healthy and safe campus green space model based on user preferences during a pandemic. Spearman correlation was employed to verify the correlation between psychological responses and preferred landscape elements. The outputs are arranged to explain the criteria for park therapy components that are appropriate and effective in reducing negative moods and anxiety levels. Statistical differences were examined significant at $p < 0.05$ using JASP 0.15 (The University of Amsterdam, Amsterdam, The Netherlands).

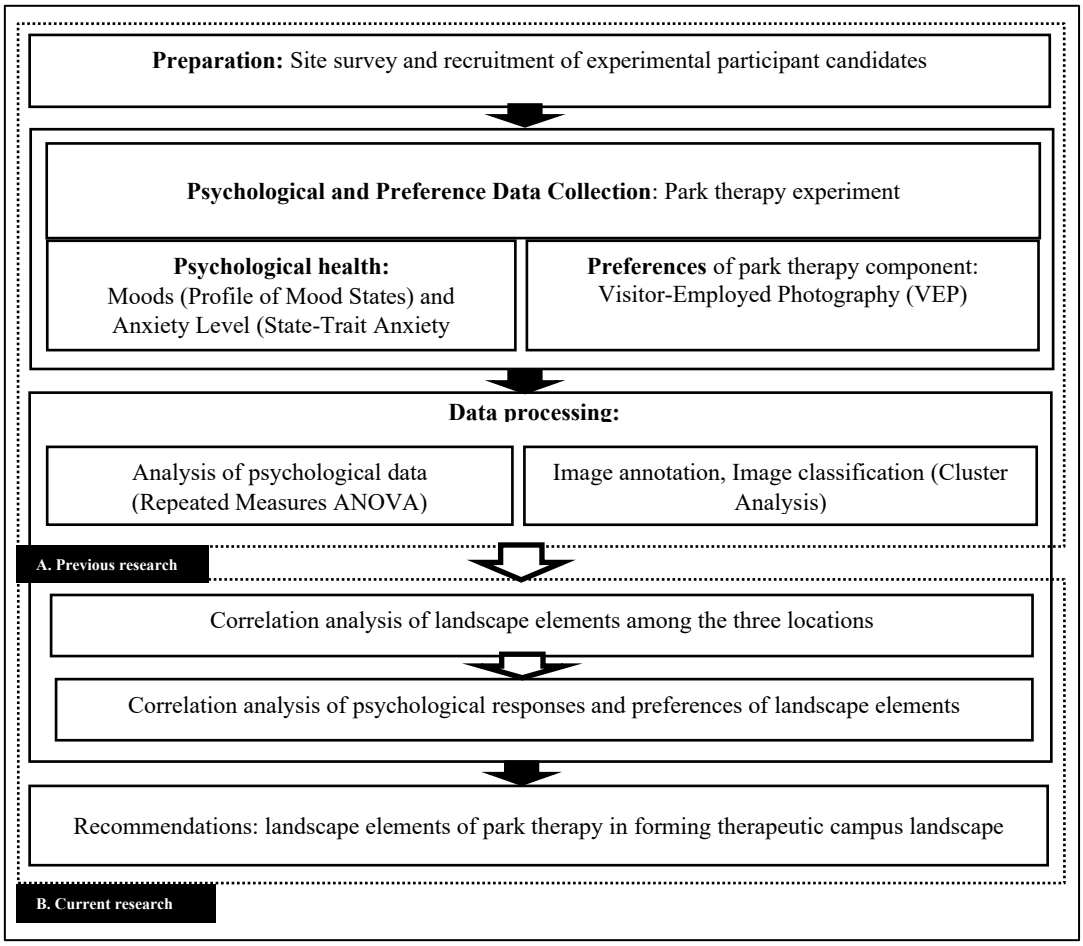

Figure 3. Research Methodology.

3. Results

The practice of park therapy in the park and campus arboretum decreased negative moods and anxiety. A significant reduction was detected in 4 negative moods including "confusion-bewilderment", "depression-dejection", "fatigue-inertia", and "tension-anxiety". Location factors, especially the arboretum and time (before and after walking), significantly reduce depression and tension. While an anxiety reduction was found after walking in the arboretum, followed by Academic Event Plaza and Jalan Raya Dramaga.

Data on experimental subjects' preference for park therapy components were gained by gathering 837 photographs. The most photographs were taken in the AEP with 380 photographs, followed by the arboretum with 347 photographs, and Jalan Raya Dramaga with 110 photographs. The Google Vision API identified 68-word terms. The top five labels for AEP were Plant (335), Sky (181), Tree (151), Natural Landscape (67) and Cloud (58). The top five labels for the Arboretum were Plant (330), Sky (171), Tree (121), Natural Landscape (54), and Flower (52), whereas the top five labels for Jalan Raya Dramaga were Plant (206), Sky (47), Flower (27), Cloud (21), and Road Surface (4) (Pratiwi & Sulistyantara, 2021). The examples of photographs taken by the subjects are presented in Figure 4. Based on the number of photographs captured at each location, experimental participants stated that AEP and arboretum had more preferred landscape elements than Jalan Raya Dramaga.

Figure 4. Geo-tagged Photographs. (a) Academic Event Plaza; (b) Arboretum; (c) Jalan Raya Dramaga.

3.1 Correlation of landscape elements from images detected by Google API

The correlation analysis of landscape elements detected automatically through the Google Vision API showed a significant correlation from each location. It exhibited that the subjects have the same consistency of preferences for landscape elements even though they moved to other locations. The two highest labels detected by the three locations were Plant and Sky. The analysis showed a high correlation between the landscape elements in the AEP and the arboretum (r = 0.971). Information can be seen in Table 1.

Table 1. Landscape Elements Correlation Analysis collected by Google Vision API.

Location	Pearson r	Spearman rho	Kendal tau B
AEP-Arboretum	0.998***	0.971***	0.953***
AEP-Jalan Raya	0.883***	0.486***	0.428***
Arboretum-Jalan Raya	0.907***	0.511***	0.452***

* $p < 0.05$, *** $p < 0.01$, *** $p < 0.001$

3.2. Correlation of landscape elements from questionnaire data

Preference data was also collected manually by filling out questionnaires by the subjects. The results showed 21 attractive landscape elements according to the subjects. The most chosen landscape elements by the subjects were "trees" (89), "roads" (47), "paving blocks" (40), "flowers" (38), and "bushes" (37). The correlation analysis of landscape elements collected manually by questionnaire showed that only the arboretum had a significant correlation with AEP (r = 0.674) and Jalan Raya Dramaga (r = 0.608). At the same time, there was no significant correlation between the elements selected in AEP and Jalan Raya Dramaga (Table 2). It exhibited that the preference of landscape elements based on the questionnaire does not show consistency among all locations. Based on the correlation analysis of the two data sources, it can be stated that the landscape elements determined automatically from the photograph analysis of the VEP method using the Google Vision API had a better preference consistency. Therefore, the formulation of park therapy components will use a list of landscape elements from photograph analysis.

Table 2. Landscape Elements Correlation Analysis from Questionnaire Data.

Location	Pearson r	Spearman rho	Kendal tau B
AEP-Arboretum	0.829***	0.674***	0.551***
AEP-Jalan Raya Dramaga	0.668***	0.349	0.254
Arboretum-Jalan Raya Dramaga	0.849***	0.608***	0.515***

* $p < 0.05$, *** $p < 0.01$, *** $p < 0.001$

3.3. Correlation of Psychological Responses and Landscape Elements

The results of the correlation analysis show that there is a correlation between psychological responses and park therapy components. Psychological response to anxiety status (STAI) has a significant correlation with three landscape elements, namely "plant community" (r = -1), "plant" (r = -0.999), "flower" (r = -0.999), and "sky" (r = -0.997). The correlation

between anxiety status and the three elements of the landscape shows a negative correlation (Table 3). The negative correlation showed that the addition of the elements "plant community", "plant", "flower", and "sky" could reduce anxiety status after walking. Figure 5 shows a heat map of the correlation of anxiety status with the three landscape elements. In addition, Total Mood Disturbance negatively correlates with one landscape element, "plant community" (*r* = -0.999). The negative correlation between the two showed that adding "plant community" elements can reduce mood disturbances after walking (Table 4 and Figure 6).

Table 3. Correlation Analysis between STAI and Landscape Elements.

Variable		Plant	Flower	Sky	Plant community	STAI 2
1. Plant	Pearson's r	—				
	p-value	—				
	Spearman's rho	—				
	p-value	—				
1. Flower	Pearson's r	1.000*	—			
	p-value	< .001*	—			
	Spearman's rho	1.000*	—			
	p-value	0.333	—			
2. Sky	Pearson's r	0.999	0.999*	—		
	p-value	0.021	0.021	—		
	Spearman's rho	1.000*	1.000	—		
	p-value	0.333	0.333	—		
3. Plant community	Pearson's r	0.999*	0.999*	0.998*	—	
	p-value	0.022	0.022	0.043	—	
	Spearman's rho	0.866	0.866	0.866	—	
	p-value	0.333	0.333	0.333	—	
4. Natural Landscape	Pearson's r	0.988	0.988	0.993	0.983	
	p-value	0.097	0.097	0.076	0.119	
	Spearman's rho	1.000	1.000	1.000	0.866	
	p-value	0.333	0.333	0.333	0.333	
5. STAI 2	Pearson's r	-0.999*	-0.999*	-0.997*	-1.000*	—
	p-value	0.027	0.048	0.048	0.005	—
	Spearman's rho	-0.500	-0.500	-0.500	-0.866	—
	p-value	1.000*	1.000	1.000	0.333	—

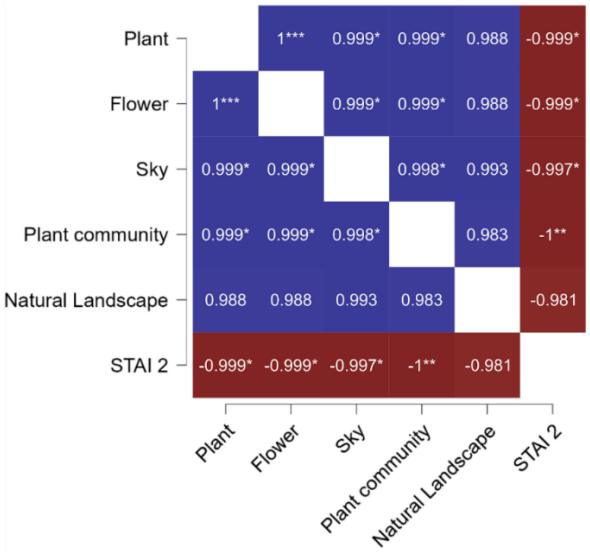

Figure 5. Heat map of correlation between anxiety status and landscape elements of park therapy.

Table 4. Correlation Analysis of POMS and Landscape Elements.

Variable		Plant community	TMD 2	TMD 1
1. Plant community	Pearson's r	—		
	p-value	—		
	Spearman's rho	—		
	p-value	—		
2. TMD 2	Pearson's r	-0.999*	—	
	p-value	0.035	—	
	Spearman's rho	-0.866	—	
	p-value	0.333	—	
3. TMD 1	Pearson's r	-0.286	0.338	—
	p-value	0.815	0.780	—
	Spearman's rho	0.000	0.500	—
	p-value	1.000	1.000	—

* $p < .05$, ** $p < .01$, *** $p < .001$

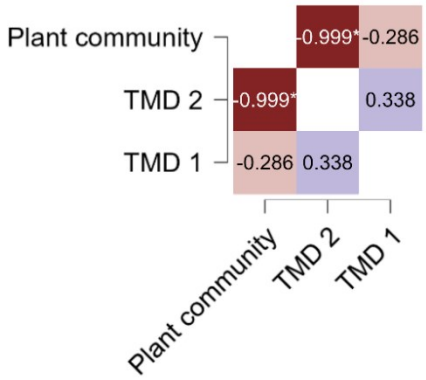

Figure 6. Heat Map Correlation of Total Mood Disturbance and Landscape Elements of Park Therapy.

4. Discussions

The environment becomes the main stimulus that can give the effect of wanting to move and have an activity (refuge and prospect) or move away (escape). Green space is an inseparable part of an academic landscape where students can interact, learn, observe, and research. A campus landscape with vista, spaces and appropriate design can form students' good behaviour and nature awareness of the surrounding landscape, grow a sense of pride in their university and lead to their satisfaction and academic motivation (Ghorbanzadeh, 2019). The previous studies showed that the type of natural green space could affect the psychological response of students. The type of landscape affects the decrease in psychological responses, especially negative moods such as "depression-dejection" and "tension-anxiety" detected in the arboretum. It was in line with Gatersleben & Andrews (2013) that an arboretum might have a high prospect (clear vision) and a low refuge (place to hide) so that it becomes a restorative natural green space. Walking in the campus park and arboretum affected decreased almost all negative moods, including "confusion-bewilderment", "depression-dejection", "tension-anxiety", and "fatigue-inertia" as well as anxiety status. The previous studies also exhibited significant differences in moods and state anxiety after walking in urban parks (Lyu et al., 2019; Song et al., 2013, 2014, 2015, 2019). Furthermore, parks have positive psychological effects by offering recreational aims for users with mental disorders (Tok et al., 2020).

4.1 Consistency of landscape elements correlation among the three locations

Based on the correlation analysis, it was discovered that the preference for landscape elements was consistent in the three locations. The two highest labels detected by the three locations were “plant” and “sky”. It shows that the openness of views to the sky (high prospect) and the plants along the walking course were mostly chosen by young adults. Gatersleben & Andrews (2013) proved that natural landscapes with high prospects and low refuge created restorative places. Moreover, the AEP with an

artificial landscape (plaza) and its feature also provide high prospects and low refuge, which establishes potential benefits of psychological restoration (Subiza-pérez et al., 2020). Plant and the sky are natural landscape elements providing pleasurable experiences through the human senses and significantly affect tension, confusion, and depression (Wang et al., 2019). Plant strongly influences human perceptions, preferences, and physiological and psychological effects because the organs of plants, from the roots to the flowers, can produce and release BVOCs that humans can perceive via their five senses (Loreto et al., 2014). Thus, practising forest bathing in space with high prospects and low refuge by integrating stimulation of the five senses in the natural landscape leads to beneficial psychological and physiological effects (Antonelli et al., 2020).

4.2 Restorative Park Therapy Components

The therapeutic landscape element cannot be seen in landscape photographs while walking on the courses. The correlation between image labels and the psychological effects after walking was explored further. It was found that anxiety levels were negatively related to landscape elements. The only landscape element, plant community, was negatively correlated with Total Mood Disturbance. While, plant community, plant, flower, and sky were correlated with a state of anxiety. The more these elements were detected by Google API, the lower the mood disturbance and state of anxiety. Campus green space was considered among the most preferred feature by students, showing the significance of creating alternative campus habitats for students (Bostancı & Akdağ, 2020). Greenery and flowers, as natural stimuli, become prominent seasonal landscape elements that correlate with physiological and psychological responses, such as a reduction in diastolic blood pressure and an increase in vigor after walking in urban parks (Pratiwi et al., 2020). This study proved a correlation between landscape preference in different sites. Moreover, park therapy components, including plant, flower, and sky, were negatively correlated with negative moods and anxiety levels. Thus, the hypothesis of this research (namely, that preferred landscape elements would correlate with decreased psychological responses of negative moods and state anxiety) was supported.

5. Conclusions

The prevalence of mental health problems has doubled among young adults due to the COVID-19 pandemic. Many studies have proved physiological and psychological of taking the atmosphere in a forest landscape, namely Shinrin-yoku. Still, they lack study regarding the relation between landscape preference and the psychological effects of Shinrin-yoku. The eminence of image annotation using Google API is effective and has potential in formulating park therapy components. Park therapy components, including plant, flower, and sky, were negatively correlated with negative moods and anxiety levels. The campus green space with high visibility to the sky view, proper planting design, and fascinating landscape elements can potentially overcome psychological disturbances for the academic community. Therefore, managing tree canopy management regularly, proposing a compact and mass planting design, and selecting flowering landscape plants are needed to get optimal psychological relaxation results.

Future research should seek to discover therapeutic campus greenspace design criteria based on academic community preference. Physical, social, symbolic, and experienced spaces in the campus landscape must be integrated into campus greenspace planning to encourage thorough health restoration in the academic campus landscape.

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Conflicts of interest

The Author(s) declares(s) that there is no conflict of interest.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author/s.

Ethics statements

No potentially identifiable human images or data are presented in this study.

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Conceptualization: P.I.P., B.S. Data curation: P.I.P., S.S., S.N.L. Formal analysis: P.I.P., S.S., S.N.L.

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References

Antonelli, M., Donelli, D., Barbieri, G., Valussi, M., Maggini, V., & Firenzuoli, F. (2020). Forest volatile organic compounds and their effects on human health: A state-of-the-art review. *International Journal of Environmental Research and Public Health*, *17*(18), 1–36. https://doi.org/10.3390/ijerph17186506

Asian Development Bank (2022). *Rising from the pandemic*. ADB. https://doi.org/http://dx.doi.org/10.22617/TCS220093-2

Amen, M. (2022). The effects of buildings' physical characteristics on urban network centrality. *Ain Shams Engineering Journal*, *13*(6), 101765. https://doi.org/10.1016/j.asej.2022.101765

Amen, M., & Nia, H. A. (2018). The dichotomy of society and urban space configuration in producing the semiotic structure of the modernism urban fabric. *Semiotica*, *2018*(222), 203–223. https://doi.org/10.1515/sem-2016-0141

Benzina, N., Morgieve, M., Euvrard, M., Flores Alves Dos Santos, J., Pelissolo, A., & Mallet, L. (2020). Personalised 360° video exposure therapy for the treatment of obsessive-compulsive disorder: A single case study. *French Journal of Psychiatry*, *1*(2020), 31–38. https://doi.org/10.1016/j.fjpsy.2020.02.004

Bostancı, S., & Akdağ, S. G. (2020). Understanding aesthetic experiences of architectural students in vertical and horizontal campuses. *Journal of Contemporary Urban Affairs*, *4*(2), 13–26. https://doi.org/10.25034/ijcua.2020.v4n2-2

Dutta, A., Verma, Y., & Jawahar, C. V. (2018). Automatic image annotation: the quirks and what works. *Multimedia Tools and Applications*, *77*(24), 31991–32011. https://doi.org/10.1007/s11042-018-6247-3

Eckbo, G. (1964). *Urban Landscape Design.* New York: McGraw-Hill.

Elsadek, M., Liu, B., & Lian, Z. & Xie, J. (2019). Green façades: Their contribution to stress recovery and well-being in high-density cities. *Urban Forestry and Urban Greening*, *46*(2019), 126446. https://doi.org/10.1016/j.ufug.2019.126446

Fernández-Blázquez, M. A., Ávila-Villanueva, M., López-Pina, J. A., Zea-Sevilla, M. A., & Frades-Payo, B. (2015). Psychometric properties of a new short version of the State-Trait Anxiety Inventory (STAI) for the assessment of anxiety in the elderly. *Neurología*, *30*(6), 352–358. https://doi.org/10.1016/j.nrleng.2015.05.002

Foellmer, J., Kistemann, T., & Anthonj, C. (2021). Academic greenspace and well-being — can campus landscape be therapeutic? evidence from a german university. *Wellbeing, Space and Society*, *2*(1), 100003. https://doi.org/10.1016/j.wss.2020.100003

Gao, T., Zhang, T., Zhu, L., Gao, Y., & Qiu, L. (2019). Exploring psychophysiological restoration and individual preference in the different environments based on virtual reality. *International Journal of Environmental Research and Public Health*, *16*(17), 3102. https://doi.org/10.3390/ijerph16173102

Gatersleben, B., & Andrews, M. (2013). When walking in nature is not restorative-The role of prospect and refuge. *Health and Place*, *20*(2013), 91–101. https://doi.org/10.1016/j.healthplace.2013.01.001

Ghorbanzadeh, M. (2019). A Study on the quality of campus landscape on students' attendance at the university campus. *Civil Engineering Journal*, *5*(4), 950–962. https://doi.org/10.28991/cej-2019-03091302

Guo, L. N., Zhao, R. L., Ren, A. H., Niu, L. X., & Zhang, Y. L. (2020). Stress recovery of campus street trees as visual stimuli on graduate students in autumn. *International Journal of Environmental Research and Public Health*, *17*(1), 148. https://doi.org/10.3390/ijerph17010148

Hadi, A. A., Mizuuchi, Y., Honjo, T., & Furuya, K. (2017). Identifying impressive landscape objects based on geotagged photographs (a case study of self-portraits and ordinary photographs). *Journal of Indonesian Tourism and Development Studies*, *5*(2), 73–80. https://doi.org/10.21776/ub.jitode.2017.005.02.02

Hadi, A. A., Mizuuchi, Y., Setyanti, D., Honjo, T., & Furuya, K. (2018). Identifying visitor preferences for locations and features in bogor botanical garden, indonesia, using gps tracking and geotagged photographs. *Journal of Architecture&ENVIRONMENT*, *16*(1), 047. https://doi.org/10.12962/j2355262x.v16i1.a3029

Hassan, A., Tao, J., Li, G., Jiang, M., Aii, L., Zhihui, J., Zongfang, L., & Qibing, C. (2018). Effects of walking in bamboo forest and city environments on brainwave activity in young adults. *Evidence-Based Complement ary and Alternative Medicine*, *2018*(9653857), 1–9.

https://doi.org/10.1155/2018/9653857

Holt, E. W., Lombard, Q. K., Best, N., Smiley-Smith, S., & Quinn, J. E. (2019). Active and passive use of green space, health, and well-being amongst university students. *International Journal of Environmental Research and Public Health*, *16*(3), 424. https://doi.org/10.3390/ijerph16030424

Jo, H., Song, C., & Miyazaki, Y. (2019). Physiological benefits of viewing nature: A systematic review of indoor experiments. *International Journal of Environmental Research and Public Health*, *16*(23), 4739. https://doi.org/10.3390/ijerph16234739

Julian, L. J. (2011). Measures of anxiety: state-trait anxiety inventory (STAI), beck anxiety inventory (BAI), and hospital anxiety and depression scale-anxiety (HADS-A). *Arthritis Care & Research*, *63*(S11), S467–S472. https://doi.org/10.1002/acr.20561

Konuma, H., Hirose, H., & Yokoyama, K. (2015). Relationship of the japanese translation of the profile of mood states second edition (POMS 2®) to the first edition (POMS®). *Juntendo Medical Journal*, *61*(5), 517–519. https://doi.org/10.14789/jmj.61.517

Kuzevanov, V. (2013, November). Botanic gardens and arboreta as ecological resources for sustainable development. Paper presented at International Symposium "Role of the Arboretum and Botanical Garden against Climate Change of the East Asia". Abstract retrieved from http://iskna.org/

Lee, J., Park, B. J., Tsunetsugu, Y., Kagawa, T., & Miyazaki, Y. (2009). Restorative effects of viewing real forest landscapes, based on a comparison with urban landscapes. *Scandinavian Journal of Forest Research*, *24*(3), 227–234. https://doi.org/10.1080/02827580902903341

Lee, J., Park, B., Ohira, T., & Kagawa, T. (2015). Acute effects of exposure to a traditional rural environment on urban dwellers : a crossover field study in terraced farmland. *International Journal of Environmental Research and Public Health*, *12*(2), 1874–1893. https://doi.org/10.3390/ijerph120201874

Li, K., Zhai, Y., Dou, L., & Liu, J. (2021). A preliminary exploration of landscape preferences based on naturalness and visual openness for college students with different moods. *Frontiers in Psychology*, *12*(1), 629650. https://doi.org/10.3389/fpsyg.2021.629650

Lin, S., Hsiao, Y.-Y., & Wang, M. (2014). Test Review: The profile of mood states 2nd edition. *Journal of Psychoeducational Assessment*, *32*(3), 273–277. https://doi.org/10.1177/0734282913505995

Loreto, F., Dicke, M., Schnitzler, J. P., & Turlings, T. C. J. (2014). Plant volatiles and the environment. *Plant, Cell and Environment*, *37*(8), 1905–1908. https://doi.org/10.1111/pce.12369

Luo, S., Shi, J., Lu, T., & Furuya, K. (2022). Sit down and rest: use of virtual reality to evaluate preferences and mental restoration in urban park pavilions. *Landscape and Urban Planning*, *220*(1), 104336. https://doi.org/10.1016/j.landurbplan.2021.104336

Lyu, B., Zeng, C., Deng, S., Liu, S., Jiang, M., Li, N., Wei, L., Yu, Y., & Chen, Q. (2019). Bamboo forest therapy contributes to the regulation of psychological responses. *Journal of Forest Research*, *24*(1), 61–70. https://doi.org/10.1080/13416979.2018.1538492

Ochiai, H., Ikei, H., Song, C., Kobayashi, M., & Takamatsu, A., Miura, T., Kagawa, T., Li, Q., Kumeda, S., Imai, M., & Miyazaki, Y. (2015). Physiological and psychological effects of forest therapy on middle-aged males with high-normal blood pressure. *International Journal of Environmental Research and Public Health*, *12* (3), 2532–2542. https://doi.org/10.3390/ijerph120302532

OECD (2021). Supporting young people's mental health through the COVID-19 crisis. *Tackling Coronavirus (COVID-19)*, *May*, 1–15. https://doi.org/10.18356/9789210057790c003

Oku, H., & Fukamachi, K. (2006). The differences in scenic perception of forest visitors through their attributes and recreational activity. *Landscape and Urban Planning*, *75*(1–2), 34–42. https://doi.org/10.1016/j.landurbplan.2004.10.008

Park, B. J., Furuya, K., Kasetani, T., Takayama, N., Kagawa, T., & Miyazaki, Y. (2011). Relationship between psychological responses and physical environments in forest settings. *Landscape and Urban Planning*, *102*(1), 24–32. https://doi.org/10.1016/j.landurbplan.2011.03.005

Park, B. J., Tsunetsugu, Y., Kasetani, T., Kagawa, T., & Miyazaki, Y. (2010). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): Evidence from field experiments in 24 forests across Japan. *Environmental Health and Preventive Medicine*, *15*(1), 18–26. https://doi.org/10.1007/s12199-009-0086-9

Park, B. J., Tsunetsugu, Y., Kasetani, T., Morikawa, T., Kagawa, T., & Miyazaki, Y. (2009). Physiological effects of forest recreation in a young conifer forest in Hinokage Town, Japan. *Silva Fennica*, *43*(2), 291–301. https://doi.org/10.14214/sf.213

Park, B., Tsunetsugu, Y., Kasetani, T., Hirano, H., Kagawa, T., Sato, M., & Miyazaki, Y. (2007). Physiological effects of Shinrin-yoku (taking in the

atmosphere of the forest)—using salivary cortisol and cerebral activity as indicators. *Journal of PHYSIOLOGICAL ANTHROPOLOGY, 26*(2), 123–128. https://doi.org/10.2114/jpa2.26.123

Pratiwi, P. I., & Furuya, K. (2019). The neighbourhood park preferences and its factors among elderly residents in Tokiwadaira, Japan. *Asian Journal of Behavioural Studies*, *4*(16), 64–79. https://doi.org/10.21834/ajbes.v4i16.178

Pratiwi, P. I., Furuya, K., & Sulistyantara, B. (2014). The difference in people's response toward natural landscape between university students of Japan and Indonesia. *Jurnal Manusia Dan Lingkungan*, *21*(2), 247–253. https://doi.org/10.22146/jml.18550

Pratiwi, P. I., Kim, M., & Furuya, K. (2020). Difference in Perception of Urban Green Spaces between Danchi and Apartment Residents in Tokiwadaira, Matsudo City, Japan. *Jurnal Manusia Dan Lingkungan*, *26*(2), 80–90. https://doi.org/10.22146/jml.35608

Pratiwi, P. I., Sulistyantara, B. (2021, December). Manfaat Kesehatan Park Therapy di Kampus IPB Dramaga. Paper presented at Seminar Nasional Penelitian IPB. Abstract retrieved from https://lppm.ipb.ac.id/seminar-nasional-2021/

Pratiwi, P. I., Xiang, Q., & Furuya, K. (2019). Physiological and psychological effects of viewing urban parks in different seasons in adults. *International Journal of Environmental Research and Public Health*, *16*(21), 4279. https://doi.org/10.3390/ijerph16214279

Pratiwi, P. I., Xiang, Q., & Furuya, K. (2020). Physiological and psychological effects of walking in urban parks and its imagery in different seasons in middle-aged and older adults: evidence from Matsudo City, Japan. *Sustainability*, *12*(10), 4003. https://doi.org/10.3390/su12104003

Raviola G., Naslund J.A., Smith S.L., Vikram, P. (2019). Innovative models in mental health delivery systems: Task sharing care with non-specialist providers to close the mental health treatment gap. *Current Psychiatry Reports, 21*(6), 44. https://doi.org/10.1007/s11920-019-1028-x

Richards, D. R., Tunçer, B., & Tunçer, B. (2018). Using image recognition to automate assessment of cultural ecosystem services from social media photographs. *Ecosystem Services*, *31*(2018), 318–325. https://doi.org/10.1016/j.ecoser.2017.09.004

Satria, A., Hidayat, A., & Abdul Haris, A. H. (2021). IPB university's policy of biodiversity's innovation for eco-edutourism. *Journal of Sustainability Perspectives*, *1*(2), 103–107. https://doi.org/10.14710/jsp.2021.11748

Seitz, C. M., Reese, R. F., Strack, R. W., Frantz, S., & West, B. (2014). Identifying and improving green spaces on a college campus: a photovoice study. *Ecopsychology*, *6*(2), 98–108. https://doi.org/10.1089/eco.2013.0103

Shi, J. (2020). New *Methods for Landscape Assessment with Eye-Level Photography: Automated Landscape Classification, View Factors, and Virtual Reality* (Publication No. 109369) [Doctoral dissertation, Chiba University]. Chiba University Repository.

Simonds J.O., Starke, B.W. (2013). *Landscape Architecture: A Manual of Environmental Planning and Design.* New York: Mc-Graw Hill.

Song, C., Ikei, H., Igarashi, M., Miwa, M., Takagaki, M., & Miyazaki, Y. (2014). Physiological and psychological responses of young males during spring-time walks in urban parks. *Journal of Physiological Anthropology*, *33*(1), 8. https://doi.org/10.1186/1880-6805-33-8

Song, C., Ikei, H., Igarashi, M., Takagaki, M., & Miyazaki, Y. (2015). Physiological and psychological effects of a walk in urban parks in fall. *International Journal of Environmental Research and Public Health*, *12*(11), 14216–14228. https://doi.org/10.3390/ijerph121114216

Song, C., Ikei, H., Kagawa, T., & Miyazaki, Y. (2019). Effects of walking in a forest on young women. *International Journal of Environmental Research and Public Health*, *16*(2), 9–13. https://doi.org/10.3390/ijerph16020229

Song, C., Ikei, H., Kobayashi, M., Miura, T., Li, Q., Kagawa, T., Kumeda, S., Imai, M., & Miyazaki, Y. (2017). Effects of viewing forest landscape on middle-aged hypertensive men. *Urban Forestry and Urban Greening*, *21*(2017), 247–252. https://doi.org/10.1016/j.ufug.2016.12.010

Song, C., Joung, D., Ikei, H., Igarashi, M., Aga, M., Park, B. J., Miwa, M., Takagaki, M., & Miyazaki, Y. (2013). Physiological and psychological effects of walking on young males in urban parks in winter. *Journal of Physiological Anthropology*, *32*(1), 18. https://doi.org/10.1186/1880-6805-32-18

Subiza-pérez, M., Vozmediano, L., & San, C. (2020). Welcome to your plaza : assessing the restorative potential of urban squares through survey and objective evaluation methods. *Cities*, *100*(1), 102461. https://doi.org/10.1016/j.cities.2019.102461

Sunarti, E., Fithriyah, A. F., Khoiriyah, N., Novyanti, W., Islamia, I., & Hasanah, V. R. (2022). Portrait of Indonesian family during one year the COVID-19

pandemic: analysis of factors influencing family welfare and resilience. *Journal of Disaster Research*, *17*(1), 31–42. https://doi.org/10.20965/jdr.2022.p0031

Takayama, N., Saito, H., Fujiwara, A., & Horiuchi, M. (2017). The effect of slight thinning of managed coniferous forest on landscape appreciation and psychological restoration. *Progress in Earth and Planetary Science*, *4*(1), 17. https://doi.org/10.1186/s40645-017-0129-6

Tok, E., Agdas, M. G., Ozkok, M. K., & Kuru, A. (2020). Socio-psychological effects of urban green areas: case of Kirklareli city center. *Journal of Contemporary Urban Affairs*, *4*(1), 47–60. https://doi.org/10.25034/ijcua.2020.v4n1-5

Tsunetsugu, Y., Park, B. J., Ishii, H., Hirano, H., Kagawa, T., & Miyazaki, Y. (2007). Physiological effects of Shinrin-yoku (taking in the atmosphere of the forest) in an old-growth broadleaf forest in Yamagata Prefecture, Japan. *Journal of Physiological Anthropology*, *26*(2), 135–142. https://doi.org/10.2114/jpa2.26.135

Urech, P. R. W., Dissegna, M. A., Girot, C., & Grêt-Regamey, A. (2020). Point cloud modeling as a bridge between landscape design and planning. *Landscape and Urban Planning*, *203*(1), 103903. https://doi.org/10.1016/j.landurbplan.2020.103903

Völker, S., & Kistemann, T. (2015). Developing the urban blue: Comparative health responses to blue and green urban open spaces in Germany. *Health and Place*, *35*(1), 196–205. https://doi.org/10.1016/j.healthplace.2014.10.015

Wang, X., Shi, Y., Zhang, B., & Chiang, Y. (2019). The influence of forest resting environments on stress using virtual reality. *International Journal of Environmental Research and Public Health*, *16*(18), 3263. https://doi.org/10.3390/ijerph16183263

Włodarczyk-Marciniak, R., Sikorska, D., & Krauze, K. (2020). Residents' awareness of the role of informal green spaces in a post-industrial city, with a focus on regulating services and urban adaptation potential. *Sustainable Cities and Society*, *59*(1), 102236. https://doi.org/10.1016/j.scs.2020.102236

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